Seignorage pooling of EMU, pool bias and seignorage change by the Euro

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Abstract

To deal with changes of capitalized seignorage due to EMU, we supply the still missing capital-theoretical framework. We show that seignorage pooling of EMU is composed of two components, a dynamic component and a static component. By its dynamic component the pool provides insurance against seignorage losses from changes of national shares in the European market for monetary base, while the static component is reflecting a problematic pool-bias. The seignorage model is then applied to simulate EMU-changes of capitalized seignorage in two scenarios. Estimates of changes in the literature are evaluated. Finally, recent (Dec. 6, 2001) decisions by the ECB with regard to seignorage-pooling are evaluated.

1 Introduction

With respect to the earnings of the Deutsche Bundesbank rumors of a capitalized loss of around 80 Bill. DM have been floating around. German government finances would therefore suffer a capitalized loss of 40 Bill. of Euro. However, the exact amount is under debate. The loss number of 40 Bill. Euro comes from the economists Sinn and Feist.1

Sinn and Feist derive losses exclusively from the pooling of seignorage that comes with the Maastricht treaties. Under EMU, the national central banks have become branches of the new European Central Bank (ECB). The ECB maintains a seignorage pool to which central bank earnings must be delivered before they are redistributed to the national central banks according to a fixed key. The key is determined by the quota of the national states in the capital of the ECB. According to Sinn and Feist, without pooling there would be no losses for the FRG.

1Of course the number varies according to the set of countries considered. The number 40 refers to an EMU without Denmark, Sweden and Great-Britain. See Sinn, Hans Werner and Holger Feist, 1997, Eurowinner and Eurol loosers: The Distribution of Seignorage-Wealth in EMU, European Journal of Political Economy 13, 665-689.
In the approach of Sinn and Feist capitalized seignorage is measured by the monetary base.² Sinn and Feist calculate net gains or losses for the FRG by means of the following formula: monetary base of the FRG - (capital share of the FRG x monetary base in Euroland). For Sinn and Feist, the German monetary base is the capital value of German payments into the seignorage pool of the ECB. Summing monetary bases over the countries participating in EMU, one obtains the monetary base of Euroland, the capital value of the pooled seignorage, of which a part, corresponding to the German capital share in the ECB, is paid back to the FRG.

2 The problem: modelling the change of seignorage

The method of Sinn und Feist leads to several questions:

First question: Is the pooling of seignorage the only change that comes with the Euro and EMU?

Prior to the Euro, the Deutsche Bundesbank had a monopoly position in the supply of the DM as a currency, a position which it lost by the transition to EMU. With the Euro, all non-German central banks in EMU are offering the same product as the Deutsche Bundesbank. On the supply side for central bank money in Euroland, we have an oligopoly in a homogenous product of national central banks. As predicted by myself 5 years ago³, the loss of the monopoly position has in the meantime lead to

² The monetary base is the quantity of central bank money in circulation, i.e. the quantity of circulating coins and central bank notes in addition to the sight deposits of commercial banks at the Euro-system which includes the ECB and the national central banks of the countries participating in the EMU. The monetary base does include neither the coins and bank notes in the vaults of the central banks, nor the deposits of the general public at the commercial banks.

a considerable reduction of the German share in the market for monetary base in Euroland. The German monetary base has even declined in absolute terms. This decline is described in the graphs.\footnote{Source of data for the volumes of monetary base: Monatsberichte der Deutschen Bundesbank, Statistischer Anhang, II. Bankstatistische Gesamtrechnungen in der Europäischen Währungsunion, Liquiditätsposition des Bankensystems, Bestände, November 2001, S. 14*.
Markets shares: own calculations.}

Obviously, the pooling of seignorage is not the only relevant change following the Euro. Other possible changes will be considered later.

\textbf{Second question} : "Is it correct, to measure capitalized seignorage by the monetary base?"

Sinn and Feist have answered "yes" with a phony reasoning that cannot satisfy anybody. For a correct answer with a convincing reasoning we must reach out further.

