IMF WORKING PAPER

WP/95/21

INTERNATIONAL MONETARY FUND

IMF Institute and Research Department

The Role of Foreign Currency Debt in Public Debt Management

Prepared by Patrick de Fontenay, Gian Maria Milesi-Ferretti and Huw Pill 1/

February 1995

Abstract

This paper analyzes the choice between public debt denominated in domestic currency and foreign currency in the context of public debt management theories. It discusses the experience of Belgium, Denmark, Ireland, Italy, New Zealand and Sweden and relates it to the theoretical arguments in favor or against the issuance of foreign currency debt.

JEL Classification Numbers:

F34, H63

1/ This paper was prepared for a volume on the *Macroeconomic Dimensions of Public Finance*, coordinated by M. Blejer and T. Ter-Minassian. The authors are grateful to Mark de Broeck, Tim Lane, Alessandro Missale and Alessandro Prati for discussions, clarifications and for generously sharing their data. They also thank David Archer and Lars Kalderen for their insights on, respectively, New Zealand's and Sweden's foreign borrowing, and Marco Cangiano, Mary McKeon, Anton Op de Beke, the Belgian Ministry of Finance, the Central Bank of Denmark and the Swedish National Debt Office for providing data. Huw Pill of Stanford University was a Summer Intern at the Institute at the time this paper was written.

Contents

Summary

This paper focuses on the choice between domestic currency and foreign currency debt. This aspect of public debt management is of interest because, among highly indebted countries, significant differences exist in the currency composition of outstanding public debt. While in Italy the share of foreign currency debt in total debt has been negligible until recently, in Ireland it is over one-third. Borrowing in foreign currency removes the incentive to reduce ex post the real value of government debt through unexpected inflation. However, it exposes the domestic currency value of government liabilities to fluctuations in exchange rates.

The paper examines the theoretical determinants of the choice between domestic and foreign currency debt and presents an empirical analysis of the behavior of the share of public debt denominated in foreign currency in a group of member countries of the Organization for Economic Cooperation and Development, including Belgium, Denmark, Ireland, Italy, New Zealand, and Sweden. The theoretical analysis focuses on time consistency issues, the possibility of confidence crisis, the role of incomplete information, and the hedging role of public debt management. Practical considerations relate to, inter alia, portfolio management and the balance of payments situation. The empirical analysis examines the covariance between real interest payments on domestic and foreign currency debt on the one hand, and productivity and public spending shocks on the other hand. It also reports correlations of the share of foreign currency debt in total debt with the interest differential on domestic versus foreign debt instruments.

I. Introduction

Public debt management became a key policy issue for a number of highly indebted industrialized countries in the late 1970s and early 1980s, when public debt accumulation accelerated significantly following the emergence of primary fiscal imbalances, the large increase in real interest rates and the concurrent slowdown in economic growth. Although some of the high debt countries, such as Ireland and Denmark, have succeeded in reversing the increasing trend of the debt-to-GDP ratio, the burden of public debt remains significant today in several economies. In 1993, for example, debt-to-GDP ratios exceeded 100 percent in Belgium, Greece and Italy; in the same countries, interest payments on public debt exceeded 10% of GDP.

In the theoretical literature, after the seminal paper by Tobin (1963), debt management was largely ignored for over two decades. 1/ The increasing importance of debt burdens spurred a surge of interest in public debt management over the last 10 years. Papers by Lucas and Stokey (1983), Bohn (1988), Calvo (1988), Calvo and Guidotti (1990) and others have emphasized issues such as the hedging role of different government debt instruments; the link between the currency denomination and maturity of the public debt and the incentive to erode its value by inflation; the relation between debt management and the likelihood of runs on government debt; and the optimal structure of debt maturity. Empirical work, however, remains scarce. One of the main reasons is the difficulty of collecting data on public debt that are comparable across countries.

Why should public debt management matter? The so-called Barro debt neutrality theorem (Barro, 1974) demonstrates the irrelevance of the path of public debt and taxes under a series of restrictive assumptions: complete markets, non-distortionary taxation, perfect capital markets, operative intergenerational links between private agents. However, in the presence of distortionary taxation, incomplete markets, and, generally, market imperfections the government's portfolio management can have macroeconomic as well as redistributive effects. This paper focuses on one aspect of public debt management, namely the choice between domestic currency and foreign currency debt. It examines its theoretical determinants and presents an empirical analysis of the behavior of the share of public debt denominated in foreign currency in a group of OECD countries, including Belgium, Denmark, Ireland, Italy, New Zealand and Sweden.

The issue is of interest because, among highly indebted countries, significant differences exist in the currency composition of outstanding public debt. While in Italy the share of foreign currency debt in total debt has been negligible until recently, in Ireland it is over a third. The choice of currency denomination is important in several respects. Borrowing in foreign currency removes the incentive to reduce ex-post the real value

---

1/ Among the few exceptions, see Fischer (1975) and Friedman (1978).

of government debt through unexpected inflation. 1/ However, it exposes the domestic currency value of government liabilities to fluctuations in exchange rates. More detailed discussion of these and other issues is contained in subsequent sections.

The rest of the paper is organized as follows. Section II reviews some aspects of the theoretical and empirical literature on public debt management, focusing on the choice between domestic and foreign currency denominated borrowing. Practical objectives and problems of public debt management are discussed in Section III. Section IV briefly discusses trends in the currency composition of public debt for a group of OECD countries. It also presents some preliminary empirical evidence on the hedging role of domestic and foreign currency debt, and on the relation between interest differentials, exchange rate volatility and the share of foreign currency debt. Finally, section V contains some concluding remarks.

II. A Review of the Literature

The rapidly growing literature on public debt management is surveyed in Missale (1994). For the purpose of this study, we focus on four distinct but related areas of the theory of public debt management, namely: the hedging role of debt instruments; time-consistency issues; the possibility of confidence crises; and the role of incomplete information. This ignores important issues such as the effect of debt management on interest rates and returns to equity (Friedman, 1978; Agell et al, 1990).

Discussion of the hedging role of debt instruments builds on the existing finance literature, having clear analogies with the Consumption Capital Asset Pricing Model (CCAPM). It focuses on how debt management can provide insurance against macroeconomic risk, such as stochastic output fluctuations and terms of trade shocks. A role for public debt management in hedging macroeconomic risks is contingent on departing from the complete markets paradigm: in a complete markets setting, the private sector would be able to hedge optimally against all risks, making public debt management redundant. An active role for the public debt authorities in managing macroeconomic risks may be justified when they have access to better information, or to financial markets and instruments from which the private sector is excluded. 2/

When taxes are distortionary, tax smoothing considerations (Barro, 1979) suggest that the government should issue debt instruments whose return is positively correlated with productivity (income) shocks and negatively correlated with government spending shocks (see also Missale, 1994). The

---

1/ This option is also foregone when the government issues domestic debt indexed to the price level.

2/ Grimes (1992) shows that public debt management can play a hedging role even when private agents have access to the same hedging instruments as the government.

reason is as follows: lower interest payments in "bad times", or when public spending is unusually high, reduce the need for higher tax revenue and therefore higher distortions. Governments do not issue debt instruments whose returns are explicitly conditional on productivity developments or on public spending: the latter would create a moral hazard problem. In such an incomplete markets setting, the issue then becomes to what degree real returns on conventional debt instruments co-vary with output and public spending fluctuations. In this context, studies have examined the choice between nominal debt instruments of different maturity (Calvo and Guidotti 1990, 1992), the choice between nominal and indexed debt (Bohn 1988; Calvo 1988, Calvo and Guidotti 1990) as well as the choice between domestic nominal debt, indexed debt and foreign currency debt (Bohn, 1990a). The latter Bohn paper argues that indexed debt cannot smooth consumption flows (because its returns are determined in real terms), while nominal domestic debt, which provides hedging, gives the government an incentive to reduce debt through inflation. The advantage of foreign currency debt is that it eliminates the inflation incentive while at the same time maintaining hedging properties.

In addition to hedging issues, recent literature on macroeconomic policy and credibility has highlighted the potential strategic role of public debt management. Time-consistency issues, highlighted in the seminal work by Kydland and Prescott (1977) and Calvo (1978), are important whenever the government is unable to commit to a set of future policies. In this setting, there may be an incentive ex-post to deviate from the optimal set of policies determined ex-ante. With reference to public debt, the typical time-consistency problem arises in the presence of distortionary taxation that makes it costly to reduce public debt (Calvo, 1988; Persson, Persson and Svensson 1987; Calvo and Obstfeld, 1990). Under these circumstances, a government that issues nominal debt has an incentive to promise low inflation ex-ante, in order to reduce nominal interest payments, and then reduce ex-post the value of the debt in a lump-sum fashion through unexpected inflation. This incentive is stronger the larger public debt is and the longer its maturity. Rational and well-informed private agents would, however, understand this incentive and ask for correspondingly higher nominal interest payments on nominal debt. In equilibrium, inflation would be sub-optimally high, without any benefit in terms of public debt erosion. The government can solve this problem by "tying its own hands" through issuance of foreign currency debt or indexed domestic debt. 1/ Issuing only indexed debt, however, precludes the use of unexpected inflation as a

---

1/ Watanabe (1992) discusses the optimal currency composition of government debt in such a context when domestic prices are sticky. Milesi-Ferretti (1995) looks at strategic debt management in a political economy context, showing that left-wing governments, that typically place more weight on output stabilization, may have an incentive to issue indexed or foreign currency debt in order to reduce their incentive to create inflation and thereby increasing their electoral chances.

tax smoothing device to reduce the value of nominal debt in bad times, while increasing it correspondingly in good times (Calvo and Guidotti, 1990).

A problem with this literature is that in general it implicitly rules out any form of debt default except inflation. If one views unexpected inflation as just another form of (partial) default, then issuing indexed or foreign currency debt may simply increase the risk of outright repudiation, given the absence of the monetization option. 1/ A confidence crisis can arise whenever markets believe that the government will be unable either to service public debt while avoiding the recourse to inflation/devaluation as a means of reducing the real public debt burden. These crises are possible when there is some fundamental inconsistency in government policy behavior --for example, the rate of money growth is inconsistent with a fixed exchange rate. However, Calvo (1988) shows that the possibility of a default on debt obligations can lead to self-fulfilling crises. For example, the expectation of a devaluation will lead private agents to ask for high nominal interest payments: this may force the government to devalue if a large fraction of debt needs to be rolled over, because otherwise the burden of debt service would be excessive (Giavazzi and Pagano, 1990a; Obstfeld, 1994). Alesina, Prati and Tabellini (1990) discuss how debt management can reduce the risk of self-fulfilling confidence crises triggered by expectations of default on public debt.

