

# Are Government Deficits Monetized? Some International Evidence

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## INTRODUCTION

One of the dominant economic concerns in the current decade is the persistence and size of U.S. federal budget deficits. The reasons for this concern vary from the general public's feeling that it is irresponsible for government to "live beyond its means," to economists' traditional concern that budget deficits may cause interest

rates to rise and thus "crowd out" private investment.

In the last few years, another reason to worry about deficits has received widespread attention. More and more, economists and informed citizens are claiming that large and sustained government budget deficits are the root cause of the high levels of inflation experienced by many countries. They claim that large budget deficits create economic and political pressures that force central banks to monetize some of the debt, that is, to create more money than is needed to accommodate real growth. The concern is that the resulting higher money growth translates into more inflation in the future. But are these concerns indeed valid? Do large deficits necessarily

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bring higher money growth and inflation? The question is one about balance. The answer turns on whether the economic and political pressures to monetize sustained deficits are typically strong enough to overcome the popular desire for a stable monetary environment and low inflation.

We can answer the question by finding out whether money growth and government debt growth seem to be related historically. This requires more than just looking at the U.S. data, however. Finding a relation between debt and money growth in the U.S., or in any one country, may not mean that monetization forces are strong. Economic circumstances specific to a certain country, or even plain chance, could result in money and government debt growing together for some time, even when there is no causal relation between them. But if the economic forces to monetize are strong, then the growth rates of debt and money should tend to change together in *most* countries. Therefore, we study the relation between government debt and money growth for ten industrialized countries. But in order to interpret the empirical findings, first we need to define "monetization," to explain its mechanics, and to examine closely the principal theories that claim that central banks tend to monetize government debt.

#### MECHANICS OF DEBT MONETIZATION

Government runs a *deficit* whenever its revenues fall short of its expenditures. In order to obtain the funds necessary to cover the deficit, the treasury or the finance ministry must borrow, that is, it must sell bonds. Thus deficits increase the outstanding amount of government debt, otherwise known as the national debt. Central banks purchase government bonds, via what are known as "open market purchases," either directly from the government treasury or else in the private financial markets.<sup>1</sup> In either case,

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<sup>1</sup>A central bank can create new reserves by purchasing any asset from the public, not just government bonds. But in practice central banks purchase government bonds almost exclusively.

open market purchases create additional currency and bank reserves.<sup>2</sup> The additional currency and reserves increase the monetary base immediately and provide more liquidity to the banking system. This new liquidity enables banks to increase their lending, which, through a complex process, ends up increasing the national money supply, measured by M1 or other, more inclusive, monetary aggregates.<sup>3</sup>

In countries with poorly developed financial markets, the relation between deficits and money creation is usually quite direct. Since the financial markets cannot absorb enough of the continuing increases of government debt, the central bank is forced to buy much of it. In these circumstances, government deficits automatically result in increases in the monetary base and thus in the money supply.<sup>4</sup>

In industrialized countries with well-developed financial markets, the situation is quite different. In these countries, new government debt generally is sold to the private sector rather than to the central bank. The central bank may buy some of this debt as part of its monetary policy, but generally it is under no obligation to do so. In fact, in some countries, including the U.S., it is illegal for the central bank to buy debt directly from the government, except in emergency circumstances.

To summarize: in countries with well-developed financial markets there is no *direct* connection between budget deficits and new money creation. Therefore, if there is a connection, it must be indirect. Sustained budget deficits can cause high base and money growth only if they set in motion economic and political pressures

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<sup>2</sup>The term "bank reserves" used here refers to deposits held by banks at the central bank.

<sup>3</sup>Monetary base is currency in the hands of the public plus bank reserves. M1 is currency in the hands of the public plus checkable deposits. For a precise definition of these and other measures of money for the U.S., see a recent issue of the *Federal Reserve Bulletin*.

<sup>4</sup>Such countries sometimes can limit the effect their deficits have on their domestic money supply by borrowing abroad.

that make central banks reassess their monetary policy and decide to create more money than they would otherwise.