\section{The solution: an approach from the theory of the firm}

Central bank profits arise from the production of central bank money. Therefore we shall treat the central bank as a firm that generates a flow of seignorage. For the capital value of this flow I apply a standard capitalization formula\footnote{In the following, everything is in real terms.}:

\begin{equation}
CS_t = \frac{S_t}{1+r} + \frac{S_{t+1}}{(1+r)^2} + \ldots + \frac{S_{t+p-1}}{(1+r)^p}.
\end{equation}

The meaning of the symbols in this formula is:

- $CS_t$ = capital value of seignorage at the beginning of period $t$,
- $S_t$ = seignorage at the end of period $t$,
- $r$ = constant time preference rate (of government),
- $p$ = number of periods (length of the flow of seignorage).

The consecutive seignorage variables $S$ are linked recursively by growth:

\begin{equation}
S_{\tau+1} = (1 + g_{\tau})S_{\tau}, \quad \tau = t, t + 1, t + 2, \ldots,
\end{equation}

where $g_{\tau}$ is the growth rate of seignorage in period $\tau$. To simplify the analysis, constant growth rates over time are assumed, i.e. trend rates of growth are considered:

\begin{equation}
g_{\tau} = g_{\tau+1} = g_{\tau+2} = \ldots = g = \text{const.}
\end{equation}
In addition, I let $p$ go to infinity, assuming a nonfinite lifetime of central banks and EMU. Under these assumptions, the capital value of seignorage is given by the well known Gordon-formula:

$$CS_t = S_t \frac{1}{r-g}.$$  \hspace{1cm} (4)

Let’s make another step ahead. Seignorage is the earnings of the net earning assets of the central bank. By a simple transformation of the balance sheet of the central bank\(^6\) it is easy to see, that the net earning assets can be represented by the monetary base. Thus, seignorage may be viewed as interest-earnings of the monetary base:

$$S_t = i_t B_t.$$  \hspace{1cm} (5)

In this formula

- $i_t =$ rate of earnings of the net earning assets of the central bank (= monetary base),
- $B_t =$ monetary base representing net earning assets.

To simplify, the rate of earnings is assumed to be constant over time. The rate of growth of seignorage ($S$) is then equal to the rate of growth of the monetary base ($B$) and vice versa. The capitalized seignorage is therefore an algebraic product of monetary base and a variable $s$, which I shall call seignorage multiplier

$$CS_t = B_t \frac{i_t}{r-g} = sB_t,$$  \hspace{1cm} (6)

with

$$s = \frac{i_t}{r-g},$$  \hspace{1cm} (7)

The analogy to the money and credit multipliers is obvious.

In the literature, the capitalized value of seignorage is set equal to the monetary base

$$CS_t = B_t,$$  \hspace{1cm} (8)

i.e. a seignorage multiplier of 1 is assumed. However, in general there is no reason, for the conditions to be satisfied, which justify a multiplier of 1. Even in a stationary world ($g = 0$) we cannot be sure that $i = r$.

Now, the answer to the second question is: In general the capitalized seignorage cannot be measured by the monetary base.

\(^6\)These transformations include a consolidation of state issuance of coins and normal central banking activity (note issuance, credit granting etc.)
An approach, that starts with a seignorage multiplier of 1 and firmly sticks to it, is neglecting the possibility that the multiplier itself may change by the transition to EMU. After all, the seignorage multiplier depends on three variables, all of which in principle can change by the introduction of the Euro.

4 The effects of EMU on the capitalized seignorage: components, pooling and net effect

4.1 Components of capitalized seignorage and their changes

For capitalized seignorage we have an algebraic product of the current monetary base and the seignorage multiplier. The change of the capitalized seignorage is given by the changes of the monetary base and the seignorage multiplier according to the following formula:

\[ \Delta x = (x^e - x) \]  \hspace{1cm} (9)

where \( x^e(x) \) stands for values after (before) the transition to EMU. In addition, it is assumed, that changes caused by the transition to EMU occur as a jump. Market shares and permanent growth rates jump from the old to the new equilibrium values. In the graph "Monetary base with EMU-break" the uninterrupted line represents an idealized trajectory, while the interrupted line represents the real course of the monetary base observable for Germany. The idealized line is supposed to approximate the realistic line.
\[ CS = sB, \quad (10) \]
\[
\frac{\Delta CS}{CS} = \frac{\Delta s}{s} + \frac{\Delta B}{B}, \quad (11)
\]
\[
\Delta CS = [(1 + \frac{\Delta B}{B}) \frac{\Delta s}{s} + \frac{\Delta B}{B}]CS. \quad (12)
\]

As a next step, we must determine the (relative) change of the monetary base \( \frac{\Delta B}{B} \) and of the seignorage multiplier \( \frac{\Delta s}{s} \). I start with the (relative) change of the monetary base.

