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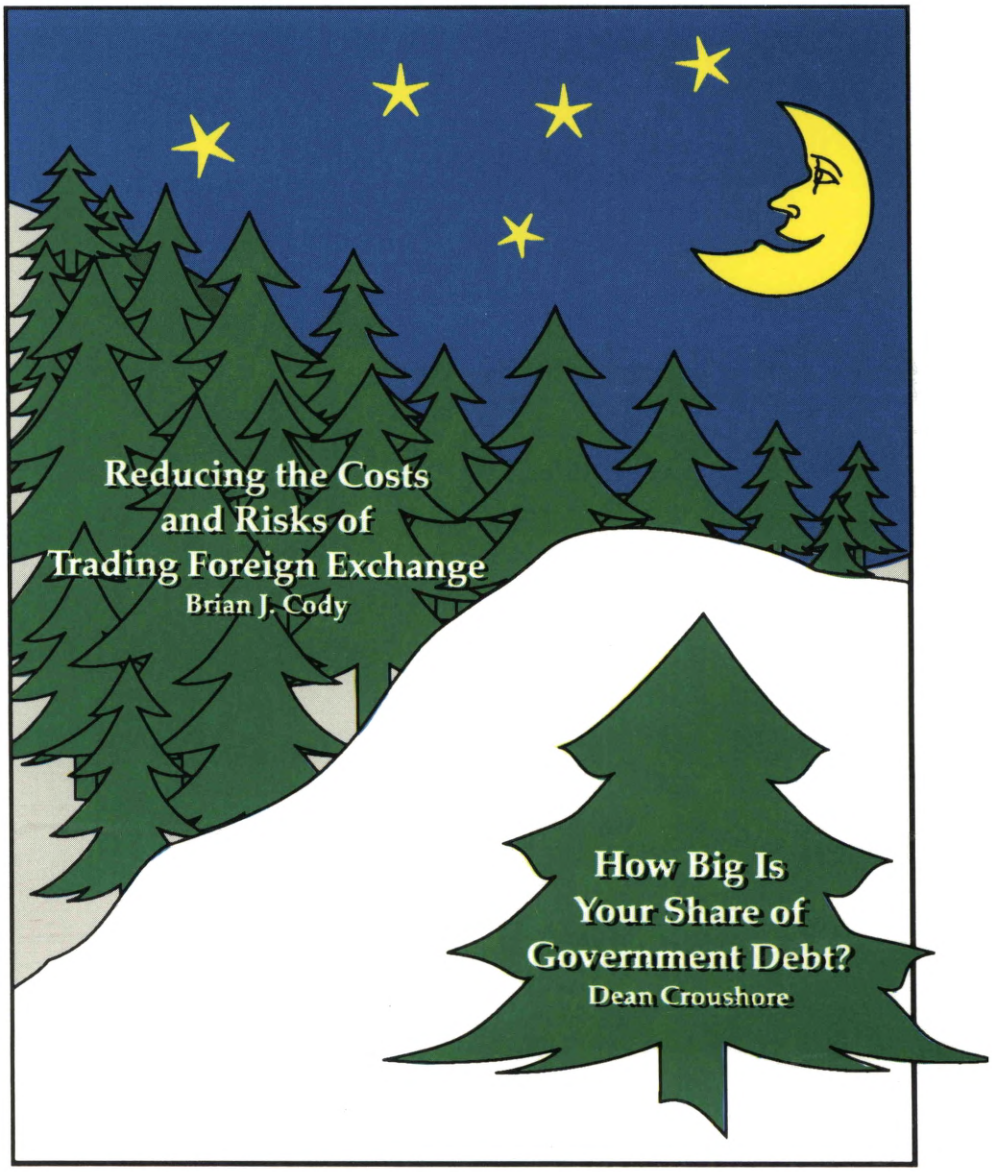

Business Review

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NOVEMBER/DECEMBER 1990

How Big Is Your Share of Government Debt?

*Dean Croushore**

Government debt grew so dramatically in the 1980s that a taxpayer might well ask: "Now how much do I owe?" And perhaps more to the point: "Will my taxes go up to pay for it?"

It's true that the $150 billion average budget deficits of the 1980s tripled the national debt over the last 10 years. But that doesn't mean that the average taxpayer's debt burden is now three times as heavy. There are several mitigating factors.

First, population and prices have also increased, so the rise in real debt per capita has not been so dramatic. Second, real income per capita, and hence the average taxpayer's ability to pay the debt, has gone up too. And finally, the government has been accumulating assets, not just liabilities, over the years. Those assets can help the government rationalize the size of its debt.

But even so, some disturbing trends are beginning to emerge. The government is accumulating debt more rapidly than assets. If this

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trend continues, higher tax rates or reduced government services seem inevitable.

GOVERNMENT DEBT

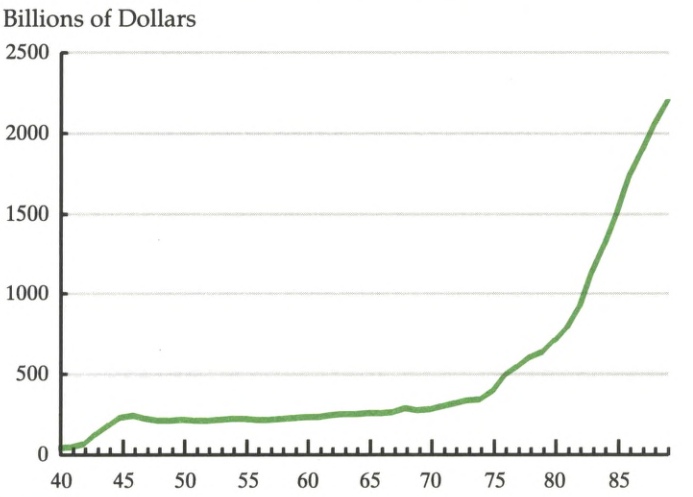
One look at the current trend in government debt and it is easy to see why people are alarmed. Federal debt (the total of all past annual deficits) has skyrocketed in recent years (Figure 1). Prior to World War II the federal debt was less than $100 billion. Financing the war ran the debt up to $250 billion, and it grew slowly to $350 billion by the early 1970s. But the real acceleration began in 1975. Since then the debt has increased to over $2200 billion—a 13 percent annual rate of increase.[1] What's behind this rapid growth?

A major part of the reason for the run-up in government debt is high inflation.[2] If we adjust for the impact of inflation (using the GNP deflator), we measure the *real debt*. The real federal debt declined through the 1950s, the 1960s, and the first half of the 1970s. It began rising in 1976, then accelerated sharply beginning in 1982. Overall, though, the real federal debt hasn't grown nearly as rapidly as the nominal debt. Real debt has grown at a 7 percent annual rate since 1975, much lower than the 13 percent rate for nominal debt.

But the real federal debt isn't the proper concept for a worried taxpayer. It ignores the change in the market value of government debt caused by changes in market interest rates. It ignores the fact that the government owns financial assets on which it receives interest. It ignores the debt of state and local governments. And it ignores the growth of population and productivity over time.

No valuation of government debt would be complete without adjusting for changes in interest rates. The debt of the government is recorded at its value when issued (book value). However, when market interest rates change, the current market value of existing government debt changes inversely. For example, when interest rates fall, as they did in the mid-1980s, the government suffers an implicit capital loss on its existing debt because it has borrowed at an interest rate above that prevailing

FIGURE 1
Nominal Federal Debt



Federal debt held by the public; end of fiscal year.
Source: U.S. Treasury Department

[1]The debt figure ($2.2 trillion) used here is the gross nominal federal debt (which now exceeds $3 trillion) minus federal debt held by federal agencies and trust funds (such as social security).

