

DISCUSSION PAPER SERIES

No. 3156

**GIVING UP THE SWISS FRANC:
SOME CONSIDERATION ON
SEIGNIORAGE FLOWS UNDER EMU**

Andreas M Fischer, Thomas Jordan
and Caeser P Lack

INTERNATIONAL MACROECONOMICS



Centre for Economic Policy Research

www.cepr.org

Available online at:

www.cepr.org/pubs/dps/DP3156.asp

GIVING UP THE SWISS FRANC: SOME CONSIDERATION ON SEIGNIORAGE FLOWS UNDER EMU

Andreas M Fischer, Schweizerische Nationalbank and CEPR
Thomas Jordan, Schweizerische Nationalbank
Caeser P Lack, Schweizerische Nationalbank

Discussion Paper No. 3156
January 2002

Centre for Economic Policy Research
90–98 Goswell Rd, London EC1V 7RR, UK
Tel: (44 20) 7878 2900, Fax: (44 20) 7878 2999
Email: cepr@cepr.org, Website: www.cepr.org

This Discussion Paper is issued under the auspices of the Centre's research programme in **INTERNATIONAL MACROECONOMICS**. Any opinions expressed here are those of the author(s) and not those of the Centre for Economic Policy Research. Research disseminated by CEPR may include views on policy, but the Centre itself takes no institutional policy positions.

The Centre for Economic Policy Research was established in 1983 as a private educational charity, to promote independent analysis and public discussion of open economies and the relations among them. It is pluralist and non-partisan, bringing economic research to bear on the analysis of medium- and long-run policy questions. Institutional (core) finance for the Centre has been provided through major grants from the Economic and Social Research Council, under which an ESRC Resource Centre operates within CEPR; the Esmée Fairbairn Charitable Trust; and the Bank of England. These organizations do not give prior review to the Centre's publications, nor do they necessarily endorse the views expressed therein.

These Discussion Papers often represent preliminary or incomplete work, circulated to encourage discussion and comment. Citation and use of such a paper should take account of its provisional character.

Copyright: Andreas M Fischer, Thomas Jordan and Caeser P Lack

January 2002

ABSTRACT

Giving Up the Swiss Franc: Some Consideration on Seigniorage Flows Under EMU*

The monetary debate in Switzerland about joining the European Monetary Union (EMU) has primarily focused on the gains in terms of transaction costs and lower uncertainty from using a common currency versus the sacrifice of giving up an independent monetary policy. This Paper considers an additional factor in this debate, namely the decrease of seigniorage for Switzerland in the case of joining EMU. Our calculations reveal that this loss of revenues is not trivial. Swiss currency holdings per capita are among the largest in the world. They are estimated to be 5000 Swiss francs per capita in 2002. If Switzerland joined EMU at that time, about half of the seigniorage stemming from the previous Swiss franc currency circulation would be redistributed among the EMU member countries in the worst case. Our results indicate that Switzerland would be the third largest contributor of seigniorage in absolute terms after Germany and Spain. In relative terms, the Swiss per capita contribution would be more than four times as high as the German contribution.

JEL Classification: E58, E62 and H22

Keywords: seigniorage, Swiss National Bank and the euro

Andreas M Fischer
Schweizerische National Bank
Borsenstrasse 15
Postfach
8022 Zurich
SWITZERLAND
Tel: (411) 631 3294
Fax: (411) 631 3901
Email: fischer.andreas@snb.ch

Thomas Jordan
Schweizerische National Bank
Borsenstrasse 15
Postfach
8022 Zurich
SWITZERLAND

For further Discussion Papers by this author see:
www.cepr.org/pubs/new-dps/dplist.asp?authorid=126190

For further Discussion Papers by this author see:
www.cepr.org/pubs/new-dps/dplist.asp?authorid=152633

Caeser P Lack
Schweizerische National Bank
Borsenstrasse 15
Postfach
8022 Zurich
SWITZERLAND
Tel: (4 11) 631 31 11
Fax: (4 11) 631 39 11
Email: snb@snb.ch

For further Discussion Papers by this author see:
www.cepr.org/pubs/new-dps/dplist.asp?authorid=156841

* The views expressed in this Paper are solely the responsibility of the authors and do not necessarily reflect the views of the Swiss National Bank. This Paper benefited from helpful comments by Niklaus Blattner, Peter Klauser, Ulrich Kohli, Michel Peytrignet, Georg Rich, Jean-Pierre Roth, Enzo Rossi, Umberto Schwarz, Erwin Sigrist, Erich Spörndli, Roland Tornare, Thomas Wiedmer and an anonymous referee.

Submitted 19 December 2001

1. Introduction

In a fiat money system, seigniorage denotes the revenue stemming from the monopolistic right to issue central bank money, i.e., currency and bank reserves. The monetary base is an interest-free credit from the public to the central bank. Seigniorage corresponds to earnings the central bank achieves from this interest-free credit.¹ The central bank usually transfers some of its seigniorage to the government. Seigniorage, however, does not correspond exactly to the amount of central bank profits. The central bank's balance sheet and the size of its assets can be larger than the monetary base so that the central bank profits are potentially higher than actual seigniorage. The assets in excess of the amount of the monetary base are often built up by not transferring all central bank profits to the government.

Transfers of profits from the Swiss National Bank (SNB) have become increasingly important for governmental finances in Switzerland. The SNB appropriated 1.5 billion Swiss francs in recent years to the federal and cantonal governments. This amounted to 1.3% of total government revenue in 1999. While this ratio is comparable to many OECD countries, what is striking, however, is that transfers of profits have only recently become a source of revenue for Swiss governments. The SNB retained most of its seigniorage and earnings until the early 1990s to build up a substantial wealth mostly in the form of international reserves. The size of profit transfers in relation to total government revenue never exceeded 0.02% prior to 1990, allowing the SNB to increase its reserves for market, credit and liquidity risks (hereafter we use the SNB term provisions).

In this paper, we ponder the future evolution of SNB seigniorage flows, i.e., the SNB's income due to interest-free credit in the form of the monetary base. In particular, we ask what would happen to seigniorage flows if Switzerland joined the European Monetary Union (EMU). Although large amounts of money are involved, this question has received little or no public attention. The answer to this question lies partly hidden in the Statute of the European Central Bank (ECB). Seigniorage revenue is redistributed among all EMU member countries according to their respective capital share in the ECB. The capital share is calculated from the country's GDP and population share in the EMU.² It therefore does not take into account the various contributions of the different members to the overall holding of the common currency. The socialization of seigniorage flows under EMU has dire consequences for countries that

¹ For a detailed analysis of seigniorage see Baltensperger and Jordan (1997 and 1998).

² See Article 29 and 32 of the Protocol (No. 18) on the Statute of the European Systems of Central Banks and of the European Central Bank.

operate with large currency holdings. Swiss currency holdings per capita are among the highest in the world.³

Our motivation for the seigniorage question is threefold. First, we feel this question has not received the deserved attention in the Swiss EMU debate. The monetary debate on Switzerland joining EMU has focused primarily on the benefits of an independent monetary policy versus the transaction gains and reduced uncertainty from a common currency. EMU skeptics highlight two arguments that allegedly outweigh the gains from reduced transaction costs. The first is that Europe is not an optimal currency area. This says that the SNB can provide a better policy geared towards the Swiss economy than can the ECB. The diverging inflation and growth rates between peripheral and core EMU countries are often mentioned as examples that one size does not fit all. The second argument points to the interest rate differential between euro and Swiss interest rates. Swiss rates are on average 150 basis points lower than euro rates, a situation that no small EMU member country faced. The loss of this advantage could have financial repercussions for particular sectors of the Swiss economy. The potential loss in wealth through declining real estate prices and the negative impact on business investment are often mentioned. A fast upward pressure of the Swiss interest rate would lead to massive adjustment costs for the Swiss economy.