4.1.1 The (relative) change of the monetary base \( \frac{\Delta B}{B} \)

Describing the German monetary base by the German market share \( m \) in the European monetary base:

\[
B = m \sum_{l=1}^{z} B_l, \quad (13)
\]
\[
\begin{align*}
m & \overset{\text{def}}{=} \frac{B}{\sum_{l=1}^{z} B_l}; \quad (14)
\end{align*}
\]
and describing the European monetary base by the European market share \( em \) in the world monetary base \( B^w \):

\[
\sum_{l=1}^{z} B_l = em \ B^w, \quad (15)
\]
\[
\begin{align*}
em & \overset{\text{def}}{=} \frac{B}{\sum_{l=1}^{z} B_l}; \quad (16)
\end{align*}
\]
we have:

\[
B = m \ \underbrace{em \ B^w}. \quad (17)
\]

Assuming that the world monetary base \( B^w \) does not change by the introduction of the Euro then we can treat \( B^w \) like a constant. For the change of the German monetary base caused by the Euro we then obtain:

\[
\frac{\Delta B}{B} = \frac{\Delta m}{m} + (1 + \frac{\Delta m}{m}) \frac{\Delta em}{em}. \quad (18)
\]

In a linear approximation, there would be no cross product of changes. Exact values for changes will help later in finding certain important properties of the seignorage change.

The (relative) change of the German monetary base involves several factors:
1. factor: the relative change of the German market share in the European monetary base \( \left( \frac{\Delta m}{m} \right) \). It is related to the loss of the German monopoly position in the supply of a currency of the quality of the DM.

2. factor: the relative change of the European market share in the world monetary base \( \left( \frac{\Delta e_m}{e_m} \right) \). It is related to the quality of the Euro relative to other currencies in the world.

4.1.2 The (relative) change of the seignorage-multiplier \( \left( \frac{\Delta s}{s} \right) \)

From the definition of the seignorage-multiplier \( s \), we derive the following formula for its change:

\[
\Delta s = \frac{\partial s}{\partial i} \Delta i + \frac{\partial s}{\partial r} (\Delta r - \Delta g).
\] (19)

We shall assume, that the introduction of EMU does not alter the rate of time preference and that the rate of earnings of the net earning assets of the central bank does not change significantly either:

\[
\Delta i = \Delta r = 0.
\] (20)

For the (relative) change of the seignorage multiplier we then obtain:

\[
\frac{\Delta s}{s} = \frac{1}{(r - g)} \Delta g.
\] (21)

In the following, \( \Delta g \) will be treated as a parameter.

Now, we must finally deal with the pooling of seignorage under EMU.

4.2 The pooling of seignorage under EMU

For the capitalized net payements from the seignorage pool we have the following formula:

\[
P = \rho \sum_{l=1}^{z} CS^e_l - CS^e
\]

\[
= \rho \sum_{l=1}^{z} B^e_l s^e_l - B^e s^e.
\]

Here \( \rho \) is the pool share of the country under consideration, i.e. in EMU the share in the capital of the ECB.\(^8\) I decompose the pooling-effect into a dynamic (first) component:

\(^8\)Variables and parameters which refer to Germany are written without index, except if they appear under a summation sign as in (22).
\[-s^e B(1 + \frac{\Delta em}{em}) \frac{\Delta m}{m}, \quad (24)\]

and into a static (second) component:

\[s^e (\sum_{i=1}^{z} B_i^e) (\rho - \frac{s^e}{s^m} m) \quad (25)\]

with

\[s^e = \frac{\sum_{i=1}^{z} s_i^e B_i^e}{\sum_{i=1}^{z} B_i^e}. \quad (26)\]

With these formulae, we can understand, that a sufficiently strong decrease of the German market share ($\Delta m < 0$) will turn Germany from a net payer into the pool to a net recipient of the pool. For the static component we shall later demonstrate, that it is measuring a bias of the seignorage pool.

4.3 The net-change of seignorage

4.3.1 An overview of the components

It is now possible to survey the factors, which will contribute to a change of seignorage due to EMU.

In the survey (Table 1), I have listed five effects:

1. the seignorage multiplier effect; (It represents, among other things, the permanent growth effect of the Euro, should there really be one.)

