

MONETARY REFORM IN AN UNCERTAIN ENVIRONMENT

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Introduction

The 20th century has produced a rich array of monetary experience. The experience can be organized in several different ways. One emphasizes the role of gold in international monetary arrangements. Early in the century, domestic monies of major trading countries were convertible into gold at a pre-established fixed price, and gold coins circulated. Currently, governments do not set the price of gold, and there is no formal requirement on governments to exchange gold for currency or currency for gold.¹ This is a relatively recent phenomenon, and there are some who prefer to return to a fixed, guaranteed price. A second method of organization focuses on the arrangements for exchanging a country's currency for other currencies and particularly on the choice between fixed and fluctuating exchange rates. Major trading countries now either permit exchange rates to be determined by market forces or adjust the rates frequently to reflect market

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¹Some writers want to restrict the term "gold standard" to refer to a relation between the number of ounces (or grams) of gold and the unit of account, say one guinea is one ounce of gold. Here, the "guinea" is a unit of account; i.e., a convention for expressing values. The convention tells us nothing about money prices or about the relation of gold to money prices or the price level. For gold to affect the price level, there must be a connection between ounces of gold and money prices. This requires more than the choice of a unit of account. Fixing the price of gold by agreeing to buy and sell ounces of gold at a fixed price establishes a link and opens the possibility of stabilizing the price level by buying and selling gold. I see no point to "reform" of the unit of account. One unit, even an abstract unit, is as useful as any other.

forces. A third method of organizing experience focuses on the role of governments or central banks in the monetary system. Under either a gold standard or a regime of fixed currency exchange rates, the government sets a price and agrees to buy and sell its money at that price. The decision to control the price or exchange rate leaves the determination of the quantity to market forces. A decision to control the quantity of money performance requires that the prices of gold and other currencies be permitted to change.

Experience with the various monetary arrangements has served to heighten awareness of the disadvantages of each. The interwar gold standard transmitted the price deflation and contraction of the early '30s, and contributed to the depth and extent of the period known as *the depression*. The postwar, international system, known as Bretton Woods, established fixed, but adjustable, exchange rates and, after more than a decade, increased welfare by establishing convertibility between major currencies. The price of gold was fixed, but gold had a minor role, and its role diminished as the system matured. The Bretton Woods system avoided deflation but transmitted inflation. When the system ended, major trading countries moved toward a loose system of domestic monetary control with fluctuating or adjustable exchange rates and preannounced targets for growth of one or more monetary aggregates.

Some main problems with the current arrangement are well known. Most countries have not avoided inflation; costs of disinflation have been higher than generally anticipated; and in many countries, monetary targets have not been achieved with enough regularity to make the announcements of planned money growth credible. Consequently, expectations about growth of monetary aggregates are volatile at times; there is widespread skepticism about the ability of central banks to provide noninflationary money growth and about the costs of doing so. During the past two or three years, interest rates (at all maturities) in the U.S. and many other countries have been higher (after adjusting for inflation) and more volatile than in the past 50 years or more. High and variable rates of interest and variable money growth increase uncertainty and contribute to the stagnation of the economies of major trading nations. The concurrent increase in the variability of interest rates and money under current arrangements suggests that the present system has not traded higher variability of interest rates for lower variability of money growth. This suggests, in turn, that the variability of either money or interest rates, or both, can be reduced by monetary reform.

Monetary management, at the discretion of central banks or governments, based on forecasts of future economic activity and infla-

tion, has *not* produced stability. Experience has shown that economist's forecasts of short-term changes are less accurate, and government actions less stabilizing, than many economists and officials once believed. Research has shown that every policy is a choice of rule; the only purely discretionary policy is a purely random or a haphazard policy. Hence, the rational choice of policy is a choice between rules.

Policy rules may differ in a variety of ways including complexity, formal statement, prescribed flexibility, responsiveness to relative and absolute changes in supply and demand for goods and services, and in the uncertainty that they engender about the future. The more frequent are changes in the policy rule, the less certain is the actual or perceived adherence to the rule. The flexibility that permits government to change policy has a cost: Anticipations about the future conduct of policy are altered. The effect of uncertainty is an important, but often neglected, characteristic that affects the cost of following alternative rules in a world subject to unpredictable changes.

