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European Financial Integration and Revenue from Seignorage:
The Case of Italy

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Abstract

Financial integration is likely to entail EEC-wide convergence in both inflation rates and bank reserve requirements, thereby lowering some governments' seignorage revenues. These revenue losses, however, may be offset by concomitant effects on exchange rate expectations and on interest rates on publicly held government debt. In Italy, the high stock of such debt in relation to base money implies that, to offset the loss of seignorage, it will take only about a 1/2-percentage-point decline in real interest rates. A decline of this magnitude seems feasible, provided that there is credible action to place the public debt on a sustainable path.

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Summary

This paper develops a framework for the computation of fiscal gains from seignorage in Italy and uses it to illustrate how the public finances might be affected by European financial integration. The paper argues that, from the point of view of countries with a high stock of interest-bearing public debt, the issuance of base money is akin to a debt management operation, whose economic significance is best measured by the associated savings in the government's interest bill. In this light, the extraction of gains from seignorage is subordinate to the goal of minimizing net interest payments on the public debt.

Over the 1981-87 period, seignorage is estimated to have produced annual average interest savings on Italy's public debt amounting to $1\frac{1}{3}$ percent of GDP. These savings peaked at the equivalent of 1.7 percent of GDP in 1982 and fell steadily thereafter to 1 percent of GDP by 1987, in line with the decline in the average interest rate on publicly held government debt. This latter decline, however, was not commensurate with the pace of disinflation, leading to a steady increase in the real rate of interest. As a result, by 1987, a substantial portion of measured seignorage gains reflected Italy's high real interest rate, which exceeded the average real interest rate in other major European countries by about $1\frac{3}{4}$ percentage points. This differential remained largely unchanged in 1988.

In the period ahead, European financial integration can be expected to affect revenues from seignorage not only by enforcing EEC-wide convergence in rates of inflation and bank reserve requirements, but also by reducing interest rate differentials among like instruments denominated in different EEC currencies. These differentials should disappear as remaining capital controls are lifted, if inflation convergence succeeds in enhancing the fixity of exchange rates. Provided that the credibility of the exchange rate regime is supported by action to place Italy's public debt on a sustainable path, Italian interest rates thus seem set to decline substantially. Such decline could easily offset the fiscal losses resulting from any decline in seignorage revenues.

Numerical simulations confirm that the potential effect of financial integration on the building of public debt in Italy is likely to be of second-order importance. If the annual rate of inflation declines from 5 percent to 3 percent beginning in 1989, and the average reserve ratio on bank deposits is concurrently reduced from 22.5 percent to 5 percent, the ratio of public debt to GDP in 1992 would remain almost unchanged, provided that the real rate of interest on publicly held debt declined by $\frac{1}{2}$ percentage point. Such an interest rate effect is well within the realm of possibility.



European Financial Integration and Revenue from Seignorage:
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I. Introduction

The move toward financial integration in Europe is likely to be associated with mounting pressures on EC member countries to harmonize a wide range of policies. As capital flows are fully liberalized, the maintenance of exchange rate stability without resort to controls or massive intervention will require convergence in rates of inflation. In addition, the ability of financial institutions to operate throughout the Community under their home country rules can be expected to require also greater uniformity in prudential controls and regulations. These prospects have given rise to concerns about the consequences of financial integration for some EC members. In particular, it has been argued that countries with weak public finances, which have in the past relied heavily on the inflation tax or seignorage as a source of fiscal revenue, may find the costs of financial integration especially high (Dornbusch (1987) and Giavazzi (1988)).

This paper assesses the potential significance of the loss of seignorage revenues from the particular perspective of Italy. Section II discusses two alternative definitions of seignorage and highlights the conditions under which these definitions are economically meaningful. Based on these definitions, Section III derives quantitative estimates of revenues from seignorage in Italy during the 1980-87 period. The implications of financial integration for the public finances are assessed in Section IV and the conclusions are summarized in Section V.

II. The Definition of Seignorage

The definition of seignorage is a subject on which there has been considerable disagreement in the literature. ^{1/} Part of the difficulty has resulted from attempts to liken the process of money creation to the collection of ordinary tax revenue. Because the government has a monopoly over the issuance of high-powered money, it is able to finance some of its expenditure through money creation. This allows it to acquire real resources by issuing money, which can be thus viewed as a substitute for taxation. The flow of high-powered money is accordingly a widely used measure of revenue from seignorage (e.g., Fischer (1982)).

Although this approach has the advantage of simplicity, it obscures the actual mechanics of money creation and, as a result, it fails to provide an economically meaningful measure of seignorage. A more rigorous definition would need to start by identifying the principal items in the central bank's balance sheet that could be affected by the issuance of money. Having recognized that for every change in the stock of

^{1/} See, for example, Friedman (1971), Phelps (1973) and McClure (1986).

high-powered money there must be a corresponding change in some other asset or liability of the central bank, one can then draw the economic implications in a more rigorous fashion.

In an open economy, the central bank can create money through purchases of either domestic or foreign assets. In the extreme case in which the full stock of high-powered money is backed by gold or some other commodity it is obvious that the process of money creation may have no tax-like effects whatsoever. The central bank exchanges one noninterest-bearing asset for another and, if convertibility is guaranteed, it is prepared to reverse this exchange in the future at the public's request. If prices are stable, the central bank can accommodate the increasing demand for money through purchases of gold without giving rise to any transfer of real resources to the public sector. Thus, under a commodity-based monetary standard, price stability precludes the existence of revenues from seignorage as long as high-powered money remains fully backed.

Suppose now that inflation surfaces as a result of a large inflow of gold. Again there are no tax-like effects as long as convertibility is maintained at the original par rate, although the purchasing power of both gold and money may decline. The tax-like effect of inflation materializes only when the government adjusts the par rate. The inflation tax or seignorage is then equal to the increase in the central bank's net worth resulting from the revaluation of its holdings of gold. Assuming that the real price of gold is kept stable, the transfer of resources from the holders of high-powered money to the central bank is equal to the product of the rate of inflation and its stock of gold, which is equal to the stock of high-powered money. We thus have 1/

$$S_t = (1+p_t) G_t - H_t = p_t H_t \quad (1)$$

where S_t , the revenue from seignorage, is defined as the increase in the central bank's net worth, G_t is the value of the central bank's stock of gold before revaluation, p_t is the rate of inflation and H_t is the stock of high-powered money. Note that this revenue is generated in the absence of any monetary financing of the budget deficit and it may or may not be appropriated by the government in the form of a transfer of central bank profits.

The budget deficit has a more direct relation with money creation when money is created through central bank lending to the government. Even then, however, the issuance of money is more akin to a debt management operation than to a tax. This is because high-powered money is

1/ The analysis throughout this paper is restricted to the seignorage revenues associated with fully anticipated inflation. Although surprise inflation could yield higher fiscal gains, such gains are short-lived unless inflation continues accelerating. Resort to such a policy, however, would be inconsistent with continued participation in the Exchange Rate Agreement of the EMS.

itself a form of government debt which is payable on demand. Although the government can momentarily finance its deficit by creating money through its borrowing from the central bank, this money may eventually find itself back into the central bank in exchange for international reserves. Thus, as long as convertibility is maintained, monetary financing may be quickly transformed into financing through a rundown of the central bank's foreign assets. The ease with which monetary financing can be reversed makes it inappropriate to compare it to any type of tax.

Once we view the process of money creation as simply an operation that replaces interest-bearing government debt with noninterest-bearing central bank debt, it becomes easier to define the resulting budgetary gains. Seignorage can be defined to be equal to the profits of the central bank resulting from its ability to finance its purchases of interest-bearing government securities through the issuance of noninterest bearing high-powered money. These profits can be treated as a fiscal revenue transferred to the government which is typically the principal shareholder in the central bank. 1/ Equivalently, one can consolidate the accounts of the central bank and the government and define seignorage as the interest savings on their consolidated debt resulting from the central bank's ability to borrow at zero interest. In either case, seignorage is equal to the nominal interest rate on the public debt (r_t) multiplied by the stock of noninterest-bearing high-powered money. We have 2/

$$S_t = r_t H_t \quad (2)$$

Note that (2) is identical to (1) if and only if the real rate of interest on public debt is zero.

In practice high-powered money is backed not only by gold and government securities but also by other assets denominated both in domestic currency and in foreign exchange. Net returns on the latter may vary erratically from year to year reflecting valuation adjustments. Nevertheless, over longer periods of time one could abstract from the effects of exchange rate volatility. Equations (1) and (2) could then be used as polar estimates of the budgetary effects of seignorage.