When the public has incomplete information about the characteristics of the policymaker, debt management can be used to "signal" the government's preferences, for example with regard to the likelihood of a fiscal stabilization. Drudi and Prati (1993) argue that issuing a sufficient amount of foreign currency debt may allow a government that is "serious" about fiscal stabilization to signal its intentions and reduce the "risk premium" on nominal domestic currency debt by making default through inflation less likely. 2/

A number of these theoretical propositions have been evaluated empirically. However, the empirical analysis has been hampered by the lack of good data. Bohn (1990b) has examined whether debt management in the US

1/ In this context, it is important to underscore that the instruments issued by the government to finance its public debt can be tailored towards specific buyers, such as banks, pension funds etc. The fact that certain debt instruments are underwritten by a particular group of investors (for example, financial institutions, or small savers) may imply different default probabilities across debt instruments (see for example De Broeck, 1992).

2/ If the likelihood of a stabilization occurring is *a priori* low, there is a possibility that issuing more foreign currency (safe) debt will increase the risk premium on domestic debt, analogously to the effects of issuing more senior debt on the riskiness of junior debt in corporate finance.

is consistent with tax smoothing considerations. 1/ Giovannini and Piga (1992) and Caselli, Giovannini and Lane (1994) have studied the determinants of differences in the cost of servicing the public debt for a number of different countries. Whilst fiscal fundamentals and some of the debt management issues discussed in the theoretical section of this paper are found to account for cross-national and time-series variations in debt servicing costs, substantial unexplained country-specific differences remain. Alesina et al. (1992) focus on the existence of a default premium in government bond yields in highly indebted countries. They find some evidence of a default premium in the interest paid by high debt countries, although the absolute magnitude of this premium is small. 2/ De Broeck (1992) examines the maturity structure of government debt from the perspective of the time consistency literature, taking into account the implications of the ownership distribution of the outstanding debt. He tests the implications of a cost-minimizing model for public debt servicing, finding evidence that ownership and maturity of the public debt have an influence on the intensity of time-consistency problems. Drudi and Prati (1993) examine the relation between the share of foreign currency denominated public debt and the interest differential between domestic and foreign currency borrowing. They also evaluate the impact of exchange rate volatility on the currency denomination of debt issues. Since our analysis is also along these lines, their results are further discussed below.

III. Practical Considerations

We now consider a number of practical issues related to foreign currency denominated debt and discuss their links with the theoretical literature. Historically, borrowing abroad by industrial countries' governments has been associated with deficits in the "basic balance" 3/ of the balance of payments (Chart 1a,b). The "compensatory borrowing" undertaken by the oil importing countries after the 1973 oil shock is a case in point. A number of governments took the view that they could borrow on international financial markets at more favorable terms than the private sector. Furthermore, capital controls limited in some cases autonomous private capital inflows. In some cases, public or semipublic enterprises or financial institutions were used, instead of the central government, to undertake the necessary foreign borrowing.

As an example, the first step taken by Sweden to finance the current account deficit resulting from the first oil shock was to remove restrictions on foreign borrowing by private corporations and public entities like municipalities. The Swedish authorities, notably the central

---

1/ On the optimality of the maturity structure of US public debt see also Calvo and Guidotti (1991).

2/ On risk premia on Italian debt returns, see also Cottarelli and Mecagni (1990).

3/ The "basic balance" is defined here as the sum of the current account and the private capital account.

bank, were reluctant to support foreign borrowing by the central government as it was feared this might relax fiscal discipline. In 1977, however, Sweden launched its first syndicated loan, as private sector borrowing was insufficient to finance the current account deficit. Foreign borrowing continued in subsequent years with the amount of foreign borrowing decided on the basis of a forecast of the current account deficit and borrowing by the private sector and public entities other than the State, and of a target for official reserves. In the second half of the 1980s, the reduced need for compensatory borrowing made it possible again to give priority to borrowing in local currency. 1/

More recently, capital markets in all industrial countries have become closely integrated, and capital controls have been dismantled. Foreign investors freely purchase government securities denominated in local currency and can choose to hedge the currency risk if they wish. Even among capital importing countries, some, like Australia, no longer issue government securities denominated in foreign currencies. 2/ Others, however, still do. This section of the paper looks at the possible considerations behind the issuance of such debt under two headings: financial and "strategic" macroeconomic considerations.

1. Financial considerations

For countries whose capital markets are relatively narrow, the real cost of foreign borrowing may be lower than the cost of domestic borrowing at market rates. Yield differentials between debt instruments denominated in local currency and in foreign currencies, both expressed in real terms, imply that the two types of debt are not perfect substitutes. One explanation may be the presence of a risk premium on the domestic currency debt, which may be related to the size of the foreign debt, the country's record of macroeconomic management, and foreign investors' preference for debt instruments denominated in their own currencies, in part because hedging the currency risk is not feasible for long-dated investments (at least at a reasonable cost). Some countries, however, resorted to financial repression--administrative measures such as interest rate controls coupled with restrictions on capital mobility--to borrow domestically at below-market rates.

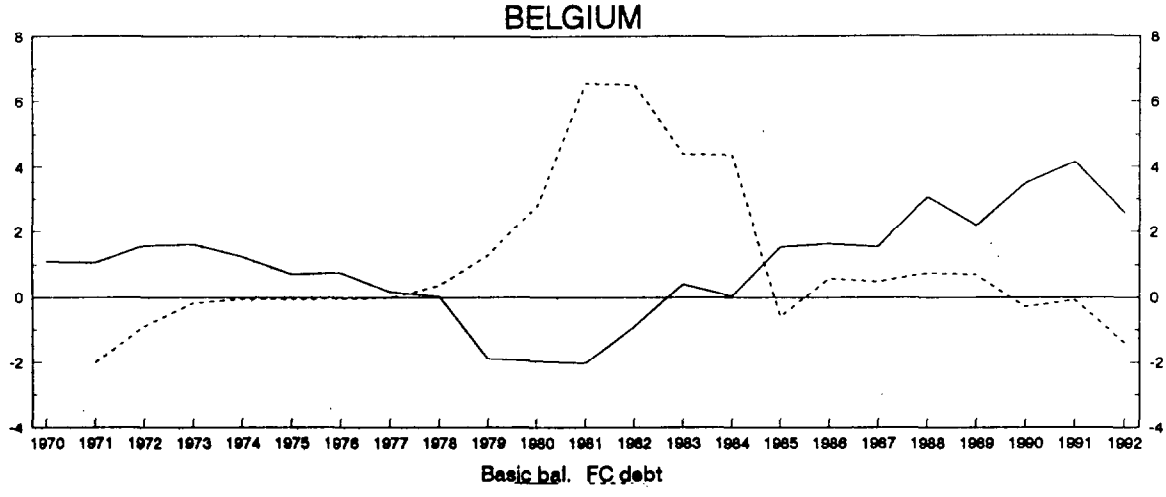
Foreign currency denominated debt may enable the borrowing government to issue bonds with longer maturities than those sold on the domestic market, thereby producing a more favorable debt profile (i.e., avoiding a "bunching up" of redemptions) than would have been possible on the domestic market. Foreign markets may also be deeper and more liquid, making debt

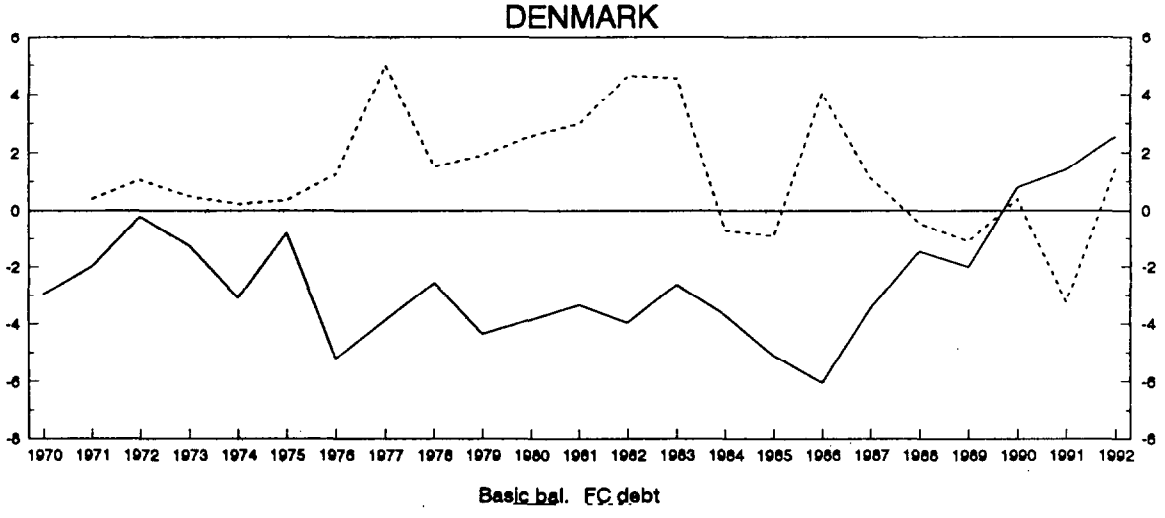
---

1/ We are indebted to Lars Kalderen, former head of Sweden's Debt Office, for this description of Swedish foreign borrowing operations.

2/ Even if a country does not issue foreign currency denominated debt, it might swap the proceeds of a domestic currency debt issue into a debt denominated in foreign currency(ies).