A second motive for addressing the seigniorage question is to understand how federal and cantonal governments will be affected differently by Switzerland joining EMU and to clarify the economic incentives for the differing state entities regarding EMU membership. Cantonal governments are the main beneficiaries of central bank profit transfers. So far, they have received two thirds of these transfers, yet the total income of all cantonal governments is only 20% larger than the federal government's revenue. This suggests that the economic costs arising from seigniorage loss through EMU membership are potentially smaller for the federal government than the cantonal governments.

The third motivation is to expand on the studies by Bini Smaghi and Gros (2000) and Sinn and Feist (1997). They calculate the distribution of seigniorage for EMU-11 member countries. Their results show that the socialization of seigniorage benefits countries that operated with low currency ratios prior to EMU entry. Countries such as Finland, France, and Portugal gained from EMU entry, whereas Germany and Spain lost. Our analysis limits itself

³ A large share of Swiss banknotes is presumably held abroad. Unlike studies by Porter and Judson (1996) for the United States and Seitz (1995) for Germany, there is no formal study for Switzerland that attempts to measure the share of banknotes held abroad.

not only to the present EMU-12 members but also considers the impact of potential future EMU entrants besides Switzerland.

The paper's roadmap is as follows. Section 2 reviews past SNB seigniorage flows and transfers to the government. In particular, the unusual size of Switzerland's currency ratio and the increasing reliance of Swiss federal and cantonal governments on central bank transfers as a share of government finance are documented. Section 3 presents calibrated estimates of seigniorage flows under various assumptions regarding EMU entry. Section 4 considers various policy issues concerning the EMU debate. Section 5 concludes.

2. Seigniorage Flows and SNB Transfers

Seigniorage is usually only a minor source of government revenue in low-inflation countries. On average, seigniorage revenues in the member countries of the European Union (EU) in 1998 were 0.35% of GDP, ranging from 0.16% for Luxembourg to 0.67% in Greece. While a substantial part of this revenue is usually transferred to the government, the remaining seigniorage serves to feed central bank provisions and to finance central bank operations. Seigniorage can be considered as a constant source of income to the state. Although small in relation to GDP, the discounted value of future seigniorage revenues can amount to a considerable sum. Figure 1 plots the evolution of the annual transfers of the SNB to Swiss governments and two theoretical measures of seigniorage between 1958 to 1999. Table 1 presents the same information expressed as shares of GDP averaged over several subperiods. The first measure of seigniorage is commonly referred to as the opportunity cost seigniorage. It is constructed by multiplying the three-month Libor (as a proxy for the return on the SNB's portfolio) with the (annual average) monetary base. The second measure, known as monetary seigniorage, is defined as the change in the (annual average) monetary base. The two measures are the same only when the nominal interest rate equals the growth of the monetary base. Central bank profits include - beside seigniorage - earnings from assets which are not financed through the monetary base but rather through equity and provisions for credit, market and liquidity risk. The profits are also influenced by price changes in the central banks assets. Transfers to the government are the difference between retained earnings for building up provisions and central bank profits.

[Table 1 about here]

Figure 1 and Table 1 demonstrate that seigniorage and transfers from the central bank to the government can differ substantially. The SNB started to make sizeable transfers to the federal and cantonal governments in 1992 (for its fiscal year 1991). Before this date, the SNB retained the lion's share of its profits. Since then the size of the SNB transfers has been increasing in trend. As of 1998, the SNB annual transfers have been set to 1.5 billion Swiss francs. The annual transfer payment is not based on net revenue (i.e. the difference between the return on SNB assets and its operating expenses) of the corresponding business year as is the case for most central banks. The SNB retains profits in order to build up international currency reserves. The size of the increase in currency reserves depends on the average nominal GDP growth over the preceding five years. Every five years the SNB and the finance department negotiate an agreement concerning the transfer of profits depending on expected earnings and the need to increase currency reserves. The transfers are held constant during the time of the agreement with the aim of facilitating the budget process of the confederation and the cantons.

[Figure 1 about here]

From Figure 1, it is evident that the two seigniorage measures fluctuate considerably. Opportunity cost seigniorage is dependent on the size of the monetary base and of interest rate swings.⁴ In the first half of the 1990s, short-term interest rates were high as the SNB was pursuing a tight monetary policy to combat inflation. This yielded seigniorage revenue of 0.56% of GDP. In the second half of the 1990s, the tide changed as the three-month Libor averaged only 1.3% in an environment marked by low real growth and low inflation. During this period opportunity cost seigniorage declined to 0.11% of GDP.

Monetary seigniorage exhibits sharper fluctuations than opportunity cost seigniorage. Three monetary decisions, influencing sharp changes in the monetary base, stand out. The breakup of the Bretton Woods System, which spawned an appreciating Swiss franc, produced an increase in the money supply in 1971. The brief period of exchange rate management in late 1978 and early 1979 resulted in an increase of over 5 billion Swiss francs in the monetary base followed by its near equivalent reduction in the course of 1979 when the SNB resumed its policy of monetary targeting. In 1988, the lowering of the liquidity requirements combined

⁴ Note that the opportunity cost concept of seigniorage is a more complete concept than the monetary concept. See Baltensperger and Jordan (1997).

with the introduction of the Swiss Interbank Clearing System (SIC) reduced the demand for giros, i.e. sight deposits of commercial banks at the SNB. The monetary base, in turn, fell by over 2 billion Swiss francs in 1988. These abrupt swings in the monetary base suggest that the monetary concept may not be a good indicator of the actual seigniorage flow, particularly because the SNB transfers income stemming from interest bearing assets to the government rather than handing over the newly printed banknotes to the government for free.

To understand the recent importance of SNB transfers and the consequences of seigniorage for Swiss government finances, Figure 2 plots the corresponding transfers as a share of three measures of government revenue: total government revenue (federal and cantons), federal government revenue, and cantonal government revenue. These ratios tended to increase during the last decade. Before 1990, they never exceeded 0.02%. The figure reveals that cantonal governments are more dependent on SNB transfers than is the federal government, because they receive two thirds of SNB transfers, whereas the federal government receives only a third. In the last three years, SNB transfers to the cantons averaged just under 2% of cantonal financing, whereas the same average of transfers to the federal government was 0.8% for federal finances. To what extent the SNB transfers to the federal and cantonal government are influenced under EMU is investigated in the next section.

[Figure 2 about here]

3. Seigniorage Flows under EMU

Some Preliminaries

EMU seigniorage revenue is socialized among its members. Article 32 of the *Protocol on the Statute of the European System of Central Banks (ESCB) and of the European Central Bank* states that monetary income of participating national central banks, i.e. seigniorage, is distributed according to the respective capital share of the ECB. The capital share is calculated as the average of the population share and the GDP share of the respective member state in the overall population and overall GDP of all EMU participants.⁵

⁵ Article 29.1 of the Protocol on the Statute of the European System of Central Banks and of the European Bank states: *When in accordance with the procedure referred to in Article 123(1) of this Treaty the ESCB and the ECB have been established, the key for subscription of the ECB's capital shall be established. Each national central bank shall be assigned a weighting in this key which shall be equal to the sum of:*

To analyze the impact of EMU on Swiss seigniorage, it is important to understand the effects of EMU membership on the balance sheet and the income derivation of national central banks within the European System of Central Banks. National central banks will continue to issue banknotes and bank reserves and these items will continue to be liabilities of the national central banks. However, the income from assets held against these liabilities, i.e., the so-called monetary income or seigniorage, is pooled and redistributed among the EMU members. The national central banks can deduct interest paid for the remuneration of bank reserves from monetary income. At Stage Two of EMU, the ECB decided that the monetary income is only derived from assets held against bank reserves.⁶ Since the reserve requirements are remunerated, monetary income for redistribution was extremely low during this phase and the countries kept most of their national seigniorage. With Stage Three, however, monetary income will be also derived from banknote issuance and consequently, all the seigniorage will be redistributed.