#### ECONOMICS OF DEBT MONETIZATION

If central banks do respond to increasing levels of debt by creating more money, they are said to *monetize* the debt. A useful definition of monetization is that, in response to high debt growth, authorities create money at a rate *in excess* of the growth in goods and services, or real output. In other words, monetization is a relation between the *growth rates* of debt and money, after subtracting from both the growth rate of *real* output (see *The Economic Meaning of Monetization* in SOME ELEMENTS OF MONETIZATION THEORY, p. 21). According to this definition, government debt is monetized if money growth rates follow the pattern of the debt growth rates. This notion of monetization is different from what often is implied by the popular press—that monetizing the deficit means that the monetary authorities simply buy up the debt issued to finance a deficit by issuing equal amounts of reserves.

Economists have come up with two principal scenarios in which debt growing faster than real output may create incentives for monetization. The first is related to the premise that if government debt is growing faster than GNP and other assets, the private sector is not willing to purchase the additional debt at the going real interest rates (nominal rates minus expected inflation). In order for the private sector to hold more government bonds in their portfolios relative to their other assets and to their income, the real rates on these bonds must rise.<sup>5</sup> But the resulting rise in real rates tends to reduce investment spending and to slow real economic activity. To the extent that a central bank is concerned with helping to maintain the original pace of economic growth, it may try to resist such an increase in

<sup>5</sup>This reasoning assumes that government debt is net wealth. For a complete discussion of these issues, see Robert Barro, *Macroeconomics* (New York: John Wiley and Sons, 1984), and Robert Mundell, *Monetary Theory* (California: Goodyear Publishing Co., 1971).

real interest rates by making the money supply grow faster, and the result is inflation down the road (see *The Link Between Excess Money Growth and Inflation* in SOME ELEMENTS OF MONETIZATION THEORY, p. 22).

The second scenario involves governments' incentives to lower the real burden of this debt through inflation.<sup>6</sup> Government uses some of the taxes it collects to pay the interest on its debt. The larger the debt, the larger the government's interest expense, and hence the higher taxes must be to pay the interest. Since these higher taxes would go right back to the taxpayers who own government bonds in the form of interest payments, one might think that these taxes would "wash" in an aggregate sense. But this is wrong. Taxation distorts economic decisions and creates economic inefficiencies because it reduces the relative attractiveness of taxed activities, like working or investing, and it increases the relative attractiveness of untaxed activities, like leisure. The inefficiencies caused by taxing to pay interest on the debt are a major aspect of what economists call the "burden of the national debt."<sup>7</sup> This burden can be reduced only by finding ways to reduce tax rates on the various economic activities.

One way to reduce this burden is to engineer a *higher than anticipated* inflation. Inflation must be higher than anticipated because if the bondholders had correctly expected the coming inflation, they would have incorporated this expectation into higher interest rates, in order to compensate them for the expected loss in the

<sup>6</sup>For expository convenience, the discussion here assumes that central banks react to whatever fiscal policy the government chooses. We do not mean to imply by this that monetary policy is subservient to fiscal policy, or that the two policies are not formulated jointly. The incentives to monetize that we discuss operate regardless of the nature of the decision-making process, and they exist even under optimal public financing policies.

<sup>7</sup>This theory is based on the view that government has strong incentives to maintain an efficient tax scheme. Alternatively, if the government finds it politically impossible to raise sufficient taxes, it may resort to inflation as a source of revenue, even if this action results in an inefficient tax scheme.

purchasing power of their investment. Higher than expected inflation reduces the real value of all the interest expense government has to pay on the existing long-term, fixed-coupon bonds until they mature.<sup>8</sup> Since the government's interest expense is in nominal dollars, its real value declines with inflation, and this means that tax rates can be reduced (or at least not be raised). To the extent that the inflation is not expected, it does not distort economic incentives. Therefore, engineering an unexpectedly high inflation substitutes a non-distortionary tax on bondholders for the distortionary taxes levied on taxable economic activities.<sup>9</sup>

