TIME CONSISTENCY OF MONETARY POLICY IN THE OPEN ECONOMY

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Henning Bohn

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Abstract

The paper is concerned with time-consistency problems caused by monetary policy in an open economy. The temptation to generate surprise inflation is shown to depend positively on the amounts of nominal debt issued by the government <u>or</u> issued by individuals. Private debt matters, because inflationary money growth causes redistribution between domestic residents and foreigners. A government that cares about the welfare of its residents will be tempted to inflate whenever it or its residents have issued nominal debt to foreigners. A net creditor position, however, may eliminate the time-consistency problem.

If money supply affects real exchange rates, foreign currency debt has similar incentive effects as nominal debt, but typically in the opposite direction. The time-consistency problem may be reduced or even eliminated by issuing foreign currency debt. To maximize the incentive effect, this debt should be sold to foreigners. Hence, international portfolio diversification may reduce welfare.

For the United States, these international considerations should become increasingly relevant as the country accumulates external deficits. My estimates indicate that the incentive to inflate more than doubled between 1982 and 1987. More than two-thirds of this increase was due to higher external debt, which was largely financed in nominal terms.

1. Introduction

It is well known that a government's ability to print money causes severe incentive problems that may have devastating welfare implications.[1] While early papers focussed on the government's ability to inflate away fiat money (Calvo (1978)), it is clear that the same problem affects all government liabilities denominated in the domestic currency.[2]

This paper shows that international lending modifies inflationary incentives in several important ways. First, external nominal debt may be much more important than government debt. For the United States, $1 external debt has roughly the same effect on incentives as $3 of government debt. Second, if money has real effects, foreign currency debt (private or government) reduces the incentives to inflate. Interestingly, international portfolio diversification reduces welfare in many cases.

The argument is set in a simple equilibrium model of an open economy with welfare maximizing government, in which welfare effects and incentives of monetary policy can be derived rigorously. The first half of the paper is concerned with incentive effects of nominal debt. The paper shows that not only nominal government liabilities matter for incentives, but also any external nominal private or government debt. Nominal government debt creates an incentive to inflate, because taxes are assumed to be distortionary, while money creation is, ex post, a lump-sum tax. External nominal debt creates similar incentives if the government cares about its own residents, because inflation devalues such debt.

Quantitatively, inflationary redistribution of wealth from domestic residents to the government increases welfare by the marginal welfare cost of taxes while redistribution from foreigners to domestic agents increases welfare one-for-one. Since plausible estimates of the marginal welfare cost of taxes are about 1/3, changes in nominal external debt are about three times as important for monetary incentives as equally large changes in government debt. This is especially relevant for the United States, which has recently experienced large movements in external and government liabilities, most of which are denominated in dollars.

In the second half of the paper, foreign currency debt is added to the set of assets. It only has incentive effects, if monetary policy can influence real exchange rates. If higher money supply causes real depreciation, the time-consistency problem can be reduced by private or government foreign currency debt. To minimize the temptation to inflate, foreign currency debt should be sold to foreigners while domestic nominal debt should be held by domestic residents.

The paper is organized as follows. Section 2 presents the basic model with neutral money. Optimal monetary policy is analyzed in Section 3 with special emphasis on the role of nominal debt. Section 4 considers debt policy in a generalized model, in which money affects the real exchange rate and in which foreign currency debt is important. Conclusions are summarized in Section 5.

2. The Model

Consider a two-country world populated by infinitely-lived identical individuals. The domestic setting--preferences, money, taxes, and several securities--will be described in detail. The foreign economy is similarly structured, except that government policy of the foreign country is considered exogenous. Foreign variables are indicated by an asterisk (*).

In period t, residents of the home country are endowed with Y_t units (sometimes called domestic output) of the single good and residents of the foreign country with Y_t^* units of the <u>same</u> good (foreign output).[3] Individuals have an intertemporal utility function

$$U_t = \sum_{j\geq 0} \rho^j \cdot c_{t+j} \tag{1}$$

with a constant rate of time preference r, $\rho = 1/(1 + r)$.[4] There is no uncertainty, except about policy; but policy will be perfectly predictable along the equilibrium path.[5]

Money is introduced through a simple cash-in-advance constraint. Suppose an exogenous fraction ε of all payments can only be made with money.[6] Then sellers hold

$$M_t = \varepsilon \cdot p_t \cdot Y_t \tag{2}$$

in fiat money at the end of the period, where p_t is the price level. Since Y_t is exogenous, inflation π_t can be considered a government choice variable.

To motivate the time-consistency problem of monetary policy, it is assumed that taxes are costly to collect (while inflation taxes are, of course, lump-sum).[7] Denoting tax rates by τ_t and tax revenues by $T_t = \tau_t \cdot Y_t$, collection costs are modelled as an additional loss of resources $h(\tau_t) \cdot Y_t$, where $h(\cdot)$ is a non-negative, increasing, and convex function.[8] Without further precautions, however, loss-minimizing money growth and inflation may easily be infinity, as in Calvo (1978). Realistically, high inflation disrupts allocative decisions, which reduces the productive capacity of an economy. These frictions are modeled by another non-negative and convex loss function $f(\pi_t)$, which is increasing for $\pi_t > 0$ and decreasing for $\pi_t < 0$. It indicates the loss of output relative to potential Y_t, if inflation π_t deviates from zero.[9] Overall, income net of taxes and frictional losses is $Y_t \cdot [(1 - \tau_t - h(\tau_t)] - f(\pi_t)$.

In this section, policy analysis will focus on only two securities, namely a safe (real, indexed) bond and a nominal bond.[10] The real bond is sold at a real price of one in period t and must therefore (by equation (1)) have a payoff of 1 + r in period t + 1. The nominal bond promises a nominal interest rate i_t. It is also issued at a unit price and has a real payoff of $1 + i_t - \pi_{t+1}$ in period t + 1. Thus, nominal interest rates must satisfy

$$i_t = r + \pi^e_{t+1} \tag{3}$$

where π^e_{t+1} is expected inflation.