The ECB has recently decided on the method used to compute monetary income. To comply with the Statute of the ESCB and of the ECB, a direct method consisting in the summation of all earnings from the earmarked assets held against banknotes and bank reserves is applied. However, only certain types of assets are taken into account for computing the monetary income. If the amount of these assets is smaller than the amount of issued banknotes and bank reserves, the monetary income for this difference is computed by applying a reference interest rate. All interest payments on monetary liabilities can be deducted. To cushion the decrease of seigniorage for some countries, the ECB agreed to a transition period until 2007 where the previous level of seigniorage is gradually decreased.⁷

An indirect method can be applied to approximate monetary income in analytical work. This method computes monetary income by multiplying the monetary assets by a reference interest rate and corresponds to the opportunity cost concept of seigniorage. In practice, the indirect method should not differ substantially from the size of monetary income

- 50% of the share of its respective Member State in the population of the Community in the penultimate year preceding the establishment of the ESCB;

- 50% of the share of its respective Member State in the GDP at market prices of the Community as recorded in the last five years preceding the penultimate year before the establishment of the ESCB.

Article 29.3 plans for periodical updates of capital shares. *The weightings assigned to the national central banks shall be adjusted every five years after the establishment of the ESCB by analogy with the provisions laid down in Article 29.1*

⁶ See ECB annual report 1999, footnote on page 159.

⁷ The final decision of the ECB on the distribution of monetary income was made on December 6, 2001. See the press release under www.ecb.int "Decisions on the issue of euro banknotes and on the allocation of monetary income".

computed by the ECB's direct method. In analyzing the redistribution of Swiss seigniorage, we thus have to concentrate on the impact of EMU membership on the base for generating seigniorage for Switzerland and on the relevant interest rate and interest rate differentials measuring the income from this base. Since reserve requirements are remunerated in the EMU and excess reserves are small, monetary income can be approximated by concentrating on currency holdings as the base for generating seigniorage and neglecting bank reserves altogether.

[Table 2 about here]

Table 2 shows the currency holdings per capita for Switzerland and the 15 EU countries in 1999. The differences are pronounced. The Swiss currency holding of 3'129 euro per capita is much larger than that of any European country. If one looks at the ratio of currency to GDP that is shown in Figure 3 one obtains a similar picture. Only Spain has a higher ratio than Switzerland. The figure also shows that there is no trend for diminishing currency circulation in Switzerland over the last 10 years. Since the impact of an EMU membership of Switzerland on Swiss seigniorage depends crucially on the size of currency circulation in Switzerland relative to the currency circulation of other member countries, these numbers give an indication of the potential loss for Switzerland. This point is elaborated next in greater detail.

[Figure 3 about here]

Two Scenarios

To estimate more precisely the amount of seigniorage that Switzerland could potentially lose from EMU entry several assumptions need to be made. To keep the calculations simple, only two scenarios are discussed in detail. The first depicts the hypothetical case of Switzerland joining EMU at the beginning of 2002. In this scenario the EMU members are the original EU-11 members plus Greece. For this scenario, we abstract from the rules applied during the transition period, which mitigate seigniorage redistribution among EMU members until 2007. The second scenario calculates Switzerland's lost seigniorage under the assumption that it enters EMU at the beginning of 2010. This is con-

sidered to highlight certain issues regarding the timing of EMU entry. In the second scenario, EU candidates from Eastern Europe as well as the three EMU outsiders (i.e. UK, Denmark, and Sweden) will simultaneously join EMU in 2010. We assume that EMU currency circulation corresponds to the sum of the currency holdings of the existing member countries prior to Stage Three and those of the potential member countries prior to entry. Our assumptions regarding currency, exchange rates and real output growth are discussed in the Appendix.

Our seigniorage estimates are based on currency in circulation and not on the monetary base, which includes reserves of the banking sector. As explained above, this assumption can be made because required reserves in EMU are remunerated at a level corresponding to the average repo rate of the Eurosystem. Upon joining EMU, Switzerland, which currently does not remunerate its reserves, would also have to pay interest on its required reserves. The transition to the remuneration of reserves will entail a wealth transfer from the central bank to the private banking sector inside Switzerland. As we are only interested in the transfers between Switzerland and the EMU, reserves are excluded from the calculations.

Our calculations reveal that the seigniorage loss is considerable regardless of the scenario. Switzerland's legal share of the euro currency base would correspond to about one half of its current currency circulation. Switzerland would thus lose a base in the order of 13 billion euro to generate seigniorage. Aside from Switzerland other losers of EMU seigniorage redistribution are Germany, Spain and Austria. However, the Swiss contribution per capita would be more than four times larger than any other country's contribution.

[Table 3 about here]

Table 3 summarizes the seigniorage results under the assumption that Switzerland joins EMU in 2002. All values are for 2001 and expressed in billion euro.⁸ The first column presents the currency circulation for each country before EMU entry. In absolute terms, Switzerland's currency base is the fifth largest after Germany, Italy, Spain and France. The second column calculates the absolute currency share upon EMU entry, i.e., the national share

⁸ See the Appendix for details about the derivation of these values.

of total EMU currency implied by the country's share of the ECB capital.⁹ These currency shares in column (2) form the basis for seigniorage flows to the member countries. Switzerland's share of EMU currency after this readjustment is now only the seventh largest.

The simplest approach in picking the winners and losers consists in subtracting the first column from the second. Their difference, presented in the third column, gives the entry loss or gain for the individual members in terms of the change in the share of currency circulation, i.e., in the base for generating seigniorage income. Positive values denote winners, negative figures denote losers. Sinn and Feist (1997) interpret the entry losses or gains from EMU's socialization of seigniorage as a zero sum game.¹⁰ The entry cost of Switzerland joining EMU – measured as the loss in the base to generate seigniorage - would have constituted 12.73 billion euro (about 20 billion Swiss francs). The lost seigniorage listed in column (3) represents almost half of its currency in circulation. In absolute terms, the sum is smaller than Germany's loss, which amounts to 31.6 billion euro. In relative terms on the other hand, this corresponds to a per capita loss of 1'743 euro (or about 2700 Swiss francs) compared to a per capita loss of only 380 euro for Germany (see the fifth column). Other large per capita contributors are Austria and Spain. The Swiss contribution per capita, however, would be four times larger than any other country's contribution. By far the largest winner is France, which gains 38.2 billion euro: a result consistent with Bini Smaghi and Gros (2000) and Sinn and Feist (1997). Apart from France, also Luxembourg, Finland and Portugal gain. The fourth column shows the gains or losses in relation to the currency base before EMU.

One of the weaknesses of our first approach is that it does not take into account interest rates. Furthermore, it does not consider the interest rate differential between Switzer-

⁹ Remember that the share on the ECB capital depends on the country's GDP and the population weight. The ECB decided on December 6, 2001 that the ECB will issue 8 percent of the banknotes for generating income for its own. We have not incorporated this in our cost calculations in order to simplify the discussion.

¹⁰ Under the naive assumption that nothing will change (i.e. the future currency base and the interest rate remain constant), Sinn and Feist (1997) interpret the size of the currency base as being equivalent to the present value stream of future seigniorage flows. Since the interest rate for computing seigniorage flows is the same as the interest rate for discounting future flows, Sinn and Feist (1997) argue that their "stock concept of seigniorage" does not depend on the interest rate chosen as long as it is constant over time. It is important to note, however, that the "stock concept" only defines the current base for generating seigniorage. It does not in a general sense compute the present value of all future seigniorage flows under the assumptions of constant nominal interest rates and a constant real currency circulation and thus under the assumption of constant real seigniorage flows (constant real opportunity cost seigniorage). Except for the case of zero inflation, the concept of Sinn and Feist (1997) implies an eroding real value of the currency base and the real seigniorage flows over time.

land and the euro area and assumes that Swiss interest rates are the same as the euro rates when calculating Switzerland's entry cost. However, these factors are crucial for computing the actual flow of seigniorage. An extended approach to measure the potential loss for Swiss seigniorage by taking into account interest rates. Yet, we continue to assume that the demand for currency is interest rate inelastic and the exchange rate is constant.