Types of Monetary Reform

Interest in monetary reform has been stimulated by the combination of research and experience. Three types of reform, each with many variants, are advocated. One proposes a return to some type of gold or commodity standard under which the central bank would be obligated to buy and sell gold, or some other commodity, or basket of commodities, at a preannounced price. The second, a monetary rule, keeps the growth rate of money on a prescribed path. The third proposal, associated with Friedrich Hayek and Ludwig von Mises, eliminates the government and the central bank from the monetary system. Proposals for competitive, unregulated banking—often called “free” banking—leave control of money growth to the decisions of the public. Wealth-maximizing bankers produce the quantity and type of money that the public demands.

The distinguishing feature of a gold or commodity standard is that the government or central bank makes an enduring commitment to control one set of prices and accept the monetary and economic consequences that are consistent with the controlled prices. Friedman (1951) has presented a thorough analysis of the benefits and costs of commodity reserve currencies under the assumption that the level of output is independent of the choice of policy. The assumption of independence is restrictive, however. The choice of a monetary system determines the types of risks and uncertainty that society bears, and uncertainty affects the size of the capital stock. Hence, the

assumption that output or consumption is independent of the choice of monetary standard should be relaxed.

The most familiar version of a quantity rule—Milton Friedman's monetary rule—requires the central bank to keep a (broad or inclusive) measure of money growth at a rate equal to the long-term average rate of growth of real output. Several alternative rules do not require constant money growth; they provide for systematic, short-term changes in the growth rate of money. Some require the central bank to vary money growth in the direction opposite to the short-run changes in the current or recent average rate of inflation, or to the current or average rate of change of a basket of commodity prices. These rules are a type of commodity-price stabilization scheme, but they avoid the cost of buying, selling, and storing commodities. The government sells securities to reduce money growth when the prescribed index rises and buys securities to increase money growth when the prescribed index falls. Another type of monetary rule, proposed by Friedman (1948), requires a cyclically balanced budget, a fixed tax structure, and fixed rules for tax and transfer payments. Exchange rates fluctuate freely. The stock of money grows, on average, at the rate of growth of government spending. The latter is equal to the maintained (identical) average rates of growth of taxes and output, so the average rate of money growth is equal to the average rate of growth of output. The budget deficit and surplus fluctuates cyclically; this permits money growth to rise relative to trend during recessions and deflations, and to fall relative to trend during booms or in periods of inflation.

A credible monetary rule reduces uncertainty about money growth, but does not eliminate all short- or long-term changes in the rate of inflation. Fluctuations in output or the budget affect short-term inflation. Productivity shocks that change the growth rate of output must be followed by changes in the growth of money to avoid long-term inflation or deflation. Under a monetary rule, the risks borne by the public depend, therefore, on the type of monetary rule that is adopted and on the type of shocks that occur. Generally, permanent and transitory changes in the level and growth rate of output cannot be predicted in advance or instantly identified when they occur, so the rule cannot be adjusted until *after* the changes in the *growth rate* of output have been established.

Proposals for monetary reform usually assume that the public prefers a noninflationary rate of money growth. This may be true, but it has not been demonstrated. Nor has it been shown that the rate of inflation that maximizes wealth, or the utility of wealth and private consumption, is identically zero. More likely, the costs and net ben-

efit of price stability depend on the choice of institutional arrangements (or policy rules) used to achieve stability. Institutional arrangements that reduce risks and uncertainty lower the cost of achieving any chosen rate of inflation or deflation, including zero.

I have chosen to avoid discussion of the optimal rate of inflation. A monetary rule is as capable of producing one average rate of money growth as another; for a monetary rule, the issue is of secondary importance. Proposals that leave the rate of money growth to the market cannot assure price stability. Money growth is endogenous and its average rate of change depends on costs of production, alternative uses of gold and other real factors. Those who favor a gold standard or "free banking" urge, not always explicitly, some alternative to a stable average price level or an optimal average rate of inflation as a means of maximizing welfare.