III. The Importance of Seignorage in Italy: 1980-87

Before using equations (1) and (2) to measure seignorage in Italy, two complicating factors need to be taken into account. The first has to do with the remuneration of bank reserves. Required reserves on bank deposits have been remunerated at a rate of 5.5 percent since 1970. In

1/ In Italy, the state owns the Central Bank indirectly, through the share holdings of autonomous public entities.

2/ This definition of seignorage is akin to the opportunity-cost measure developed in Gros (1989).

1982, the Bank of Italy also introduced a preferential rate of remuneration on required reserves against certificates of deposit (CDs), which was originally set at 9.5 percent but was lowered to 8.5 percent in 1986. Partly as a result of this preferential treatment, CDs have been one of the most dynamic sources of bank funds over the last two years, raising the average rate of remuneration on required reserves to about 5.7 percent in 1987. Free reserves are remunerated at a rate of 0.5 percent. To measure net revenues from seignorage, it is necessary to modify equations (1) and (2) by subtracting from the right-hand side the central bank's interest payments on bank reserves. In addition, to identify the various components of seignorage, we replace the stock of high-powered money (H_t) by the sum of its principal components (currency (C_t), required reserves (RR_t) and free reserves (FR_t)). ^{1/} This yields

$$S_t^1 = p_t C_t + (p_t - r_t^{RR}) RR_t + (p_t - 0.005) FR_t \quad (1')$$

and

$$S_t^2 = r_t C_t + (r_t - r_t^{RR}) RR_t + (r_t - 0.005) FR_t \quad (2')$$

for the two definitions of seignorage. The average rate of remuneration on required reserves is denoted by r_t^{RR} .

The second complication relates to the measurement of the rate of return on interest-bearing public debt (r_t). Using the implicit interest rate on total public debt--including the debt held by the Bank of Italy--would yield an understatement of the market rate of interest. This is because the Government appropriates a large part of seignorage revenues by borrowing from the Bank of Italy on subsidized terms. The rate of interest on the Treasury's overdrafts is 1 percent and, in addition, the Bank of Italy refunds to the Treasury some of its interest earnings on government securities. The refund is equal to the average stock of banks' required reserves multiplied by the differential between the rates of return on required reserves and on central bank holdings of government debt. As a result of these operations, the figure for net interest payments on the public debt as reported in the government's fiscal accounts already incorporates substantial interest savings. A large part of seignorage gains is thus included in the fiscal accounts as reduced interest expenditure rather than in the form of transfers of central bank profits.

The above mechanism allows the automatic pass-along of some of the gains from seignorage to the government, but it does not provide for a complete accounting of these gains. The central bank's holdings of government securities have generally fallen short of banks' required reserves, while Treasury overdrafts have been higher than currency in

^{1/} The definition of the monetary base in Italy also includes banks' unutilized margins in their overdraft facilities with the Bank of Italy. For purposes of computing the revenues from seignorage, these margins have been excluded.

circulation since 1985. To assess the importance of seignorage it seems preferable to use equations (1') or (2'), which would yield a more comprehensive estimate irrespective of the extent to which the gains are appropriated by the Treasury. The use of equation (2'), however, requires the compilation of a new interest rate series that would provide an undistorted measure of the public sector's interest savings. To this end, it has been attempted to estimate the implicit interest rate on public debt held outside the central bank. To obtain this interest rate series, the reimbursement of interest by the Bank of Italy to the Treasury has been added back to net interest payments on the public debt, yielding a series on gross interest payments. Subtracting total interest receipts by the Bank of Italy on Treasury overdrafts and on government securities then yielded a series of interest payments on debt held by the public. The implicit interest rate series was obtained by dividing these interest payments by the average stock of public debt held outside the Bank of Italy. The results of this exercise are presented in Table 1.

The estimates of Table 1 suggest that the margin between the implicit interest rates on total government debt and on its portion held by the public peaked at around 3 1/4 percentage points in 1981-82 and declined steadily thereafter to around 1 percentage point in 1987. This decline indicates that the seignorage gains appropriated by the Treasury in the form of reduced interest payments diminished markedly during that period. Also noteworthy are the relationships between the implicit return on debt held by the public on the one hand and the Treasury bill (BOT) rates and inflation on the other. The implicit return on publicly held government debt has remained below the six-month BOT rate through most of the period but the margin between the two rates decreased steadily from a peak of 5 1/2 percentage points in 1981 to less than 1/2 percentage point in 1987. This trend may be indicative of a decreasing access by the government to financing at below-market rates from sources outside the Central Bank, but it may also reflect the lag in the effect of changes in longer-term rates. In relation to the rate of inflation, the implicit yield on publicly held government debt shows an even more pronounced shift. The ex-post real implicit yield rose from a negative 7 3/4 percent in 1980 to near zero in 1983 and it grew steadily thereafter to more than 5 percent in 1987.

The divergences among the various interest rate series raise questions on how best to measure seignorage. In computing the interest savings on the public debt, in particular, one fundamental question is whether one should use the average rate of interest on publicly held debt as measured by the implicit interest rate series or the marginal rate as measured by the treasury bill rate. If the average rate is biased downwards by the use of captive sources of funds one can argue that it is more appropriate to use the treasury bill rate, because it represents the rate that the government would have had to offer to attract willing investors in the absence of monetary financing. It could even be argued that the placement of additional government paper in the market would have required an increase in the treasury bill rate.

Table 1. Public Sector Interest Bill and Implicit Interest Rates, 1980-87

	1980	1981	1982	1983	1984	1985	1986	1987
	(In billions of lire)							
Public debt (end-year)	228,240	283,130	361,564	455,543	560,883	682,564	793,096	909,983
Borrowing from BI-UIC	52,978	66,555	78,670	79,631	92,863	120,286	130,954	137,968
Of which:								
Overdrafts on BI	19,126	25,312	31,910	23,288	41,842	48,182	52,707	61,981
Securities	30,902	37,746	40,977	43,063	43,008	66,741	75,737	72,526
Other	2,950	3,497	5,783	13,279	8,013	5,363	2,510	3,461
Borrowing from public	175,262	216,575	282,894	375,913	468,020	562,278	662,142	772,015
Net interest bill	20,648	28,799	39,265	47,933	59,265	66,653	78,061	79,700
Reimbursements from BI	864	1,912	2,180	2,681	2,188	2,293	2,634	1,502
Gross interest bill	21,512	30,711	41,445	50,614	61,453	68,946	80,695	81,202
Of which:								
Overdrafts on BI	150	242	318	347	347	507	557	621
Securities	2,133	2,206	2,535	2,763	4,041	6,120	7,601	6,862
Public	19,229	28,263	38,592	47,505	57,065	62,320	72,538	73,719
Interest on required reserves	1,852	2,049	2,349	2,918	3,446	4,167	4,627	5,299
Monetary base (end-year)	64,849	73,488	83,824	96,428	110,275	129,351	138,551	152,496
Currency	25,325	29,755	33,283	37,364	41,225	45,227	48,371	52,757
Bank reserves	39,524	43,733	50,541	59,064	69,050	84,124	90,180	99,739
Of which:								
Required reserves	34,435	37,381	45,926	55,017	63,872	76,086	85,107	93,847
Other reserves	5,089	6,352	4,615	4,047	5,178	8,038	5,073	5,892
Of which:								
Free reserves	3,142	4,326	2,996	2,467	3,533	6,187	4,196	4,020
Unused margin	1,947	2,026	1,619	1,580	1,645	1,851	877	1,872
Required reserves (annual average)	33,705	37,326	42,936	53,000	61,762	74,105	81,841	93,033
Currency (annual average)	21,690	25,640	29,254	32,766	36,326	40,590	44,288	47,483
Free reserves (annual average)	1,439	1,755	1,909	1,946	2,338	2,456	2,663	2,673
	(In percent)							
Implicit interest rates								
Total public debt	9.9	11.3	12.2	11.7	11.7	10.7	10.6	9.4
Debt held by public	11.9	14.4	15.5	14.4	13.5	12.1	11.8	10.3
Required reserves	5.5	5.5	5.5	5.5	5.6	5.6	5.7	5.7
Six-month BOT rate	16.0	19.8	19.4	17.8	15.3	13.7	11.5	10.7
Rate of inflation								
Consumer prices	21.2	17.8	16.5	14.7	10.8	9.2	5.9	4.7
GDP deflator	20.6	18.5	16.2	15.0	11.3	8.9	7.5	5.6

Sources: Bank of Italy, Annual Report, various issues; data provided by the Italian authorities; and Fund staff estimates.