Column six of Table 3 measures the opportunity cost seigniorage if Switzerland does not join EMU in 2002. This flow measure uses a reference interest rate of 5.5% multiplied by the corrected currency share for the EU-12 countries and a reference interest rate of 4.0% for Switzerland if it stays outside. We assume that Switzerland continues to maintain its current interest rate differential of 1.5 percentage points if it stays outside of EMU. Seigniorage revenue based on currency would amount to one billion euro if Switzerland remains outside.

The seigniorage flow if Switzerland were to join EMU in 2002 is given in the seventh column. This measure multiplies the currency share of column (2) with the reference rate of 5.5% for the euro area. The difference of the seigniorage flows yields the annual seigniorage loss or gain for the respective countries if Switzerland were to join EMU. This difference is given in column (8). Switzerland's annual loss amounts to 313 million euro.

Our calculation of Switzerland's seigniorage loss is heavily dependent on the reference rates. Two issues need to be considered: the level of the reference rate for the euro area and the size of the interest rate differential. The implications of the latter are such that large interest rate differentials offset the lost seigniorage upon entry. If the interest rate differential collapses and the two reference rates are at 5.5%, then Switzerland's annual seigniorage loss increases to 700 million euro. On the other hand if Switzerland has an interest rate differential of 2.75 percentage points, then there is no seigniorage loss for Switzerland. In either case the euro area benefits in that its currency base is expanded by 25.8 billion euro.

The level of the euro's reference rate is also important because it has a bearing on the interest rate differential required to achieve a neutral result for EMU entry. A lower reference rate for the euro area reduces the interest rate differential needed to mitigate Switzerland's entry loss. Figure 4 demonstrates in the form of isoprofit lines the relation between the level of the euro interest rate, the interest rate differential and the annual seigniorage loss.

This exercise yields two general results. First, for a given euro interest rate, Switzerland's loss of seigniorage decreases with an increasing spread between euro and Swiss rates. The higher the interest rate differential, the larger is the compensation from the smaller Swiss share of the euro currency base. Second, for a given interest rate spread, Switzerland's

seigniorage loss increases with interest rates. The higher the return, the bigger is the loss from a smaller currency base.

[Table 4 about here]

Table 4 shows the intra-EMU transfers if Switzerland, Denmark, Sweden, the UK and all candidates from Eastern Europe were members by 2010. Due to the relatively large share of low-income countries, the entry cost for Switzerland – again measured as the loss in the base to generate seigniorage - increases from 12.73 billion euro (4.6% of GDP in 2001) to 17.48 billion euro (5.6% of GDP in 2010). The loss in annual seigniorage flow under the assumptions of an euro reference rate of 5.5% and an interest rate differential of 1.5 percentage points increase to 525 million euro. There is now a large net transfer from the EU-12 countries mainly to the UK (due to its low currency ratio) and to Turkey (due to its high population). Again, Switzerland is by far the largest per capita contributor. Another large per capita contributor is Malta, which has an exceptionally high currency ratio. Most of the candidate countries are large per capita winners.

4. Policy Considerations

This section considers various policy issues that could further influence the outcome of our estimates next to the assumptions made in the previous section. We begin with the complex issue of the euro as a currency in 2002.

Preparation for the changeover to the euro in 2002

Euro banknotes and coins are introduced on January 1, 2002. In most participating countries, the “dual circulation period” lasts four to eight weeks. After this narrow transition period, national banknotes and coins cease to be legal tender. National currencies can still be exchanged free of charge at the respective country's central banks. It is suspected that a considerable share of the national currencies of EMU members, especially D-marks, is circulating outside the euro area. These foreign holders of D-marks will seek to exchange their money holdings before January 1, 2002. Money from the shadow economy, used to evade taxes, will also resurface. Instead of queuing up for the unfamiliar euro or risking the scrutiny of fiscal authorities for transactions greater than 30'000 DM, individuals may switch

to alternative hard currencies. The US dollar and possibly the Swiss franc stand to benefit. If this were to be true, the seigniorage base will increase in both countries. In terms of the 2010 scenario, the entry cost for Switzerland would increase.¹¹

The potential substitution from D-marks to Swiss francs is more likely if storage or transportation considerations are important for the foreign currency holder. The highest denomination of the US dollar is the 100 note and of the euro is the 500 note. Yet the 1000-franc note retains the highest value, equaling 600 US dollars or 670 euros. If the Swiss franc proves popular as a store of value or as a means of payment for durable consumer goods, the substitution into Swiss francs could be permanent. Such behavior could come into play if transaction costs are perceived to be high or the euro suffers from logistical problems.¹² A further advantage of the Swiss franc as a means of hoarding lies in its tendency to appreciate against other currencies.

Indirect evidence of the importance of 1000-franc notes for the seigniorage calculation is shown in Figure 5. More than half of the seigniorage revenue stems from 1000-franc notes. In 2001, the annual average of the nominal value of 1000-franc notes was close to 18 billion Swiss francs, whereas the annual average of the nominal value of the remaining denominations stood at slightly above 15 billion Swiss francs. The difference between the trends of the two groups of notes is striking. Annual growth of the 1000-franc notes averaged 7% since 1997, whereas growth of the non 1000-franc notes was 0.5%.

[Figure 5 about here]

Euroization

An alternative strategy to EMU entry is to euroize the Swiss economy or to independently replace the Swiss franc with the euro. This strategy has been considered by several Eastern European countries to ensure policy discipline and to reduce the vulnerability against

¹¹ Note the direction of this result is also true even if some of the D-marks are exchanged only for U.S. dollars. This reduces the currency base of the euro, while that of the Swiss franc remains unchanged. For the calculation of seigniorage redistribution we extrapolated the currency holdings based on 1993-1998 data. If the recent surge in the Swiss currency holding turns out to be permanent, the loss for Switzerland would be larger than calculated in the 2010 scenario.

¹² Concerns have been voiced in *Neuer Zürcher Zeitung* "Welteke wirbt in Russland um Vertrauen in den Euro: Skepsis vor dem Ersatz der D-Mark".

a speculative attack.¹³ The strategy represents a quick fix solution, because it does not require qualification for joining EMU or does not seek coordination with its issuer. It is, however, only a second best solution to a multilateral solution. Not only would the national central bank have no say in European monetary affairs, the SNB under its current monetary regime would also have to give up its function as lender of last resort and would lose all seigniorage.

One possible motivation why Switzerland may consider the unilateral strategy is that it does not want to enter the EU because of political or fiscal reasons, yet it might be willing to accept the euro on the belief that the economy is part of an optimal currency area. The immediate benefits of euroization are reduced transactions costs with its European partners. In its report *One Market, One Money* (European Economy 1990), the Commission of the European Communities estimated the permanent flow of exchange transactions costs savings at about 0.5% of GDP. Such arguments were also put forward by Frey (2001).

The benefits from transaction saving, however, do not seem to overwhelm the seigniorage loss from euroization. The average annual seigniorage from 1958 to 1999 was 0.5% of GDP under the opportunity cost concept and 0.6% of GDP under the monetary concept.¹⁴ In more recent years the averages have fallen because of increased financial innovation and Switzerland's peculiar low interest rate environment of the 1990s. A shorter ten-year average still yields 0.3% for the opportunity cost measure, while the monetary measure falls to 0.1%. These calculations suggest that the possible benefits of euroization through reduced transaction costs are almost offset by seigniorage revenue alone.¹⁵

Renegotiating seigniorage

The distribution of seigniorage can be a relevant factor for the possible success of EMU as an institution. Higher seigniorage transfers to some countries can compensate them for other costs and loss of influence. Alternatively, countries with a loss of seigniorage income can ask for compensation elsewhere or greater political influence in the system.¹⁶

¹³ Bulgaria, Estonia, and Kosovo operate with a currency board linked to the D-mark. The D-mark is presently used as legal tender in Montenegro. See also Dooley (1998) for transitional issues to full monetary union.