Since the real burden of government debt can be reduced only by inflating more than bondholders expect, policymakers may be tempted to keep raising the rate of money growth, and hence inflation, to stay one step ahead of the expectations of bondholders. And this could lead to a continuously accelerating inflation.<sup>10</sup>

To counteract this temptation to inflate, other economic and political forces push policymakers towards lower money growth and lower inflation. Once inflation gets started, people soon begin to

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<sup>8</sup>For this to work, at least some of the debt must be fixed-coupon, long-term debt. If all government debt were short-term (or if it all were floating-rate), then there would be no time lag over which the government could gain from an unexpected increase in inflation, since the government would have to pay an inflation premium promptly, as it continually refinances its short-term debt. And this will keep the real interest expense, and the tax rates, from falling.

<sup>9</sup>For an analysis of the underlying economics of this mechanism, see Robert Barro, "A Positive Theory of Monetary Policy in a Natural-Rate Model," *Journal of Political Economy* 93, 4 (August 1983) pp. 589-611. For an exposition of the connection between inflation, the real value of the debt, the burden of the debt, and the related tax issues, see Brian Horrigan and Aris Protopapadakis, "Federal Deficits: A Faulty Gauge of Government's Impact on Financial Markets," this *Business Review* (March/April 1982) pp. 3-16, and Brian Horrigan "The Tax Reform Controversy: A Guide for the Perplexed," this *Business Review* (May/June 1985) pp. 3-15.

<sup>10</sup>This argument is one aspect of the general problem of policymaking often referred to as the "time inconsistency" problem of government policies. For a broad exposition of the issues involved, see Herb Taylor "Time Inconsistency: A Potential Problem for Policymakers," this *Business Review* (March/April 1985) pp. 3-12.

anticipate it, and anticipated inflation carries costs of its own. High or accelerating inflation is considered extremely detrimental in industrialized market economies, where individuals and firms rely on the price mechanism to signal the relative scarcity of goods. When the overall price level is uncertain, it becomes difficult to compare relative prices and to use the price system for decisionmaking.<sup>11</sup> Furthermore, uncertain inflation increases the risks of long-term commitments, because it causes capricious windfall gains for those who happen to hold the right investments and losses to those who don't. For instance, people who have put their savings in fixed-interest long-term securities—like government bonds—will find the purchasing power of their income diminishing through time, if inflation turns out to be higher than anticipated.

For these reasons, the overwhelming majority of people support price stability as an appropriate goal of economic policy. Monetary policymakers then must balance the benefits of engineering an inflation in order to reduce the burden of the debt with the costs of having to live with the inflation. In the end, whether high debt growth leads regularly to high money growth depends on whether the inflationary forces generated by large deficits are stronger than the incentives for price stability.<sup>12</sup>

Unfortunately, economists cannot run to their

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<sup>11</sup>There is very strong empirical evidence that inflation and uncertainty about relative prices go together. See Stanley Fischer, "The Benefits of Price Stability," in *Price Stability and Public Policy*, (Federal Reserve Bank of Kansas City, 1984). Though there have been various explanations for this phenomenon, there is no consensus as to its causes.

<sup>12</sup>Of course, debt growth cannot *forever* grow arbitrarily faster than money growth, or else the economy will be literally overwhelmed with government debt. If this happens, the monetary authority must monetize the debt to ensure the solvency of the government. For a detailed analysis of these issues, see Bennett McCallum, "Are Bond-Financed Deficits Inflationary? A Ricardian Analysis," *Journal of Political Economy* (February 1984) pp. 123-135, and Thomas Sargent and Neil Wallace, "Some Unpleasant Monetarist Arithmetic," *Federal Reserve Bank of Minneapolis Quarterly Review* (Fall 1981) pp. 1-18.

laboratories and concoct experiments to find out which forces will generally prevail. Instead, we can examine the experience of several industrialized countries to see if increases in debt growth in these countries tend to coincide with increases in money growth. That is, we can find out if debt growth and money growth are positively correlated, even though the tradeoff between the desire for low inflation and the benefits from engineering an inflation is likely to be somewhat different in each country. If the inflation incentives generated by large deficits are strong and pervasive, then we should find a positive correlation between debt growth and money growth across these countries.<sup>13</sup> If we find no correlation between debt growth and money growth, then it is unlikely that monetization occurs regularly.