On the other hand, the large divergence between the implicit interest rate and treasury bill rate series in the early 1980s may be interpreted to suggest that the latter has not always been an accurate measure of the marginal cost of funds. Financial institutions, for example, may have been willing to hold government paper at below-market rates not only because of portfolio restrictions on their operations but also because of the favorable tax treatment of government securities. 1/ The tax exempt status of government securities has been abolished since 1986, but this has not facilitated the measurement of the marginal cost of new government borrowing. Interest earnings on newly issued government securities are now subject to effective tax rates ranging from 12.5 percent to 46 percent, depending on whether the holders are households or corporations. This creates difficulties for the measurement of the net-of-tax marginal cost of funds that would be required for the computation of gains from seignorage. Additional difficulties may be posed by shifts in the term structure of new debt issues, which may have a systematic effect on both the marginal and the average rates of interest without affecting the treasury bill rate.

In light of the above considerations and for the sake of simplicity, the computations that follow retain the implicit interest rate series as a measure of the opportunity cost of monetary financing. Although using the Treasury bill rate would provide substantially larger estimates of the gains from seignorage during the early 1980s, by 1987 this difference would become imperceptible after due adjustment for revenues from the new withholding tax. It would thus seem that the choice of interest rate series should make little difference for the quantification of the impact of financial integration over the 1989-92 period as presented in Section IV below. 2/

The estimates of revenue from seignorage over the 1980-87 period are presented in Table 2. A striking feature in these estimates is the disparity between the time paths of the measures provided by our two methods (equations (1') and (2')). The gains from the decline in the real value of the monetary base through inflation are highest in the early part of the period, when inflation was at its peak, and decline sharply thereafter from the equivalent of 2.6 percent of GDP in 1980 to a mere 0.1 percent of GDP in 1987. Note that the inflation tax on required reserves has become negative by 1987 because the average return on required reserves (5.7 percent) is higher than the rate of inflation (4.7 percent). By contrast, the interest savings on the public debt

1/ For an analysis of how changes in the tax treatment of government securities have affected the tax burden on Italian banks, see Di Majo and Franco (1987).

2/ In measuring the cost of the reserve requirement tax from the point of view of credit institutions, one can argue in favor of using the loan rate as a measure of the opportunity cost of funds. (Porta (1983)). From the point of view of the government, however, interest rates on public debt provide a better estimate of interest savings through money creation.

Table 2. Public Sector Interest Bill and Estimates of Seignorage, 1980-87

(In percent of GDP)

	1980	1981	1982	1983	1984	1985	1986	1987
Public debt (year average)	53.6	54.6	59.1	64.5	69.8	76.2	81.8	86.7
Borrowing from BI-UIC	12.3	12.8	13.3	12.5	11.9	13.1	13.9	13.7
Of which:								
Overdrafts on BI	3.8	4.7	5.2	4.4	4.5	5.5	5.6	5.8
Securities	8.0	7.3	7.2	6.6	5.9	6.7	7.9	7.5
Other	0.6	0.7	0.9	1.5	1.5	0.8	0.4	0.3
Borrowing from public	41.3	41.9	45.8	52.0	58.0	63.2	67.9	73.0
Net interest bill	5.3	6.2	7.2	7.6	8.1	8.2	8.7	8.1
Of which:								
Net payments to BI	0.4	0.1	0.1	0.1	0.3	0.5	0.6	0.6
Public	4.9	6.0	7.1	7.5	7.8	7.6	8.0	7.5
Monetary base (annual average) ^{1/}	14.6	13.8	13.6	13.8	13.8	14.4	14.3	14.6
Currency (annual average)	5.6	5.5	5.4	5.2	5.0	5.0	4.9	4.8
Required reserves (annual average)	8.6	8.0	7.9	8.4	8.5	9.1	9.1	9.5
Free reserves (annual average)	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3
Estimates of government revenue from seignorage								
Interest savings on the public debt								
Currency	0.7	0.8	0.8	0.7	0.7	0.6	0.6	0.5
Required reserves	0.6	0.7	0.8	0.7	0.7	0.6	0.6	0.4
Free reserves	--	0.1	0.1	--	--	--	--	--
Total	1.3	1.6	1.7	1.5	1.4	1.2	1.2	1.0
Decrease in real value of monetary base								
Currency	1.2	1.0	0.9	0.8	0.5	0.5	0.3	0.2
Required reserves	1.4	1.0	0.9	0.8	0.4	0.3	--	-0.1
Free reserves	0.1	0.1	0.1	--	--	--	--	--
Total	2.6	2.0	1.8	1.6	1.0	0.8	0.3	0.1
Memorandum items								
Average liabilities subject to reserve requirement	56.6	51.5	49.0	49.0	46.8	47.6	45.9	46.0
Effective reserve ratio	15.3	15.5	16.1	17.1	18.1	19.1	19.7	20.6
Monetary base flow	2.0	1.8	1.9	2.0	1.9	2.3	1.0	1.4

Sources: Bank of Italy, Annual Report, various issues; data provided by the Italian authorities; and Fund staff estimates.

^{1/} Excluding credit institutions' unused margin of Bank of Italy's overdraft facility.

peak at the equivalent of 1.7 percent of GDP in 1982 and decline more smoothly to 1 percent of GDP by 1987. Despite the disparity of their time paths, over the 1980-87 period as a whole, both measures average the equivalent of about 1 1/3 percent of GDP. 1/

The divergent paths of the two measures of seignorage reflect the sharp shift in the behavior of ex post real interest rates that was already referred to. Theoretical models of the inflation tax typically assume a constant--sometimes zero--real rate of interest, with the nominal interest rate moving in line with the rate of inflation. This is a legitimate assumption when describing steady state equilibria, but such analysis is not always applicable to real economic situations. In the particular case of Italy, the large increase in the real rate of interest since the early 1980s has partly offset the effect of disinflation on the nominal rate of interest, with the already noted effects on the measurement of seignorage.

The importance of the real interest rate raises serious questions about the role of seignorage as a source of revenue in the period ahead. If movements in the real interest rate are a principal determinant of the gains from seignorage, is it legitimate to consider seignorage as an independent source of revenue that ought to be maximized? Is it possible to conceive of situations in which seignorage revenues decline without undermining the overall state of public finances? These questions are addressed in the following section in the context of the determination of some of the fiscal implications of financial integration.

IV. Implications of Financial Integration

The literature on the fiscal implications of financial integration has focused on two types of effects on revenues from seignorage. The first and more obvious effect derives from the need to achieve inflation convergence. In an integrated financial environment, higher-inflation countries would probably come under strong pressure to stabilize exchange rate expectations by lowering their rates of inflation to the Community average. To the extent that revenues from seignorage have constituted a substitute for ordinary tax revenues for these countries, inflation convergence would thus need to be accompanied by compensating fiscal adjustment. The second effect of financial integration stems from the need to harmonize the implicit and explicit taxes on financial

1/ For comparison, we have also computed the flow of monetary base in relation to GDP, which is a widely used measure of seignorage in the literature (e.g., Fischer (1982), Dornbusch (1987) and Giavazzi (1988)). This flow is relatively stable throughout the 1980-84 period, averaging the equivalent of 1.9 percent of GDP, it peaks at 2.3 percent of GDP in 1985 and declines sharply to 1 percent of GDP in 1986, before rising to 1.4 percent of GDP in 1987. Over the whole 1980-87 period, this measure of seignorage averages 1.8 percent of GDP, which is significantly higher than the average obtained with our two methods.

activities in the wake of the liberalization of provision of financial services throughout the Community. Of particular significance for seignorage in this regard is the reserve requirement tax. ^{1/} Countries such as Italy, which have traditionally had higher rates of inflation and higher reserve requirements than other EEC countries, have been argued to be particularly vulnerable to the loss of revenues from seignorage resulting from financial integration (Giavazzi, 1988).

This section builds on the previous discussion and argues that, at least as far as Italy is concerned, financial integration may imply minimal fiscal losses through its effects on revenue from seignorage. In analyzing these effects the seignorage definition of equation (2') will be used for two reasons. First, the use of equation (1') rather than (2') would call for an outright rejection of the hypothesis that financial integration would give rise to significant fiscal losses. Equation (1') yields a negligible estimate of revenue from seignorage for 1987--equivalent to 0.1 percent of GDP--with the reserve requirement tax already being negative. It is quite obvious that, under such initial conditions, even if reserve requirements were to be abolished and inflation brought down to zero, there would be very little fiscal loss. Perhaps more importantly from an analytical point view, equation (2') places seignorage in the context of the need to minimize the Italian public sector's interest bill, which is in itself an important policy objective. By highlighting the effects of the real interest rate not only on the revenues from seignorage but also on the dynamics of public debt accumulation, this approach places seignorage in the proper perspective, as a goal subsidiary to the ultimate objective of stabilizing the ratio of public debt to GDP. In the following analysis, the effects of inflation convergence and of convergence in reserve ratios are discussed in separate subsections and numerical illustrations on the potential magnitude of these effects are presented in the final subsection.