¹⁴ See Table 1.

¹⁵ Note that no seigniorage loss would occur if a currency board were implemented in Switzerland. However, with a currency board, the savings of transactions costs would be very limited and similar to the ones of a fixed exchange rate system.

¹⁶ An example can be found in Casella (1992), where a bargaining model is developed so that seigniorage transfers are a negotiated outcome in resolving alternative conflicts. If policy decisions at the ECB are dominated by the largest economies, then Casella (1992) predicts that a small country is unwilling to participate unless it

Whether the high entry costs would entitle Switzerland to greater powers (e.g. ECB directorship positions reserved for Swiss citizens) within the ECB is questionable. The recognition of Switzerland's high entry costs could be offset in lower fiscal transfers in other areas. However, before this can take place, Swiss delegates need to be prepared and make this point at the bargaining table before they are willing to yield on other concessions.

Cantons versus the Federal Government

The reduction in seigniorage revenue from EMU could spawn intra-governmental tensions, because the cantonal governments are affected disproportionately. Figure 2 showed that the cantonal governments are more dependent on seigniorage revenue than is the federal government. In order to quantify the losses for the cantons, we look at the scenario of Switzerland joining EMU at the beginning of 2002. Again the hypotheses about the interest rate and the differential between Swiss franc and euro rates are crucial. In Table 5, we quantify these losses for different combinations of interest rates and interest rate differentials. For instance, if the euro interest rate is 5.5% and the interest rate differential is 1.5 percentage points, the loss for the cantons would amount to 0.21 billion euro and the loss to the federal government would amount to 0.10 billion euro (totalling 0.31 billion euro). Although cantonal governments enjoy the privilege of receiving SNB transfers, they will not be directly involved in EMU negotiations. In other words, the fate of their reduced revenue lies in the hands of the federal government. Moreover, the federal government possesses a greater array of indirect taxes to make up for the lost revenue. In fact, the VAT would have to increase to 15% in case Switzerland were to join the EU and EMU. Thus, EMU would have clear implications for the fiscal equilibrium in Switzerland. Either the cantons would have to increase direct taxes or federal tax income would have to be redistributed to the cantons. The latter would further weaken the fiscal positions of the cantons relative to the federal government. Consequently, it can be expected that cantonal governments have a greater preference for maintaining the status quo than does the federal government.

[Table 5 about here]

can secure influence that is more than proportional to its size and a transfer of seigniorage revenues in its favor.

5. Conclusions

The aim of this paper is to estimate the seigniorage loss if Switzerland were to join EMU. It is clear that the impact on seigniorage will and should not be the deciding factor for Switzerland's entry into EMU. Rather our intention is to highlight what we feel is a neglected issue in the EMU debate for Switzerland. Previous arguments have concentrated primarily on the interest rate differential or currency area arguments. Our intention is to expand the EMU debate in two dimensions.

The first direction is the recognition that Switzerland incurs a reduction in future seigniorage revenue through EMU membership, while at the same time its entry brings benefits for EMU members. Our calculations reveal that Switzerland's seigniorage loss stemming from EMU entry is not trivial. Due to the role of the Swiss currency as an international means of transaction and store of value, Swiss currency holdings per capita are among the largest in the world. They are estimated to be 5'000 Swiss francs in 2002. If Switzerland were to join EMU at that time, about half of its base for generating seigniorage income would be redistributed among the EMU member countries in the extreme. Our results indicate that Switzerland would be the third largest contributor of seigniorage within the Eurozone in absolute terms after Germany and Spain. In relative terms, the Swiss per capita contribution would be more than four times as high as the German contribution. This unfavorable outcome for Switzerland needs to be discussed as a separate issue on the agenda if negotiations were to begin.

The second direction considers the potential intra-government conflicts that may arise through the lower revenue from EMU seigniorage. In terms of the seigniorage question, it was argued that the federal government has a lesser incentive to stay out of EMU than do the cantonal governments. The federal government is not as dependent on seigniorage revenue as are the cantonal governments. Moreover, the federal government possesses a wider range of tax instruments than do the cantonal governments to make up the lost revenue.

It is clear that our seigniorage estimates for Switzerland depend heavily on a series of assumptions. Despite their influence, certain generalizations can be made about the size of the loss of seigniorage. First, a unilateral decision on the part of the Swiss government to euroize Switzerland is the most costly strategy. Second, for a given euro rate, potential seigniorage losses increase (decrease) with a decreasing (increasing) interest rate differential. For a given interest rate differential, the seigniorage losses increase (decrease) with increasing (decreasing) euro and Swiss rates. Third, the entry of Eastern European countries increases Switzerland's seigniorage loss. At minimum we find that - independent of almost any

assumptions made - Switzerland will have to reckon with significantly lower seigniorage if it were to join EMU.

Appendix

To calculate each country's capital share for the scenarios 2002 and 2010, several assumptions concerning GDP and currency circulation are required. Population data is taken from the U.S. Census International Database (2000). Data for GDP, currency in circulation, and exchange rates is taken from the IMF database. GNP figures for the Eastern European candidate countries are taken from the World Bank's World Development Report (2000).

For the first scenario (Switzerland joining in 2002), the 1999 GDP of EMU member countries is converted into euro at their respective parities. Swiss GDP in 1999 is converted in euro at a rate of 1.60. Danish, Swedish and UK GDP are converted into euro using end of period exchange rates for 1999. For the second scenario (Switzerland joining in 2010), Swiss GDP in 2000 is converted at a rate of 1.54 CHF per euro.

Real GDP for the EU-15-countries and Switzerland is assumed to grow at annual rates equal to the average rate from 1978 to 1998. The 1999 GNP figures of the candidate countries (except Malta and Cyprus) is an average of GNP measured at end of year exchange rates and GNP measured at PPP parities. The 1999 GDP figures for Malta and Cyprus are converted using end of 1999 exchange rates. Real GDP growth is assumed to be 3% for all candidate countries. The 1999-2004 currency ratios for Switzerland and the EU-15 are a trend based on an OLS-estimate for the 1993-1998 period. After 2004 the currency ratios are assumed to be constant. Since the currency ratios for the candidate countries are highly unstable, we assumed that these ratios converge to a mean of 5.9% by 2020.

References

- Baltensperger, Ernst and Thomas J. Jordan (1997). "Principles of Seigniorage," *Swiss Journal of Economics* 133(2): 133-151.
- Baltensperger, Ernst and Thomas J. Jordan (1998). "Seigniorage and the Transfer of Central Bank Profits to the Government," *Kyklos* 51(1): 73-88.
- Bini Smaghi, Lorenzo and Daniel Gros (2000). *Open Issues in European Central Banking*, MacMillan Press.
- Casella, Alessandra (1992). "Participation in a Currency Union," *American Economic Review* 82: 847-863.
- Chang, Roberto (2000). "Dollarization: A Scorecard," *Federal Reserve Bank of Atlanta Economic Review* 85(3): 1-11.
- Commission of the European Communities (1990). "One Market, One Money: An Evaluation of the Potential Benefits and Costs of Forming an Economic and Monetary Union", *European Economy* 44.
- Dooley, Michael (1998). "Speculative Attacks on a Monetary Union?," *International Journal of Finance and Economics* 3(1): 21-26.
- Frey, Bruno S. (2001). "Wir sollten den Euro übernehmen!," *Cash* 31.8.2001.
- Guidotti, Pablo and Carlos A. Rodriguez (1992). "Dollarization in Latin America: Gresham's Law in Reverse?," *IMF Staff Papers* 39: 518-544.
- Neue Zürcher Zeitung (2001). "Welteke wirbt in Russland um Vertrauen in den Euro: Skepsis vor dem Ersatz der D-Mark," 28.03.01: 19.
- Porter Richard D. and Ruth. A. Judson (1996). "The Location of US currency: how much is abroad?" *Federal Reserve Bulletin*; 82(10), 883-903.
- Rogoff, Kenneth (1998). "Blessing or curse? Foreign and Underground Demand for Euro Notes," *Economic Policy* 26: 261-290.
- Seitz, Franz (1995). "The Circulation of the Deutsche Mark Abroad," Discussion Paper, Deutsche Bundesbank.
- Sinn, Hans-Werner and Holger Feist (1997). "Eurowinners and Eurolosers: The Distribution of Seigniorage Wealth in EMU," *European Journal of Political Economy* 13(4): 665-89.