[2]Prices rose about 30 percent in the 1950s, 30 percent in the 1960s, 100 percent in the 1970s, and 60 percent in the 1980s. On average, an item priced at $1 some 40 years ago now costs over $5.

in the market. On the other hand, when interest rates rise, as they did in the late 1970s, the government gets an implicit capital gain for having borrowed earlier at a lower interest rate.[3]

Another adjustment to the debt numbers comes from realizing that the government owns various financial assets, including currency, bank deposits, gold, foreign currency, special drawing rights on the International Monetary Fund, mortgages and other loans, and taxes receivable. These financial assets are the opposite of debt, so we subtract their market value from the debt number to arrive at the *net debt*.

We should take account of the debt of state and local governments using the same adjustments we used to arrive at the market value of federal government debt. State and local governments have balanced-budget laws that limit the types of projects for which they may borrow; even so, most of these tend to be investment projects that are self-financing. As a result, state and local governments have relatively little debt compared to the federal government.

Real Net Debt. The adjustments to debt just described, as well as the asset and net-worth adjustments described later on, were calculated first by Robert Eisner and Paul J. Pieper in 1984, and again by Eisner a couple of years later.[4] Making these adjustments gives us the government's *real net debt:* the debt (adjusted for inflation and changes in interest rates) minus the real market value of the government's financial assets.[5]

Estimating the market value of any asset or liability typically requires making some assumptions, and different assumptions will lead to different estimates. Given the measurement problems inherent in such calculations, we shouldn't make too much of the real net debt level (or the calculations of real tangible assets or net worth) for any one year. But the trends in these measures over longer periods illustrate how the government's fiscal position has been changing.

The real net debt figure alone may not give a true picture of debt's importance in the economy, because it ignores the growth of population and the increased productivity of workers. As productivity and the population grow, so does national output, which we measure by GNP. So by looking at the ratio of real net debt to real GNP, we can compare government debt to our capacity to repay it (Figure 2).

State and local government debt hasn't changed much over time, so the ratio of total government net debt to GNP has moved closely with the ratio of federal government net debt to GNP. Fighting World War II pushed the government's real net debt above real GNP. (The ratio of real net debt to real GNP exceeds 1.) Over time, we gradually worked off the war debt, mostly through economic growth. In the late 1970s, during the Carter Administration, the nominal federal debt increased 44 percent, but inflation raised the price level 39 percent and real GNP grew 12 percent. Consequently, the net-debt-to-GNP ratio fell, even though nominal budget deficits were large. In the 1980s, the big deficits of the Reagan Administration raised the ratio of net debt to GNP

[3]The capital losses and gains on government debt in the 1970s and 1980s were mostly due to unexpected changes in the inflation rate. There is an incentive problem here because if the government causes inflation to rise unexpectedly, it can reduce the market value of its outstanding debt (as occurred in the 1970s), while if inflation is lower than expected (as in the 1980s), the market value of government debt rises.

[4]Eisner and Pieper have subsequently updated the data through 1988. I am indebted to them for providing me with updates of their original data, used in Figures 2, 3, and 4. For more details on their calculations, see Eisner and Pieper (1984) and Eisner (1986).

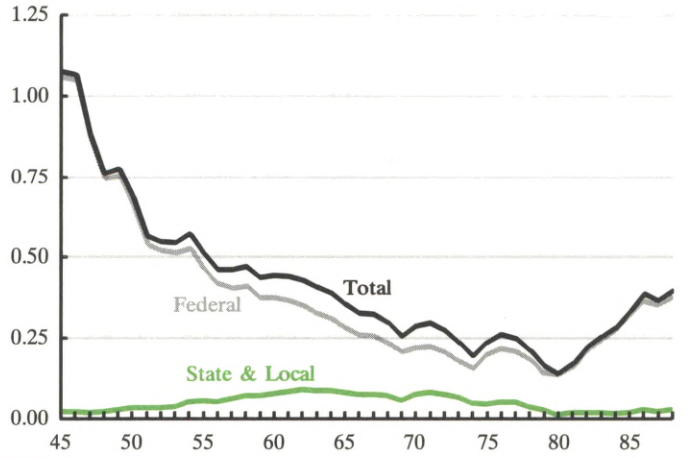
[5]Federal debt owned by the Federal Reserve System (about 10 percent of total federal debt) is netted out of the real net-debt figure.

from a low of 14 percent in 1980 to a high of 40 percent in 1988.

The rise in the ratio of net debt to GNP in the 1980s might lead a taxpayer to believe that the government will eventually raise taxes to reduce the debt. But debt alone tells only half of the government's financial story. It is important to look at *both* sides of the government's balance sheet—both its debt and the assets it acquired when incurring the debt. A useful way of putting government debt into perspective is to think of yourself, a citizen and taxpayer, as a shareholder in the government. Of course, unlike a shareholder in a corporation, you can't sell your share in the government. But when government debt rises, you implicitly incur a liability. What's more, you also own a portion of any associated increase in government assets. If those assets produce returns in the future, then you stand to benefit. How has the value of your share in government changed over time?

FIGURE 2

The Ratio of Government Net Debt to GNP



Source: Unpublished data provided by Robert Eisner and Paul Pieper, based on their previously published work. For their methodology and earlier data, see Eisner and Pieper (1984) and Eisner (1986).

THE GOVERNMENT'S TANGIBLE ASSETS AND NET WORTH

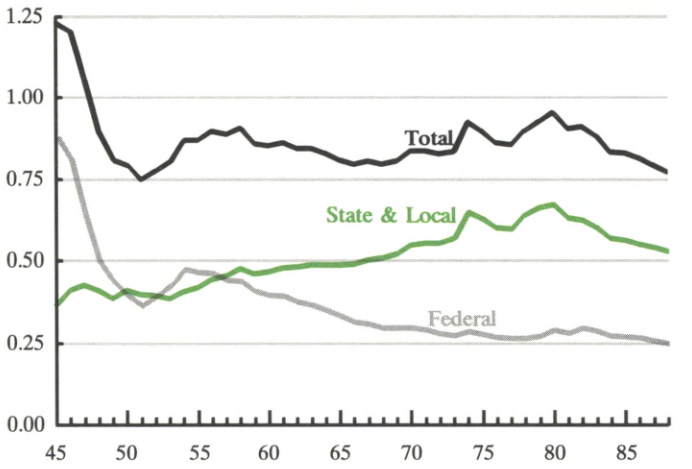
The government owns a diverse set of tangible assets: roads and bridges, parks and recreation areas, buildings for operations and schools, capital equipment, land, and mineral rights.[6] Assessing the value of these assets is difficult. An analyst using such data might want to adjust the numbers to reflect a subjective belief about which assets should be included in the count based on some criterion. For example, if land values rise, the government's asset value rises too. Yet, taxes would probably not drop unless the government sells the land. Similarly, acquiring more military hardware might enhance national security, but it's unlikely to improve national productivity growth. Distinguishing between different types of assets may be important for some purposes. But for the purpose of assessing the government's balance sheet, it is better to put some value on these assets rather than ignore them.[7]

[6]Government *financial* assets (loans, gold, and cash) were subtracted from government's gross debt to obtain government net debt. The government's nonfinancial assets are its *tangible* assets. Asset data come from the Federal Reserve's *Flow of Funds* tables, after adjustment for changes in market value. See Eisner and Pieper (1984) and Eisner (1986).