2. the international market share effect; (It reflects the role, that the Euro will play as an international money and will depend on the quality of the Euro relative to other currencies.)

3. the national market share effect; (It captures the effect of the end of the German DM-monopoly.)

4. the dynamic pooling effect; (This component features the compensation, coming from the seignorage pool, of losses from changes of the German market share in the European monetary base.)

5. the static pooling effect; (As will be shown later more clearly, this component expresses a bias of the seignorage pool, that traces back to the difference between the monetary base market share ($m$) and the share in the ECB capital ($\rho$).\footnote{In general, i.e. when $\frac{s^e}{s^m} \neq 1$, then the relation of the seignorage multiplier to its European average is also playing a role.})
<table>
<thead>
<tr>
<th>row</th>
<th>effects</th>
<th>math. expression</th>
<th>FRG-values</th>
</tr>
</thead>
</table>
| 1   | seignorage multiplier effect:  
   \( sB^e \frac{\Delta s}{s} (\Delta g, \Delta i, \Delta r) \)  
   (permanent growth effects etc.) | \( (sB^e) \frac{\Delta s}{s} (\Delta g, \Delta i, \Delta r) \) | positive |
| 2   | international market share effect:  
   changes 
   of European market shares \( \frac{\Delta em}{em} \)  
   in the world monetary base,  
   (role of Euro as international money; quality of the Euro) | \( (sB^e) \frac{\Delta em}{em} \) | positive |
| 3   | national market share effect:  
   changes 
   of the German share  
   in the European monetary base market \( \frac{\Delta m}{m} \)  
   (end of German DM-monopoly) | \( (sB) \frac{\Delta m}{m} \) | negative |
| 4   | pooling-effect:  
   1. (dynamic) component  
   (domestic market share effect) | \( -(sB^e) \frac{\Delta em}{em} B \frac{\Delta m}{m} \) | positive |
| 5   | pooling-effect:  
   2. (static) component | \( (sB^e) \frac{\Delta em}{em} \sum_{i=1}^{\infty} B^e_i (\rho - \frac{r}{\pi} m) \) | negative |
| 6   | total change  
   of capitalized seignorage  
   without pooling | \( 1+2+3 \) | ? |
| 7   | total change  
   of capitalized seignorage  
   with pooling | \( 1+2+3+4+5 \) | ? |

Assumptions: \( \Delta em^e > 0, \Delta s > 0 \), for Germany: \( \rho < \frac{r}{\pi} m, \Delta m < 0 \).
It is obvious, that the single effects do not have a common sign. Without further information nothing can be said about the sign of the total effect. Only a numerical analysis can help.

Consequently, the claim of Sinn and Feist, that only seignorage pooling causes seignorage losses cannot be maintained. The size of net payments into the pool does not tell us anything about the net-change of seignorage.

4.3.2 On the dependence of effects

Next we want to inquire about the change of the effects following a variation in the parameters, especially of the parameter "change in market shares", $\Delta m$.

Reaction of the effects to an increase of parameter values

<table>
<thead>
<tr>
<th>row</th>
<th>parameter</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>$i$</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>? (-)</td>
</tr>
<tr>
<td>2.</td>
<td>$r$</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>? (+)</td>
</tr>
<tr>
<td>3.</td>
<td>$g$</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>? (-)</td>
</tr>
<tr>
<td>4.</td>
<td>$\Delta m$</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td>$\Delta em$</td>
<td>+</td>
<td>+</td>
<td>0</td>
<td>+</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>6.</td>
<td>$g_{imp}$</td>
<td>+</td>
<td>+</td>
<td>0</td>
<td>+</td>
<td>0</td>
<td>+</td>
</tr>
</tbody>
</table>

The sign in brackets of the last column was determined using realistic numerical parameter values for the FRG.

A ceteris-paribus-variation in the assumed change of market share leaves unaltered both the sum of the first four effects and the sum of the first five effects. In the end, this means that a variation of the national market share ($\Delta m$) due to EMU does not affect the change of net seignorage and therefore does not affect the size of seignorage.