Now the budget constraints can be formulated. The quantity of debt issued by the government will be denoted by D^k_t, where k = r or k = n indicate real or nominal securities, respectively. Similarly, private debt will be denoted by B^k_t, and national liabilities by $L^k_t = D^k_t + B^k_t$. Security holdings are indicated by negative numbers. For individuals, the real cost of consumption must be covered by net income plus the excess of new borrowing over repayments of old debt. Taking into account money holdings, this is

$$\begin{aligned} c_t = {} & Y_t \cdot [1 - \tau_t - h(\tau_t)] - f(\pi_t) - (M_t - M_{t-1})/p_t \\ & + B^r_t + B^n_t - (1 + r) \cdot B^r_{t-1} - (1 + i_{t-1} - \pi_t) \cdot B^n_{t-1} \, . \end{aligned} \tag{4}$$

The government must finance old debt by taxes, money creation, or new borrowings,[11]

$$(1 + r) \cdot D^r_{t-1} + (1 + i_{t-1} - \pi_t) \cdot D^n_{t-1} = T_t + (M_t - M_{t-1})/p_t + D^r_t + D^n_t \tag{5}$$

Equations (4) and (5) can be combined for a national budget constraint,

$$\begin{aligned} c_t = {} & Y_t \cdot [1 - h(\tau_t)] - f(\pi_t) + L^r_t + L^n_t \\ & - (1 + r) \cdot L^r_{t-1} - (1 + i_{t-1} - \pi_t) \cdot L^n_{t-1} \, . \end{aligned} \tag{6}$$

Notice that government debt policy matters (through τ_t in (6)) because of the cost of tax collections, as in Barro (1979).

Notice that individual optimization does not determine the optimal supply of assets, B_t^k. When analyzing monetary policy, private debt will be taken as given.[12] But in analyzing debt policy, one will have to specify whether foreigners or domestic residents hold new government debt.

3. Optimal Policy

The key assumption about policy decisions is that the government maximizes the welfare of the representative domestic individual, but that it is indifferent about the welfare of foreigners. In general, the government maximizes (1) subject to (6), given individual decisions.

To simplify the budget constraints, notice that real money supply $M_t/p_t = \varepsilon \cdot Y_t$ is exogenous and that M_{t-1}/p_t is approximately equal to $M_{t-1}/p_{t-1} \cdot (1 - \pi_t) = \varepsilon \cdot Y_{t-1} \cdot (1 - \pi_t)$. Let $D_t = M_t/p_t + D_t^r + D_t^n$ be the total government debt and recall that nominal interest rates satisfy (3). Then (5) becomes

$$T_t = (1 + r) \cdot D_{t-1} - D_t + (\pi_t^e - \pi_t) \cdot D_{t-1}^n - (r + \pi_t) \cdot \varepsilon \cdot Y_{t-1} \qquad (7)$$

Thus, inflation increases seignorage and reduces the value of nominal debt. Quantitatively, the latter effect is by far the more important one for most developed economies; the focus will therefore be on nominal debt.[13]

Similarly, the national resource constraint (6) can be transformed to

$$c_t = Y_t \cdot \left[(1 - h(\tau_t)\right] - f(\pi_t) + L_t - (1 + r) \cdot L_{t-1} \qquad (8)$$

$$- (\pi_t^e - \pi_t) \cdot L_{t-1}^n ,$$

where $L_t = L_t^r + L_t^n$ is total external debt (since foreigners do not hold domestic money). Finally, the expected utility of the representative domestic individual can then be written as a function of government choice variables (inserting (8) into (1)) as

$$E_t[U_t] = \sum_{j\geq 0} \rho^j \cdot \left[Y_{t+j} \cdot \left(1 - h(\tau_{t+j})\right) - f(\pi_{t+j})\right] \tag{9}$$

$$- (1 + r) \cdot L_{t-1} - (\pi_t^e - \pi_t) \cdot L_{t-1}^n$$

To summarize, the government's problem is to maximize (9) subject to the budget constraint (7). In principle, both inflation and debt structure should be chosen optimally. But since optimal debt policy probably has additional determinants that are beyond the scope of this paper,[14] the focus will be on monetary policy. Taking the structure of private and government debt as given, it will be shown how debt structure affects monetary policy.

As a benchmark, consider optimal money growth with pre-commitment. If inflation could be credibly announced in period t - 1 so that $\pi_t^e = \pi_t$, optimal policy must satisfy the first order condition

$$U_\pi(FB) \equiv h'(\tau_t) \cdot \varepsilon \cdot Y_{t-1} - f'(\pi_t) = 0 \tag{10}$$

Optimal money growth balances the marginal cost of inflation, $f'(\pi_t)$, against the gains from obtaining lump-sum revenues through seignorage, as in Mankiw (1987). The solution of (10) will be referred to below as the first-best monetary policy (or first-best inflation rate);[15] the expressions in (10) will be denoted by $U_\pi(FB)$.

An important feature of the first-best solution is obtained by inspecting (10). First-best inflation does not depend on the amount of nominal government debt or on private external debt. It does depend on total government debt because of costly tax collection.[16]

With discretionary monetary policy, inflation is chosen after the nominal interest rate i_{t-1} has been set, taking π_t^e as given. Then the first order condition for optimal inflation is

$$U_\pi(FB) + h'(\tau_t) \cdot D_{t-1}^n + L_{t-1}^n = 0 \qquad (11)$$

Optimal discretionary money growth differs from the first-best, because the policy-maker has an opportunity to devalue government debt and to redistribute wealth from foreigners to residents. To obtain the optimal rate of inflation, these benefits of inflation plus the gains from seignorage must be weighted against the marginal cost of inflation, $f'(\pi_t)$.

In equilibrium, individuals form correct expectations about the resulting money growth and inflation. That is, the time-consistent perfect foresight path satisfies (11), evaluated at $\pi_t^e = \pi_t$.[17] Equilibrium nominal interest rates compensate bondholders for inflation. The net result is a second-best optimal rate of inflation that depends on both internal and external nominal debt.

Several features of the solution are interesting. First, if the weighted sum of debts $h'(\tau_t) \cdot D_{t-1}^n + L_{t-1}^n$ is positive, the second-best rate of inflation is higher than the first best. Welfare is reduced by the time-consistency problem without fooling investors (see Barro (1983), Barro and Gordon (1983)).

Second, consider the weighting factor on nominal government debt. Internal nominal government liabilities (money and bonds) tempt policymakers to inflate, because they can be used to extract a lump-sum tax from individuals. The welfare benefit of this tax is the reduced distortion, which is $h'(\tau)$ on the margin. Such incentive effects of nominal government liabilities have been studied extensively in a closed economy context (see Calvo (1978), Barro (1983), Bohn (1988a)).