[7]Precise measurement of the value of these assets is often difficult, as Boskin and others (1989) discuss. Most importantly, only tangible assets get counted, because they can be

FIGURE 3

The Ratio of Government Tangible Assets to GNP



Source: Same as Figure 2.

After adjustment to reflect market values, the numbers calculated by Eisner and Pieper show that the ratio of total government tangible assets to GNP is about the same today as it was after World War II (Figure 3). The ratio has declined steadily since 1980, however. The growth in government assets from 1949 to 1980 was due largely to growth in state and local assets. But even though these assets are owned by state and local governments, much of the funding for them came from the federal government through grant-in-aid programs. Accordingly, it is more appropriate to look at total government (federal plus state and local) debt and assets than at each level of government separately.

Government Net Worth. The government's net worth is the difference between the government's tangible asset holdings and its real net debt. If net worth rises over time, the government is accumulating assets more rapidly than it is incurring debt. If those assets produce returns over time, either directly to the government or indirectly via an expanded economy, thereby providing a larger tax base, then the government may be able to reduce taxes or increase government services in the future. Declining net worth, on the other hand, is more likely to imply higher future taxes or lower government services.

In the extreme, when a government's net worth deteriorates substantially and impairs its ability to service its debt, the risk that the government will default on its debt rises and lenders may be hesitant to make additional loans. Since default on debt would severely limit future borrowing, governments usually act by raising taxes or cutting services when their net worth deteriorates.

Looking at government net worth can help the taxpayer understand the implications of changes in the government budget deficit. In recent years, for example, the U.S. government sold off land or mineral rights solely for the purpose of reducing the deficit. The deficit was reduced, as was net debt, but so were government assets. If the land or mineral rights were sold at market value, then government net worth didn't increase even though the deficit was smaller.

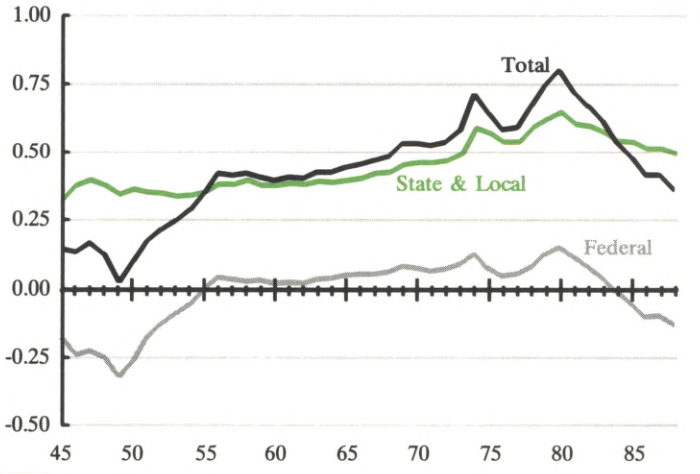
Net worth *increased* substantially in the U.S.

measured. The value of intangible assets, such as the level of education (much of the funding for which is provided by the government), is too difficult to measure accurately, but may be more important than the things we can measure.

from 1950 to 1980, at all levels of government (Figure 4), but has declined sharply ever since. Net worth is still positive, but the big deficits of the 1980s have taken their toll, cutting the ratio of net worth to GNP in half. We have given back two decades of growth in net worth relative to GNP, and today's net-worth-to-GNP ratio is about equal to that in the mid-1950s.

FIGURE 4

The Ratio of Government Net Worth to GNP



Source: Same as Figure 2.

Federal government net worth was positive from 1955 to 1983, but has been negative in recent years, according to Eisner and Pieper's latest data. You needn't become alarmed about this negative net worth, but should keep in mind that the federal government provides substantial grant-in-aid money to state and local governments. Thus, the most appropriate net-worth figure is that for the total government, which combines federal-government net worth with state-and-local-government net worth. However, it is legitimate to worry about the downward trend in total government net worth in the 1980s.[8]

Future Promises. The government has many liabilities that are not measured. If included in the balance sheet, they will make the government's net worth much smaller. These are government's financial promises for the future. Many government activities cost taxpayers nothing when they are enacted, but may have sizable costs down the road. Government loan programs, deposit insurance, pension liabilities, and the social security system are all examples.

The recent savings and loan deposit-insurance crisis—which is now expected to cost the government about $200 billion, excluding interest—shows how costly this kind of promise can be.[9] The S&L deposit-insurance system has been reformed, but it remains an implicit promise on the future. In addition, many government loans or loan guarantees (for example, many student loans) are delinquent and likely to go into default, and the government has generally not provided loan-loss reserves to cushion the blow. Recently, Boskin, Robinson,

[8]Keep in mind, too, that the data reported in Figures 2, 3, and 4 may be subject to measurement problems. Again, trends in the data are probably more reliable than levels for any one year.

[9]This estimate is L. William Seidman's, Chairman of the FDIC and RTC. See "Seidman Says Bailout Could Cost $200 Billion Plus Interest," *American Banker* (July 31, 1990).

and Huber estimated these contingent, unfunded liabilities of the government at $145 billion for loan-loss reserves and $50 billion for deposit insurance as of 1985. More recent evidence from the savings and loan crisis reveals the latter figure to have been far too low. Even more important are the implicit promises of the social security system (see *Capital Budgeting and Social Security*).

Unfortunately, because the future growth rate of the economy and future interest rates are so uncertain, there are no reliable estimates of these liabilities.[10] Consequently, we don't include them in our net-worth measure. Furthermore, the net-worth figures also ignore the value of government's investment in human

[10]See Boskin (1988) for a revealing discussion of the large uncertainty in the social security projections.

Capital Budgeting and Social Security

Many economists are concerned about how the social security system will be funded in the next century. Until recently, social security was almost entirely a pay-as-you-go system, in which current workers were taxed to pay retirees' benefits.

The system worked fine as long as the population grew smoothly. But serious problems result in such a system whenever the growth rates of different age groups differ substantially—as do the baby-boom generation, born in the years between 1948 and 1964, and the generation born since 1964. The decline in the birth rate since 1964 implies that, around the period 2030-50, there will be more retirees per worker than ever before.

To accommodate this demographic change, the government has gradually raised the social security tax rate over time, producing a surplus in the social security fund that can be used to provide retirees with benefits in the years 2030 to 2050 without raising taxes substantially. Economists consider this type of tax-smoothing over time to be optimal.

The problem with this plan is that it requires building a surplus that can be drawn on in the future. Unfortunately, by counting the social security surplus in its unified budget, the government has offset the surplus in the social security fund with a larger deficit elsewhere. The existing social security surplus is being offset entirely by other government borrowing. If this is allowed to continue, we will see either a tremendous tax increase around the year 2030 or a drastic curtailment of social security benefits.

One problem with building a surplus for the next 40 years is that the accumulations needed (estimated at $12 trillion) may exceed the value of all federal debt by the year 2030. This situation would create a conflict because under current law the government cannot invest in the private sector. However, the analysis of government net worth and capital budgeting suggests a possible solution.

Part of the accumulation could be used to retire public debt, thus releasing funds to the private sector and allowing greater private investment. And if a capital-budgeting system were in place, we could also plan to increase government spending on capital projects, beginning today through the year 2030. This would enhance private productivity and provide returns in the future. When funds are needed to pay retirement benefits in the years after 2030, the government would reduce capital spending.

From 1990 to 2030 the social security surplus would be used to retire some government debt and to finance additional government investment spending. From 2030 on, government capital spending would be reduced to a lower level, while additional social security benefits are paid. This plan simply adjusts the timing of different types of government expenditure to smooth total expenditure and tax rates over time. The federal debt would be reduced, but it would not be eliminated completely.

capital, such as education (see footnote 7). If these unmeasured assets have remained about the same size relative to the unmeasured liabilities, then the net-worth picture (Figure 4, p. 8) still provides an accurate account of movement in the ratio of government net worth to GNP.