There is a simple explanation for this result. Whatever Germany, or any other country in Euroland, is loosing in seignorage due to a fall in market share in the generation of monetary base, it will recover by paying equally less into the EMU seignorage pool. The dynamic component of the total pooling effect (component 4 of the survey) compensates the effects of variations in the national market share ($\Delta m$) on the generation of seignorage as given by the component 3 and due to nonlinearities also in components 1 and 2. In the end, we have simply rediscovered a well known effect of the pooling of production results.

De facto, the seignorage-pool of EMU is an insurance for changes of national market shares in the European monetary base. But, pooling will provide a further advantage. It eliminates the incentive for the central banks of EMU-countries, to chase for market shares for national-fiscal reasons. This effect is certainly welcome in harmonizing monetary policy in EMU.

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<table>
<thead>
<tr>
<th>Table 2: parameter values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>real rate of earnings of the earnings assets</strong> ((i))</td>
</tr>
<tr>
<td>(extrapolation based on observations for 1990-2000)</td>
</tr>
<tr>
<td>3 %</td>
</tr>
<tr>
<td><strong>(real) rate of time preference</strong> ((r))</td>
</tr>
<tr>
<td>(assumption)</td>
</tr>
<tr>
<td>5%</td>
</tr>
<tr>
<td><strong>real trend rate of growth</strong> ((g))</td>
</tr>
<tr>
<td>(extrapolation based on the observations for the years 1960-2001)</td>
</tr>
<tr>
<td>2.84 %</td>
</tr>
<tr>
<td><strong>German share in ECB-capital</strong> ((\rho))</td>
</tr>
<tr>
<td>in a Europe of 11 countries (Euroland)</td>
</tr>
<tr>
<td>(data of Maastricht contracts)</td>
</tr>
<tr>
<td>30.56%</td>
</tr>
<tr>
<td><strong>Euro-caused change of the world monetary base</strong> ((\Delta B^w))</td>
</tr>
<tr>
<td>(assumption)</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>**<strong>(\frac{s}{p})</strong> (assumption)</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td><strong>s</strong> (calculated from the prior assumption)</td>
</tr>
<tr>
<td>1.36</td>
</tr>
<tr>
<td><strong>monetary base values from February 1999</strong></td>
</tr>
<tr>
<td>(They are used as final B-values (\neq B^e) prior to the EMU-break):</td>
</tr>
<tr>
<td>1. for FRG</td>
</tr>
<tr>
<td>2. for EMU</td>
</tr>
<tr>
<td><strong>Bill. of Euro:</strong></td>
</tr>
<tr>
<td>158.5</td>
</tr>
<tr>
<td>430.9</td>
</tr>
<tr>
<td><strong>The monetary base values after the EMU-break, the</strong> (B^e)-values, are calculated by means of the formula (B^e = B + \Delta B) and they vary between scenarios.**</td>
</tr>
<tr>
<td>calculated</td>
</tr>
</tbody>
</table>
It is now also possible to show that the static pooling component is measuring a pooling bias. We have said, the seignorage pool is an insurance against changes of national market shares. If there is no change in market share, then there should be no payments into or out of the seignorage pool. Therefore, it is entirely appropriate that the dynamic component is equal to zero in such a case. But if payments into the pool become necessary all the same, then we have a bias of the pool. This bias is captured by a nonzero static component.

5  An application: the seignorage change for the FRG

5.1  Numerical results for two scenarios

For a numerical simulation I shall use the following assumptions (parameter values):

Let's consider two scenarios, an optimistic and a pessimistic one. In the optimistic scenario the real long run rate of growth of the monetary base\textsuperscript{10} \((g)\) rises by a 1/4 % and the market share of the EMU-monetary base \((em)\) in the world market for monetary base rises by 5 %. In the pessimistic scenario, instead, both changes are zero.

In both scenarios the German market shares, reached by the transition to EMU, are changed in various degrees. There is a zero variation and a non-zero-variation, a real decrease. What can we observe?

1. The sum of all 5 effects is independent of the change in market share. (See the last line of the first scenario survey.) The capitalized seignorage is changing in a way, that is independent of the degree, in which the German market shares in the European market for monetary base decline. This is the consequence of seignorage pooling under EMU.

2. The static component of the seignorage pooling-effect is constant. It is also independent of the degree, in which the share declines.

3. Contrary to the static component, the dynamic component is varying with the decline of the German market share.

4. If the German market share falls below 30,56 % then Germany will become a net recipient of payments out of the seignorage pool.