Third, and most importantly, equation (11) shows that a new factor is present in an open economy. If national debt is outstanding in nominal terms ($L^n_{t-1} > 0$), inflation redistributes wealth from foreigners to domestic individuals. This increases welfare one-for-one and provides a strong incentive to inflate. In a debtor country, the time-consistency problem of nominal government liabilities is reinforced by external nominal debt. But if the country is a creditor in nominal terms, the time-consistency problem of monetary policy is reduced and may even vanish.

Specifically, the first-best monetary policy is time-consistent, if individuals hold positive nominal claims, $(-B^n_t) > 0$, so that

$$(-L^n_{t-1}) = h'(\tau_t) \cdot D^n_{t-1} \tag{12a}$$

or

$$(-B^n_{t-1}) = \left(1 + h'(\tau_t)\right) \cdot D^n_{t-1} \tag{12b}$$

since (11) then reduces to (10). Domestic individuals must hold all government debt and they must hold additional nominal claims on foreigners. In effect, the government can credibly promise low inflation, if it is known that inflation hurts its own residents. Thus, even if the government has substantial nominal liabilities, an external creditor position may eliminate the time consistency problem entirely.

If the optimal structure of government debt is chosen optimally (and assuming that nothing else matters for optimal debt), equations (12) have an alternative interpretation. Given any structure of private debt, optimal nominal government debt should be set so as to satisfy (12).

The relative importance of internal and external nominal debt depends on the marginal welfare cost of taxes $h'(\tau)$. Estimates by Ballard, Shoven, and

Whalley (1985) indicate that plausible values of parameter are far less than one. Their preferred value is 0.332 (p. 135, Table 4). Thus, changes in external debt have about a 3-times larger impact on incentives than changes in government debt. If other estimates of the marginal cost of taxes $h(\tau)$ were used, the values would change accordingly: The relative importance of external debt would be larger, if $h(\tau)$ were lower. With lump sum taxes, only external debt would matter.

To assess the quantitative significance of these factors for the United States (as example), the net external position in dollar-denominated investments has been computed, see Table 1. Appendix 1 describes the data sources and underlying assumptions.[18] Interestingly, the United States had a negative net external position in dollar-denominated claims in all years except 1982, even in years when the total net asset position was positive. This may reflect the role of the dollar as international reserve and transactions currency. Notice the deteriorating net external position since 1981. A large fraction of the external deficit is apparently being financed by Treasury bonds and dollar-denominated bank liabilities, leading to a sharply deteriorating net dollar-position since 1982. Net external nominal debt (L^n) jumped from -13.5 billion in 1982 to 434.2 billion dollars in 1987.

Implications for inflationary incentives are derived in Table 2. The table shows how much the net wealth of domestic residents would increase, if nominal liabilities were devalued by 10%, expressed as fraction of GNP (for details, see Appendix 1). Conventional closed economy analysis would predict that welfare would increase by $h'(\tau)$ times the government debt/GNP ratio, as computed in the first line. Line 1 suggests that rising government debt/GNP ratio has steadily increased the temptation to inflate since 1981. But in an open economy, the effect of nominal external debt (line 2) must be added to obtain the full gain from inflation (line 3). Then the increase is dramatic: The temptation to inflate has more than doubled (from 1.02% to 2.46%) since 1982. A closed economy analysis of inflationary incentives would have missed most of this increase.

Intuitively, the United States had current account and budget deficits of comparable magnitude in recent years. Both have largely been financed with nominal debt. But because of the 3:1 weighting, the resulting concern about inflationary incentives should be attributed mainly to the deterioration in the external debt position rather than to the increase in government debt.

Notice how important the distinction between total and nominal debt is. Since external nominal debt was positive and increased inflationary incentives in many years in which the United States was overall a creditor. If assets and liabilities had had a similar distribution of denominations, the positive net external position would have offset some of the inflationary incentives created by government debt. But in fact external nominal debt reinforced these incentives in all years except 1982.

Given the external nominal debt, any substitution of conventional Treasury securities by government liabilities that are not denominated in US-dollars would clearly reduce incentive problems. Here it does not matter what kind of non-dollar debt is issued, e.g., indexed debt or debt denominated in foreign currencies. This choice will become more significant in the next section. But it is important where the non-dollar debt is sold. A sale to foreigners would not only reduce nominal government debt but also the amount of external nominal debt.

4. A Model with Real Effects of Monetary Policy

In the endowment economy of Sections 2 and 3, monetary policy affects only domestic prices, but not the real exchange rate or any other real variable. Consequently, the only interesting security for incentive issues is domestic nominal debt. In contrast, many policy-oriented discussions of monetary policy focus on the perceived power of monetary policy to influence real (and nominal) exchange rates and on a potential constructive role of foreign currency debt in providing incentives to use this power properly.[19]

This section shows that inflationary incentives and the trade-offs between different debt securities are modified in a significant way, if monetary policy has real effects. A rigorous justification of such monetary non-neutralities or a judgement about their empirical relevance is beyond the scope of the paper. But the previous analysis would be incomplete, if such non-neutralities turn out to be important. Therefore, several strong assumptions are imposed to derive a tractable model with non-neutralities; details can be found in Appendix 2.

First, preferences are defined over two goods, A and B, so that the real exchange rate (the relative price of B in terms of A) is variable. Good A is domestically produced from labor inputs n_t, $Y_t = Y_t^A = F(n_t)$, while good B is produced abroad in quantity $Y_t^* = Y_t^B$ with a similar production function. Formally, preferences are separable over goods and leisure,

$$U_t = \sum_{j\geq 0} \rho^j \cdot \left[u(c_{t+j}^A,\ c_{t+j}^B) + v(n - n_{t+j})\right] , \tag{13}$$

where n is total time and $u(\cdot)$ and $v(\cdot)$ are concave. This replaces (1). Consumer optimization then implies a real exchange rate of

$$e_t = u_B(c_t^A,\ c_t^B)/u_A(c_t^A,\ c_t^B) . \tag{14}$$

With prices p_t and nominal bonds defined in terms of the domestically produced good A, domestic bonds still have payoffs $1 + i_t - \pi_{t+1}$. Foreign currency bonds are defined to have a payoff in terms of good B. Their gross return will be denoted by $1 + i_t^* + x_{t+1}$, where x_{t+1} is the real rate of depreciation.[20] That is, a foreign currency bond has a high return, if the domestic good A depreciates relative to the foreign good B. Supplies of such bonds are denoted by the superscript f (D_t^f, B_t^f, and L_t^f).