We want to emphasize that the statistical results shown in the following section cannot support or reject any of the individual economic scenarios that may push towards monetization or work against it. Rather, these results can only show whether or not *in fact* monetization has taken place systematically.

#### WHAT IS THE EVIDENCE?

**Assessing the Data for Ten Countries.** In order to see whether countries typically monetize rapidly growing debt, we examine the post-war experience of ten industrialized countries: Canada, Finland, France, Germany, Holland, Japan, Italy, Switzerland, the United Kingdom, and the United States. First we look at the behav-

ior of the debt-to-GNP ratio in each of the countries, since both of the monetization scenarios discussed depend on the relation of government debt to nominal income. (See Figure 1, DEBT GROWTH IN TEN COUNTRIES, p. 18.)

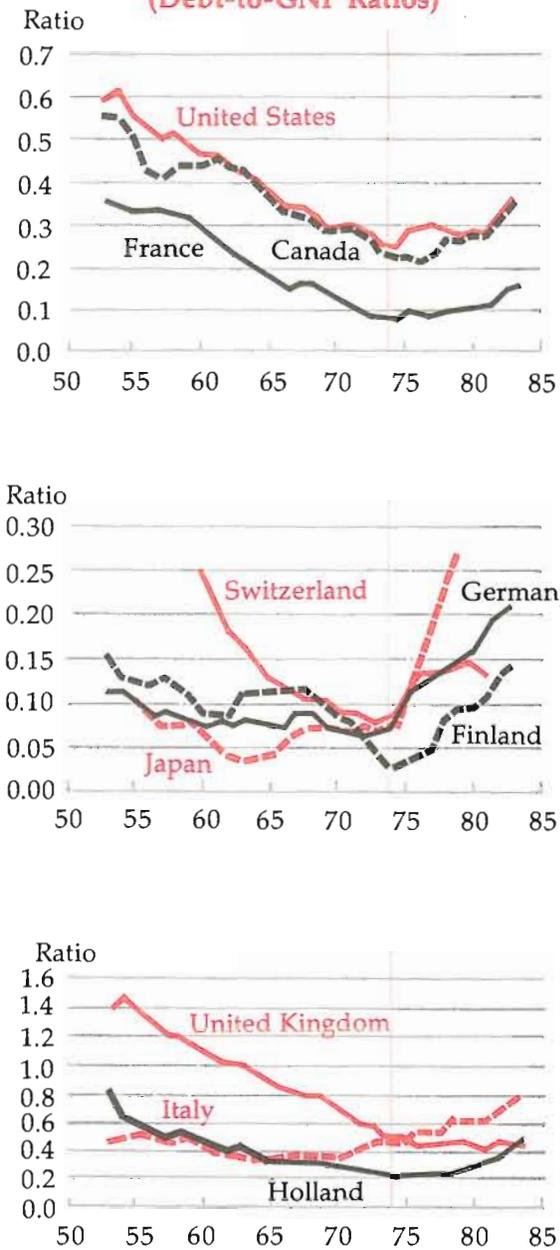
The histories of the debt-to-GNP ratios of these countries show strong similarities. Though the levels of these ratios and their year-to-year behavior vary from country to country, the ratio for each country, except Italy, declines until 1974. After 1974, each country's debt-to-GNP ratio increases, and only in Switzerland and in the U.K. does the ratio eventually resume its downward trend through the end of our sample period in 1983. One reason for the growth in the debt-to-GNP ratio after 1974 is the slow growth of output in all these countries. But the primary reason for the growth in the ratio is the explosive growth of government debt in all ten countries, unprecedented in the post-war period.<sup>14</sup> Furthermore, this high growth of government debt is sustained to the present in most of these countries.