Table 1. Seigniorage Measures

Average years	SNB payment to Treasury	Opportunity cost seigniorage ($i*H$)	Monetary seigniorage (ΔH)
1980-1984	0.0000	0.0073	0.0025
1985-1989	0.0000	0.0052	-0.0007
1990-1994	0.0014	0.0056	0.0000
1995-1999	0.0026	0.0011	0.0024
1958-1999	0.0005	0.0049	0.0063
1990-1999	0.0020	0.0032	0.0012

Note: Amounts are Swiss francs divided by GDP. SNB transfers are taken from the SNB's annual reports, H is the annual average of the monetary base, i is the yield on the three-month Libor.

Table 2. Currency per Capita and per GDP for EU-15 and Switzerland

Country	Currency per capita in euro	Currency as fraction of GDP	Country	Currency per capita in euro	Currency as fraction of GDP
Switzerland	3'129	9.32%	Sweden	998	3.83%
Germany	1'716	7.15%	Denmark	919	2.97%
Austria	1'737	7.15%	France	753	3.30%
Spain	1'416	10.11%	Greece	655	6.19%
Netherlands	1'222	5.16%	Finland	593	2.52%
Belgium	1'259	5.50%	UK	513	2.12%
Italy	1'155	6.00%	Portugal	490	4.59%
Ireland	1'118	4.78%	Luxembourg	374	0.89%

Note: Currency is banknotes in circulation (i.e. currency minus vault cash). Euro at 1999 exchange rates.

Table 3. EMU Seigniorage Distribution with and without Switzerland in 2002 (EU-12 and Switzerland)

Country	Currency base before EMU (1)	Currency share after EMU entry (2)	Gain (+) or loss (-) under the stock approach (3)	Relative gain or loss (stock approach) (4)	Gain or loss per capita (stock approach) (5)	Seigniorage flow without Switzerland in the EMU (6)	Seigniorage flow with Switzerland in the EMU (7)	Difference in seigniorage flow with Switzerland's entry (8)
Austria	15.48	11.89	-3.59	-23.2%	-439	0.63	0.65	0.020
Belgium	13.58	14.52	0.95	7.0%	92	0.77	0.80	0.025
Finland	3.26	7.62	4.36	133.9%	841	0.41	0.42	0.013
France	45.56	83.77	38.21	83.9%	639	4.46	4.61	0.144
Germany	150.57	118.93	-31.63	-21.0%	-380	6.34	6.54	0.204
Greece	7.07	10.88	3.81	53.9%	358	0.58	0.60	0.019
Ireland	4.69	5.66	0.97	20.8%	251	0.30	0.31	0.010
Italy	71.32	74.85	3.53	4.9%	61	3.99	4.12	0.128
Luxembourg	0.15	0.90	0.75	504.2%	1'683	0.05	0.05	0.002
Netherlands	18.07	23.29	5.22	28.9%	325	1.24	1.28	0.040
Portugal	4.75	10.35	5.60	118.0%	555	0.55	0.57	0.018
Spain	60.79	45.34	-15.45	-25.4%	-386	2.42	2.49	0.078
EU-12	395.27	407.99	12.73	3.22%	42	21.74	22.44	0.700
Switzerland	25.82	13.10	-12.73	-49.3%	-1'743	1.03	0.72	-0.313

Note: Details of the calculation can be found in the Appendix. All values except column (4) and (5) are in 2001 billion euro. Column (5) is in 2001 euro. Positive figures denote net winners, negative figures denote net losers. The reference rates are 5.5% for EMU members and 4.0% for Switzerland when it is not an EMU member.

Table 4. EMU (EU-12 plus all Future Candidates) Seigniorage Distribution with and without Switzerland in 2010

Country	Currency base before EMU (1)	Currency share after EMU entry (2)	Gain (+) or loss (-) under the stock approach (3)	Relative gain or loss (stock approach) (4)	Gain or loss per capita (stock approach) (5)	Seigniorage flow without Switzerland in the EMU (6)	Seigniorage flow with Switzerland in the EMU (7)	Difference in seigniorage flow with Switzerland's entry (8)
Bulgaria	2.62	4.70	2.08	79.4%	297	0.251	0.258	0.008
Cyprus	0.80	0.76	-0.04	-5.1%	-50	0.040	0.042	0.001
Czech Rep.	8.39	8.67	0.29	3.4%	28	0.463	0.477	0.014
Estonia	0.72	1.03	0.32	44.2%	230	0.055	0.057	0.002
Hungary	6.88	8.03	1.15	16.6%	117	0.429	0.442	0.013
Latvia	1.14	1.58	0.44	38.7%	196	0.084	0.087	0.003
Lithuania	1.45	2.49	1.05	72.1%	294	0.133	0.137	0.004
Malta	0.87	0.36	-0.51	-58.9%	-1'216	0.019	0.020	0.001
Poland	18.89	29.07	10.18	53.9%	263	1.552	1.599	0.047
Rumania	5.27	14.70	9.43	178.9%	430	0.784	0.808	0.024
Slovakia	3.37	4.25	0.88	26.2%	161	0.227	0.234	0.007
Slovenia	1.57	1.94	0.36	23.1%	186	0.103	0.106	0.003
Turkey	16.60	49.89	33.29	200.5%	454	2.663	2.744	0.080
Denmark	6.95	8.62	1.67	24.1%	306	0.460	0.474	0.014
UK	31.69	82.02	50.33	158.8%	830	4.379	4.511	0.131
Sweden	9.65	12.21	2.56	26.5%	288	0.652	0.671	0.020
EU-12	465.72	369.74	-95.97	-20.6%	-57	19.743	20.336	0.593
Switzerland	29.12	11.64	-17.48	-60.0%	-2'367	1.165	0.641	-0.525

Note: Details of the calculation can be found in the Appendix. All values except column (4) and (5) are in 2001 billion euro. Column (5) is in 2001 euro. Positive figures denote net winners, negative figures denote net losers. The reference rates are 5.5% for EMU members and 4.0% for Switzerland when it is not an EMU member.