Second, nominal contracts (Fisher (1977)) are used to motivate non-neutralities. The assumption is that individuals cannot use their own labor and instead sign nominal, non-contingent contracts in period t - 1 to deliver labor to others at some nominal price w_{t-1}. Given w_{t-1}, the labor input decision in period t is made on the demand side, satisfying the first order condition $F_n = w_{t-1}/p_t$. Output and labor input are functions of the real wage, denoted by $Y(w_{t-1}/p_t)$ and $n(w_{t-1}/p_t)$, with derivatives $Y_{w/p}$, $n_{w/p} < 0$. Wage negotiators form rational expectations, but they do not necessarily behave competitively. As a result, the wage level may not be socially optimal, which may provide additional incentives for monetary policy (see Barro and Gordon (1983)).[21] But rationality implies that wages are proportional to the expected price level. That is, $w_{t-1} = \theta \cdot p_t^e$, where p_t^e is the expected price level and θ is some number.

Third, assume that there is a safe storage technology for each good, which yields a gross return $(1 + r) = 1/\rho$.[22] This assumption simplifies the analysis tremendously: Interest rates on nominal and foreign currency bonds must be $i_t = r + \pi_{t+1}^e$ and $i_t^* = r + x_{t+1}^e$. Real exchange rates must be constant in expectation (otherwise, storage will be re-allocated) so that $x_{t+1}^e = 0$ and $i_t^* = r$.

The individual problem can be solved in two steps. In each period, expenditures $E_t = c_t^A + e_t \cdot c_t^B$ are allocated between the two goods. As a result, one obtains functions $c_t^A = c^A(E_t, e_t)$ and $c_t^B = c^B(E_t, e_t)$, and an indirect utility function $\bar{u}(E_t, e_t) = u(c^A(E_t, e_t), c^B(E_t, e_t))$. Appendix 2 shows that optimal expenditures can be written as

$$E_t = (1 - \rho) \cdot \Big[\sum_{j\geq 0} \rho^j \cdot Y_{t+j} \cdot (1 - h(\tau_{t+j})) - (1 + r) \cdot (L_{t-1} - S_{t-1})$$

$$- (i_{t-1} - r - \pi_t) \cdot L^n_{t-1} - (i^*_{t-1} - r + x_t) \cdot L^f_{t-1}\Big] \qquad (15)$$

where future income and taxes are evaluated along the perfect foresight path of the economy and where initial storage is denoted by S_{t-1}. The time-consistent perfect foresight path is characterized by individual utility maximization and the condition that monetary policy has no incentives to deviate. Along this path, welfare is

$$U_t = \frac{1}{1 - \rho} \cdot \bar{u}(E_t, e_t) - v(n - n(w_{t-1}/p_t)) - \sum_{j\geq 1} \rho^j \cdot v(n - n(\theta)) \ . \qquad (16)$$

The key question is under what conditions monetary policy has an incentive to deviate from this path in period t, after individuals have formed price expectations (determining interest rates and wages i_{t-1}, i^*_{t-1}, and w_{t-1}). Let $z_t = p_t/p^e_t \cong \pi_t - \pi^e_t$ be the rate of surprise inflation. If z_t is increased above zero, output and employment are increased, money and nominal bonds are devalued, and nominal and real exchange rates depreciate (under plausible conditions, see Appendix 2).[23] Taking the derivative of (16) with respect to z_t, one obtains

$$\frac{dU_t}{dz_t} = \bar{u}_E \cdot U_\pi(FB) + \Big[\bar{u}_E \cdot (1 - h(\tau_t)) \cdot \frac{dY_t}{dz_t} - v' \cdot \frac{dn_t}{dz_t}\Big] + \frac{\bar{u}_e}{1 - \rho} \cdot \frac{de_t}{dz_t}$$

$$+ \bar{u}_E \cdot [L^n_{t-1} + h'(\tau_t) \cdot D^n_{t-1}]$$

$$- \bar{u}_E \cdot [L^f_{t-1} + h'(\tau_t) \cdot D^f_{t-1}] \cdot \frac{de_t}{dz_t} \qquad (17)$$

The derivative looks complicated, but has a straightforward interpretation. Any positive expression in it creates a temptation to inflate. The time-consistent rate of inflation satisfies $dU_t/dz_t = 0$. Line 1 contains the net welfare effect of seignorage minus cost of inflation in $U_\pi(FB)$, as in equations (10),[24] the effect of surprise inflation on output and employment, as in Barro and Gordon (1983),[25] and a direct effect of changing real exchange rates on utility. This real exchange rate effect is negative, since $\bar{u}_e < 0$ and $(de_t/dz_t) > 0$. Intuitively, any rise in e_t is an unfavorable shift of the terms of trade, which reduces welfare.[26] Since inflation raises e_t, this terms of trade effect discourages money growth.

Lines 2 and 3 reveal how incentives to inflate depend on debt policy: Not only nominal debt affects incentives (as before), but also foreign currency debt. The relative weights on national and government debt are unity and the marginal cost of taxes, respectively, for both types of debt. The weight of and foreign currency debt relative to nominal debt depends on how strongly money growth affects real exchange rates (de_t/dz_t).

Since money growth increases the real exchange, it increases the real value of foreign currency debt. Thus, equation (17) provides support for the view that foreign currency debt improves the credibility of non-inflationary monetary policy. In the case of foreign currency government debt, D^f_{t-1}, a higher value of debt has to be financed by distortionary taxes at a marginal cost $h'(\tau_t)$. In the case of external foreign currency debt, L^f_{t-1}, a higher value of debt redistributes wealth to foreigners. The relative weights on national and government debt are the same as for nominal debt.

As a result, there is a clear ranking of different securities in terms of inflationary incentives. Nominal debt is the worst because it creates a temptation to devalue it through inflation. Safe debt (real, indexed, or otherwise independent of monetary policy) has no incentive effects. And foreign currency debt is even better than safe debt, since it deters monetary authorities from inflating. For all three groups of securities, external debt is about 3-times as effective on incentives as government debt (again assuming $h(\tau) = 1/3$).