CHART 1a: Basic balance and changes in foreign currency debt





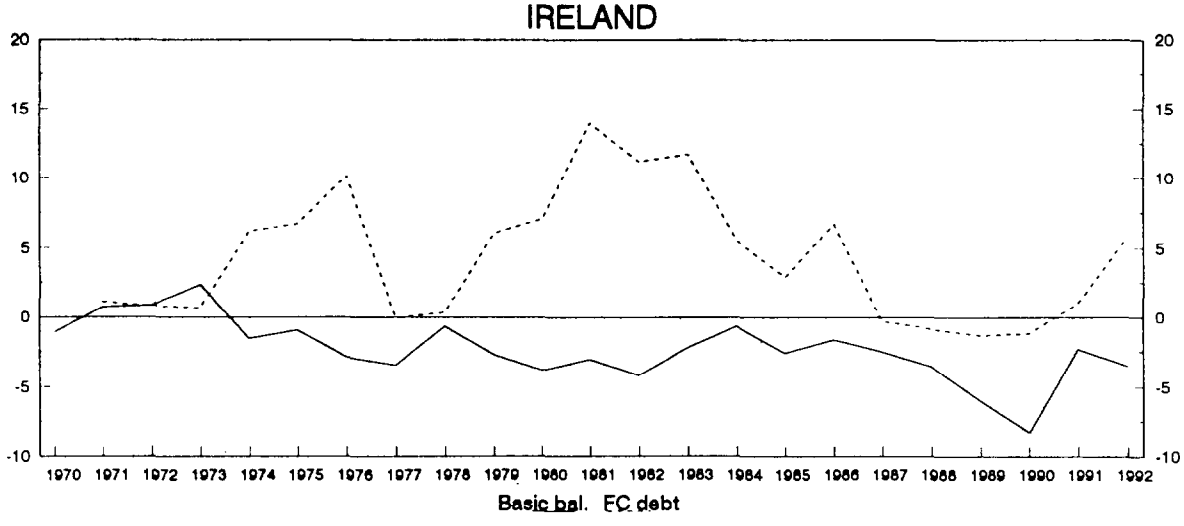
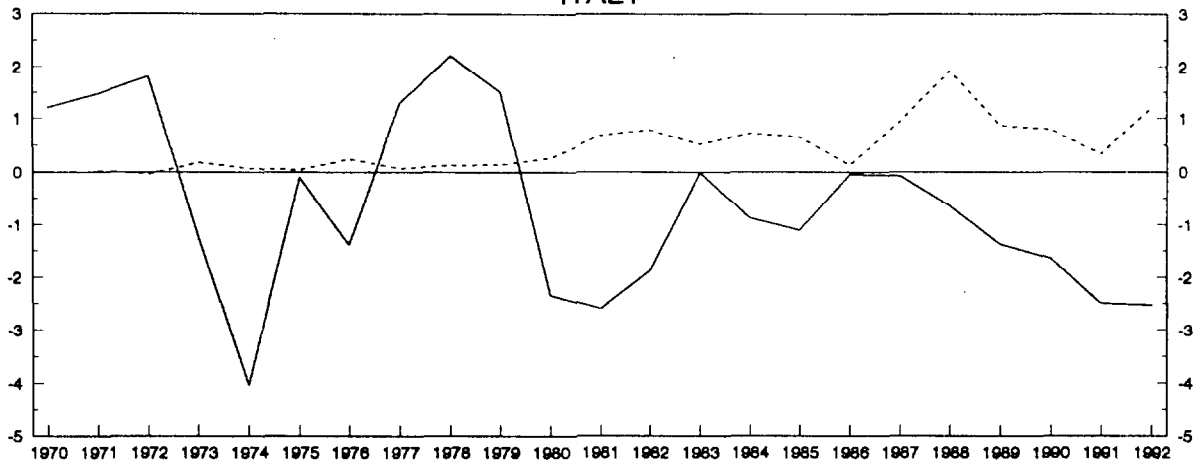


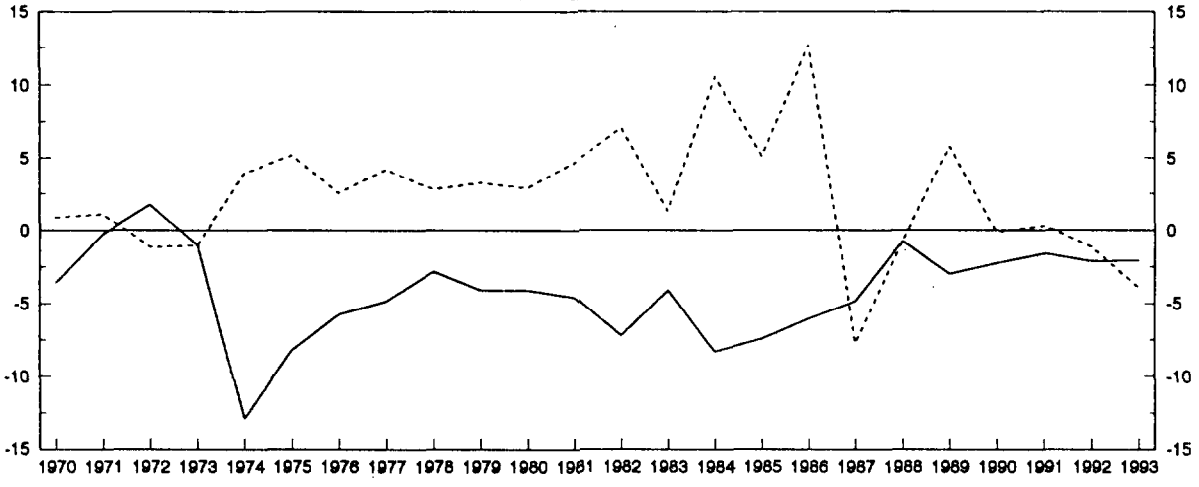
CHART 1b: Basic balance and changes in foreign currency debt

ITALY



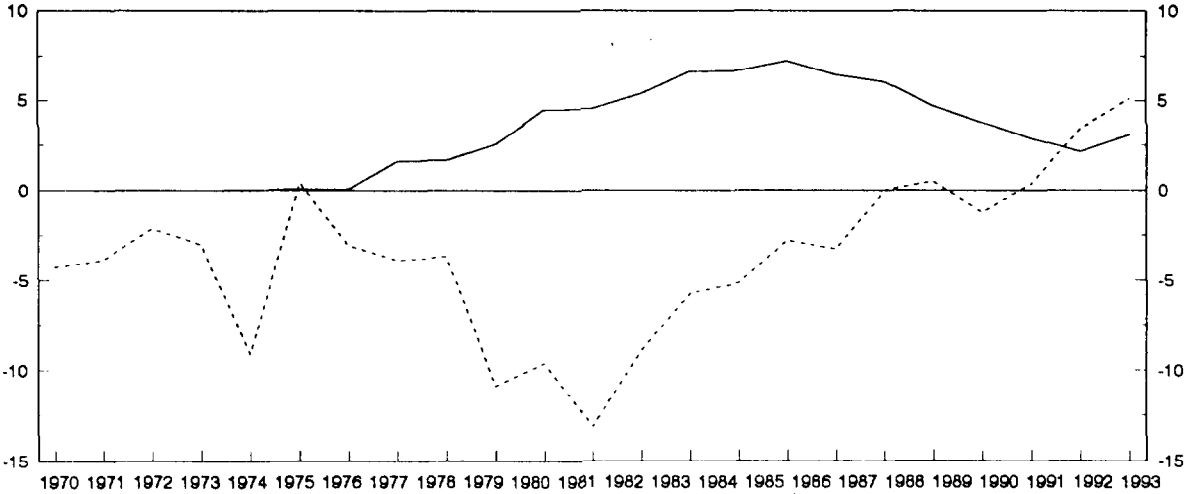
Basic bal. FC debt

NEW ZEALAND



Basic bal. FC debt

SWEDEN



Basic bal. FC debt

management operations, such as rolling over outstanding debt, less problematic or costly.

Cost, however, is only one variable that the authorities can focus on. The other is risk. The existing finance literature offers a coherent framework for analyzing the trade-off between risk and cost in managing the (net) public debt. A useful starting point is the mean/variance portfolio model. This can give the optimal currency composition of the government's debt for various combinations of cost and risk based on the expected yields, variances and covariances of the various debt instruments. The point chosen by the authorities on their "efficient frontier" would reflect the degree of risk aversion they favor. The mean/variance model brings out clearly the advantages of international diversification both from the investor's and the borrower's viewpoints. Diversification can reduce both the borrower's costs and the volatility (risk) of the total debt (Solnik, 1993). However, this issue impinges at least as much on the currency composition of the foreign currency component of the public debt as on the choice between foreign and domestic currency denominated debt, which is the focus of our paper.

The finance theory discussed above focuses narrowly on financial wealth. More sophisticated theories--notably the Consumption CAPM--argue that individuals are not ultimately concerned with the risk/return characteristics of their financial wealth portfolio, but rather with how these affect their future real consumption streams (which, after all, are the arguments of utility functions). As such, individuals should be concerned not only with the variance of, and covariance between, the return on various financial assets, but also with the relationship between financial yields and real economic shocks, such as shocks to productivity. Because the main components of the government's net worth are its spending commitments and power to raise revenue through taxation, applications of this analysis to public debt management will focus on the covariance of government's revenue and spending with its debt servicing costs expressed in various currencies, including the domestic currency. This Consumption CAPM approach is the finance theory analogue to the theoretical discussion of macroeconomic risks and public debt management which we discussed in Section II.

Even if one believes use of public debt management to hedge macroeconomic risks is impossible or undesirable, finance theory suggests other roles for foreign currency debt. Risk management could be implemented by matching the characteristics of the asset and liability sides of the government's balance sheet. This approach would create "natural hedges" against risk--a shock which reduced the value of an asset would have an offsetting reduction on the liability's value, leaving net worth unchanged. Extensive use of this strategy in public debt management may be problematic since many public sector assets are tangible resources (national parks, roads) which have no natural matching liability. However, foreign currency denominated debt may create opportunities for natural hedges in some cases, say against exchange rate effects on royalties from foreign companies' exploitation of domestic natural resources.

A final but crucial issue regarding the hedging role of public debt concerns the existence of a "comparative advantage" of the public sector in providing insurance against macroeconomic risks. This complex issue, still under scrutiny in the theoretical literature, is beyond the scope of this paper. The extent of insurance provided by different debt instruments and its stability through time are empirical questions, that are dependent on the development of new financial instruments and markets.

2. "Strategic" macroeconomic considerations

In addition to portfolio considerations, the management of the public debt raises important "strategic" policy issues. These may create important trade-offs with more practical concerns. One example from the theoretical literature concerns the incentive effects of foreign currency denominated debt. The debt management authorities may wish to improve the credibility of their anti-inflationary policy by issuing foreign currency denominated debt. Increased credibility would result in lower nominal interest payments on domestic debt, as inflation expectations are reduced. However, issuing large amounts of foreign currency debt to exploit the effect on policy credibility increases the magnitude of the potential cost should currency depreciation occur. A practical strategy would have to balance these credibility benefits against the potential cost of a large exposure to exchange risk.