Whatever the reasons for this uniformly high growth of government debt after 1974, this period provides an excellent setting in which to assess the importance of the forces to monetize deficits. In order to implement our tests, we define *excess debt growth* as the growth rate of government debt less the growth rate of real output (real GNP). Similarly, *excess money growth* is the growth of a measure of money (such as the monetary base or M1) less real output growth. If the pressures to monetize debt play a big role in monetary policymaking, we should find excess money growth increasing as excess debt growth increases, so that countries with the largest increase in excess debt growth should tend to have the largest increase in excess money growth. If monetization were systematic, a graph of changes in excess debt growth and in excess

<sup>13</sup>Note that if there is a significant correlation between debt and money growth, one still cannot conclude that debt growth *causes* money growth. Establishing empirically which way causality goes is an extremely complex and as yet unresolved issue. Econometricians have developed tests for a causal relation between variables under a very restrictive definition of causality. These are called "Granger causality" tests. For more information, see *Three Aspects of Policy and Policymaking: Knowledge, Data, and Institutions* Carnegie-Rochester Conference Series on Public Policy, Vol. 10, (Amsterdam: North Holland, 1979), and "Exogeneity," by R. Engle, D. Hendry, and J. F. Richard, *Econometrica* 51, 2 (March 1983) pp. 277-304.

<sup>14</sup>For a review of the theoretical and actual characteristics of the debt-to-income ratio in the U.K. and the U.S., see *Macroeconomics* by Robert Barro.

**FIGURE 1**  
**Debt Growth**  
**In Ten Countries**  
**(Debt-to-GNP Ratios)**



NOTES: All the data are from monthly issues of *International Financial Statistics* (Washington, D.C.: International Monetary Fund). Where GNP data were not reported, GDP (gross domestic product) data were used.

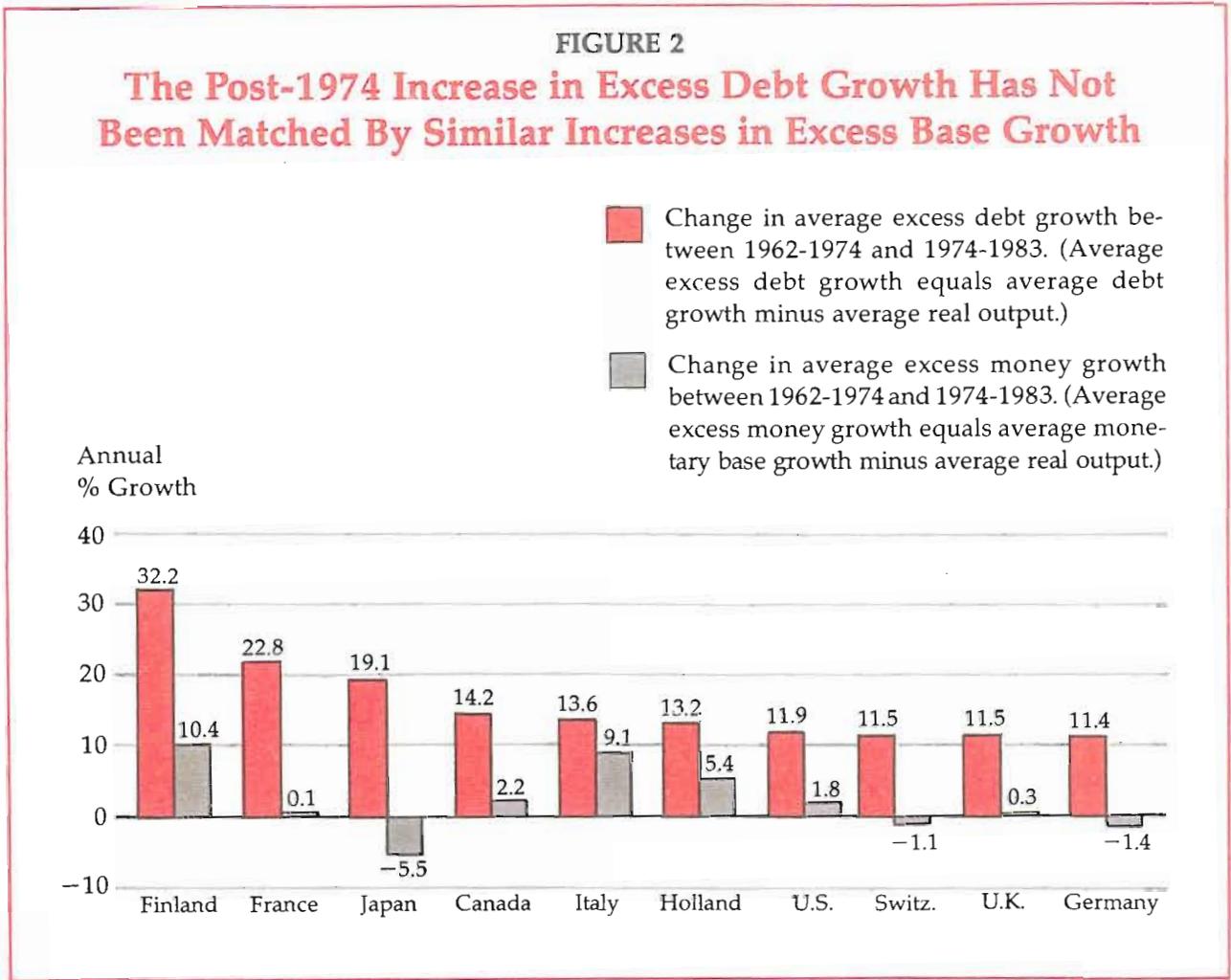
money growth should show a very similar pattern.