Next, notice that the first-best monetary policy, which sets $U_\pi(FB)$ to zero, is time-consistent if all other expressions in (17) add up to zero. Thus, any combination of nominal and foreign currency debt (and values of indexed debt given implicitly by the budget constraint) that satisfies

$$D^f_{t-1} \cdot \left[h'(\tau_t) \cdot \frac{de_t}{dz_t}\right] = D^n_{t-1} \cdot h'(\tau_t) + \left[L^n_{t-1} - L^f_{t-1} \cdot \frac{de_t}{dz_t}\right]$$

$$+ (1 - h(\tau_t)) \cdot \frac{dY_t}{dz_t} - \frac{v'}{\bar{u}_E} \cdot \frac{dn_t}{dz_t} + \frac{c^B_t}{(1-\rho)} \cdot \frac{de_t}{dz_t} \qquad (18)$$

yields the first-best monetary policy.[27]

For the interpretation, consider the case of a country with substantial internal nominal government debt, $D^n_{t-1} > 0$. In addition, the country may have a positive Barro-Gordon-type output-employment effect (in line 2 of (18)) without changing anything significant. A closed-economy analysis would predict that this government faces a time-consistency problem, i.e. has higher inflation and lower welfare than in a situation with pre-commitment. At least four factors can overturn this prediction. First, as in Section 3, a sufficient external creditor's position in nominal terms may offset nominal government debt. Second, the time-consistency problem may not arise if the government issues enough foreign currency debt to offset the inflationary effect of nominal debt. Third and fourth, external debt denominated in the foreign currency and the need to import foreign goods help in the same way.

The effects of private external debt on monetary policy have interesting implications. Since the government cares about its residents, private external nominal debt creates inflationary incentives while foreign currency debt reduces them. If the government could somehow influence individuals' portfolio choices, it would like residents to issue debt in the foreign currency and to hold assets in the domestic currency. That is, portfolio diversification is damaging for welfare.[28] This is an external effect that is ignored by individuals. Discriminatory taxes or regulatory policies affecting the segmentation of markets (e.g., Euro versus domestic) may be practically feasible ways of forcing individuals to internalize the incentive effects of their portfolio choices.

For the United States, the new factors may modify the results of Section 3 significantly, depending on how strongly monetary policy affects real exchange rates (i.e., depending on the value of de_t/dz_t). Concerning government liabilities, it is clear that a policy of financing a deficit by issuing US-dollar denominated bonds increases inflationary incentives. Even worse, much of the bonds are apparently bought by foreigners. Foreign currency Treasury-debt would have the opposite effect on incentives. Ideally, such debt should be sold to foreigners. Concerning the current level of inflationary incentives, the United States had a large positive net position in assets that are sensitive to exchange rate movements (see Table 1), mainly due to substantial direct investment abroad. This provides another incentive to inflate, because inflation and devaluation would raise the value of these investments in terms of US-dollars. However, devaluation also increases the cost of imports. Taking the model literally, this term of trade effect could be huge.[29] Then the effect of money growth on exchange rates would, on net, reduce the incentives to inflate.

Equation (18) may be given an alternative interpretation, if government debt is chosen optimally. Then it characterizes optimal debt policy. Optimal foreign currency government debt must offset the inflationary (dis-)incentives of nominal government debt, external debt, and output-employment effects.

This problem of finding the optimal structure of optimal government debt may be complicated, if national debt changes with government debt (depending to whom the government debt is sold). To see this, let q^n and q^f be the fraction of nominal and foreign currency government debt sold to foreigners. Let $L^n(0) = B^n(0)$ and $L^f(0) = B^f(0)$ be the private (= national) debt structure without government debt and let $L^n(D_t^n) = B^n(0) + q^n \cdot D_t^n$, and $L^f(D_t^f) = B^f(0) + q^f \cdot D_t^f$, be the structure of national debt as a function of government debt. Then the first-best monetary policy is time consistent, if and only if

$$D_{t-1}^f \cdot \left[q^f + h'(\tau_t) \cdot \frac{de_t}{dz_t}\right] = D_{t-1}^n \cdot \left[q^n + h'(\tau_t)\right] + \left[B^n(0) - B^f(0) \cdot \frac{de_t}{dz_t}\right]$$

$$+ \left(1 - h(\tau_t)\right) \cdot \frac{dY_t}{dz_t} - \frac{v'}{\bar{u}_E} \cdot \frac{dn_t}{dz_t} + \frac{\bar{u}_e}{(1 - \rho) \cdot \bar{u}_E} \cdot \frac{de_t}{dz_t} \qquad (19)$$

Thus, the inflationary effect of nominal government debt is lowest, if it is sold to domestic residents and not to foreigners ($q^n = 0$). Similarly, the dis-inflationary effect of foreign currency government debt is highest, if it is sold only to foreigners, not to domestic residents ($q^f = 1$). A policy of issuing domestic bonds to resident and issuing foreign currency debt to foreigners achieves the largest reduction in inflation per unit of transactions.[30] Again, international diversification is undesirable.

In principle, the existence of a "dominant" currency that is used in international lending may approximate this optimal private debt structure, provided the "dominant" country is a net creditor. For example, if foreigners borrowed on net from the United States in US-dollars, Americans would have net nominal foreign assets ($-L_t^n > 0$, due to $-B_t^n > - D_t^n > 0$), while non-Americans would have debt in denominated in US-dollar, a foreign currency. Both international positions would reduce incentive problems for their governments. On the other hand, attempts of foreign governments to accumulate foreign currency reserves work in the opposite direction. As Table 1 shows, this has historically been a significant factor. Moreover, the practice of using the "dominant" currency for international lending is harmful, if the "dominant" country is a debtor. This may become increasingly relevant as the United States accumulates external deficits.

5. Conclusions

In an open economy with capital mobility, the government's incentive to generate surprise inflation depend not only on government debt, but also significantly on external debt. If external debt is denominated in nominal terms, inflationary money growth causes redistribution between domestic residents and foreigners. A government that cares about the welfare of its residents will be tempted to inflate whenever the country is a net debtor in nominal terms. On the other hand, the usual closed-economy time-consistency problem (caused by the temptations to increase output and to reduce the internal government debt) can be offset by a sufficiently high net creditor position of the country.

If money affects real exchange rates, foreign currency debt has similar incentives effects as nominal debt, but in the opposite direction. A government faced with inflationary incentives can therefore reduce the time-consistency problem by issuing foreign currency debt. This is credible, since a depreciation caused by expansionary money would redistribute wealth away from the government, which is costly in terms of welfare. The debt should be sold to foreigners (not to residents) to maximize the welfare cost of redistributions, i.e. the incentives not to inflate.

For the United States, these international considerations should become increasingly relevant as the country accumulates external deficits. My estimates indicate that the incentive to inflate more than doubled between 1982 and 1987. More than two-thirds of this increase was due to higher external debt, which was largely financed in nominal terms.

Footnotes

[1]See, e.g., Kydland and Prescott (2977), Calvo (1978), and Barro and Gordon (1983).

[2]See, e.g., Barro (1983), Lucas and Stokey (1983), Lucas (1986), and Bohn (1988a,b).