Table 5. Annual Seigniorage Gain(+) or Loss(-) for Switzerland when Joining the EMU in 2002 (billion euro)

a) Total:

Interest rate differential	Euro nominal interest rate										
	3.0%	3.5%	4.0%	4.5%	5.0%	5.5%	6.0%	6.5%	7.0%	7.5%	8.0%
0.0 pp	-0.38	-0.45	-0.51	-0.57	-0.64	-0.70	-0.76	-0.83	-0.89	-0.95	-1.02
0.5 pp	-0.25	-0.32	-0.38	-0.44	-0.51	-0.57	-0.63	-0.70	-0.76	-0.83	-0.89
1.0 pp	-0.12	-0.19	-0.25	-0.31	-0.38	-0.44	-0.51	-0.57	-0.63	-0.70	-0.76
1.5 pp	0.01	-0.06	-0.12	-0.19	-0.25	-0.31	-0.38	-0.44	-0.50	-0.57	-0.63
2.0 pp	0.13	0.07	0.01	-0.06	-0.12	-0.18	-0.25	-0.31	-0.37	-0.44	-0.50
2.5 pp	0.26	0.20	0.14	0.07	0.01	-0.06	-0.12	-0.18	-0.25	-0.31	-0.37

b) Cantonal share (66.7%):

Interest rate differential	Euro nominal interest rate										
	3.0%	3.5%	4.0%	4.5%	5.0%	5.5%	6.0%	6.5%	7.0%	7.5%	8.0%
0.0 pp	-0.25	-0.30	-0.34	-0.38	-0.42	-0.47	-0.51	-0.55	-0.59	-0.64	-0.68
0.5 pp	-0.17	-0.21	-0.25	-0.30	-0.34	-0.38	-0.42	-0.47	-0.51	-0.55	-0.59
1.0 pp	-0.08	-0.12	-0.17	-0.21	-0.25	-0.29	-0.34	-0.38	-0.42	-0.46	-0.51
1.5 pp	0.00	-0.04	-0.08	-0.12	-0.17	-0.21	-0.25	-0.29	-0.34	-0.38	-0.42
2.0 pp	0.09	0.05	0.00	-0.04	-0.08	-0.12	-0.16	-0.21	-0.25	-0.29	-0.33
2.5 pp	0.18	0.13	0.09	0.05	0.01	-0.04	-0.08	-0.12	-0.16	-0.21	-0.25

c) Federal share (33.3%):

Interest rate differential	Euro nominal interest rate										
	3.0%	3.5%	4.0%	4.5%	5.0%	5.5%	6.0%	6.5%	7.0%	7.5%	8.0%
0.0 pp	-0.13	-0.15	-0.17	-0.19	-0.21	-0.23	-0.25	-0.28	-0.30	-0.32	-0.34
0.5 pp	-0.08	-0.11	-0.13	-0.15	-0.17	-0.19	-0.21	-0.23	-0.25	-0.28	-0.30
1.0 pp	-0.04	-0.06	-0.08	-0.10	-0.13	-0.15	-0.17	-0.19	-0.21	-0.23	-0.25
1.5 pp	0.00	-0.02	-0.04	-0.06	-0.08	-0.10	-0.13	-0.15	-0.17	-0.19	-0.21
2.0 pp	0.04	0.02	0.00	-0.02	-0.04	-0.06	-0.08	-0.10	-0.13	-0.15	-0.17
2.5 pp	0.09	0.07	0.05	0.02	0.00	-0.02	-0.04	-0.06	-0.08	-0.10	-0.12

All figures in 2001 euro and pp denotes percentage points.