Furthermore, issuing foreign currency denominated debt implies that the government has foregone the option of resorting to domestic price inflation to reduce the burden of the outstanding debt. To the extent that this makes outright repudiation of the debt more likely, the yield on foreign currency denominated public debt may embody a default premium which would tend to offset any perceived cost advantages of issuing foreign debt. 1/

If policymakers embarking on a stabilization program believe that domestic interest rates do not yet reflect the reduction in future inflation which is to result from their program, issuing foreign currency denominated debt (or indexed securities) can reduce the cost of borrowing if their expectations prove to be correct. Another consideration for some countries is that borrowing in the currency of low-inflation countries, where nominal interest rates are relatively low, reduces the short-term cost of borrowing and (artificially) the budget deficit. In the short run, this may relax the fiscal constraint on a government whose time horizon is shortened by the possibility of losing power.

Given all these potential roles for foreign currency denominated debt in public debt management, a final issue concerns how actively the authorities should attempt to exploit them. An active management strategy--which incorporates interest and exchange rate forecasts--incurs transactions

---

1/ As noted above, empirical work has failed to identify large default premia on government debt. See also footnote 1 on page 23.

costs and may, in some cases, require the government to have better information than the private sector. A passive management strategy is likely to be less expensive to operate but, if derivative instruments and swap operations are not fully exploited, may leave the government exposed to unnecessary exchange, interest rate and other risks.

IV. Empirical Evidence

1. The Data

The data for public debt and its composition used to calculate the ratio of foreign currency to total public debt are taken from national sources and from Missale (1994). These data refer to central government gross debt. Government long bond yields for a variety of currencies were obtained from International Financial Statistics, as were the exchange rates used to undertake currency conversions where necessary. Finally, the servicing costs and currency composition of foreign currency denominated public debt was derived from a number of national sources. A detailed discussion of the sources is contained in the Appendix.

Before proceeding to describe the simple empirical studies undertaken, it should be emphasized that public debt data are of uneven quality. The data used are generally not consistent across countries; in some cases, they are not consistent through time even for the same country. In the light of these caveats, the results presented below should be treated with caution.

2. Foreign currency debt management in Belgium, Denmark, Ireland, New Zealand and Sweden

We now discuss the role of foreign currency denominated debt in those countries in our sample of countries where it has been issued in significant amounts--Belgium, Denmark, Ireland, New Zealand and Sweden. The ratio of government debt to GDP rose in all these countries starting in the mid-seventies, a reflection of primary fiscal deficits coupled with an increase in interest rates and a decline in the GDP growth rate (Chart 2a,b). 1/ Denmark implemented a drastic fiscal stabilization plan, that reversed the trend of the debt-GDP ratio in the mid-eighties (Giavazzi and Pagano, 1990b). In the same period, Sweden also completed a successful fiscal stabilization, reducing the debt-to-GDP ratio below 50 percent by the late eighties. 2/ In New Zealand, gross public debt reached 77 percent of GDP in 1986, but was drastically reduced in 1987 because of an exchange rate appreciation and asset sales: it has remained around 60 percent of GDP

1/ The data reported in this section refer to central government gross debt, and is used for reasons of consistency and data availability.

2/ However, public debt has risen considerably in 1992 and 1993, bringing the debt-to-GDP ratio close to 80 percent.

thereafter. 1/ Ireland's fiscal stabilization also took place late in the decade, reducing the debt-to-GDP ratio below 100 percent by 1989. Finally, although its primary budget has been in surplus since 1985, Belgium was able to slow but not reverse the trend in the debt-to-GDP ratio.

The evolution of foreign currency borrowing and its currency composition differs significantly across these countries (Chart 2a,b). In Belgium, the share of foreign currency debt, negligible in the mid-seventies, rose rapidly until 1984, reaching a maximum of 24 percent of total debt; in 1993 it stood at over 16 percent. The currency composition of foreign debt has been relatively stable, with debt in low-inflation European currencies--Deutsche marks, Swiss francs and Dutch guilders--accounting for over 70 percent of the total (Table 1). The Belgian authorities actively manage foreign currency debt using swap operations, but do not report detailed data on these operations.

Denmark has long been an active borrower on international capital markets. Its foreign currency debt was used to finance external imbalances until the mid-70s (Chart 1a,b). The share of foreign currency debt fell until the early eighties and was broadly constant thereafter (Chart 3). The currency composition of foreign currency debt shows a predominance of US dollars in the early eighties. Subsequently, the share of debt denominated in Deutsche Marks and in ECU has risen, reaching a combined total of over 45 percent in 1992 (Table 2).

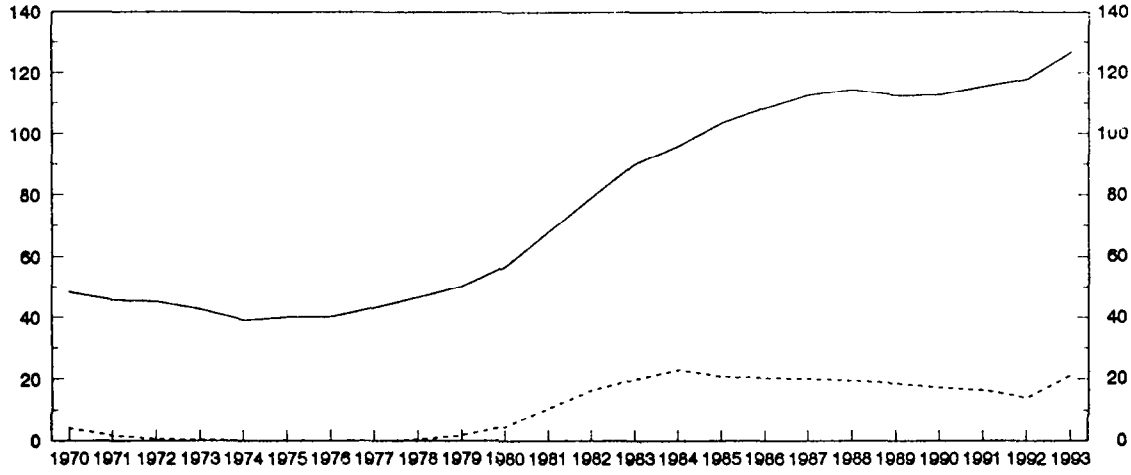
In Ireland, the share of foreign currency debt rose rapidly until the mid-80s, in parallel with the accumulation of total debt. By 1984, the foreign currency component of debt was larger than the domestic one. During the period of fiscal stabilization, the share of foreign currency debt was gradually reduced, although it rose in 1992 because of the punt depreciation. The currency composition of debt in 1980 reflected a predominance of securities denominated in DM and US dollars (Table 3). During the eighties, borrowing in other currencies, such as Yen, Sterling and Swiss Francs increased, while the DM component, after falling until 1990, has recently risen to 43 percent of foreign currency debt (Table 3).

In New Zealand, the share of foreign currency debt in total debt has followed the same pattern as the debt to GDP ratio, rising gradually from 12 percent in 1973 to over 50 percent in 1986, and then falling gradually to 36 percent in 1993. The currency composition of New Zealand's foreign currency debt has changed substantially over the last 20 years, reflecting an increase in the share of debt denominated in US dollars (from 12 percent of total foreign debt in 1973 to over 50 percent in 1993) and Japanese Yen, and a corresponding decrease in debt denominated in European currencies (Table 4).

1/ The fiscal year in New Zealand ran from April 1 to March 31 until 1989, and from July 1 to june 30 thereafter. The data for, say, 1986 refer to debt outstanding at March 31, 1987.