[3]Equivalently, purchasing power parity is imposed. To simplify the exposition, a discussion of endogenous real exchange rates is deferred to Section 4.

[4]Constant r keeps real factors invariant with respect to policy changes and simplifies the welfare analysis. For a model with endogenous real interest rates, see Bohn (1988a). Linear utility is not a necessary assumption (see Section 4), but it simplifies the exposition.

[5]Uncertainty in endowments or other exogenous variables could easily be added (wity linear utility). Most importantly, the certainty model abstracts from differences in state-contingent payoffs of different securities.

[6]One may naturally set $\varepsilon = 1$. But various stories about cash and credit goods or trading opportunities would be consistent with $0 < \varepsilon \leq 1$. Since velocity $1/\varepsilon$ differs from one in reality, the factor ε should not be constrained to one in the model. Otherwise, one might obtain a very misleading impression about the quantitative importance of seignorage. It is assumed that foreigners also receive a fraction ε of their sales of Y^* in their money M^*. But they have no reason to hold domestic money (assuming positive nominal interest rates). Since M^* is taken as given, foreign currency debt is equivalent to indexed debt for the purposes of this section (because of purchasing power parity and no uncertainty).

It should be emphasized that seignorage will not play an important role in the analysis. Therefore, I feel that simple assumptions on money are preferable to a more elaborate, rigorous model of why fiat money is held.

[7]Only taxes on endowments are considered. Taxes on interest income would create more time-consistency problems (which are well known and not the subject of this paper) and might cause additional distortions. But notice that, due to the fixed discount factor, taxes would not affect after-tax returns.

[8]The loss function $h(\cdot)$ can be interpreted as a function indicating the net cost of inefficiencies caused by distortionary taxes, which are not modeled explicitly. This way of modeling frictions follows Barro (1979). The results of the paper would not change, if distortions were derived from first principles. For example, if all taxes were income taxes, if output were produced from labor inputs, and if the utility function included an additive term for the disutility of labor, the key equations (10) and (11) would remain unchanged. The functional form of $h'(\tau)$ would involve the labor supply elasticity and other parameters of the model in a specific way. But a less restrictive interpretation will be more convenient for the calibration in Section 3.

[9]Many individuals apparently dislike inflation, but it is unclear why moderate, anticipated inflation (i.e., short of hyperinflation) should have significant real cost. One motivation based on redistribution between heterogeneous agents is provided in Bohn (1988b). Alternatively, one could assume that real money balances at the start of the period enter into the utility function, which would make $f(\cdot)$ a specific function of preference parameters. But since this would only complicate the model without providing additional insights, a flexible functional form is used.

[10]Few governments currently issue indexed securities (e.g. Britain, but not the US). But in this certainty model, any asset with a return that is unaffected by domestic inflation is equivalent to an indexed bond. Foreign currency debt is an example.

[11]For simplicity, government spending is set equal to zero. Any exogenous process of government spending could be added easily.

[12]That is, it is beyond the scope of this paper to model all determinants of private debt that may be relevant in practice (e.g., differences in time-preferences, risk aversion, transactions cost, motives of portfolio diversification and hedging).

[13]For the United States, the ratio of the money base (which is the relevant concept of money for seignorage) to GNP was 5.7% at the end of 1987 as compared to a government debt (privately held) to GNP ratio of 38.9%. With nominal interest rates below 10%, total seignorage is less than $25 billion, as compared to federal receipts of $854 billion FY1987 (for data, see 1988 Economic Report of the President).

[14]In particular, considerations of tax-smoothing over time or over states of nature may be important; see, e.g., Barro (1979), Lucas and Stokey (1983), Bohn (1988a,b,c).

[15]Second order conditions are always satisfied, guaranteeing a unique interior solution. Some readers might want to call this policy second-best (and other policies third best) because of the cost of tax collection $h(\tau)$. With lump sum taxes, zero inflation would be first-best. But costly tax collection is a maintained assumption in this paper, so that the distinction of first- and second-best will refer to monetary policy. Notice that the solution to (15) to close to zero, if ε is small.

[16]This and the subsequent statements can be proven easily by taking total differentials.

[17]If the mapping from π_t^e to π_t has a derivative less than one, a unique time-consistent solution (a fixed point) exists. This will be assumed and it seems to be satisfied in all interesting cases. For example, nonnegative nominal government debt is a sufficient condition.

[18]There are 2 problems with the data. First, the market value of net foreign assets is difficult to measure; published statistics use book values to some extent. Second, the currency-denomination of some investment positions is not known.

[19]The potential to affect real exchange rates is crucial for foreign currency debt to have incentive effects. In the model of Section 2, monetary policy affects nominal exchange rates in the same way as prices. There, foreign currency debt is equivalent to indexed debt (given a known foreign monetary policy).

[20]Depreciation x_t is the rate of change in e_t. Assuming foreign inflation is exogenous, a distinction of foreign nominal or real bonds is pointless, though possible. Thus, let foreign inflation be zero.

[21]As Barro and Gordon point out, some distortion or non-competitive behavior is necessary to motivate a temptation for monetary policy to reduce unemployment through inflation.

[22]It is assumed that initial conditions are such that the technology is used at a positive level.

[23]These properties of the model replicate features of widely used open-economy models, such as Dornbusch (1976).

[24]Now the effect is weighted by marginal utility. With pre-commitment, this line would be set to zero to obtain the first-best policy.

[25]In a contract model, inflation increases both variables. The net welfare effect is only positive, providing an incentive to inflate, if equilibrium employment is inefficiently low so that the welfare-increasing output effect exceeds the welfare-reducing effect of higher labor inputs, see Barro and Gordon (1983).

[26]Recall that preferences are over goods A and B and that the country only produces A and imports B.

[27]Appendix 2 shows that $\bar{u}_e$ in (17) can be replaced by $-c_t^B \cdot \bar{u}_E$.

[28]Of course, the model leaves out uncertainty (except about policy), which is the usual motivation for diversification.

[29]The way the model is set up, money causes permanent changes in the real exchange rate. Therefore a devaluation reduces net wealth by the change in the discounted present value of imports. With imports of about $480 billion in 1986 and, say, a 4% real rate, the terms of trade effect would be equivalent to a net external debt of $12000 billion. The fact that the real exchange rate effect is permanent is, however, clearly due to simplifying assumptions of the model. If the effect were temporary, it would be much smaller. Therefore, it should be interpreted cautiously.