GOVERNMENT CAPITAL BUDGETING

The recent erosion of government net worth is a legitimate concern. Can anything be done to arrest this trend? One approach by which the government could stabilize its net worth is to finance current government consumption expenditures out of current tax revenues and borrow only for financing government capital investment projects.[11]

Using debt only to finance capital spending has a certain intergenerational-equity appeal as well. Government consumption spending benefits the current generation, and their taxes would pay for it. Government capital expenditures benefit future generations, and letting them pay off a share of the debt would shift payment for those benefits to them. Unfortunately, the current federal budgeting procedure does not make any distinction between government consumption and capital spending. Thus it is ill-suited for managing the government's net-worth position. Whether we build missiles, hire more teachers, audit income-tax statements, or support the arts, the official figures show only that the money was spent. They don't tell us how much of our spending provides current benefits and how much provides future benefits. For this reason, economists and lawmakers have introduced several proposals to put the federal government on a capital-budgeting system similar to those used by private businesses and state and local governments.

A New Budget Process? A capital-budgeting system would help citizens know which government expenditures benefit current generations and which expenditures will yield future benefits. For example, money spent on building a new road to relieve traffic congestion has a completely different time pattern of returns than money spent to buy surplus cheese. The former has an effect on commuters and shippers for many years, the latter an effect on consumers and farmers in the present. Under a capital-budgeting scheme, the road would be booked as a capital expenditure and depreciated over time, while the cheese subsidy would be recorded as a current expenditure. The cheese subsidy would have to be paid for with current tax revenue, while the road could be financed by borrowing.

The use of a capital-budgeting system would also help taxpayers recognize that deficits are not "bad" if the borrowed funds are used productively. For example, Japan runs government budget deficits that are substantially larger as a percent of GNP than ours are. But the Japanese government invests most of its borrowed money for capital projects, according to Michael Boskin in a 1987 study. As a result, Japan's governmental net worth is rising, despite large deficits.

Unlike Japan, U.S. government investment growth did not keep pace with government

[11]The controversial theory of "Ricardian equivalence" argues that it doesn't matter how much of government spending is financed by taxes and how much is financed by debt. This is because people know that debt today requires higher taxes tomorrow, so they increase today's savings to pay tomorrow's taxes. As a result, government debt has no effect on interest rates or output. There is no convincing empirical evidence for or against this theory, however, despite many attempts to find some. See Barro (1989) and Bernheim (1989) for opposing views of the theory and evidence. A more conventional view is that government debt crowds out private capital spending by raising interest rates. The economy's output depends on its capital stock, both public and private. Deficits that finance current government spending raise interest rates, crowd out private capital spending, and thus reduce the economy's output. However, if deficits finance government *capital* spending (and if government capital is a close substitute for private capital), then the total capital stock is not reduced and thus the economy's output does not fall.

deficits during the 1980s. Budget pressures have recently placed great restraint on government spending, including investment spending. As a result, even projects whose benefits to the public exceed their costs go undone. Recent evidence by researcher David Aschauer suggests that government investment is far too low, given the returns such investment could generate. We would be better-off, it seems, if the government had greater borrowing ability to increase capital spending.

There is a political danger inherent in a capital-budgeting system, however. Politicians could label current expenditure as capital expenditure in order to reduce taxes today. It may be easy to see through such schemes, much as people saw through the methods used in the last few years to meet the Gramm-Rudman deficit-reduction targets. Nonetheless, for a capital-budgeting system to be effective, it may be necessary to establish some objective criteria for determining precisely which types of government spending belong in the capital budget.

CONCLUSION

In evaluating the government's financial position, we need to account not only for its debt, but for its ownership of tangible assets. Over time, changes in government assets, in net debt, and in net worth all help determine the true impact of government fiscal policy.

As of January 1, *1990*, your share of the government net debt (federal, state, and local) was about $9,000, and you owned a share of government assets valued at $16,000. Thus, your share in the government's net worth is $7,000, which may help you worry less about government debt. But you might worry about this: on January 1, *1980*, your share of government's net worth was $13,000 (in 1990 dollars). So you "lost" $6,000 in the 1980s.

The sense in which you "lost" is made clear by comparing the government's real net debt and asset figures in 1980 and 1990. While real net debt tripled, this huge rise in government indebtedness generated no similar gain in government assets. So taxpayers, and future taxpayers, will be paying interest on this debt with little hope that there will be higher future returns from government assets to help pay it off.

Taxpayers would be in a better position to judge whether budget deficits were good or bad for their economic future if the federal government adopted a capital-budgeting system. Then they would know whether government spending is supporting current or future consumption.

A capital-budgeting system would change the nature of the debate over the size of the government's budget deficit. Currently we argue over how much of a deficit reduction should come from reducing government spending and how much should come from increasing taxes. Capital budgeting tells us that the composition of government spending—the amount spent on tangible assets—is equally important. Knowing this, taxpayers could be more confident about the extent to which increases in government debt are a burden on future generations.

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Reducing the Costs and Risks of Trading Foreign Exchange

*Brian J. Cody**

A U.S. exporter who has received Deutsche marks from a German firm wants to exchange his mark receipts for dollars. A chief financial officer of a U.S. corporation wants to purchase Spanish pesetas in order to buy corporate stock on the Madrid stock market. A foreign exchange speculator wants to increase his holdings of French francs because he believes that the franc's value will appreciate in the near future.

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Thousands of trades like these generate the business that underlies the enormous flow of funds each day between institutions participating in the foreign exchange market. The volume of global foreign exchange trading has doubled in the last three years, according to surveys by the Bank of England, the Federal Reserve Bank of New York, and other central banks. The surveys estimate the average daily turnover in the New York market as of April 1989 at $129 billion, up 120 percent compared to March 1986. This daily turnover is roughly 21 times the average daily value of stocks traded on the New York Stock Exchange in 1989.

This enormous volume of foreign exchange contracts is arranged between foreign exchange brokers and traders at financial and nonfinancial institutions throughout the world. The volume reflects a wide variety of transactions involving flows of international capital and goods.

To market participants, however, these transactions involve costs and financial risks. Accordingly, private financial institutions, as well as the world's central banks, have been studying payment arrangements that allow netting of transactions between institutions. Netting will undoubtedly cut the transaction costs of foreign exchange trading. More important, if properly implemented, netting arrangements should both reduce credit and liquidity risks to all participating financial institutions and enhance the soundness of the entire payments system.

BILATERAL NETTING ARRANGEMENTS

The basic idea behind netting arrangements is simple. Consider two friends who owe each other money. The debts could be settled by each friend paying the other the full amount owed. However, the friends could save on their transaction costs if the one owing more money simply subtracted the amount owed to her and paid the net amount to her friend.

Each day, individual banks and other financial institutions engage in hundreds of trades in the foreign exchange market. Like the two friends, these institutions are reducing their transaction costs by netting their foreign exchange payments. The only difference is that, because each institution arranges hundreds of transactions in all the major currencies in a single day, the potential savings are much larger.

Consider three banks with foreign exchange departments: Rhinebank, Floyds, and Countibank. On a particular Monday, the institutions have arranged a total of eight transactions in the spot foreign exchange market.[1] Each interbank transaction involves the exchange of one currency for another. These transfers could be generated by the flow of goods (exporters selling foreign exchange receipts), financial instruments (a firm buying foreign securities), or exchange rate speculation (speculators betting on exchange rate movements).