1. Effects of inflation convergence

A major shortcoming of some of the previous attempts to measure the fiscal implications of financial integration is their narrow focus on seignorage as a source of revenue to be maximized. Such a focus obscures the fact that financial integration is likely to affect the fiscal accounts through multiple channels, some of which may be much more important than the loss of seignorage revenues. In the case of Italy, interest rate developments are likely to be one of the most important linkages between inflation convergence and the budget

^{1/} The withholding tax on deposit interest has similar effects to the reserve requirement tax. Both taxes collect revenues from the financial system and they both drive a wedge between the after-tax deposit rate and the loan rate, thereby spurring disintermediation. Our analysis focuses on the implications of financial integration for revenues from implicit taxation through seignorage, but the effects of harmonization of explicit taxes are beyond the scope of this paper.

deficit. In 1987, interest payments on the public debt net of refunds from the Bank of Italy amounted to the equivalent of 8.1 percent of GDP. Interest savings through seignorage, by contrast, amounted to only 1 percent of GDP (Table 2). These figures suggest that a decline in the rate of inflation that is accompanied by a decline in real interest rates on the public debt may well lower the burden of servicing the public debt in amounts that more-than-offset the associated loss of revenues from seignorage.

The difficulties in separating the real effects of changes in real interest rates from the nominal effects of changes in the rate of inflation make it worthwhile to formalize the above argument in terms of the dynamics of the ratio of public debt to GDP. Using equation (2) as our definition of seignorage and abstracting from the payment of interest on bank reserves yields the following representation for the dynamics of the debt-to-GDP ratio: 1/

$$\dot{b} = d + (i - y)b - (i + p)h \quad (3)$$

where

b = ratio of public debt to GDP

d = ratio of public sector's primary deficit to GDP

i = real interest rate

y = rate of growth of real GDP

p = rate of inflation

h = ratio of high-powered money to GDP

Equation (3) allows us to assess the implications of inflation convergence that affects simultaneously revenues from seignorage and the real rate of interest. Differentiating (3) with respect to p yields

$$\frac{db}{dp} = (b - h)\frac{\partial i}{\partial p} - h \quad (4)$$

1/ To derive (3), let B and H denote the nominal stocks of public debt and high-powered money, respectively, and Y and D nominal GDP and the nominal primary deficit. By definition we have $\dot{b} = \Delta(B/Y) = \Delta B/Y - (B/Y)(\Delta Y/Y) = \Delta B/Y - b(y+p)$. The process of debt accumulation is described by $\Delta B = (i + p)(B - H) + D$, which when substituted in the equation above yields (3). Note that (3) differs from the formulation adopted by Dornbusch (1987) in that seignorage savings depend on the nominal rate of interest rather than on nominal income growth. This reflects our definition of seignorage as the interest savings on the public debt in contrast to Dornbusch's use of the flow supply of high-powered money.

Equation (4) implies that a decline in the rate of inflation will accelerate the process of debt accumulation if and only if

$$\partial i / \partial p < h / (b - h) \quad (5)$$

Using the 1987 figures for h and b in Italy as presented in Table 2, we have

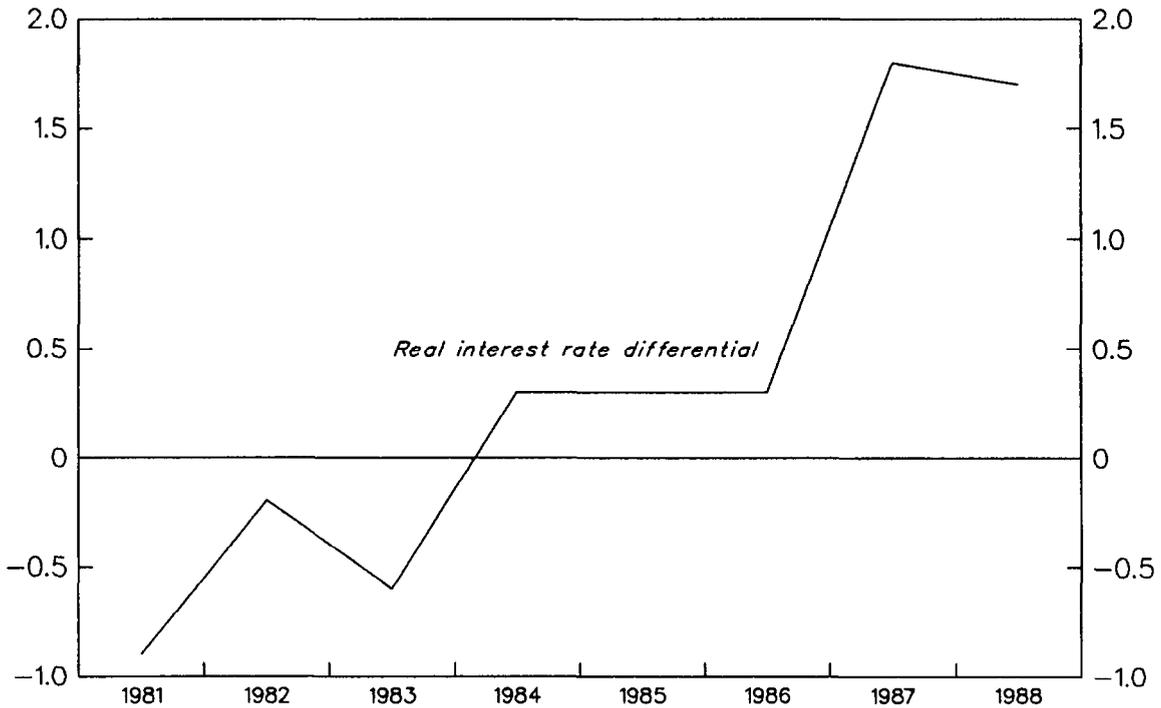
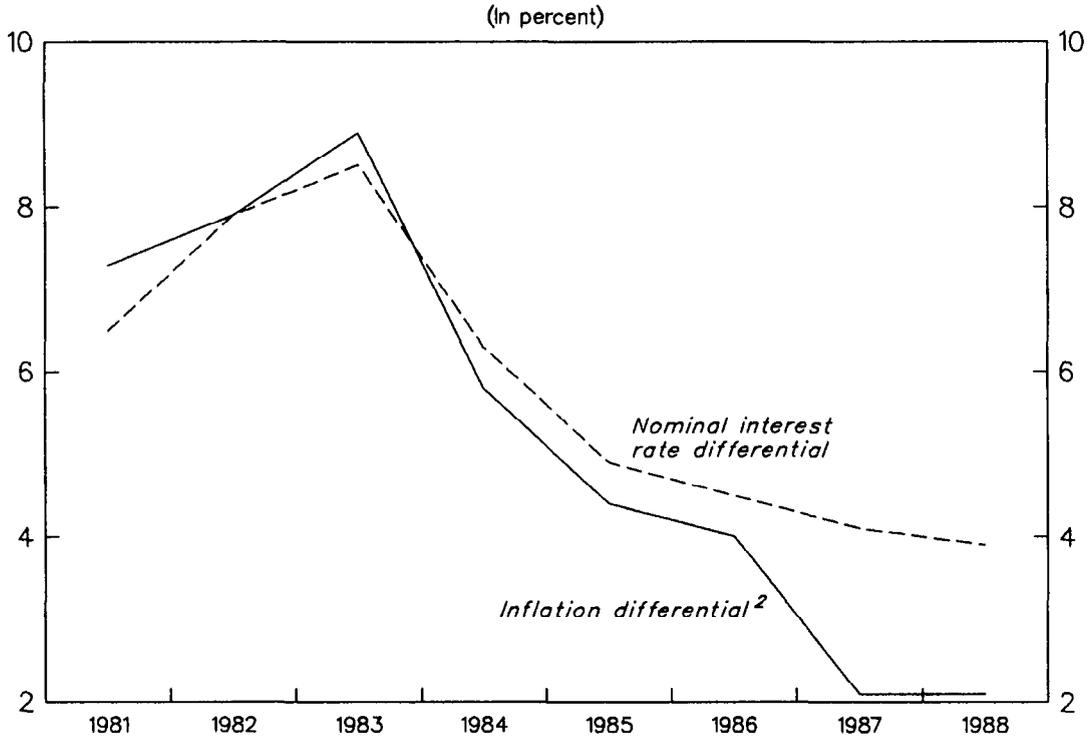
$$h / (b - h) = .146 / (.867 - .146) = .203 \quad (6)$$

According to these estimates, inflation convergence will accelerate the process of public debt accumulation if and only if each percentage point decrease in the rate of inflation is accompanied by less than a 0.2 percentage point decline in the real interest rate on the public debt. The fiscal implications of a lower inflation rate are thus likely to hinge on the extent to which real interest rates react favorably to the move toward financial integration.