[30]This may be relevant if there are additional constraints, e.g., if the transactions are costly or if the markets will not accept unlimited quantities of government securities at the given price.

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Appendix

A.1. Details on Tables

Tables 1 and 2 are derived from Commerce Department and Federal Reserve data, as follows. To obtain Table 1, US foreign assets and liabilities must be divided into items denominated in US-dollars, items valued within a foreign country, and a residual. The procedure will be described in detail for the year 1985. The same procedure was used for all other years, unless specifically noted.

Column 1 of Table A reproduces the Commerce Department data for 1985, taken from the Survey of Current Business, June 1988. Columns 2-4 contain the decomposition. Of the US official reserves, line 7 clearly belongs in the foreign column and lines 4-6 are put in the residual category. Though Special Drawing Rights and the IMF position might be considered mixtures of dollar and foreign currency claims, their status as marketable assets is questionable. Therefore, I chose not to include them in either category. Concerning US loans and other long term government assets (lines 9-11), I assume line 11 is foreign, since line 10 identifies the dollar denominated component. Concerning line 12, it is unclear how much of it is foreign currency denominated. Lacking more detailed information, all of it is added into the foreign column.

Concerning US private assets, it is important to recall from Section 4 that any real or nominal assets with payoff in terms of the "foreign good" should be included in foreign debt L_t^f. Therefore, I copy lines 14-17 into the foreign category. Lines 18 and 19 contain both dollar and foreign currency components. I compute the fraction denominated in foreign currency from data published in the Federal Reserve Bulletin (Tables 3.16, 3.19, and 3.23 in various issues up to June 1988) and allocate the entries in lines 18 and 19 accordingly. The Federal Reserve totals differ slightly from the Commerce Department's values in column 1, but the discrepancy is trivial for most years (under 1% for 1980-81 and 1982-87, 1.3% for 1982). Exceptions are 1970 and 1975, for which I do not have data on the foreign currency component of line 18. For these years, the fraction for 1980 (8.7%) is used. Since the foreign currency fractions are small for all years with complete data, the error is presumably not serious.

Foreign official assets in the US are all considered dollar denominated (see below for line 26). Foreign direct investment and investment in corporate stocks are clearly real assets (lines 29 and 33), while Treasury securities and bonds are nominal (lines 30 and 32). Lines 34 and 35 are divided into dollar and foreign currency components in the same way as lines 18 and 19, using Federal Reserve data (Tables 3.16, 3.17, and 3.22 of the Bulletin), except that the foreign currency fraction in line 35 was computed for all bank-reported liabilities (lines 26 and 35) for simplicity. If line 26 contains a foreign currency component, the amount should be entered in line 26 instead of line 35, but such a change would not affect the total foreign denominated debt.

I have also explored how an inclusion of foreign branches of US banks would affect the net investment position. It turns out that the consolidated numbers differ little (less than $20 billion for any year) from those in Table 1. Based on Federal Reserve statistics, foreign branches had net dollar liabilities and net foreign currency assets since 1984, which would increase both balances in Table 1 in absolute value.

Finally, a comment on the accuracy of the estimates is appropriate. Though some subjective judgement was unavoidable, the fact that all large dollar items are well-measured, leads me to believe that the net dollar position contains little error. For the quantitatively largest items in Table A, bank-reported assets and liabilities (lines 19, 26, and 35), the currency is known for all but an amount of less than $1 billion. If there are inaccuracies in my decomposition, they are likely in those smaller, "other" items that I did not inspect closely (e.g., lines 11, 12, 24, 25, 27). In addition, I do not have data on off balance sheet commitments like forward contracts or currency swaps. In the net foreign and in the total investment position, the valuation of US direct investment abroad is an important factor. If, as some observers suspect, this item is undervalued, the balances would be more positive than the numbers in Table 1 indicate.

Table 2 uses data on privately held government debt, monetary base, and GNP from the Economic Report of the President. Line 1 shows the rations of year-end privately held government debt plus monetary base to GNP, multiplied by $h'(\tau) \cdot 10\% = 1/30$. Exceptions are 1970 and 1975 where debt is only available for fiscal years. Line 2 shows 10% of the ratio of net dollar-denominated debt (from Table 1) to GNP, and line 3 is the sum of lines 1 and 2. Notice that lines 1 and 3 include the effect of devaluing the real value of money. If one wanted to isolate the part of the wealth effect that exceeds the first best, seignorage would have to be excluded (see equation (11) versus (10)). For the 1980's, excluding seignorage would reduce the numbers in lines 1 and 3 by 0.18%-0.19%.

A.2. Details on the Model of Section 4

For individual i, let n_t^i be the labor input supplied to "others" and n_t^j be the labor input demanded from others, both at the nominal wage w_{t-1}. The period-t budget constraint is

$$c_t^A + e_t \cdot c_t^B + S_t + B_t = (1 + r) \cdot (B_{t-1} - S_{t-1}) - (i_{t-1} - r - \pi_t) \cdot B_{t-1}^n \cdot$$

$$-(i_{t-1}^* - r + x_t) \cdot B_{t-1}^f + n_t^i \cdot w_{t-1}/p_t - n_t^j \cdot w_{t-1}/p_t$$

$$+ F(n_t^j) \cdot \left(1 - \tau_t - h(\tau_t)\right) \qquad \text{(A-1)}$$

Maximizing (13) with respect to n_t^j, c_t^A, and c_t^B yields

$$F_n(n_t) = w_{t-1}/p_t \ , \qquad \text{(A-2)}$$

$$u_A(c_t^A,\ c_t^B) = u_A(c_{t+1}^A,\ c_{t+1}^B),\ u_B(c_t^A,\ c_t^B) = u_B(c_{t+1}^A,\ c_{t+1}^B) \ , \qquad \text{(A-3)}$$

and (14), where c_{t+1}^A and c_{t+1}^B are evaluated along the equilibrium path of the economy. (A-3) and (14) imply that e_t must be constant in equilibrium.

Symmetry implies $n_t^j = n_t^i = n_t$. Notice that n_t^i is not a choice variable of individual i. Instead, θ is given at some level that may not satisfy the optimality condition $v'(n - n_{t+j}) = w_{t-1}/p_t^e \cdot u_A$. Provided $F_{nn} < 0$, (A-2) implies that employment and therefore output are decreasing functions of $w_{t-1}/p_t = (p_t^e/p^e) \cdot \theta = \theta/(1 + z_t)$. Thus, surprise inflation z_t increases output and employment. Since output is endogenous, the money supply needed to generate surprise inflation must be computed from (2). Still inflation can and will be taken as the policy instrument.