Figure 1: Measures of Revenue from Money Creation

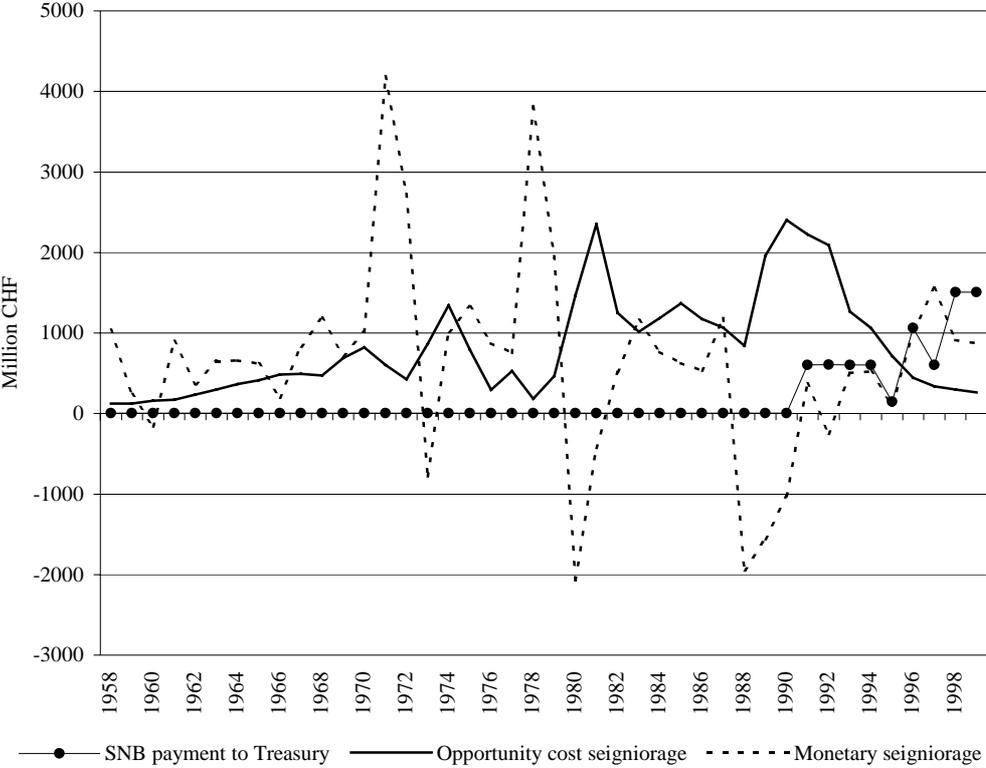


Figure 2: SNB Transfers as a Fraction of Government Revenue

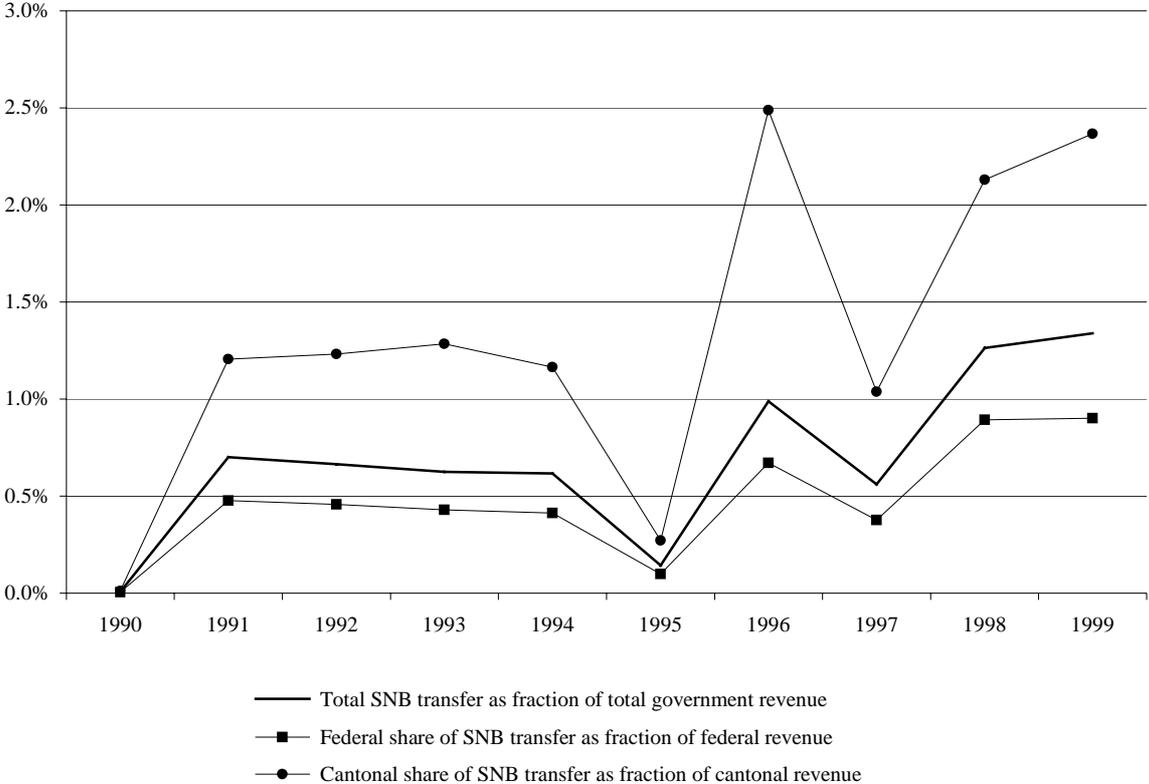


Figure 3: Ratio of Currency in Circulation to GDP

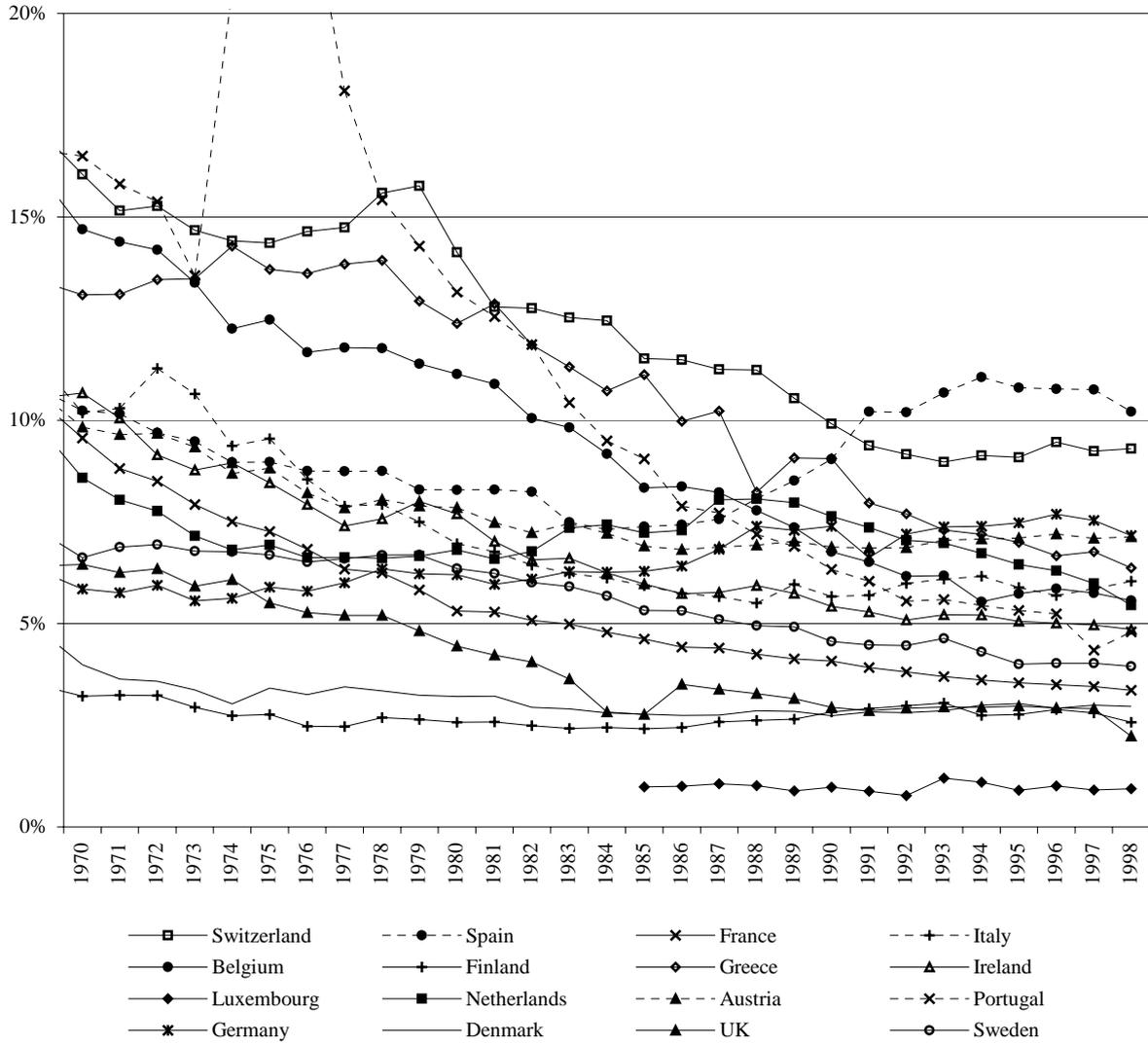


Figure 4: Isoprofit-Lines (Annual Seigniorage Gain/Loss) for Switzerland when Joining the EMU in 2002 (in Million Euro)

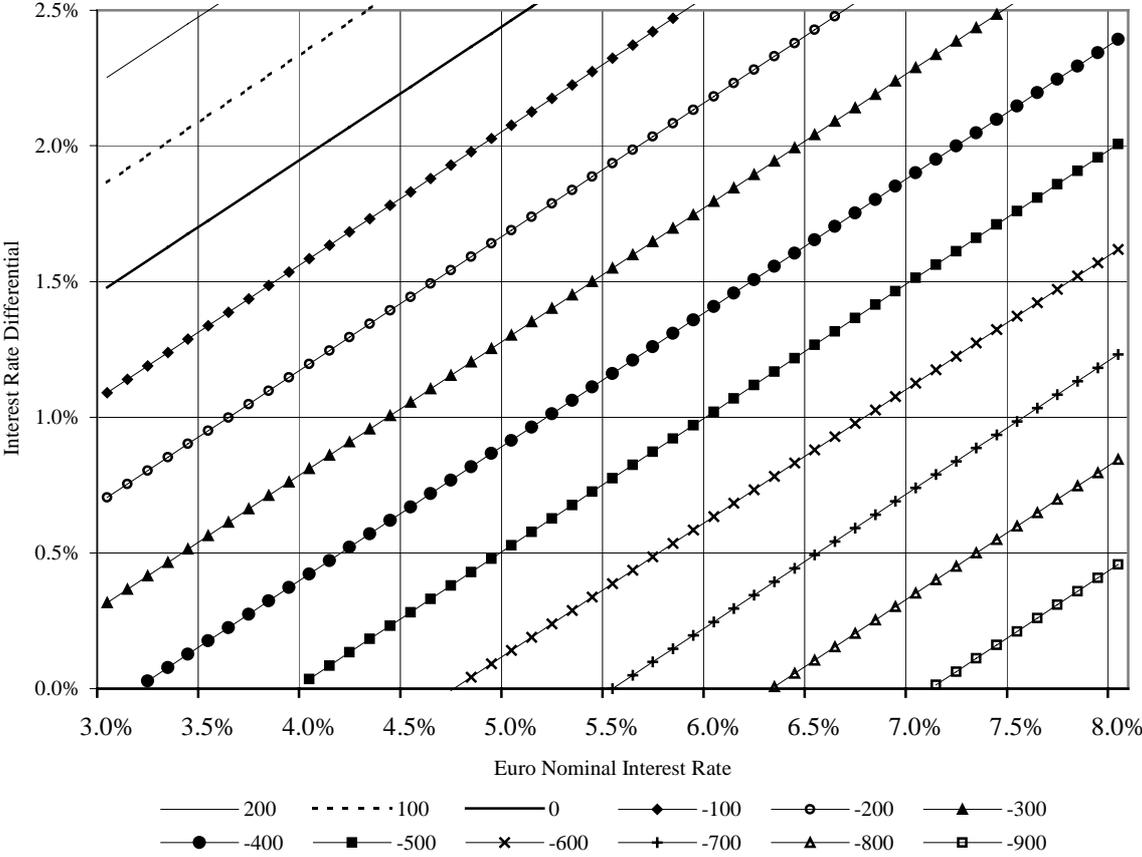


Figure 5: Nominal Values of 1000-Franc Notes versus the Remaining Notes