What are the prospects for a significant decline in Italian interest rates in a financially integrated Europe? The theoretical argument is quite straightforward. The liberalization of capital movements may necessitate a strengthening of the cohesion of the EMS, with inflation convergence allowing the transition to a system of irrevocably fixed exchange rates and, ultimately, to monetary unification (Giavazzi, 1988). If the fixity of exchange rates is credible, the freedom of capital movements can be expected to eliminate interest rate differentials on debts with like characteristics. Financial integration will thus lead to convergence of both inflation and nominal interest rates. Such convergence is bound to imply a decline in real interest rates in Italy, which have been significantly higher than in all other G-7 countries during the last two years (Table 3). In relation to the average real interest rate in the three other major EEC countries, in particular, there was a differential of about 1 3/4 percentage points in both 1987 and 1988 (Chart 1). This differential would be wiped out if financial integration were to eliminate interest rate dispersion in the EEC. 1/

1/ As is illustrated in Chart 1, Italy's real interest rate differential vis-à-vis the rest of G-7 Europe was negative in 1981-83, it became moderately positive in 1984-86 and then rose sharply to about 1 3/4 percentage points in 1987-88. The recent widening of the real interest rate differential reflects a sharp decline in the inflation differential which, unlike in previous years, failed to be accompanied by a commensurate decline in the nominal interest rate differential. If this behavior of interest rates is due to bond holders' fears that the recent inflation gains might be reversed, the move toward a fixed exchange rate regime could spur a resumption of the decline in the nominal interest rate differential.

CHART 1
ITALY
INFLATION AND INTEREST RATE DIFFERENTIALS VIS-A-VIS
OTHER G-7 EUROPE ¹



Sources: Bank of Italy, *Relazione Annuale-Appendice* and *Rassegna Congiunturale*; and IMF, *International Financial Statistics* and *Current Economic Indicators*.

¹Data for other G-7 Europe are simple averages of data for France, Germany and the United Kingdom

²Based on consumer price indices.

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Table 3. Nominal and Real Interest Rates in Major Industrial Countries, 1981-88

(Annual averages; in percent)

	1981	1982	1983	1984	1985	1986	1987	1988
United States								
Inflation	10.3	6.2	3.2	4.3	3.5	1.9	3.7	4.1
Interest rate <u>1/</u>	14.7	11.1	9.0	9.9	7.7	6.1	6.0	6.9
Real rate	4.0	4.6	5.6	5.4	4.1	4.2	2.2	2.7
Italy								
Inflation	17.8	16.5	14.7	10.8	9.1	5.9	4.7	5.0
Interest rate <u>1/</u>	19.6	19.4	17.8	15.3	13.9	11.9	11.1	11.2
Real rate	1.5	2.5	2.7	4.1	4.4	5.7	6.1	5.9
Japan								
Inflation	4.9	2.6	1.8	2.3	2.3	0.6	0.1	0.7
Interest rate <u>2/</u>	7.7	7.1	6.7	6.3	6.7	5.1	3.9	4.1
Real rate	2.7	4.4	4.8	3.9	4.3	4.5	3.8	3.4
Germany								
Inflation	6.3	5.3	3.3	2.4	2.1	-0.2	0.3	1.2
Interest rate <u>3/</u>	10.6	8.0	5.6	5.7	5.0	3.9	3.3	3.8
Real rate	4.0	2.6	2.3	3.2	2.8	4.1	3.0	2.6
France								
Inflation	13.3	12.0	9.5	7.7	5.8	2.5	3.3	2.7
Interest rate <u>4/</u>	15.4	14.6	12.4	11.7	9.9	7.7	8.1	7.8
Real rate	1.9	2.3	2.6	3.7	3.9	5.1	4.6	5.0
United Kingdom								
Inflation	11.9	8.6	4.6	5.0	6.1	3.4	4.1	4.9
Interest rate <u>1/</u>	13.5	12.0	9.9	9.6	12.0	10.8	9.5	10.1
Real rate	1.4	3.1	5.1	4.4	5.6	7.1	5.2	4.9
Canada								
Inflation	12.5	10.8	5.8	4.3	4.0	4.1	4.4	4.1
Interest rate <u>1/</u>	17.7	13.6	9.3	11.1	9.4	9.0	8.1	9.4
Real rate	4.6	2.6	3.3	6.5	5.2	4.7	3.6	5.1
Average G-7 Europe excluding Italy								
Inflation	10.5	8.6	5.8	5.0	4.7	1.9	2.6	2.9
Interest rate	13.2	11.5	9.3	9.0	9.0	7.4	7.0	7.2
Real interest rate	2.4	2.7	3.3	3.8	4.1	5.4	4.3	4.2

Sources: Bank of Italy, *Relazione Annuale-Appendice*, and *Rassegna Congiunturale*; and IMF, *International Financial Statistics* and *Current Economic Indicators*.

1/ Three-month treasury bill rate, bond-equivalent basis.

2/ Discount rate on two-month private bills.

3/ Twelve-month federal debt registered claims.

4/ Three-month interbank loan rate.

One major qualification to the above argument relates to the credibility and sustainability of a fixed exchange rate regime. The state of public finances is likely to be of key importance in this regard. A credible program to place the public debt on a sustainable path would go a long way toward alleviating any doubts on the feasibility of adhering to a fixed exchange rate regime. The perpetuation of an unsustainable fiscal deficit, by contrast, could undermine the credibility of any plan to achieve monetary unification. This could give rise to a permanent real interest rate differential, which would represent the worst possible outcome as long as exchange rates remained fixed, with the higher cost of borrowing failing to be offset by the monetary erosion of the public debt. In the absence of fiscal adjustment, the eventual outcome under this scenario would be a revival of inflation, exchange rate instability and, almost certainly, a reversal of the move toward financial integration.

2. Effects of convergence of reserve ratios

The adverse effects of convergence in reserve ratios have been argued to be potentially much more damaging for the Italian public finances than inflation convergence. Giavazzi (1988, p. 19), for example, has pointed out that, following financial integration, competition among commercial banks across Europe under home country rule is likely to necessitate a lowering of Italy's high reserve ratio to the levels prevailing in northern European countries. International portfolio diversification could further decrease seignorage revenues from bank reserves, by lowering the share of financial wealth held in domestic deposits, which constitute the base for the reserve requirement tax.

A comparison of reserve ratios in effect in major industrial countries indeed suggests that Italy will probably have to enforce sharp reductions in the reserve requirements imposed on domestic banks to keep them competitive in an integrated financial environment. As is illustrated in Table 4, Italy's reserve ratio exceeds by a large margin the ratios in effect in all its major EEC partners. To the extent that all European countries will remain constrained to keep their banks competitive with banks in the Euromarket--where there is no reserve requirement--and in the United States and Japan, convergence is likely to occur at the lower range of currently applicable reserve ratios. 1/

The U.K. experience following its removal of exchange controls in October 1979 is highly instructive in this regard. The ability of U.K. residents to arbitrage freely in the Euromarket virtually eliminated the

1/ Caranza, Papadia and Zautzik (1988) have estimated that, despite the accrual of interest on required reserves, interest income forgone by Italian banks on account of reserve requirements amounted to the equivalent of 1 percent of their deposit liabilities in 1987. By comparison, the burden of reserve requirements was equivalent to 0.3 percent of deposits in Germany, 0.2 percent in France and nil in Belgium and the Netherlands.

Table 4. Reserve Ratios in Major Industrial Countries,
(In percent)

	Minimum Reserve Ratio	Maximum Reserve Ratio	Rate of Remuneration of Required Reserves
Italy	22.50 <u>1/</u>	25.00 <u>2/</u>	5.5-8.5
Germany	4.15 <u>3/</u>	12.10 <u>4/</u>	--
France	1.00 <u>5/</u>	5.00 <u>6/</u>	--
United Kingdom	0.50	0.50	--
Belgium-Luxembourg	--	--	--
Netherlands	--	--	--
United States	3.00 <u>7/</u>	12.00 <u>8/</u>	--
Japan	0.125 <u>9/</u>	1.625-2.50 <u>10/</u>	--

Sources: International Monetary Fund; and Caranza, Papadia, Zautzik (1988).