Figure 1 depicts the spot foreign exchange transactions occurring between Rhinebank, Floyds, and Countibank. Rhinebank and Floyds engage in four transactions with each other—twice trading Deutsche marks (DMs) for dollars, once trading dollars for pounds sterling (£s), and once trading £s for DMs. Countibank engages in a total of four transactions, two each with Rhinebank and Floyds.

When these obligations are settled, Rhinebank will process 12 transactions, making four payments to Floyds and two to Countibank—one for each foreign exchange contract—and receiving as many payments from each. Floyds would also process 12 transactions. Since it had arranged four contracts, Countibank would process eight transactions. If they were to adopt a netting arrangement, these three banks could cut their transaction costs (the back-office expenses of processing the trades, as well as a per-item charge on payment messages sent over the wire-transfer network) by reducing the number of payments and receipts they have to process on any particular day.

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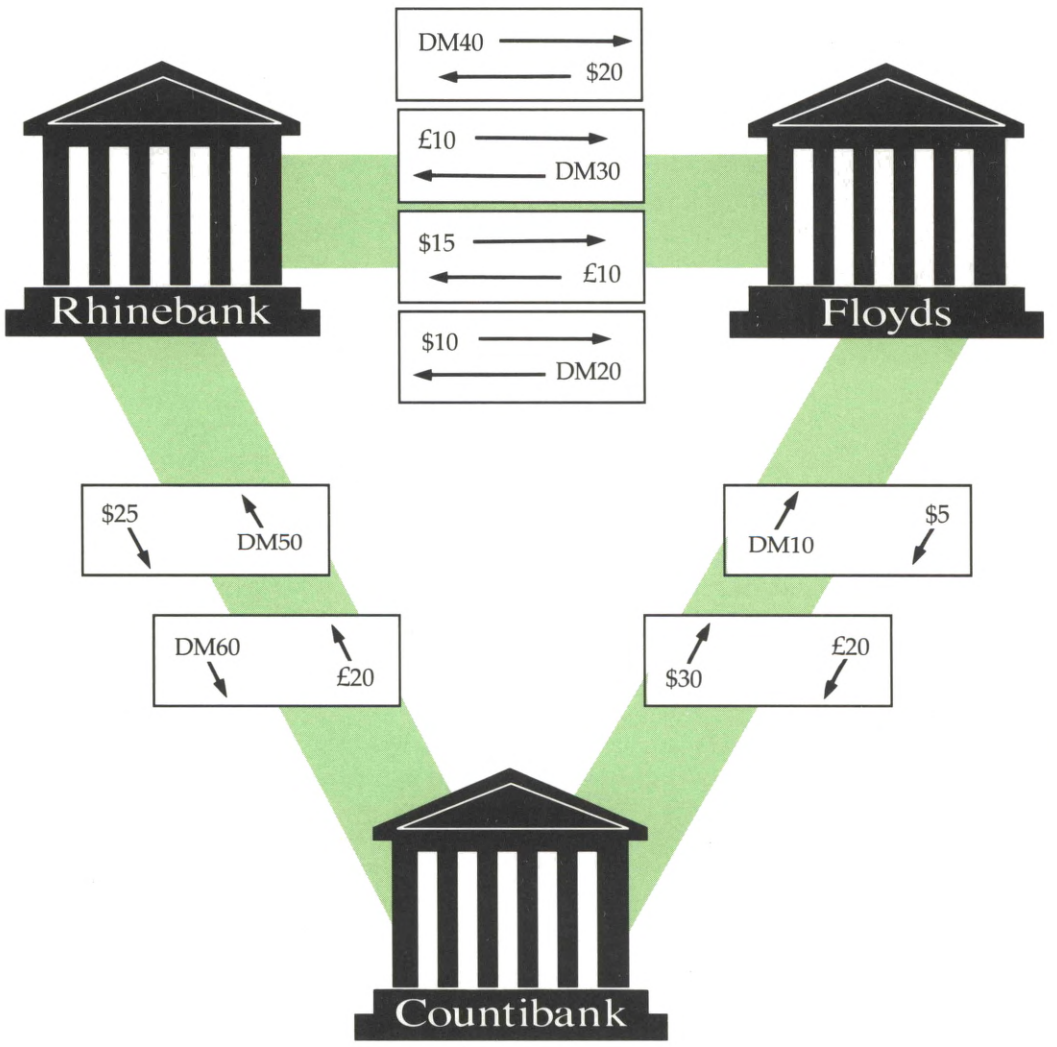
[1]Spot foreign exchange settlements typically occur two business days from the trade date. The New York Fed's foreign exchange survey reports that spot transactions accounted for 63.9 percent of all foreign exchange trading reported by New York banks in April 1989. Foreign exchange swaps, forward contracts, options, and futures accounted for the remaining portion. For complete results, see "Summary of Results of U.S. Foreign Exchange Market Survey Conducted in April 1989," Federal Reserve Bank of New York, September 13, 1989; "The Market for Foreign Exchange in London," Bank of England *Quarterly Bulletin* (November 1989) pp. 531-35; and "Survey of Foreign Exchange Market Activity," Bank for International Settlements, Monetary and Economic Department (February 1990).

FIGURE 1

Sample Set of Foreign Exchange Transactions



Total Transactions = 16

Note: All exchange rates are hypothetical examples.

The simplest type of netting that could be arranged among the banks is *bilateral netting*. In a bilateral arrangement, two institutions agree, either informally or in a legal contract, to net the currency payments due to the other on a particular day. After netting, only one payment in each currency is due to or received from each counterparty on each day. Figure 2 presents the payments flows that result from a series of bilateral netting arrangements between Rhinebank, Floyds, and Countibank.

With bilateral netting, the number of transactions falls considerably, by 50 percent in this example. Bilateral arrangements tend to benefit institutions that engage in a large number of transactions with a particular counterparty or trading partner. For example, Countibank, though its transaction costs are reduced, does not benefit as much as the other banks because it engages in only half as many transactions with Rhinebank and Floyds as these banks do between themselves.

The most tangible benefit of bilateral netting to these institutions is the reduction in transaction costs. However, banks also incur additional costs in the form of additional risk, because there is typically a delay of two business days between the time when a trade is arranged and the moment when the currencies actually change hands. This lag exposes institutions to the risk that their expected foreign exchange receipts will be delayed more than two days or might never be received. What's more, it is typical for payments to be made at the beginning of the delivery day in one currency before other funds are received later in that day in another currency.[2] Netting can reduce an institution's exposure to this risk. In fact, bilateral netting can provide several risk-reduction benefits.

Liquidity risk is the risk that although the debtor will eventually make good on his obligation, he will not make payment on time because of a temporary lack of funds in terms of one or more currencies. Bilateral netting agreements unambiguously reduce exposure to liquidity risk in the foreign exchange market. Before netting, Floyds faced the liquidity risk that Rhinebank would not be able to pay the US$25 million it owed. After netting, Rhinebank would owe only US$5 million on net to Floyds, substantially reducing Floyds' liquidity risk.

Credit risk is the risk that a debtor will default on his obligation, never paying the creditor. For instance, Floyds faces credit risk because there is a chance that, between the time its deals with Rhinebank are arranged and the actual exchanges occur, Rhinebank will declare bankruptcy and default on its obligations. Credit exposure, which equals total expected foreign exchange receipts, is one measure of the credit risk borne by an institution. Figure 2 shows the dollar amount of each bank's apparent credit exposure in the three currencies before and after bilateral netting. Whether a bilateral netting arrangement reduces the participants' actual credit exposure depends on how the banks view the netted payments.