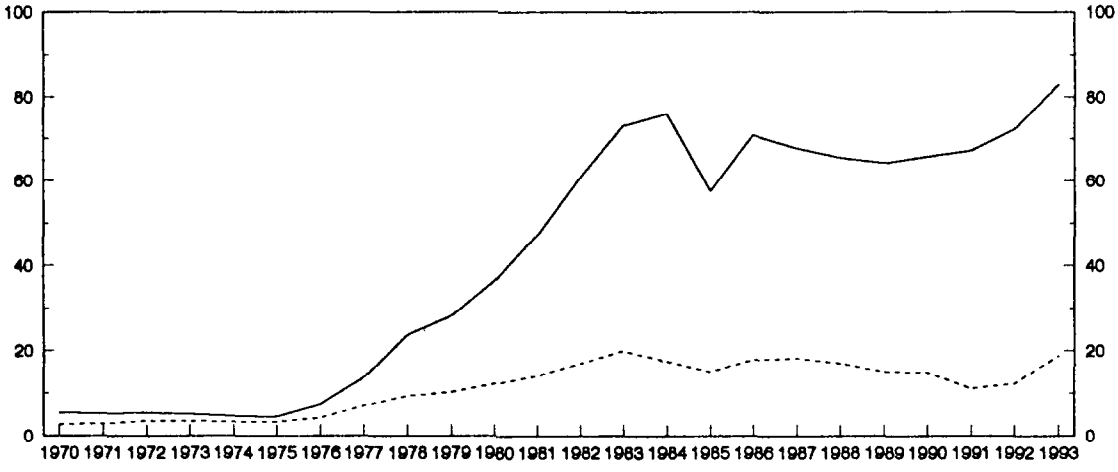
CHART 2a: Debt-to-GDP ratios

BELGIUM



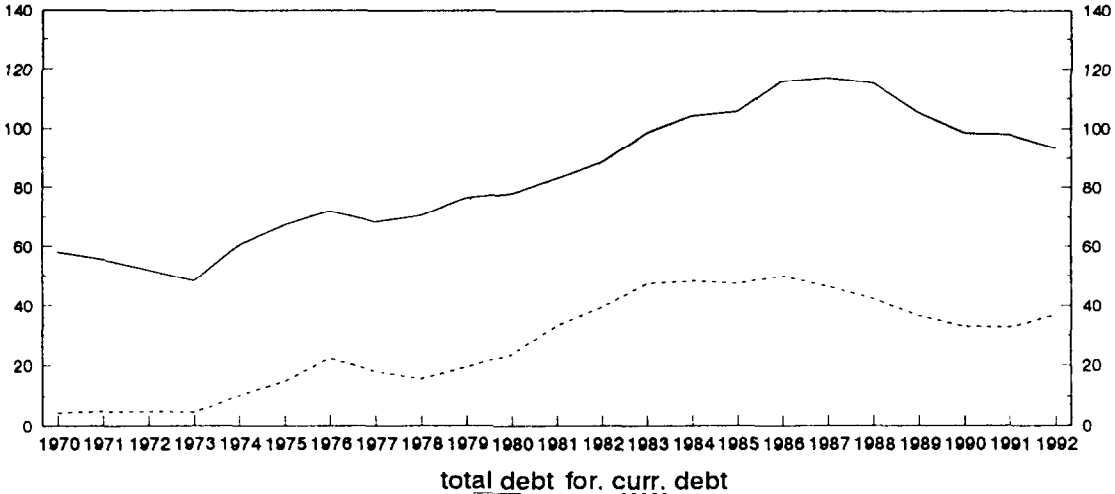
total debt for. curr. debt

DENMARK



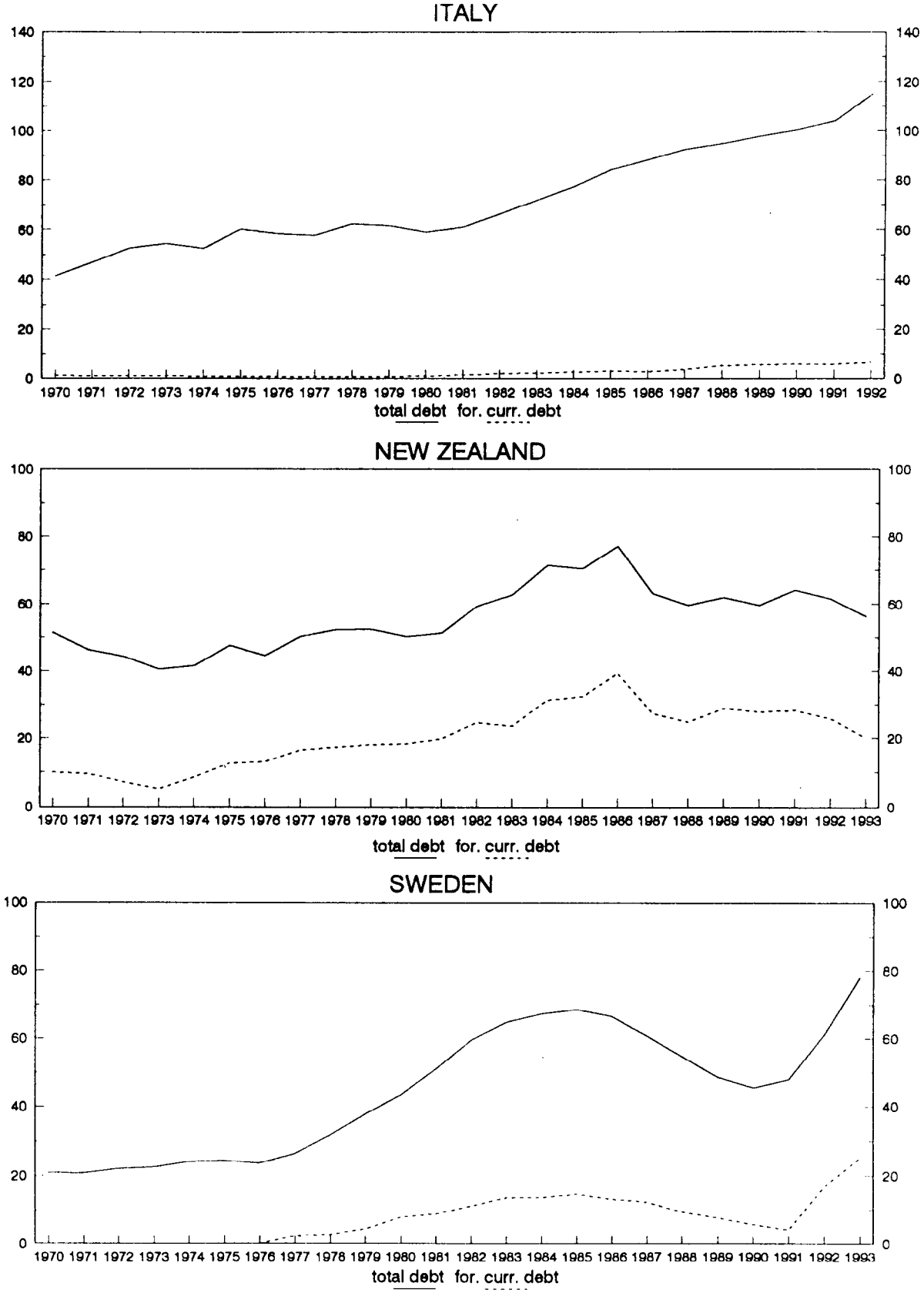
total debt for. curr. debt

IRELAND



total debt for. curr. debt

CHART 2b: Debt-to-GDP ratios



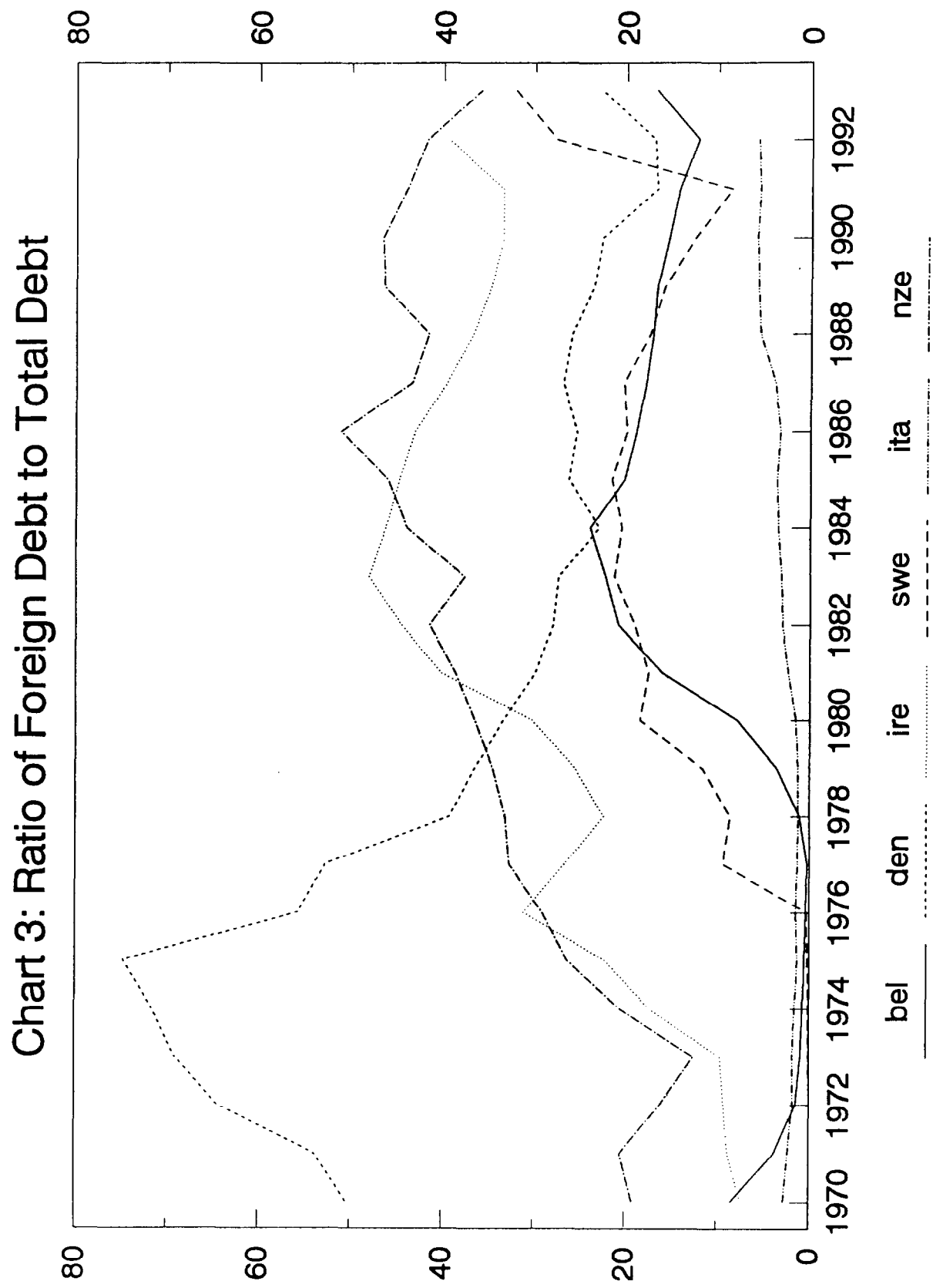


Chart 3: Ratio of Foreign Debt to Total Debt
80
60
40
20
0
1970 1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992
bel
den
ire
swe
ita
nze

Table 1. Belgium: Currency Composition of Foreign Public Debt
(Percentage Terms)

Year	DM	SFr	US$	N.Guil.	Others
1976	28.21	7.69	23.08	38.46	2.56
1977	29.41	8.82	23.53	38.24	
1978	6.04	1.34	85.23	7.38	
1979	52.45	23.43	22.55	1.57	
1980	44.22	29.46	24.76	1.57	
1981					
1982	34.44	26.16	27.56	10.32	1.53
1983	31.82	24.52	31.79	10.61	1.27
1984	29.09	23.47	35.70	9.29	2.46
1985	33.95	25.29	29.97	10.04	0.76
1986	41.74	26.43	22.29	9.54	
1987	49.01	30.72	8.89	11.38	
1988	42.43	34.25	14.22	9.10	
1989	45.58	35.24	10.36	8.82	
1990	42.10	35.48	13.87	8.55	
1991	34.22	35.84	16.10	8.62	5.22
1992	35.35	38.28	12.00	8.57	5.80
1993	55.46	30.40	5.78	5.51	2.86

Table 2. Denmark: Currency Composition of Foreign Public Debt (Percentage Terms)*

Year	US$	DM	SFr	ECU**	Yen	Others
1970	43.12	26.54	10.22			20.12
1971	39.66	31.66	9.27			19.41
1972	48.28	27.38	7.94			16.40
1973	42.18	26.68	7.98			23.16
1974	38.16	30.26	7.47			24.11
1975	46.27	26.65	5.47			21.62
1976	41.21	31.64	9.15			18.00
1977	50.08	29.62	8.36			11.95
1978	39.97	35.63	11.09			13.31
1979	36.50	40.03	10.89		5.69	6.89
1980	43.95	28.11	11.52		7.22	9.20
1981	53.89	21.33	11.02		6.56	7.19
1982	64.26	15.29	7.68		7.09	5.69
1983	67.15	13.25	5.77		7.94	5.89
1984	54.43	15.22	7.26	0.61	13.31	9.18
1985	45.26	16.98	11.31	2.78	12.67	11.00
1986	46.13	17.62	10.14	4.90	8.23	12.98
1987	34.97	21.00	12.98	7.98	10.80	12.27
1988	26.53	23.63	16.45	11.65	10.23	11.52
1989	23.81	25.88	15.44	14.63	8.75	11.49
1990	13.06	30.81	17.66	15.20	3.02	20.25
1991	18.52	30.83	17.09	19.52	2.02	12.02
1992	36.13	22.71	13.33	14.28	3.02	10.53
1993	30.72	28.52	12.63	5.66	3.39	19.09

* Fiscal year: April 1 to March 31 from 1970 to 1977, and January 1 to December 31, 1978 to 1993.