5. These numbers show, that seignorage pooling in EMU is biased against Germany. In an unbiased pooling of seignorage, Germany would be compensated completely for any even small change in the market share. However Germany will receive positive net-payments (4.+5. components) from the seignorage pool not before its market share, which was 0,37 before

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\textsuperscript{10}In judging these assumptions on the growth rate of the real monetary base and the change of that rate it should be taken into account that they need not be identical with the rates and changes of GDP. After all, the velocity of money may change systematically over time. A real rate of growth of 2,84% for GDP alone would be too high.
EMU, has dropped below 0.3056. Only with a decline in market share, that is stronger than this critical value, will Germany be compensated by the seignorage pool. In addition, the compensation will only cover that part of the decline, that is exceeding the critical value of 0.06.

1. scenario survey

<table>
<thead>
<tr>
<th>properties</th>
<th>Scenario</th>
<th>in decimals</th>
<th>pessimistic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>optimistic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\Delta g$</td>
<td>0.0025</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>$\Delta em$</td>
<td>0.05</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>$m^e$</td>
<td>0.368</td>
<td>0.295</td>
<td>0.368</td>
</tr>
<tr>
<td>$\Delta m$</td>
<td>0 -0.0725</td>
<td>0 -0.065</td>
<td></td>
</tr>
<tr>
<td>effects of EMU</td>
<td>in Bill. Euro</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. multiplier-component</td>
<td>26.75</td>
<td>21.47</td>
<td>0 0</td>
</tr>
<tr>
<td>2. international market share component</td>
<td>11.00</td>
<td>8.83</td>
<td>0 0</td>
</tr>
<tr>
<td>3. national market share-component</td>
<td>0 -43.41</td>
<td>0 -38.76</td>
<td></td>
</tr>
<tr>
<td>sum: 1.+2.+3. components</td>
<td>37.76</td>
<td>-13.10</td>
<td>0 -38.76</td>
</tr>
<tr>
<td>4. dynamic pool-component</td>
<td>-41.59</td>
<td>-41.59</td>
<td>-37.27 -37.27</td>
</tr>
<tr>
<td>5. static pool-component</td>
<td>-41.59</td>
<td>-41.59</td>
<td>-37.27 -37.27</td>
</tr>
<tr>
<td>sum: 4.+5. c. = total pool-component</td>
<td>-41.59</td>
<td>9.27</td>
<td>-37.27 -37.27</td>
</tr>
<tr>
<td>sum: 1.+2.+3.+4. components</td>
<td>37.76</td>
<td>37.76</td>
<td>0 0</td>
</tr>
<tr>
<td>sum: 1.+2.+3.+4.+5. components</td>
<td>-3.82</td>
<td>-3.82</td>
<td>-37.27 -37.27</td>
</tr>
</tbody>
</table>

6. The economic value of the pool bias is given by the static component of the pooling effect.

7. According to my calculation in the optimistic case, the pool bias is costing Germany roughly 43 Bill. Euro and in the pessimistic scenario roughly 39 Mrd. Euro. These values, are not far from those of Sinn and Feist.

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11In these calculations I assume an EMU, that includes Greece, but not Denmark, Sweden and Great-Britain.
2. scenario survey

<table>
<thead>
<tr>
<th></th>
<th>scenario</th>
<th>optimistic</th>
<th>pessimistic</th>
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<tbody>
<tr>
<td>properties</td>
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<tr>
<td>rise of the</td>
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<td>1/4</td>
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<tr>
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<td>0</td>
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<tr>
<td>rise of the</td>
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<tr>
<td>European market share</td>
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<td>effect of EMU</td>
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<td>37</td>
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<tr>
<td>pool-bias</td>
<td>(pooling-costs)</td>
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<td></td>
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<tr>
<td>net-seignorage-loss</td>
<td></td>
<td>3,8</td>
<td>37</td>
</tr>
</tbody>
</table>

8. In the pessimistic case, the static component of pooling is given by:

\[ \pi \left( \sum_{l=1}^{z} B_l \right) (\rho - \frac{s}{m}). \tag{27} \]

In this formula, unlike in formula (25), all variables refer to the time before EMU. Under the assumption \( \frac{s}{m} = 1 \), this is proportional to the formula that Sinn and Feist are using, the factor of proportionality being \( \pi \).