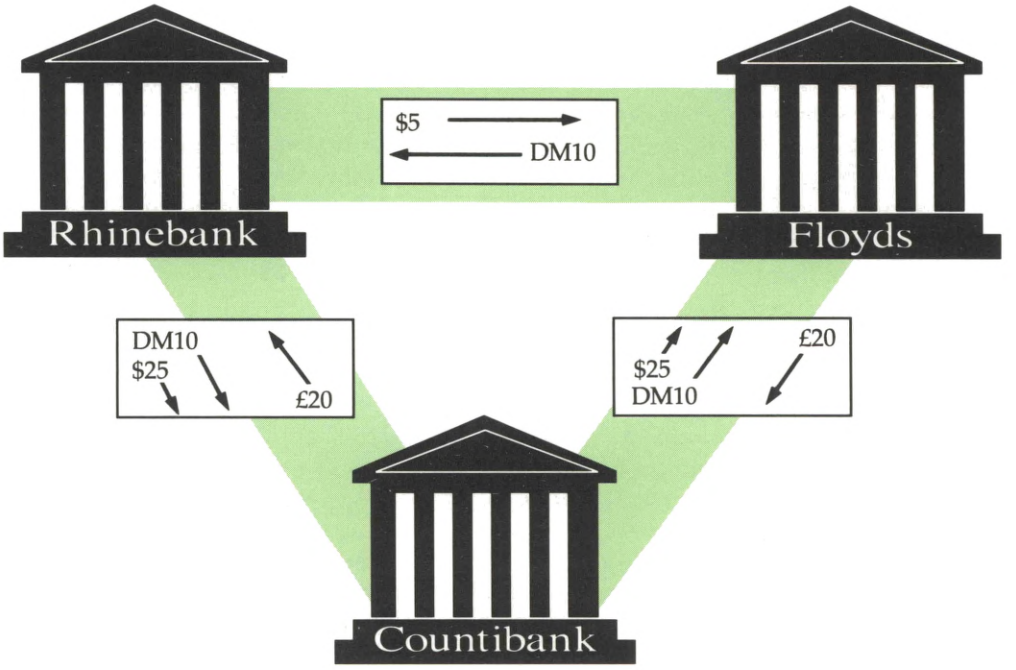
If the gross foreign exchange obligations—the individual foreign exchange contracts—are not legally satisfied until final payment is actually made, then the banks are said to be engaged in *bilateral payments netting*.[3] This arrangement leaves an institution's credit exposure unchanged

[2]Other terms are sometimes used to describe aspects of credit risk, such as "settlement risk," which can contain elements of credit and liquidity risk, and "replacement cost risk." For a more detailed discussion, see "Report on Netting Schemes," Group of Experts on Payments Systems of the Central Banks of the Group of Ten Countries, Bank for International Settlements (February 1989).

[3]Payment netting can be either an informal or a formal agreement to net the amount of the gross liabilities. The formal agreement, which is legally binding, is known as *binding payments netting*. In both cases, the parties remain legally bound for the gross transactions, not the net amounts.

FIGURE 2

Payments and Receipts with Bilateral Netting



TOTAL TRANSACTIONS = 8

Credit Exposure from Gross Obligations

	Total Expected Receipts			Converted to Dollars
	US$	DM	£	(DM2 = US$1, US$1.5 = £1)
Rhinebank	20	100	30	115
Floyds	55	50	10	95
Countibank	30	60	20	95

Credit Exposure, Bilateral Netting (by Novation)

	Total Expected Receipts			Converted to Dollars
	US$	DM	£	(DM2 = US$1, US$1.5 = £1)
Rhinebank	0	10	20	35
Floyds	30	10	0	35
Countibank	25	10	20	60

because, if one party were to default, the netting agreement would dissolve back into agreements in terms of gross, not netted, obligations. Reconsider Rhinebank and Floyds. On net, Floyds expects to receive an equivalent of $35 million from Rhinebank and Countibank. Floyds' credit exposure would appear to have fallen to $35 million from an original exposure of $95 million. If Rhinebank were to declare bankruptcy before Wednesday's payments were made, Floyds would be legally bound to its gross obligations with Rhinebank. It would have to pay Rhinebank US$20 million, DM30 million, and £10 million. With regard to Rhinebank's gross obligations to Floyds, however, Floyds would become just another unsecured creditor to the failed institution and would probably not receive complete payment for the gross amounts owed by Rhinebank.[4]

In fact, there is a danger that bilateral payments netting could actually *increase* credit risk if an institution were mistakenly to treat its net obligations, rather than its underlying gross positions, as the measure of its true credit exposure. Institutions routinely set limits on the credit exposure they are willing to accept with respect to individual parties. If a bilateral netting arrangement leads traders to underestimate their true credit exposure, they might continue arranging deals even though they had exceeded their credit exposure limit.

Bilateral *netting by novation* is a way of reducing credit exposure. As in payments netting, two institutions engaged in netting by novation calculate their net obligations in each currency. Unlike payments netting, netting by novation legally discharges the gross obligations and replaces them with a new (novated)

[4]Floyds might have "rights of set-off" in this case that would, in effect, allow it to net its liabilities to a counterparty with its claims on that counterparty. The existence and scope of such rights vary among countries, however, and are not discussed in detail here. See "Report on Netting Schemes," pp. 13-14.

Absence of Legal Precedents Hampers Netting Arrangements

One impediment to establishing arrangements for netting by novation is their uncertain legality. Netting by novation replaces original gross obligations with new contracts requiring only the payment of net amounts.

No nation has any legal precedents upholding these contracts. The closest case we have is a 1975 British case involving not financial firms but two airlines: Air France and the now-defunct British Eagle. Both were part of a multilateral netting system operated by the International Air Transport Association. The Association acted as a clearinghouse, settling debts among individual airlines on a net basis. When British Eagle went under, its liquidator tried to recover the gross obligations owed to Eagle by Air France. Air France contended its obligation was limited to the net amount it owed to the clearinghouse. The court decided in favor of Air France and thus supported the legality of the netting contracts.

Of course, the details of the airline case differ from those in foreign exchange transactions, and the precedent applies only in one country, the United Kingdom. Courts around the world could rule differently on the enforceability of foreign exchange clearinghouse contracts. Should this happen, each financial firm involved in a bankruptcy situation would seek disposition of the case in the court most favorable to its interest. For instance, a British bank forced to liquidate could try to have its case against a French bank tried in France, where it might feel the netting contract has less chance of being enforced.

Netting systems are trying to overcome the uncertainties surrounding the legality of foreign exchange netting arrangements. One such system, FXNET, has developed agreement language it believes will stand in several legal jurisdictions, including the United States, Japan, and Switzerland. (For more information on these contracts, see *FXNET Legal Documentation*, Volumes 1 & 2, April 21, 1989.)

agreement for the net amount (see *Absence of Legal Precedents Hampers Netting Arrangements*). If an institution were to fail and, most importantly, the bankruptcy courts accepted the novated contracts as binding, the parties would be responsible for only the net amounts of the contracts, not the original gross obligations. Consequently, netting by novation effectively reduces each institution's credit exposure to the netted amounts. So in this case, Floyds' credit exposure, when expressed in dollars, really is reduced to $35 million.

In sum, bilateral netting arrangements—payments netting and netting by novation—can substantially reduce the transaction costs and liquidity risk incurred by the netting parties. While all netting institutions will benefit, the degree of cost and liquidity-risk reduction depends directly on the number and magnitude of foreign exchange contracts maturing on a particular day. While bilateral payments netting has the potential to reduce credit exposure, netting by novation will undoubtedly reduce this risk.