** Included in "others" prior to 1983.

Table 3. Ireland: Currency Composition of Foreign Public Debt (percentage terms)*

Year	US$	DM	SFr	ECU**	Yen	Others
1970	56.47	24.86				18.68
1971	55.28	31.37				13.35
1972	45.49	25.67				28.84
1973	37.82	38.45				23.73
1974	41.65	14.52	6.41			37.42
1975	53.24	11.21	4.36			31.19
1976	54.80	16.98	8.03			20.19
1977	53.98	16.88	10.06		3.24	15.84
1978	51.91	18.49	11.34		3.67	14.60
1979	38.43	41.25	9.08		1.89	9.35
1980	26.31	48.73	12.21		4.11	8.65
1981	30.91	46.20	9.60		5.13	8.16
1982	33.69	44.74	6.94		4.09	10.53
1983	39.41	35.67	7.77	0.98	6.81	9.36
1984	40.13	28.79	6.49	1.13	9.39	14.07
1985	32.12	29.33	10.01	3.32	10.79	14.42
1986	31.12	29.25	14.43	4.88	12.50	7.83
1987	27.11	28.15	15.06	6.42	12.77	10.50
1988	20.45	28.38	19.41	6.31	13.76	11.69
1989	17.09	33.65	18.03	6.76	13.60	10.88
1990	19.29	35.16	21.99	6.89	7.67	9.00
1991	14.94	34.03	28.82	5.87	7.99	8.36
1992	13.78	41.23	27.77	4.73	8.12	4.37

* End-March until 1973; end-December 1974-77; end-September thereafter.

Table 4. New Zealand: Currency Composition of Foreign Public Debt (Percentage Terms)*

Year	US$	Jp. Yen	Europ. Curr.
1971	13.78	10.87	75.34
1972	12.77	11.70	75.53
1973	12.45	12.45	75.11
1974	5.68	7.07	87.25
1975	16.81	8.27	74.91
1976	25.25	8.21	66.54
1977	21.13	12.06	66.82
1978	15.17	11.09	73.74
1979	15.05	13.91	71.04
1980	28.49	15.89	55.62
1981	18.56	15.84	65.60
1982	23.98	18.44	57.58
1983	29.57	18.71	51.72
1984	27.53	31.26	41.21
1985	29.63	34.05	36.32
1986	43.55	31.29	25.16
1987	46.97	31.43	21.60
1988	62.62	23.27	14.10
1989	62.97	13.90	23.13
1990	59.99	15.53	24.48
1991	50.77	21.79	27.43
1992	47.89	28.31	23.80
1993	55.34	20.46	24.20

* Includes currency swaps from 1986. Fiscal year April 1 to March 31 from 1970 to 1989, July 1 to June 30 after 1989.

Sweden started issuing foreign currency debt in the late seventies. The share of foreign currency debt increased significantly as public debt was being accumulated, and reached a quarter of total debt by 1985. This component has fallen steadily to 12 percent of total debt in 1991, but has risen sharply in the last two years (Charts 2b and 3). The currency composition of Swedish foreign currency debt saw a predominance of instruments denominated in US dollars. Borrowing in Deutsche Marks, Yen, Swiss Francs and Dutch guilders is more limited. Sweden has actively managed its foreign currency debt, using foreign currency swaps, increasingly so since the mid-eighties. As shown in Table 5, the currency composition of Swedish foreign currency debt including and excluding debt management operations is substantially different.

It should also be noted that in recent years public debt management has undergone substantial changes in most of the countries discussed here. For example, Ireland, New Zealand and Sweden have instituted debt management offices or agencies with a degree of formal autonomy from the rest of the government; 1/ in Denmark, foreign currency debt, formerly managed by the Treasury, is under the responsibility of the Central Bank since 1991; and in Belgium a major debt management reform has been undertaken since 1989.

3. The Evidence

We first consider the role of public debt management in hedging macroeconomic risks. Theory suggests that the hedging role of government debt should be reflected by a negative correlation of the real interest cost of debt with public spending shocks and a positive correlation with productivity shocks. By calculating correlations between servicing or interest costs on domestic or foreign currency denominated debt and productivity or public spending shocks, we can begin to address the issue of which type of debt is the better hedging instrument.

For simplicity, we proxy productivity shocks with deviations of real GDP growth from its trend. 2/ Similarly, public spending shocks are measured as deviations of the growth rate from trend. We use a measure of public spending which excludes interest payments to avoid spurious correlation problems. The real interest cost is measured by subtracting CPI inflation from an imputed nominal interest rate, calculated as the ratio of nominal interest payments to nominal debt at the end of the previous year. In the case of Italy, the only data available were on servicing costs rather than interest payments. Moreover, these data were not disaggregated into

---

1/ See International Monetary Fund (1994).

2/ Bohn (1990b) uses a more sophisticated VAR methodology to extract the covariance structure between output shocks and debt returns for the United States.

Table 5. Sweden: Currency Composition of Foreign Public Debt (percentage terms)*

Year	US$	DM	SFr	N.Guil.	Yen	Others
			Including Debt Management Operations			
1981	60.52	14.06	9.91	2.06	5.89	7.56
1982	63.79	12.40	9.85	2.22	4.84	6.90
1983	66.68	9.86	8.35	1.97	5.13	8.01
1984	65.02	9.17	7.95	1.98	5.27	10.60
1985	55.54	13.72	11.79	3.66	6.89	8.39
1986	50.44	12.84	14.29	4.94	9.78	7.73
1987	45.68	14.75	15.55	3.29	11.56	9.07
1988	38.42	12.51	17.22	2.07	13.19	16.58
1989	29.69	11.63	19.53	1.84	10.60	26.71
1990	17.05	10.35	20.00	1.29	7.24	44.07
1991	-4.08	21.37	2.79	8.37	-0.95	72.49
1992	12.89	32.22	0.16	3.85	0.11	50.77
			Excluding Debt Management Operations			
1981	60.54	14.02	9.85	2.05	6.03	7.51
1982	64.63	12.37	8.90	2.21	5.03	6.87
1983	68.26	9.82	7.28	1.95	5.37	7.32
1984	67.76	9.08	5.87	1.96	5.43	9.90
1985	59.44	13.70	8.68	3.65	6.76	7.76
1986	54.01	14.68	8.91	4.15	11.50	6.75
1987	49.60	13.97	8.47	4.22	15.29	8.44
1988	38.63	14.70	9.41	4.18	18.83	14.24
1989	29.49	16.93	8.38	4.69	16.97	23.54
1990	32.17	9.36	7.35	5.18	18.75	27.20
1991	30.24	8.78	7.53	5.03	18.42	29.99
1992	48.38	25.98	2.03	1.08	4.79	17.74

domestic and foreign currency denominated components. For the other five countries, the currency decomposition was available. 1/

For Sweden, it was also possible to obtain a time series for realized foreign exchange losses on the foreign currency denominated component of the public debt. We use these data to calculate a series for total current servicing costs and repeat the correlations exercise with this. For the other countries with a currency breakdown, realized exchange losses are included for Denmark and New Zealand and not included for Belgium and Ireland. The OECD data used for Italy is for total servicing costs and therefore includes realized exchange losses.

Since there was a change in the behavior of real interest rates associated with the worldwide monetary tightening of the early 1980s, results are also presented for various sub-samples. Because of the patchy coverage of the data, these sub-samples were not standardized across countries. This analysis illustrates how stable or predictable the simple correlations are over time and thus suggest whether it will be possible for the public authorities to exploit them.

Given the poor quality of the data, the small number of observations and the possibility of spurious correlation, our results can only be indicative. This is highlighted by the lack of precision in our estimated correlation coefficients. The results are presented in Tables 6 and 7 below.

Using the official Belgian series, real interest costs on foreign currency denominated debt have a negative correlation with deviations from trend real GDP growth, rather than the positive correlation desired by the theoretical discussion. However, the correlation is less negative than is the case for domestic currency denominated debt. As such, foreign currency debt out-performs domestic currency denominated debt on this criterion.

However, the analysis of the sub-samples suggests that the extent of the correlation varies through time. Foreign currency denominated debt is more positively correlated with productivity shocks than domestic debt in some periods but not in others. Therefore, which type of debt is preferable on theoretical grounds varies through time. Moreover, the magnitude of the relative advantage and the sign of the simple correlation both vary considerably.

For Denmark, the correlation between real interest payments and deviations of growth from trend are positive for both domestic and foreign currency payments both in the whole period and in the two sub-samples.

1/ The Belgian Ministry of Finance produces its own series on the average nominal interest rate paid on domestic and foreign currency denominated debt. Therefore, for Belgium, we present results for the official series rather than our imputed measure.

Table 6. Correlations Between Real Interest Costs and Productivity Shocks
Domestic Currency and Foreign Currency Debt (Belgium, Denmark, Ireland)
(Pearson Correlation Coefficients)*

		For.Curr.(1)	For.Curr.(2)	Dom.Curr.
Belgium	1961-92	-0.152 (0.407)		-0.204 (0.262)
	1961-70	0.249 (0.488)		0.017 (0.963)
	1971-80	-0.155 (0.669)		-0.024 (0.949)
	1981-92	-0.152 (0.655)		0.267 (0.427)
Denmark	1971-92		0.313 (0.156)	0.423 (0.050)
	1971-81		0.421 (0.197)	0.576 (0.064)
	1982-92		0.027 (0.938)	0.364 (0.271)
Ireland	1974-92	0.281 (0.245)		0.237 (0.329)
	1974-81	0.599 (0.116)		0.685 (0.061)
	1982-94	0.456 (0.159)		0.106 (0.757)

* Two-tailed significance statistics in parentheses (probability that statistic is equal to zero)

(1) Excluding foreign exchange losses.