**The Results.** The facts are otherwise. Although excess debt growth increases after 1974 in all ten countries, excess money growth does not increase by nearly as much, and in some cases it actually declines. Figure 2 illustrates this fact for the case of the monetary base.<sup>15</sup> Excess debt growth in each period (1962-74 and 1974-83) is calculated as average government debt growth minus average real output growth. The change in excess debt growth then is the difference in excess debt growth between the two periods. The change in excess money growth is calculated the same way.

It is easy to see from Figure 2 that the relation between excess base growth and excess debt growth varies widely across countries. Three of the ten countries in our sample, Germany, Japan, and Switzerland, show reductions in their excess base growth rate after 1974, despite high excess debt growth. And in two other countries with high debt growth, France and the U.K., the increase in excess base growth is negligible. The other five countries, Canada, Finland, Holland, Italy, and the U.S. do show some increase in their excess base growth. However, in each of these countries, the increases in excess base growth are always much smaller than the increases in excess debt growth. Only in Italy do the data suggest that substantial monetization of deficits was taking place, because only in this case are the debt growth and base growth rates similar. By contrast, though the Finnish base growth is substantial, it is only one third of the growth rate of debt. So, in contrast to what we would expect if systematic monetization was taking place, the pattern in Figure 2 looks pretty much random.

However, this analysis is rather casual. We can make it more rigorous by performing a statis-

<sup>15</sup>We use the monetary base as the money measure to illustrate the pattern that emerges, but the overall conclusions are very similar when we use M1 as a measure of money.



tical test to quantify the relation between debt growth and money growth. This requires making a ranking so that the country with the lowest average excess debt growth is at the top of the list, and the country with the highest average excess debt growth is at the bottom of the list. Similarly, we rank countries according to their excess money growth, from lowest to highest. Then we calculate a statistic called the "rank correlation coefficient," which measures how similar the rankings in the two lists are. Now, if higher debt growth is very closely related to higher money growth, the countries will be ranked in almost exactly the same order in the two lists; in that case, the value of the rank correlation coefficient will be close to 1. If there is no relation between high debt growth and high

money growth, the rankings in each list will look quite random, and the coefficient will be near 0. If the rankings are exactly opposite, then the coefficient's value will be  $-1$ .