MULTILATERAL NETTING

Another form of netting—*multilateral netting*—can further cut the transaction costs of foreign exchange trading, as well as potentially reduce liquidity and credit risk. Multilateral netting involves some agreement that directs how individual parties will net as a group and share the risk of default of any participant. The presence of this agreement provides multilateral netting with the additional feature of potentially reducing *systemic risk*—the risk that a default at one institution could trip otherwise solvent institutions into default.

Several multilateral netting proposals suggest the use of an institution that stands between individual banks. In these cases, multilateral foreign exchange netting is a system in which financial institutions engaged in foreign exchange transactions net their gross obligations with a central counterparty. This facility functions as the clearinghouse for the interbank transactions. This central counterparty would also function as the settlement agent for the system, initiating the final settlement for the participating institutions. It can be organized under various structures, including a partnership of members who clear or an independent agency that agrees to act in this capacity. The netting strategy works the same as in bilateral netting, except that the institutions make or receive only one payment in each currency to or from this third party.

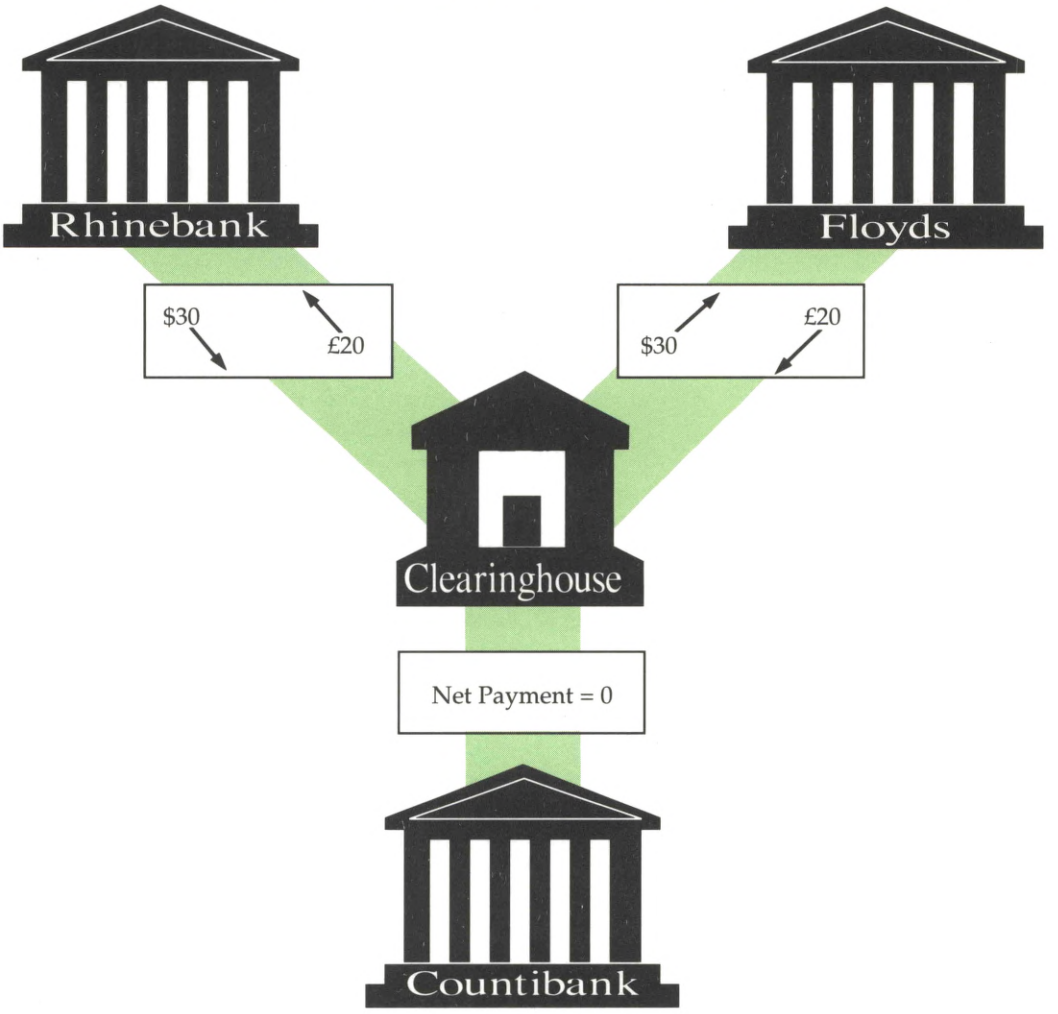
With multilateral netting, once two institutions arrange a foreign exchange contract, they notify the central counterparty of their deal. Once the central authority verifies the contract, the original gross obligations between the institutions are replaced by agreements between the individual banks and the central authority. As subsequent transactions are recorded, each bank accumulates a net position with the central authority. At the end of trading, no matter how many institutions it deals with each day, a bank makes or receives only one net payment in each currency to or from the clearinghouse.

Multilateral netting reduces transaction costs and liquidity risk... Figure 3 presents the payments flows resulting from the multilateral netting of payments between the three banks and the central counterparty in our example. Based on the set of underlying obligations, Countibank will process no payments or receipts in any currency, since on net it is square with the central authority. Multilateral netting also reduces liquidity risk. On net, Rhinebank is owed only £20 million, and Floyds only US$30 million, from the central counterparty.

...But Credit Risk May Not Be Reduced. The ability of a multilateral netting arrangement to reduce credit risk depends on the structure of the agreement. *Multilateral payments* netting takes essentially the same form as its bilateral cousin. While the individual banks accumulate net balances against the central counterparty, the original gross obligations

FIGURE 3

Payments and Receipts Under Multilateral Netting



TOTAL TRANSACTIONS = 4

Credit Exposure: Multilateral Netting

	Total Expected Receipts			Converted to Dollars
	US$	DM	£	(DM2 = US$1, US$1.5 = £1)
Rhinebank	0	0	20	30
Floyds	30	0	0	30
Countibank	0	0	0	0
Clearinghouse	30	0	20	60

remain in effect until final net payments are received. If one institution were to default, this netting system would require all transactions involving the defaulting institution to be removed from the clearinghouse's books. Once the obligations with the defaulting institution are "unwound" into their original bilateral obligations, new net positions would be calculated between the solvent institutions and the clearinghouse.[5] Any transaction with the defaulting institution must then be settled on a bilateral basis between that institution and the particular trading partner.

There Is a Way to Reduce Credit Risk... In contrast to payments netting, *multilateral netting by novation and substitution* reduces credit risk. Under this system, once the institutions notify the central authority of their foreign exchange contract, new agreements between each of the individual banks and the central counterparty are substituted for that original obligation between the two banks. These new (novated) agreements legally take the place of the original contract. If one of the institutions were to default, the netted obligations of the other institutions with respect to the central authority would remain in effect. Those arising from trades with the defaulting bank would not be unwound.

If Rhinebank were to default, Countibank would not have to make or receive any payments with respect to either the clearinghouse or Rhinebank because its net position was zero. Likewise, Floyds' obligation to the central authority would also be unchanged. It would receive US$30 million and owe the central counterparty £20 million. Thus, this form of netting reduces each bank's credit exposure from the amount of the gross liabilities to the net position against the clearinghouse. In other words, the central counterparty bears the credit exposure in this system; that is, it would still be obligated to pay Rhinebank £20 million, even if Rhinebank were to default on its payment.