(2) Including foreign exchange losses.

Table 6 (Concluded). Correlations Between Real Interest Costs and Productivity Shocks
Domestic Currency and Foreign Currency Debt (Italy, New Zealand, Sweden)
(Pearson Correlation Coefficients)*

		For.Cur.(1)	For.Cur.(2)	Dom.Cur.	Total
Italy	1980-91				0.568 (0.054)
New Zealand	1971-92		0.145 (0.519)	-0.109 (0.628)	
	1971-81		0.397 (0.227)	-0.027 (0.938)	
	1982-92		0.270 (0.422)	0.251 (0.457)	
Sweden	1980-92		0.320 (0.286)	0.415 (0.159)	

* Two-tailed significance statistics in parentheses (probability that statistic is equal to zero)
(1) Excluding foreign exchange losses.
(2) Including foreign exchange losses.

This correlation is consistently higher and more significant for interest payments on domestic currency debt, and seems to have fallen during the 1980s.

For Ireland, both forms of public debt give the desired positive correlation with productivity shocks. However, the foreign currency denominated debt is more positively correlated, suggesting it is preferable on this narrow theoretical criterion. Analysis of the Irish sub-samples also suggests the correlation varies substantially through time, although here the signs always remain positive.

In the case of New Zealand, the correlations are small and unstable over time. Although the real interest cost of foreign currency denominated debt exhibits the desired positive correlation with productivity shocks in Swedish data, the correlation is lower than with domestic currency debt. Finally, in the case of Italy total interest payments are positively correlated with deviations of growth from trend during the 1980s.

Turning to correlations of real interest costs with public spending shocks, a similar mixed set of results emerges. For Belgium, Denmark and Ireland interest payments on domestic and foreign currency debt exhibit a (theoretically desirable) negative correlation with deviations of public spending from trend. For Sweden, the correlation is negative for foreign currency debt, but positive for domestic currency debt. Finally, for New Zealand the correlation is positive for both types of debt. Again, the analysis of the sub-samples suggest these correlations are unstable through time and that the ranking of the two forms of debt on this criterion has varied in different periods. Overall, this simple correlation analysis does not suggest any systematic advantage of domestic over foreign currency debt as a hedge against macroeconomic shocks. Of course, these results are based on large aggregates and on rough measures of shocks, and must be considered only indicative. Future research could focus on a more detailed breakdown of debt instruments in order to examine their hedging properties.

A second issue we address is the relation between the share of foreign currency denominated debt in the total outstanding public debt and the yield differential between foreign and domestic currency bonds. We calculate the interest rate on foreign currency bonds as the weighted average of the domestic government long bond yields in their own currency, where the weights correspond to the currency composition of the foreign currency public debt.

Cost minimization considerations suggest that governments may favor issuing foreign currency debt if the cost of borrowing domestically is considerably higher than the cost of borrowing in international markets. Of course, uncovered interest parity considerations suggest lower interest rates abroad merely represent an expected depreciation of the domestic currency (plus a risk premium on the domestic currency)--if capital markets are perfectly integrated then the choice of currency is irrelevant. However, if such integration is imperfect and in the presence of a risk

Table 7. Correlations Between Real Interest Costs & Public Spending Shocks Domestic Currency and Foreign Currency Debt (Belgium, Denmark, Ireland) (Pearson Correlation Coefficients) *

		For.Cur.(1)	For.Cur.(2)	Dom.Cur.
Belgium	1961-92	-0.071 (0.710)		-0.251 (0.181)
	1961-70	0.437 0.207)		0.128 (0.724)
	1971-80	-0.325 (0.360)		-0.291 (0.415)
	1981-92	0.236 (0.512)		0.319 (0.369)
Denmark	1971-92		-0.522 (0.015)	-0.470 (0.031)
	1971-81		-0.287 (0.392)	-0.386 (0.241)
	1982-92		-0.906 (0.001)	-0.290 (0.417)
Ireland	1974-92	-0.400 (0.100)		-0.251 (0.066)
	1974-81	0.289 (0.530)		0.169 (0.717)
	1982-94	-0.072 (0.833)		-0.273 (0.416)

* Two-tailed significance statistics in parentheses (probability that statistic is equal to zero).

(1) Excluding foreign exchange losses.

(2) Including foreign exchange losses.

Table 7 (Concluded). Correlations Between Real Interest Costs and Public Spending Shocks
Domestic Currency and Foreign Currency Debt (Italy, New Zealand, Sweden)
(Pearson Correlation Coefficients)*

		For.Cur.(1)	For.Cur.(2)	Dom.Cur.	Total
Italy	1980-91				-0.441 (0.152)
New Zealand	1971-92		0.286 (0.221)	0.256 (0.276)	
	1971-81		0.807 (0.003)	0.803 (0.003)	
	1982-92		0.312 (0.414)	0.652 (0.057)	
Sweden	1980-92		-0.103 (0.751)	0.507 (0.093)	

* Two-tailed significance statistics in parentheses (probability that statistic is equal to zero).
(1) Excluding foreign exchange losses.
(2) Including foreign exchange losses.

premium on the domestic currency, or if the government believes that market expectations of depreciation are "excessive" or unwarranted, it may be cheaper to borrow in a foreign currency. 1/ In fact, studies such as Giovannini and Piga (1992) and Drudi and Prati (1993) suggest that borrowing in foreign currency may indeed reduce servicing costs. For the case of New Zealand, for example, between June 1984 and December 1991, the cumulative cost of foreign currency borrowing would have been close to half that of an equivalent amount of domestic borrowing in short-term fixed interest securities. 2/

In Table 8 we present the results of simple linear regressions of the foreign minus domestic currency yield spread on both the level and (proportional) changes in the ratio of foreign currency denominated debt to total public debt. The latter is probably the more appropriate measure since changes in the yield spread are likely to produce changes in the currency composition of the public debt at the margin rather than in its average composition. We have annual data for Belgium, Denmark and Ireland and quarterly data for Sweden. 3/ Regressions are used as a simple way of describing the basic correlations rather than being intended to imply a specific functional or structural relationship.

The results are generally supportive of a positive relationship between the yield spread and the foreign currency debt share, as suggested by cost minimization considerations. These findings confirm those obtained by Drudi and Prati (1993) for Belgium, Denmark and Ireland using quarterly data for a shorter sample. For all four countries, a positive coefficient on the spread variable emerges from a regression on the level of the foreign currency debt ratio. In the case of both Ireland and Sweden, the explanatory power of the regression is extremely low (although for Ireland the regression with the change in the debt share as dependent variable performs better). It is also interesting to observe that the "fit" of the equation for Denmark is good if the 1970s are excluded, but it is poor if the sample is extended back to 1970. This result is consistent with the interpretation that in the later period foreign currency debt was actively managed for purposes other than financing current account deficits. It should also be noted that the direction of causality is also unclear: it is

---

1/ The interest differential could also reflect different default premia on the two types of debt. In general, debt-rating agencies such as Standard and Poor and Moody's give a higher rating to domestic than foreign currency debt.

2/ We are grateful to David Archer for this point. More generally, empirical work on interest differentials across countries systematically finds that the forward premium overestimates actual depreciation.

3/ The currency breakdown of New Zealand foreign currency debt (Table 4) is insufficient for the purpose of calculating a "representative" current interest rate on foreign currency borrowing.

Table 8. Regressions of Ratio of FC Denominated to Total Public Debt on the Foreign/Domestic Bond Yield Spread*

	Sample	Constant	Spread	R^2
(a) Dependent variable in levels				
Belgium	1976-93	8.62 (4.13)	4.07 (1.63)	0.25
Denmark	1970-92	29.76 (8.65)	1.81 (1.67)	0.05
Denmark	1980-92	19.40 (1.55)	1.39 (0.33)	0.60
Ireland	1970-92	24.54 (6.44)	1.33 (1.33)	0.01
Sweden (1)	1981-92	17.16 (3.29)	0.24 (0.41)	0.01
Sweden (2)	1981-92	18.39 (1.52)	-0.15 (0.43)	0.01
(b) Dependent variable in first differences				
Belgium	1976-93	0.85 (0.61)	-0.19 (0.24)	0.00
Denmark	1980-92	-0.03 (0.09)	-0.01 (0.02)	0.01
Ireland	1970-92	-0.12 (0.09)	0.05 (0.02)	0.22
Sweden (1)	1981-92	0.04 (0.07)	-0.006 (0.018)	0.01
Sweden (2)	1981-92	0.03 (0.07)	-0.021 (0.019)	0.00

* Standard errors in parentheses.
(1) Currency weights after debt management; quarterly data.
(2) Currency weights before debt management; quarterly data.

possible that the spread is affected by the rise of foreign currency denominated debt. 1/

The correlations with changes in the ratio of foreign currency denominated to total public debt are less clear cut. For Sweden, the relationship is negative, whilst for both Belgium and Denmark the yield spread can account for very little of the observed movement in the debt ratio. However, the evidence for Ireland is more compelling. The yield spread has a positive effect on the change in the foreign currency denominated debt ratio, as would be implied by the authorities deciding on currency denomination of issue according to a cost minimization criterion where they have lower expectations of depreciation than the market.

However, there are alternative explanations of a positive relationship between the ratio and the yield spread. For example, during periods of continued depreciation, the yield spread would be high (on uncovered interest parity grounds) whilst the value of foreign currency debt in domestic currency (and thus the foreign currency debt to total public debt ratio) would be rising because of revaluation effects. However, Drudi and Prati (1993) find that a positive relation between share of foreign currency debt and yield spread exists even after adjusting the former for exchange rate changes. Distinguishing between the various possible channels through which the observed statistical relationship may operate is extremely problematic, especially with the low number of degrees of freedom available in these small sample periods.

We also considered the relationship between the currency denomination of public debt issues and exchange rate volatility. 2/ Again, there are a number of plausible channels through which the relationship may operate. One might expect to observe a negative relationship between real exchange rate volatility and the issue of foreign currency debt. The former will tend to increase the uncertainty associated with the servicing costs of the public debt which, assuming governments are risk averse, would tend to reduce their attraction as funding instruments.