1/ Target average reserve ratio.

2/ Marginal reserve ratio on increases of deposits until the target average reserve ratio of 22.5 percent is reached, at which point there will be a uniform reserve ratio of 22.5 percent.

3/ Applies to savings deposits above DM 10 million up to DM 100 million for residents.

4/ Applies to sight deposits above DM 100 million for residents and to all sight deposits for nonresidents.

5/ Applies to savings deposits.

6/ Applies to sight deposits.

7/ Applies to net transactions accounts up to US\$36.7 million, nonpersonal time deposits with less than 1.5-year maturities and Eurocurrency liabilities.

8/ Applies to net transactions accounts over US\$36.7 million.

9/ Applies to deposits of Y 1,000 billion or less and to deposits with mutual loans and savings banks and Shinkin banks.

10/ Applies to deposits of more than Y 3,300 billion with banks, long-term credit banks and authorized foreign exchange banks.

differentials between domestic and Euro-sterling interest rates, but at the same time it gave rise to a large distortion in the pattern of financial intermediation. Deposits flowed out of domestic banks--which were subject to a system of noninterest-bearing reserve requirements known as the "corset"--and were placed in the Eurocurrency market, where net borrowing by U.K. banks and nonbanks expanded sharply. To stem the tide of disintermediation and the associated distortion of domestic money supply figures the authorities abolished the corset in June 1980. This eliminated the cost advantage of the Eurocurrency market and led to a rapid decline in net borrowing of Euro-sterling by U.K. banks, which became net lenders in the Euro-sterling market soon thereafter. 1/

Notwithstanding these considerations, the fiscal losses that would result from the harmonization of reserve requirements have been overstated. One particular problem with the measure of gains from seignorage in Giavazzi (1988) is the disregard of the remuneration of required reserves in Italy. As is shown in Table 4, Italy is the only one among major industrial countries that remunerates banks' required reserves. Although the applied rate of remuneration has remained rigid throughout the high-inflation 1970s and early 1980s, by 1987 the average rate of return on Italian banks' required reserves exceeded the rate of inflation by a full percentage point. As a result, according to our definition of equation (2'), seignorage revenue from required reserves had declined to only 0.4 percent of GDP in 1987 and it is set to decline further in the period ahead if inflation and real interest rates also decline. Perhaps more fundamentally, defining seignorage revenues as the flow supply of high-powered money may create the misleading impression that any decrease in reserve requirements may be tantamount to a negative tax. This definition would be identical to the definition of equation (1) in a long-run steady-state equilibrium with constant real money demand, but it is highly inappropriate for the measurement of seignorage over discrete, short-term intervals. Even equation (1) would overstate the gains from seignorage in the presence of remunerated required reserves. Indeed, in the extreme case of remuneration at market rates, the fiscal effects of a rise in the required reserve ratio are identical to the effects of an open market sale of government securities that sterilizes an equal quantity of reserves.

Some additional considerations call for caution in assessing the fiscal effects of a decline in the reserve ratio. Unlike the direct effects on revenues from seignorage, the size and even the direction of other less direct effects are difficult to gauge. The effect on market interest rates is particularly important in the case of Italy as was already pointed out. When wealth owners view the various types of assets as imperfect substitutes, a lowering of the reserve ratio may exert conflicting influences on government bond rates. If the resulting increase in banks' excess reserves is sterilized through open market sales of government bonds, then the increased supply of bonds may tend

1/ For a more detailed account on these developments, see Johnston (1982, pp. 264-267).

to raise bond rates. At the same time, however, if the banking system is competitive, the lowering of the reserve ratio will be translated into lower intermediation margins, with banks lowering the interest rates at which they are willing to extend loans and hold bonds for any given deposit rate. The net effect on the bond rate will thus be ambiguous. If banks raise deposit rates, the increased amount of intermediation will tend to lower the public's direct demand for government securities but it will also tend to increase banks' demand for securities, with the net effect on the bond rate again being ambiguous. Although a formal treatment of the general equilibrium implications of changes in reserve ratios are beyond the scope of this paper, this discussion makes it clear that a narrow focus on the impact on revenues from seignorage--which are very small anyway--may provide a biased view of the associated fiscal effects. 1/

Another important aspect of the fiscal effects of reserve requirements relates to their incidence. With keen competition for the deposits and loans of prime customers that already have access to foreign markets, Italian banks may already be accepting a decrease in their profitability as the cost of remaining competitive with the Euromarket. A high reserve ratio may thus have the effects of a tax on bank profits, adding a new perspective to the measurement of fiscal gains from seignorage. Because 70-80 percent of banking system activity in Italy is controlled by public or quasi-public institutions, some of these purported gains may merely represent transfers within the public sector. Although some of the quasi-public banks do not explicitly transfer their profits to the budget, their implicit transfer through seignorage cannot be legitimately viewed as a fiscal gain. Overreliance on such transfers may ultimately require the recapitalization of some banks, with a cost to the budget that offsets previous fiscal gains from the reserve requirement tax. Thus, from an intertemporal perspective, the case for continued reliance on seignorage in Italy is further weakened.

3. Some numerical illustrations

In this section, numerical simulations are used to illustrate how some of the already-described relationships between financial integration and revenues from seignorage would be reflected in the process of public debt accumulation. The analysis is conducted in the context of a discrete-period variant of the framework of subsection 1 above. This framework allows the tracing of the path of public debt in relation to GDP given our assumptions about the principal parameters. By varying the assumptions on inflation, reserve requirements and the real interest rate, we obtain illustrative estimates of the impact of financial integration on the ratio of public debt to GDP by 1992, which is the end of the reference period.

1/ For a formal description of the type of general equilibrium framework underlying this discussion, see Tobin and Brainard (1963).

a. The framework

Assuming that borrowing to finance the deficit is spread evenly throughout each period, the following equation can be obtained for the dynamics of public debt:

$$\Delta B_t = B_t - B_{t-1} = (r_t B_{t-1} + D_t - S_t) / (1 - r_t/2) \quad (7)$$

where B_t and B_{t-1} stand for the stock of public debt at the end of periods t and $t-1$, respectively, D_t is the primary (noninterest) deficit in period t , r_t is the average nominal interest rate on publicly held government debt, and S_t stands for seignorage revenues as defined in equation (2'). To simplify the analysis, we assume that the ratio of banks' average free reserves to their reservable deposits, denoted by f , remains constant. The ratios of average currency holdings and average reservable deposits to GDP are also assumed to remain constant. Denoting these ratios by c and dp , respectively, and letting k denote the average required reserve ratio yields the following equation for the ratio of seignorage revenue to nominal GDP in period t :

$$S_t / Y_t = c \cdot r_t + k \cdot dp \cdot (r_t - r_t^{RR}) + f \cdot dp \cdot (r_t - 0.005) \quad (8)$$

where r_t^{RR} is the rate of remuneration of required reserves in period t . Changes in the rate of inflation (p_t) affect the nominal interest rate (r_t) and the path of nominal GDP (Y_t) as follows:

$$r_t = (1 + i_t)(1 + p_t) - 1 \quad (9)$$

$$Y_t = (1 + y_t)(1 + p_t) Y_{t-1} \quad (10)$$

where i_t is the real rate of interest on publicly held government debt and y_t is the real rate of growth of income. Combining equations (7)-(10) we obtain an expression that gives us the path of the average public debt in relation to GDP as a function of the paths of the primary deficit in relation to GDP (d_t) and of the parameters i_t, p_t and k .

b. The results

The simulation exercise is run over the 1989-92 period under two scenarios. Both scenarios begin with the same initial conditions for 1988, based on the Italian authorities' official estimates for output and the public finances. The assumptions on real GDP growth and on the primary deficit in relation to GDP thereafter are consistent with official figures as presented in the Relazione Previsionale e Programmatica for 1989 and in the fiscal re-entry program published in May 1988. Under the adjustment scenario of the re-entry program, the goal is to shift the primary balance into a surplus equivalent to 0.4 percent of GDP by 1992.