Table 1 (p. 20) presents rank correlation coefficients, which were calculated using both the monetary base and M1 as measures of money, since the theories we rely on are not specific as to which money measure is the more appropriate. The first line in the table shows the statistical significance of the data in Figure 2. The correlation across countries between *changes* in excess debt and money growth is small and statistically insignificant, whether the monetary base or M1 is used as the measure of money. The second line in Table 1 shows a somewhat different rank correlation test. Rather than calculating

TABLE 1  
**Rank Correlation Coefficients**

	<u>Debt-Monetary Base</u>	<u>Debt-M1</u>
Rank correlation of the change in excess debt and money growth between 1962-74 and 1974-83.	0.36 (1.08)	-0.08 (0.22)
Rank correlation of average excess debt and money growth, 1974-1983.	0.26 (0.70)	0.20 (0.58)

NOTE: t-statistics are in parentheses. None of the rank correlations is significantly different from zero, from a statistical standpoint.

the correlation of changes of excess debt and money growth between the two periods, we calculate the correlation between the 1974 to 1983 average excess debt growth and the corresponding average excess money growth for the ten countries.

The results suggest that not only were large *changes* in excess debt growth not accompanied by comparable *changes* in excess money growth, but also high *average* excess debt growth is not accompanied by high *average* excess money growth. We conclude that in our sample of industrialized countries, it is unlikely that high excess debt growth generates sufficiently powerful economic and political forces for monetization.<sup>16</sup>

## CONCLUSION

Theories have been advanced to show that large government deficits can create incentives for monetary authorities to increase money growth (that is, to monetize the debt) and thereby cause inflation. These incentives take two principal forms. One is the desire to hold down interest rates by purchasing some of the newly

floated government debt in the open market, and the second is the desire to reduce the burden of the national debt by generating unanticipated inflation. But working against these inflationary forces is the popular desire to keep inflation low and to have a stable monetary environment.

We examine the period after 1974 for ten industrialized economies to determine whether excess government debt growth and excess money growth are related across these countries. This period is particularly appropriate, because it is marked by such a rapid growth of debt in all of these countries. We find that over this period there is no evidence that excess money growth is systematically related to excess debt growth. Remarkably, even though government debt grew rapidly after 1974 in all the countries in our sample, the monetary base shrank or did not grow in five of these ten countries over the same period. Statistical tests we conduct lead us to conclude that, for at least a period up to a decade, it seems likely that monetary authorities can pursue monetary policies that are independent of the growth of government debt.

<sup>16</sup>A variety of additional econometric tests we conducted on these data support these conclusions. For example, we calculated regressions of money growth on its own lags, lagged debt growth, and lagged real growth (4 lags each). For all countries, we *rejected* the hypothesis that permanent increases in debt growth increase money growth permanently. These tests ask whether debt growth systematically led to money growth in any of these countries during the post-war period. In contrast, the tests we present here ask

whether it is likely that countries responded to the uniformly high debt growth after 1974 by increasing their money growth, on average. For more detailed discussions of the tests and the results, see Aris Protopapadakis and Jeremy Siegel, "The Impact of Government Debt Growth on Money Growth and on Inflation: Evidence from Ten Industrialized Countries," Federal Reserve Bank of Philadelphia Working Paper No. 86-11.

## Some Elements of Monetization Theory

### The Economic Meaning of Monetization

When economists say that “deficits are monetized,” they generally mean that debt growth puts enough economic and political pressure on the monetary authority so that it purchases some or all of the new debt. In order to be able to interpret the empirical evidence, we need to develop a more precise definition of monetization. To do so, first we need to introduce some simple macroeconomic equilibrium growth concepts.

Suppose U.S. output (GNP) were growing in real terms by 3 percent a year. If money demand is proportional to income (a reasonable approximation), then the economy could absorb a 3 percent annual growth rate in the monetary base without causing any inflation, since money growth would not exceed real output growth. To give a sense of the numbers, the U.S. monetary base is currently around \$220 billion, so the Federal Reserve could increase the base by \$6.6 billion next year (3 percent). The economy also could absorb a 3 percent annual increase in the level of government debt (that is, a deficit equal to 3 percent of the debt) without causing any pressures on the financial markets, since other assets and incomes would be growing at the same rate in this scenario. With our national debt slightly over \$2 trillion, that means the Treasury could run a deficit of \$60 billion next year without causing any increase in the economy’s overall ratio of government debt to nominal income. This pattern could continue indefinitely; it is an example of what economists call a “steady state,” that is, an unchanging pattern of economic growth. In such a steady state we would *not* say that the deficit is monetized, even though the central bank buys \$6.6 billion of the \$60 billion deficit through open market operations in the next year. This is because the central bank’s purchases are intended to create enough money to support real output growth with no inflation, and they are not caused by the deficits.