In the pessimistic scenario, the components which have been neglected by Sinn and Feist (3. and 4. component), are perfectly compensating, something I have once called a compensation of errors.\(^{12}\) The compensation is between the national market share component and the dynamic pool-component. The compensation is a direct consequence of seignorage pooling.

9. In the optimistic scenario the net-seignorage loss of Germany is far below the pool bias (compare 3,8 Bill. with roughly 42,0 Bill. Euro). In the pessimistic scenario, the seignorage loss is equal to the pool bias of 37,3 Mrd. Euro. It should be noted that the pool bias is not varying with the change in the market share, but with the other parameters. However, the other assumptions are held constant within a particular scenario.

10. In the pessimistic scenario Germany is loosing an amount equal to the static component of the pooling effect, i.e. equal to the pool bias.

11. The scenarios are illustrating the basic insight, that there is a major difference between the change of net seignorage, the net payment into the

\(^{12}\)See the web adress above.
seignorage pool and the pool bias.\textsuperscript{13}

5.2 The effects of the recent decisions of the ECB-council.

On December, 6, 2001, the ECB has produced a somewhat cryptic decision\textsuperscript{14} with respect to seignorage pooling, a decision that, according to my calculations, is eliminating at most 10\% of the existing pool bias.\textsuperscript{15} If this number is applied to the static component of 37 or 42 Bill. of Euro, then the reduction of the pool bias is roughly 4 Bill. Euro.

3. Scenario-survey

<table>
<thead>
<tr>
<th>Scenario</th>
<th>optimistc</th>
<th>pessimistic</th>
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<tbody>
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<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>effects of EMU</th>
<th>in Bill. Euro</th>
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<tbody>
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<tr>
<td>Remaining pool-bias (pooling-costs)</td>
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</tr>
<tr>
<td>change of net-seignorage without pool-bias</td>
<td>38</td>
</tr>
</tbody>
</table>

\textsuperscript{13}If one of these is estimated by the other one, one is likely to commit an error similar to the approximation of the course of the Rhine by the course of the Danube.

\textsuperscript{14}I am referring to decision ECB/2001/16 in connection with decision ECB/2001/15.

\textsuperscript{15}Though the new ECB-regulation is quite complicated and difficult to penetrate, it is easy to estimate an upper bound of the bias reduction using capital-theoretic or finance-mathematical methods. For the time, for which predominantly only a partial compensation of the bias is provided by the regulation, we can assume a full compensation and we can relate it to the bias for the whole period for which EMU is existing.
5.3 The real size of seignorage change

I have reached the point where I can answer the question about the size of the seignorage change for the FRG. I have presented two scenarios (see the third scenario-survey).

In the optimistic scenario, Germany is suffering at best no loss of seignorage under the new pooling rules.

In the optimistic case, Germany would receive roughly 38 Bill. Euro more of seignorage if there were no pool bias.

In the pessimistic scenario, Germany is losing an amount equal to the static component of the pooling effect, i.e. equal to the pool bias. Apart from a factor of proportionality this is equal to the scenario of Sinn and Feist.\(^\text{16}\) In this scenario and after the incomplete correction of the pool, Germany is still suffering a loss of roughly 34 Bill. Euro.

In the pessimistic case, Germany would neither be winning nor losing seignorage if there were no remaining pooling bias.

6 Summary and conclusion

Seignorage pooling is providing advantages: it is providing security against fluctuations in market shares and it is harmonizing monetary policy. These advantages may be obtained technically at zero cost. The price for it, in form of the remaining pooling bias of at least 34 Bill. Euro therefore is still too high for Germany. It is also unjust, since other Euroland countries on average are receiving the pooling benefits at a negative price. The other countries are getting pooling with cream, while Germany is getting a pooling with too much salt. However, there is opportunity for further elimination of salt, because, according to the rules of Maastricht, capital shares are reviewed every five years.

Without further corrections the Germans remain sitting on a capitalized loss by the pooling bias of\(^\text{17}\) roughly 450 Euro per capita. Please observe: a loss by the pooling bias does not exclude that net seignorage of a country is increasing.

References


\(^\text{16}\) If I would neglect the factor of proportionality my results for the pessimistic case would deviate more strongly from the Sinn and Feist numbers of 40 Bill. Euro, the reason being, that Sinn and Feist have used monetary base data that are different from the ones used here.

\(^\text{17}\) Depending on the scenario at least 414 or 460 Euro per capita.