...and Systemic Risk May Be Reduced. Prior to the default of Rhinebank, Countibank had no obligation with respect to the clearinghouse since its net position was zero. If multilateral payments netting were in effect, then after the default and unwinding of Rhinebank's transactions, Countibank would not only have to make payments directly to Rhinebank—its original gross obligations—but it would also have liabilities to the clearinghouse. If Countibank could not meet these obligations, it too would have to default. Multilateral payments netting provides no mechanism to prevent the failure of one institution from infecting other institutions in the payments system. Thus, multilateral payments netting would not help reduce systemic risk. Multilateral netting by novation and substitution, however, can reduce systemic risk. Since the system does not unwind transactions if a party fails, the clearinghouse essentially shields the other institutions from the failed party and absorbs the systemic risk. In terms of our previous example, the clearinghouse would still pay Floyds US$30 million, even though it had received no funds from the bankrupt Rhinebank.

The risk shield of multilateral netting by novation and substitution, however, is only as strong as the capital position of the central counterparty. That is, the degree of reduction

[5]The New York Clearing House for Interbank Payments System (CHIPS) currently would "unwind" obligations should any institution default. On June 4, 1986, the New York Fed conducted a survey of the transactions passing through CHIPS on a "typical" day. The survey found that foreign exchange transactions accounted for 72.6 percent of the system's 28 billion transactions. CHIPS is developing a new payment finality program that would eliminate the risk of transactions being unwound should an institution fail to meet its obligations. The program calls for the 140 U.S. and foreign banks in CHIPS to pledge about $4 billion in U.S. government securities as collateral that would be sold to cover the transactions of an institution that could not settle by the normal close of business. See "Large-Dollar Payment Flows From New York," Federal Reserve Bank of New York *Quarterly Review* (Winter 1987-88) and "Members of Chips Agree to Share Payment Risks," *American Banker*, March 19, 1990.

in systemic risk depends entirely on the central agent's ability to fulfill its payment obligations even if one or more of its debtors default. If the clearinghouse could not sustain the loss, the netted amounts could possibly be unwound into the gross obligations. Without sufficient capital, then, multilateral netting by novation and substitution provides no advantage over multilateral payments netting.

Say the central agent is organized and capitalized by a consortium of financial institutions. These institutions would reduce systemic risk by pooling the risk and sharing it among themselves. They would bear the cost of supplying the needed funds to pay off the clearinghouse's debts should a member institution fail. If an independent institution serves as the central counterparty, it must have either sufficient funds or lines of credit on which it can draw should one of its debtors fail.

Securing the necessary financial capital is crucial to the success of any multilateral netting arrangement, and it can be costly. But it is just one of the many costs of establishing and maintaining such a system. There are financial, legal, and computer costs as well. In fact, many of these costs are incurred even in bilateral netting arrangements. Ultimately, the desirability of any netting system hinges on its risk-reduction benefits outweighing all these costs.

CURRENT EFFORTS TO DESIGN NETTING ARRANGEMENTS

Facing tremendously expanded activity in the foreign exchange market, financial institutions are finding the use of netting schemes increasingly desirable to control transaction costs and reduce risk. As a result, a number of competing bilateral and multilateral foreign exchange netting systems are being developed. Some are already in operation; others are on the drawing board.[6]

The FXNET netting system—a London-based limited partnership—currently provides a bilateral netting by novation system in London and New York for participating institutions. FXNET has designed the computer facilities and supporting legal documents used by individual institutions that arrange bilateral netting agreements on these markets.

International Clearing Systems, INC. (ICSI), a wholly owned subsidiary of the Options Clearing Corporation, is developing a multilateral netting by novation and substitution arrangement.[7] This plan envisions foreign exchange clearinghouses as self-regulating organizations, with rules and bylaws written and administered by their participants and owners. These financial institutions would be responsible for funding the clearinghouse.

The Euronetting project, currently being developed under the direction of the Banca Commerciale Italiana, would also provide netting by novation and substitution.[8] Its central clearinghouse is envisioned as a legal corporation capitalized by a top tier of paying agents or banks. The handful of top-tier banks

[6]Summaries of some of these projects are presented in "Banking and Payment Services: Official Papers of an International Symposium Sponsored by the Board of Governors of the Federal Reserve System," *Payment Systems Worldwide* 1 (Spring 1990).

[7]See ICSI, "Netting of Foreign Exchange Trades and Other Obligations: An Illustration of the Use of On-line, Real Time Clearance and Settlement Systems for the Quantification and Control of Risk in Financial Markets," a submission to the Office of Technology Assessment, United States Congress, for its study *Clearing and Settlement of Financial Instruments Worldwide* (February 1989). The Options Clearing Corporation (OCC) currently operates such a clearinghouse for options, including foreign exchange options, traded on U.S. securities exchanges. The OCC is owned by the Chicago Board Options Exchange, the American Stock Exchange, the Philadelphia Stock Exchange, the Pacific Stock Exchange, and the Mid-West Stock Exchange.

[8]See Renato Polo, "A Perspective on the Euronetting Project," *Payment Systems Worldwide* 1 (Spring 1990) pp. 46-47.

would be responsible for maintaining the clearinghouse accounts, transferring funds among correspondent banks, and supplying needed capital if a member institution fails.

The Society for Worldwide Interbank Financial Telecommunication (SWIFT), the world standard for interbank financial communications, is developing a new service called ACCORD. This service will match (unofficially net) foreign exchange transactions between institutions and advise institutions of opportunities to net their foreign exchange payments. As such, ACCORD would operate as an information service and would not be legally responsible for arranging netting agreements between institutions. Introduction of this service is planned for 1990.

Central banks have been studying private financial institutions' efforts to develop foreign exchange netting arrangements.[9] Their interests include establishing safe systems, limiting their risk exposure, and ensuring proper regulation. As with any financial market innovation, netting arrangements might raise new supervisory and regulatory issues. For instance, central bankers are aware that there is a natural tendency for markets to move from a more to a less strictly regulated environment.[10] The regulation of payments systems in major financial centers, such as those in the United States or Europe, could drive systems to less regulated or completely unregulated centers, such as those in the Caribbean.

CONCLUSION

The use and continued development of foreign exchange netting arrangements offer the potential to improve the efficiency and reduce the costs of dealing in the rapidly expanding foreign exchange market. While these systems will undoubtedly reduce transaction costs, their ability to reduce the various risks—liquidity, credit, and systemic—depends on the legal structure of the system. The work of central banks and private institutions on these netting schemes should help ensure a more efficient and less risky foreign exchange market.

[9]For more information, see *Payment Systems in Eleven Developed Countries*, prepared under the aegis of the Bank for International Settlements by the Central Banks of the Group of Ten Countries and Switzerland (May 1989); and Federal Reserve Governor Wayne Angell, "Cooperative Approaches to Reducing Risks in Global Financial Markets: Issues and Policies," May 14, 1990. The views of the Group of Experts on Payments Systems from the G-10 central banks concerning netting arrangements are expressed in "Report on Netting Schemes," Group of Experts on Payments Systems of the Central Banks of the Group of Ten Countries, Bank for International Settlements (February 1989).

[10]Speaking before an international symposium, Tommaso Padoa-Schioppa, Deputy Director General of the Banca d'Italia, stated, "For instance, the recent initiatives to reduce systemic risk on Fedwire and CHIPS could be undermined by the shift of some of the dollar payments to 'offshore' clearing systems" (from "Payment Systems: A New Ground for Central-Bank Cooperation," speech before the International Symposium on Banking and Payment Service, sponsored by the Board of Governors of the Federal Reserve System, June 9, 1989, p. 16).

INDEX 1990

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