1/ Drudi and Prati (1993) use instrumental variable estimation and find that the yield spread is indeed affected positively by the share of foreign currency debt.

2/ Effective real exchange rates were calculated using the weights implied by the currency composition of the outstanding foreign currency denominated public debt at the end of the previous year. The within year variance of the real effective exchange rate was then calculated. This was used as a simple measure of real exchange volatility and included as an additional explanatory variable in the regression of yield differentials on the level and change in the foreign currency share of total public debt.

The results, not reported, are inconclusive. 1/ The addition of the volatility parameter significantly improves the explanatory power of the regression for changes in the currency composition of Belgian public debt, but is not statistically significant in other regressions. Measurement error is likely to be a problem. Furthermore, the authorities ought to be more forward looking and concerned with exchange movements over the whole term to maturity rather than contemporaneous volatility.

V. Concluding Remarks

The currency composition of public debt in highly indebted industrial countries differs significantly both across countries and across time. In the 1970s and, for some countries, in the early 1980s, the main consideration in issuing foreign currency denominated public debt was the need to finance deficits on the basic balance of payments. With the dismantlement of exchange controls, this consideration has largely disappeared as monetary authorities could induce a capital inflow by raising domestic interest rates. This study has examined the choice between domestic and foreign currency denominated debt based on various other considerations. The review of the theoretical literature suggests several factors relevant to public debt management decisions in general, and choice of currency of denomination specifically. Although the theory does not offer unambiguous conclusions about the optimal currency composition of public debt, it provides some general guidance for debt management strategy. The study also discussed how implementation of debt management strategies is complicated by practical issues, compounded by the dearth of empirical work resulting from lack of data of reasonable quality and uniformity.

With all these caveats in mind, the empirical analysis suggests that cost considerations matter in the choice to issue foreign currency debt. On the basis of ex-post cost comparisons with domestic debt one would expect that foreign currency debt would be issued more frequently and in larger quantities than it has been. The perception of risk from foreign currency debt might have been exaggerated and the benefits from currency diversification understated by the public debt managers. With regard to the hedging role of domestic and foreign currency debt, we find that the correlation of debt returns with productivity (and therefore government revenue) and spending shocks differs both across countries and across time. Given the limited sample period and the lack of quarterly data for most countries, the econometric analysis is at most indicative. At any rate, it is doubtful whether "macroeconomic hedging" is a practical consideration for government and public debt managers.

1/ Drudi and Prati (1993) using higher frequency data find a significant effect of exchange rate volatility on the share of foreign currency debt only for Denmark.

Data Sources

The data for total central government debt and foreign currency denominated central government debt were taken from Missale (1994) and from national sources, listed below.

Data for nominal GDP, nominal exchange rates, bond yields, CPI inflation and the GDP deflator were obtained from International Financial Statistics (September 1994). Real exchange rate measures were obtained using the IMF's EER software program.

Data on the currency composition of the central government debt were obtained from a variety of national sources, viz.:

Belgium: Ministry of Finance, Annual Report on the Public Debt.
Ministry of Finance, Service d'Etudes et de Documentation, Bulletin de Documentation.

Denmark: Danmarks Nationalbank, Data on Danish Public Foreign Borrowing.

Ireland: Ministry of Finance.
Central Bank of Ireland, Quarterly Bulletin.

New Zealand: Reserve Bank of New Zealand.

Sweden: Riksgalds Kontoret (Swedish National Debt Office), Statistical Yearbook.

Data on interest payments on foreign and domestic currency denominated debt were obtained from the same national sources for Belgium, Denmark, Ireland, and Sweden. Realized foreign exchange losses on the foreign debt were also obtained from the Swedish source. The data for total servicing costs used for Italy was obtained from the OECD.

References

Agell, Jonas, Mats Persson and Benjamin Friedman (eds.) (1990), Does Public Debt Management Matter? Oxford: Clarendon Press.

Alesina, Alberto, Alessandro Prati and Guido Tabellini (1990), "Public Confidence and Debt Management: a Model and a Case Study of Italy", in R. Dornbusch and M. Draghi (eds.), Public Debt Management: Theory and History, Cambridge: Cambridge University Press, 96-118.

Alesina, Alberto, Mark De Broeck, Alessandro Prati and Guido Tabellini (1992), "Default Risk", *Economic Policy* 15, October, 428-51.

Barro, Robert J. (1974), "Are Government Bonds Net Wealth?", *Journal of Political Economy* 82, 1095-1117.

Barro, Robert J. (1979), "On the Determination of the Public Debt", *Journal of Political Economy* 87, October, 940-71.

Bohn, Henning (1988), "Why Do We Have Nominal Debt?", *Journal of Monetary Economics* 21, 127-40.

Bohn, Henning (1990a), "A Positive Theory of Foreign Currency Debt", *Journal of International Economics* 29, 273-92.

Bohn, Henning (1990b), "Tax Smoothing with Financial Instruments", *American Economic Review* 80, December, 1217-30.

Bohn, Henning (1991), "Time Consistency of Monetary Policy in an Open Economy", *Journal of International Economics* 30, 249-66.

Calvo, Guillermo (1978), "On the Time Consistency of Optimal Policy in a Monetary Economy", *Econometrica* 46, November, 1411-28.

Calvo, Guillermo (1988), "Servicing the Public Debt: the Role of Expectations", *American Economic Review* 78, September, 647-61.

Calvo, Guillermo and Pablo E. Guidotti (1990), "Credibility and Nominal Debt", *IMF Staff Papers* 37, September, 612-35.

Calvo, Guillermo and Pablo E. Guidotti (1991), "Optimal Maturity of Nominal Government Debt: The First Tests", *Economics Letters* 35, 415-21.

Calvo, Guillermo and Pablo E. Guidotti (1992), "Optimal Maturity of Nominal Government Debt: an Infinite-Horizon Model", *International Economic Review* 33, November, 895-919.

Calvo, Guillermo and Maurice Obstfeld (1990), "Time Consistency of Fiscal and Monetary Policy: a Comment", *Econometrica* 58, September,

Caselli, Francesco, Alberto Giovannini and Timothy Lane (1994), "Determinants of the Cost of Servicing a High Public Debt: a Comparison of Belgium, Ireland and Italy", mimeo, International Monetary Fund.

Cottarelli, Carlo and Mauro Mecagni (1990), "The Risk Premium on Italian Government Debt, 1976-88", *IMF Staff Papers* 37, December, 865-80.

De Broeck, Mark (1992), "The Financial Structure of Government Debt in OECD Countries: an Examination of the Time Consistency Issue", mimeo, University of Leuven.

De Broeck, Mark (1993), "Intermediated Government Debt", mimeo, University of Leuven.

Dornbusch, Rudiger (1989), "Ireland's Failed Stabilization", *Economic Policy* 10, April, 173-210.

Drudi, Francesco and Alessandro Prati (1993), "Debito in Valuta e Politiche di Gestione del Debito Pubblico", mimeo, Banca d'Italia.

Fischer, Stanley (1975), "The Demand for Index Bonds", *Journal of Political Economy* 83, June, 509-34.

Fischer, Stanley and Lawrence Summers (1989), "Should Governments Learn how to Live with Inflation?", *American Economic Review* 79, May, 382-87.

Friedman, Benjamin (1978), "Crowding Out or Crowding In? Economic Consequences of Financing Government Deficits", *Brookings Papers on Economic Activity* Vol. 3, 593-641.

Giavazzi, Francesco and Marco Pagano (1990a), "Confidence Crises and Public Debt Management", in R. Dornbusch and M. Draghi (eds.), Public Debt Management: Theory and History, Cambridge: Cambridge University Press, 125-43.

Giavazzi, Francesco and Marco Pagano (1990b), "Can Severe Fiscal Contraction Be Expansionary? Tales of two Small European Countries", *NBER Macroeconomic Annual*, 75-111.

Giovannini, Alberto and Gustavo Piga (1992), Understanding the High Interest Rates on Italian Government Securities", CEPR Discussion Paper No. 720, October.

Grimes, Arthur (1992), "Optimal Public Debt Structure", Reserve Bank of New Zealand Discussion Paper No. 92/15, December.

International Monetary Fund (1994), "International Capital Markets: Developments, Prospects and Policy Issues", September.

Kydland, Finn and Edward Prescott (1977), "Rules Rather Than Discretion: the Inconsistency of Optimal Plans", *Journal of Political Economy* 85, 473-93.

Lane, Timothy (1993), "Market Discipline", *IMF Staff Papers* 40, March, 53-88.

Leibfritz, Willi, Deborah Roseveare and Paul Van den Noord (1994), "Fiscal Policy, Government Debt and Economic Performance", OECD Economics Dept. Working Paper No. 144.

Lucas, Robert E. Jr, and Nancy L. Stokey (1983), "Optimal Fiscal and Monetary Policy in an Economy without Capital", *Journal of Monetary Economics* 12, 55-93.

Milesi-Ferretti, Gian Maria (1995), "Do Good or Do Well? Public Debt Management in a Two-Party Economy", *Economics & Politics* 7, March, forthcoming.

Missale, Alessandro (1994), Public Debt Management, Unpublished Ph. D. dissertation, M.I.T.

Missale, Alessandro and Olivier Blanchard (1994), "The Debt Burden and Debt Maturity", *American Economic Review* 84, March, 309-19.

Obstfeld, Maurice (1994), "The Logic of Currency Crises", NBER Working Paper No. 4640, February.

Persson, Mats, Torsten Persson and Lars E. O. Svensson (1987), "Time Consistency of Fiscal and Monetary Policy", *Econometrica* 55, November, 1419-31.

Sargent, Thomas J. (1993), "Fact or Fiction: Shortening Debt Maturity Lowers Interest Costs", Chicago, The Catalyst Institute, December.

Solnik, Bruno (1993), "Fundamental Considerations in Cross-Border Investment: the European View", The Research Foundation of Chartered Financial Analysts.

Tobin, James (1963), "An Essay on the Principles of Debt Management", in *Fiscal and Debt Management Policies*, Englewood Cliffs: Prentice Hall.

Watanabe, Tsutomu (1992), "The Optimal Currency Composition of Government Debt", *Bank of Japan Monetary and Financial Studies* 10 No. 2, November, 31-62.