The two scenarios differ in their parameters on the rate of inflation (p), the real interest rate on publicly held debt (i) and the reserve ratio (k). In the base scenario inflation decelerates somewhat in 1988-89 and levels off thereafter, while the real interest rate declines by about 0.7 percentage point from its 1988 level; the average required reserve ratio rises by about 1 percentage point in 1989, thereby reaching its long-run steady state level (p = 5%, i = 4%, and k = 22.5%). 1/ By contrast, the financial integration scenario allows a marked reduction in the rate of inflation--from 5 to 3 percent--a somewhat larger decline in the real rate of interest--to 3.5 percent--and a sharp decrease in the average reserve ratio--from 22.5 percent to 5 percent. These parameters remain unchanged throughout the 1989-92 period. Both scenarios assume the same average rate of remuneration of bank reserves (5.9 percent), and the same ratios of average currency holdings and average reservable deposits to GDP (4.8 percent and 43.3 percent, respectively) throughout the 1989-92 period. 2/

The simulation results under the two scenarios are presented in Tables 5 and 6. In the base scenario the annual revenues from seignorage decline slightly from the equivalent of 0.9 percent of GDP in 1988 to 0.8 percent of GDP in the 1989-92 period. This decline is attributable to the assumed decline of the real rate of interest and of the rate of inflation, which more-than-offset the effect of the higher reserve ratio by reducing the margin between the nominal interest rate on the public debt and the rate of remuneration of required reserves. By 1992, the average stock of public debt begins to level off at the equivalent of 97 1/2 percent of GDP, with the net interest bill amounting to 8.2 percent of GDP. 3/ In the financial integration scenario, seignorage revenues fall sharply from 0.9 percent of GDP in 1988 to 0.3 percent of GDP thereafter. Despite this decline, however, the average stock of public debt to GDP is also leveling off by 1992 at about the same level in relation to GDP as in the previous scenario. This result is achieved through the reduction of real interest payments

1/ Under current regulations, the marginal reserve ratio is to remain at the level of 25 percent until the average reserve ratio rises to 22.5 percent, at which point both the marginal and average ratios will be set equal to 22.5 percent. The average reserve ratio for all credit institutions as a whole has risen steadily from around 15 percent in 1980 to 20.6 percent in 1987 and it is estimated to have risen further to 21.5 percent in 1988, making the attainment of the 22.5 percent target quite feasible in 1989.

2/ The average rate of remuneration on required reserves was 5.7 percent in 1987. However, owing to the sharp recent expansion in the stock of certificates of deposit, which enjoy a higher rate of remuneration of required reserves held against them (8.5 percent), the average rate of return on total required reserves is assumed to have risen to 5.8 percent in 1988 and to 5.9 percent in 1989 and thereafter.

3/ The net interest bill is equal to the interest that would have been paid if all government debt were held by the public minus interest savings from seignorage.

Table 5. Seignorage and Public Sector Debt--Base Scenario, 1987-92

	1987	1988	1989	1990	1991	1992
(In billions of lire)						
Public debt (end-year)	909,983	1,035,500	1,150,443	1,267,162	1,384,185	1,499,651
Currency (annual average)	47,483	51,526	55,725	60,325	65,369	70,902
Average required reserves	93,033	100,394	113,152	122,493	132,733	143,969
Average free reserves	2,673	3,085	3,336	3,612	3,914	4,245
Average liabilities subject to reserve requirement	452,163	465,000	502,898	544,412	589,925	639,862
Gross domestic product	982,594	1,074,907	1,162,512	1,258,477	1,363,686	1,479,122
Interest bill	79,700	89,800	91,693	101,618	111,568	121,382
Seignorage saving						
Currency	4,881	5,302	5,127	5,550	6,014	6,523
Required reserves	4,265	4,508	3,734	4,042	4,380	4,751
Free reserves	261	302	290	314	341	369
Total	9,408	9,811	8,861	9,592	10,394	11,274
Primary deficit	34,100	34,400	23,250	15,102	5,455	5,916
(In percent of GDP)						
Public debt (year average)	86.7	90.5	94.0	96.1	97.2	97.5
Currency (year average)	4.8	4.8	4.8	4.8	4.8	4.8
Average required reserves	9.5	9.3	9.7	9.7	9.7	9.7
Average free reserves	0.3	0.3	0.3	0.3	0.3	0.3
Average liabilities subject to reserve requirement	46.0	43.3	43.3	43.3	43.3	43.3
Interest bill	8.1	8.4	7.9	8.1	8.2	8.2
Seignorage saving						
Currency	0.5	0.5	0.4	0.4	0.4	0.4
Required reserves	0.4	0.4	0.3	0.3	0.3	0.3
Free reserves	--	--	--	--	--	--
Total	1.0	0.9	0.8	0.8	0.8	0.8
Primary deficit	3.5	3.2	2.0	1.2	0.4	-0.4
Total deficit	11.6	11.6	9.9	9.3	8.6	7.8
Principal assumptions						
Real GDP growth	3.1	3.8	3.0	3.1	3.2	3.3
Inflation (GDP deflator)	5.6	5.4	5.0	5.0	5.0	5.0
Nominal GDP growth	8.9	9.4	8.2	8.3	8.4	8.5
Real interest rate	4.4	4.7	4.0	4.0	4.0	4.0
Implicit interest rate on debt held by public	10.3	10.3	9.2	9.2	9.2	9.2
Average reserve ratio	20.6	21.6	22.5	22.5	22.5	22.5
Average return on required reserves	5.7	5.8	5.9	5.9	5.9	5.9

Sources: Relazione Previsionale e Programmatica per il 1989; Documento di Programmazione Economico-Finanziaria Relativo Alla Manovra di Finanza Pubblica Per Gli Anni 1988-1992; Bank of Italy, Bollettino Economico, February 1989; and Fund staff estimates.

Table 6. Seignorage and Public Sector Debt--Financial Integration Scenario, 1987-92

	1987	1988	1989	1990	1991	1992
(In billions of lire)						
Public debt (end-year)	909,983	1,035,500	1,125,903	1,213,681	1,297,490	1,375,750
Currency (annual average)	47,483	51,526	54,664	58,049	61,704	65,652
Average required reserves	93,033	100,394	24,666	26,193	27,843	29,624
Average free reserves	2,673	3,085	3,273	3,476	3,694	3,931
Average liabilities subject to reserve requirement	452,163	465,000	493,319	523,870	556,853	592,486
Gross domestic product	982,594	1,074,907	1,140,369	1,210,992	1,287,236	1,369,606
Interest bill	79,700	89,800	67,596	73,246	78,660	83,739
Seignorage saving						
Currency	4,881	5,302	3,611	3,834	4,076	4,336
Required reserves	4,265	4,508	174	185	196	209
Free reserves	261	302	200	212	226	240
Total	9,408	9,811	3,784	4,019	4,272	4,545
Primary deficit	34,100	34,400	22,807	14,532	5,149	5,478
(In percent of GDP)						
Public debt (year average)	86.7	90.5	94.8	96.6	97.5	97.6
Currency (year average)	4.8	4.8	4.8	4.8	4.8	4.8
Average required reserves	9.5	9.3	2.2	2.2	2.2	2.2
Average free reserves	0.3	0.3	0.3	0.3	0.3	0.3
Average liabilities subject to reserve requirement	46.0	43.3	43.3	43.3	43.3	43.3
Interest bill	8.1	8.4	5.9	6.0	6.1	6.1
Seignorage saving						
Currency	0.5	0.5	0.3	0.3	0.3	0.3
Required reserves	0.4	0.4	--	--	--	--
Free reserves	--	--	--	--	--	--
Total	1.0	0.9	0.3	0.3	0.3	0.3
Primary deficit	3.5	3.2	2.0	1.2	0.4	-0.4
Total deficit	11.6	11.6	7.9	7.2	6.5	5.7
Principal assumptions						
Real GDP growth	3.1	3.8	3.0	3.1	3.2	3.3
Inflation (GDP deflator)	5.6	5.4	3.0	3.0	3.0	3.0
Nominal GDP growth	8.9	9.4	6.1	6.2	6.3	6.4
Real interest rate	4.4	4.7	3.5	3.5	3.5	3.5
Implicit interest rate on debt held by public	10.3	10.3	6.6	6.6	6.6	6.6
Average reserve ratio	20.6	21.6	5.0	5.0	5.0	5.0
Average return on reserves	5.7	5.8	5.9	5.9	5.9	5.9

Sources: Relazione Previsionale e Programmatica per il 1989; Documento di Programmazione Economico-Finanziaria Relativo Alla Manovra di Finanza Pubblica Per Gli Anni 1988-1992; Bank of Italy, Bollettino Economico, February 1989; data provided by the Italian authorities; and Fund staff estimates.

on the publicly held portion of government debt, which largely offsets the loss in seignorage revenues. The net interest bill under this scenario stabilizes at the equivalent of 6.1 percent of GDP, compared with 8.2 percent under the base scenario.