Taking the total derivative of (14) and the definition of E_t, it is straightforward to show that consumption of both goods is increasing in E_t, that c_t^B is decreasing in e_t, and that the indirect utility $\bar{u}(E_t,\ e_t)$ has derivatives

$$\bar{u}_E = \frac{e_t \cdot u_{AA} \cdot u_B + u_{BB} \cdot u_A}{e_t^2 \cdot u_{AA} + u_{BB}} = u_A > 0, \quad \text{and} \quad \bar{u}_e = - u_A \cdot c_t^B < 0 \ .$$

With constant interest rates, (A-1) can be rewritten as intertemporal budget constraint, assuming the transversality condition is satisfied. It is

$$\sum_{j\geq 0} \rho^j \cdot [c^A_{t+j} + e_{t+j} \cdot e^B_{t+j}] = \sum_{j\geq 0} \rho^j \cdot E_{t+j} = (1 + r) \cdot$$

$$(B_{t-1} - S_{t-1}) - (i_{t-1} - r - \pi_t) \cdot B^n_{t-1} - (i^*_{t-1} - r + x_t) \cdot B^f_{t-1}$$

$$-(M_t - M_{t-1})/p_t + \sum_{j\geq 0} \rho^j \cdot \left[F(n_t) \cdot \left(1 - \tau_t - h(\tau_t)\right)\right] , \qquad \text{(A-4)}$$

using the pricing equations (3) for periods $t + j > t$. Next, the government budget constraint implies

$$\sum_{j\geq 0} \rho^j \cdot E_{t+j} = (1 + r) \cdot (L_{t-1} - S_{t-1}) - (i_{t-1} - r - \pi_t) \cdot L^n_{t-1}$$

$$-(i^*_{t-1} - r + x_t) \cdot L^f_{t-1} + \sum_{j\geq 0} \rho^j \cdot \left[F(n_t) \cdot \left(1 - h(\tau_t)\right)\right] . \qquad \text{(A-5)}$$

Because of (A-3) and (14), E_t is constant over time, $\sum_{j\geq 0} \rho^j \cdot E_{t+j} = E_t/(1 - \rho)$. This implies (15). Equation (16) is obtained by substituting (15) into (13) and noting that the real wage is θ in expectation.

To obtain the equilibrium values of aggregate variables, future employment must be evaluated at $n(\theta)$, taxes at the value implied by (7), and inflation at the value satisfying $dU_t/dz_t = 0$, where dU_t/dz_t is defined in (17). It is assumed that $dU_t/dz_t = 0$ has a unique solution, which can be assured, e.g., by a sufficiently high value of $f''(\pi_t - \bar{\pi})$.

To determine how surprise inflation affects the exchange rate, notice that the equilibrium on the market for domestic output implies

$$c^A_t(E_t, e_t) + c^{A*}_t(E^*_t, 1/e_t) = Y_t . \qquad \text{(A-6)}$$

Since $dY_t/dz_t > 0$, surprise inflation leads to real depreciation, if world demand for good A is decreasing in its relative price. This is assumed.

Table 1: Net Investment Position of the United States

Year	1970	1975	1980	1981	1982	1983	1984	1985	1986	1987
Total ($-L_t$)	58.6	74.2	106.3	141.1	136.9	89.4	3.5	-110.7	-269.2	-368.2
Dollar ($-L_t^n$)	-20.8	-41.9	-49.8	-9.7	15.3	-8.8	-80.8	-193.5	-325.2	-434.2
Foreign ($-L_t^f$)	103.2	163.3	287.0	303.7	298.8	304.2	315.1	360.8	411.8	468.5

Legend: Billions of US-dollars. See Appendix 1 for definitions and sources.

Table 2: Wealth Effects of a 10%-Devaluation of Nominal Claims

Year	1970	1975	1980	1981	1982	1983	1984	1985	1986	1987
Government Debt	1.16%	1.04%	0.94%	0.93%	1.07%	1.18%	1.25%	1.36%	1.45%	1.49%
External Debt	0.21%	0.26%	0.18%	0.03%	-0.05%	0.03%	0.21%	0.48%	0.77%	0.97%
Open Economy Total	1.37%	1.30%	1.12%	0.96%	1.02%	1.21%	1.46%	1.84%	2.22%	2.46%

Legend: Own computations, see Appendix 1 for definitions and sources.

Table A.1: US Foreign Assets and Liabilities in 1985

Line	Type of Investment	Total	Dollar	Foreign	Other
1	Net investment position	-110.7	-192.5	359.8	-278.0
2	US assets abroad	950.3	541.3	378.7	30.3
3	US official reserve assets	43.2	0.0	12.9	30.3
4	Gold	11.1			11.1
5	SDR	7.3			7.3
6	Reserve position in the IMF	11.9			11.9
7	Foreign currencies	12.9		12.9	
8	Other US government assets	87.6	84.1	3.5	0.0
9	US loans and other long term assets	85.8	84.1	1.7	
10	Repayable in dollars	84.1	84.1		
11	Other	1.7		1.7	
12	US foreign currency holdings and US short term assets	1.8		1.8	
13	US private assets	819.5	457.2	362.3	0.0
14	Direct investment abroad	230.3		230.3	
15	Foreign securities	112.8		112.8	
16	Bonds	73.0		73.0	
17	Corporate stocks	39.8		39.8	
18	US claims on unaffiliated foreigners reported by US nonbanking concerns	29.1	26.7	2.3	
19	US claims reported by US banks, not included elsewhere	447.4	430.5	16.9	
20	Foreign Assets in the US	1061.0	733.8	18.9	308.3
21	Foreign official assets	202.6	202.6	0.0	0.0
22	US government securities	143.4	143.4		
23	US Treasury securities	135.7	135.7		
24	Other	7.7	7.7		
25	Other US government liabilities	15.7	15.7		
26	US liabilities reported by US banks, not included elsewhere	26.7	26.7		
27	Other foreign official assets	16.7	16.7		
28	Other Foreign Assets	858.4	531.1	18.9	308.3
29	Direct investment	184.6			184.6
30	US Treasury securities	83.6	83.6		
31	Other US securities	206.2	82.5		123.7
32	Corporate and other bonds	82.5	82.5		
33	Corporate stocks	123.7			123.7
34	US liabilities to unaffiliated foreigners reported by US nonbanking concerns	29.5	25.9	3.6	
35	US liabilities reported by US banks, not included elsewhere	354.5	339.2	15.3	