Suppose now that a change in fiscal policy sends the deficit to \$200 billion, implying a 10 percent growth rate for the debt. If the debt is not monetized at all, then the base will continue to grow at 3 percent. But what if the Federal Reserve decides to monetize the deficit? Can that mean that it must buy the additional \$140 billion of new debt?

The answer is, no! To buy all the additional \$140 billion would expand the monetary base by almost 64 percent, and this would eventually increase the price level by over 60 percent! Instead, the Federal Reserve could buy enough of the new debt to let the monetary base grow by only 10 percent to match the debt growth. Then the base would expand by \$22 billion (that is, the Fed would buy only an extra \$15.4 billion of debt). That would mean debt and the monetary base would grow by 10 percent, and nominal GNP also would grow by 10 percent. The 10 percent growth for nominal GNP would come from the 3 percent real growth and from the 7 percent increase in the price level generated by the higher level of the base. In the end, this particular strategy will leave the ratios of government debt to money and to nominal GNP unchanged, which is consistent with a steady state.

To summarize, monetization occurs when fiscal decisions cause the government debt to increase at a rate faster than the growth rate of real output, and when the central bank responds by increasing the growth of the monetary base (and, hence, other measures of money, such as M1) to a rate also in excess of real output growth.<sup>a</sup>

It is clear that there are various degrees of monetization. If, as in our example, the central bank decides to match the growth rate of the monetary base to the new growth rate of debt, then the central bank is monetizing the debt fully, because such a decision will keep the debt-to-nominal GNP ratio stable, and

<sup>a</sup>This notion can be amended to take account of some low underlying inflation rate that may be desirable for a variety of reasons. If the desired inflation is greater than zero, then monetization occurs when the growth rate of the monetary base exceeds the amount required to support real output growth plus this desired inflation.

this policy can continue indefinitely. However, the central bank could allow the base to grow by less than the new growth rate of the debt (although faster than real growth), and only partially monetize the debt. It is even possible that the central bank could let the base grow faster than debt for a time, and more than fully monetize the debt.

### **The Link Between Excess Money Growth and Inflation**

Technically, the link between money growth and inflation is quite complex, but it is possible to give an intuitive description of the process by considering a few fundamental relations in the economy. Let us start from an economic equilibrium in which money and prices are growing at some trend rate. For simplicity, assume that money growth matches real output growth, so that the price level is stable. An increase in the growth rate of the money supply initially leaves the private sector with more money than it wants for its desired transactions. Individuals and firms try to buy more interest-earning assets or more goods and services with the newly acquired money.

As they attempt to buy more such assets, they bid up the price of these assets and cause interest rates to decline. The decline in interest rates leads to greater demand for goods throughout the economy. This rise in demand comes from firms that find that the lower interest rates make it attractive to boost their investment plans, or by consumers who increase their demand for durable goods. The decline in interest rates and the increases in spending on goods and services are such that the private sector now wants to hold all the new money, because now this new growth rate of money is consistent with its new spending plans and the new interest rates.

The increase in demand for goods may translate into increases in real output in the short run, particularly if there are unemployed resources in the economy. But increases in demand cannot always be met with higher output, especially once all the resources in the economy become employed. As increasing demand outpaces the ability to produce more output, eventually the higher money growth will force up the prices of goods and services in the economy. Therefore, money growth in excess of real output growth will produce inflation in the long run. For instance, if money demand is proportional to income, and if real output grows at 3 percent, then a 3 percent money growth rate will result in a stable price level (0 percent inflation) while a 10 percent money growth will result in a 7 percent inflation.

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