To isolate the effects of changes in each one of our three parameters, sensitivity analysis was conducted on the base scenario. For variations in each parameter, the values of the average stock of public debt, the net interest bill and the revenue from seignorage--all in relation to GDP--were derived for the year 1992. As regards the effects of changes in the rate of inflation, the results are consistent with the view commonly expressed in the literature. A rise in the rate of inflation increases the nominal interest bill in relation to GDP but it also increases gains from seignorage and, thereby, it allows a slowdown in the process of real debt accumulation. For example, a ceteris paribus increase in the annual rate of inflation from the base rate of 5 percent to 10 percent would increase the net interest bill in 1992 from 8.2 percent of GDP to 12.1 percent, while also doubling annual revenues from seignorage from 3/4 percent to 1 1/2 percent of GDP (Table 7). The higher inflation would allow the 1992 ratio of average public debt to GDP to fall to 94.5 percent, compared with 97.5 percent in the base scenario. Less obvious are the effects of changes in the real rate of interest. A rise in this rate increases seignorage gains by increasing the interest saved through monetary financing, but it also increases real interest payments on the publicly held portion of the public debt. The latter effect more than offsets the seignorage effect, raising the net interest bill and thereby the end-period debt-to-GDP ratio. For example, a rise in the real interest rate from 4 to 5 percent raises annual gains from seignorage from 0.8 percent of GDP to 0.9 percent of GDP (Table 8). Even so, the net interest bill in 1992 rises from 8.2 percent to 9.4 percent of GDP and the 1992 debt-to-GDP ratio rises from 97.5 percent to 100.6 percent. Finally, ceteris paribus decreases in the reserve ratio are found to have the expected adverse effects on both seignorage and public debt accumulation, but these effects are not very significant. A fall in the reserve ratio from 22.5 percent to 5 percent lowers annual seignorage revenues from 0.8 percent of GDP to 0.5 percent, increases the net interest bill in 1992 from 8.2 percent of GDP to 8.5 percent of GDP and raises the debt-to-GDP ratio in 1992 from 97.5 percent to 98.4 percent (Table 9).

The simulation results are predicated on the simplifying assumptions of constant income velocities of currency and deposits, but this does not necessarily cause an understatement of the fiscal costs of financial integration. The lowering of nominal interest rates and of financial intermediation margins would tend to increase demand for both currency and bank deposits, by lowering the opportunity cost of holding cash and by raising deposit rates relative to rates of return on other financial assets. Exchange rate stability would also reduce incentives to substitute foreign for domestic currency, unless there were a move toward a currency union. Even in a currency union, revenues from seignorage would not necessarily decline. Each member government would be

Table 7. Sensitivity of Public Debt,
Interest Bill, and Seignorage in 1992 to Changes
in the Rate of Inflation in 1989-92

(In percent of GDP)

Inflation rate	Public debt	Interest bill	Seignorage
--	101.4	4.0	--
1.0	100.5	4.9	0.2
2.0	99.7	5.8	0.3
3.0	98.9	6.6	0.5
4.0	98.2	7.4	0.6
5.0	97.5	8.2	0.8
6.0	96.8	9.0	0.9
7.0	96.2	9.8	1.1
8.0	95.6	10.6	1.2
9.0	95.1	11.3	1.4
10.0	94.5	12.1	1.5
11.0	94.1	12.9	1.7
12.0	93.6	13.6	1.8
13.0	93.2	14.4	2.0
14.0	92.8	15.1	2.1
15.0	92.4	15.8	2.3
16.0	92.1	16.6	2.4
17.0	91.8	17.3	2.6
18.0	91.5	18.1	2.7
19.0	91.3	18.8	2.9
20.0	91.1	19.6	3.0
21.0	90.9	20.3	3.2

Source: Fund staff estimates.

Table 8. Sensitivity of Public Debt,
Interest Bill, and Seignorage in 1992 to Changes
in the Real Interest Rate in 1989-92

(In percent of GDP)

Real interest rate	Public debt	Interest bill	Seignorage
--	86.1	4.2	0.2
0.5	87.4	4.6	0.2
1.0	88.8	5.1	0.3
1.5	90.1	5.5	0.4
2.0	91.6	6.0	0.5
2.5	93.0	6.6	0.5
3.0	94.5	7.1	0.6
3.5	96.0	7.6	0.7
4.0	97.5	8.2	0.8
4.5	99.0	8.8	0.8
5.0	100.6	9.4	0.9
5.5	102.2	10.0	1.0
6.0	103.9	10.7	1.1
6.5	105.6	11.3	1.1
7.0	107.3	12.0	1.2
7.5	109.0	12.7	1.3
8.0	110.8	13.5	1.4
8.5	112.6	14.2	1.4
9.0	114.5	15.0	1.5
9.5	116.3	15.8	1.6

Source: Fund staff estimates.

Table 9. Italy: Sensitivity of Public Debt,
Interest Bill, and Seignorage in 1992 to Changes
in the Average Reserve Ratio in 1989-92

(In percent of GDP)

Average reserve ratio	Public debt	Interest bill	Seignorage
1.0	98.6	8.6	0.5
2.0	98.5	8.6	0.5
3.0	98.5	8.6	0.5
4.0	98.4	8.6	0.5
5.0	98.4	8.5	0.5
6.0	98.3	8.5	0.5
7.0	98.3	8.5	0.5
8.0	98.2	8.5	0.6
9.0	98.2	8.5	0.6
10.0	98.1	8.4	0.6
11.0	98.1	8.4	0.6
12.0	98.0	8.4	0.6
13.0	98.0	8.4	0.6
14.0	97.9	8.4	0.6
15.0	97.9	8.3	0.7
16.0	97.8	8.3	0.7
17.0	97.8	8.3	0.7
18.0	97.7	8.3	0.7
19.0	97.7	8.3	0.7
20.0	97.6	8.3	0.7
21.0	97.6	8.2	0.7
22;5	97.5	8.2	0.8

Source: Fund staff estimates.

entitled to share in the profits of the common monetary authority, to which would be transferred the privilege of issuing noninterest-bearing debt against interest earning assets. This could benefit countries with weaker currencies if world demand for a common European currency were to exceed the sum of the world demands for individual EEC currencies.

V. Summary and conclusions

For countries like Italy, with a high interest bill on the public debt and with remunerated bank reserves, the most meaningful way to define the budgetary gains from seignorage is in terms of the associated interest savings on the public debt. These savings depend not only on the rate of inflation but also on the real rate of interest that the public requires to hold government securities. Recognizing the importance of the real interest rate allows us to place the interest savings from seignorage in the proper perspective. The narrow goal of generating such savings is subsidiary to the broader objective of slowing down the growth of public debt in relation to GDP.

Financial integration will tend to reduce gains from seignorage but it may have stronger effects on the process of public debt accumulation through its impact on domestic interest rates. Inflation convergence, in particular, may allow a lowering of real interest rates, by making the fixity of the exchange rate more credible. The fiscal benefits of lower interest rates could more-than-offset any adverse effects on gains from seignorage. Convergence in reserve ratios may also have a less significant fiscal effect through seignorage than through the real interest rate, but the direction and size of the interest rate effect are difficult to anticipate. Numerical simulations show that a decrease in the annual rate of inflation in Italy from 5 percent to 3 percent together with a reduction in the average reserve ratio from 22.5 percent to 5 percent would have an almost neutral effect on the process of public debt accumulation, provided that they were accompanied by a reduction in the real rate of interest on publicly held government debt by 1/2 percentage point. Such an interest rate effect is well within the realm of possibility.

The potential loss of interest savings from seignorage seems to be of second-order importance and it should not detract from some of the other challenges that Italy will face in preparing for financial integration. Prominent among these challenges is the need to curb the budget deficit net of interest payments, so as to ensure that its financing will not interfere with the process of capital flow liberalization. Another important challenge is the need to harmonize the taxation of financial assets throughout the Community. If harmonization implies the move toward a minimum common level of taxation, Italy--which currently has among the highest withholding tax rates on deposit interest--may suffer a decrease in its tax receipts. A lower withholding tax will also reduce the tax advantage of investment in government securities from the point of view of Italian households, with consequent effects on their asset preferences. In the absence of offsetting changes in the

asset preferences of other investors, tax harmonization may thus affect the interest rate on public debt. These issues are worthy of more attention and are important topics for future research.

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