To avoid discussion of banks, banking, and financial arrangements, I use the term "money" to refer to base money—currency or note issues and bank reserves. If money is produced by a government monopolist, money means the monetary base—the monetary liabilities issued by the monopolist. Private production of money refers to the production of currency or notes, which may circulate or be held as a reserve by other banks. Currency may be gold, and notes may be claims to a fixed quantity of gold or commodities. None of the proposals require 100 percent reserve requirements to be effective, although the costs and benefits of each reform change with the set of arrangements, including reserve requirements, mandated or chosen. Further, I assume that there is no regulation of interest rates or portfolios and no relevant restriction of private choice. Private producers of money can, if they choose, compete with the government.

Supplementing the broad, economic implications of a monetary reform are the broader issues of political economy. The monetary reform that the voters in democratic countries prefer may differ from the reform that the market would choose. It seems best to put issues of social or political choice aside until we have a better idea about the way the various reforms are likely to work.

The perspective I choose is that of a consumer interested in maximizing the utility of wealth or consumption. He prefers lower to higher risk; he is risk averse. Monetary reforms that increase uncertainty are rejected in favor of reforms with lower uncertainty even if wealth is the same. I argue that risk and uncertainty affect the level of income and consumption: Lower risk and uncertainty are associated with a larger capital stock, higher income, and higher consumption. A monetary reform that reduces uncertainty is preferred for this reason.

Uncertainty, Risk, and Real Income

My definitions of risk and uncertainty follow the definitions used by Knight (1921) and Keynes (1921, 1936).² Risk refers to the "known" distribution of outcomes. These are of two kinds. People may know the probability of an event, for example, the toss of an unbiased coin, or they may classify events based on experience or subjective belief. Following Knight (1921, pp. 224–5), we may identify the first with mathematical probability and the second with empirical probability. Uncertainty refers to events for which the distribution of outcomes is unknown, and the basis for classification is tenuous. An example, used by Keynes (1937), is the probability that capitalism would survive until 1970. Wars, atomic explosions, and various political decisions affecting tax rates or regulation are best described as uncertain as to timing and often as to occurrence. There is no useful way to predict many events, or to classify the time of their occurrence into distributions, or to compute the expected time of occurrence.

Risk and uncertainty cannot be eliminated. The distributions of future economic outcomes cannot be given fixed means and constant variances. Changes in taste or technology or political changes induce permanent changes in the level or growth rate of prices and output that cannot be predicted in advance. Often, such changes cannot be identified as transitory or permanent changes, or classified as changes in level or growth rate until sometime after the changes occur. Recent events, including changes in the price of oil, in the relative size of government, or the permanence of the decline in world inflation and the stability of political regimes in the Middle East, are illustrative.

The classification of events as risky or uncertain is not fixed, and the cost of risk bearing is not constant. Costs can be reduced for an individual or society by developing market arrangements, by the choice of policy rules, and by the choice of asset portfolios.

The choice of policy rules affects the ability to classify events. A credible system of fixed exchange rates lowers risk and uncertainty about the exchange rate, but increases the risk and uncertainty about money growth. A credible monetary rule lowers the risk and uncertainty about future money growth, but increases the risk and uncertainty about future exchange rates and interest rates. Each of these rules generates different expected responses of prices and output, and different variability of prices and output.

Diversification, pooling, and hedging are examples of market arrangements that reduce risk and the cost of risk-bearing. The devel-

²Meltzer (1982) compares Knight and Keynes and distinguishes their view of expectations from current versions of rational expectations.

opment of each of these arrangements depends on someone's ability to classify events into probability distributions and compute expected values. Costs of risk-bearing differ with the degree of risk, measured by the parameters describing the distribution of outcomes. Differences in the cost of risk-bearing are likely to be smaller than differences between the cost of bearing risk and the costs of uncertainty. The reason is that uncertain events cannot be classified, so costs cannot be reduced by market arrangements that convert risky outcomes into smaller and more certain costs.

Individuals can reduce the cost of uncertainty, under any set of rules, by holding relatively safe assets in place of risky assets. Countries with a history of political instability generally have less capital per man, and less durable capital, than countries with stable governments. In such countries, the marginal product of capital is often high, but the return to investment is uncertain. People shift wealth to assets with values that are less dependent on political decisions, including foreign assets and precious metals. The stock of domestic real capital falls until the after-tax, risk-adjusted real return compensates holders for bearing the additional uncertainty.

The costs of bearing avoidable uncertainty fall on present and future generations. Domestic and foreign lenders demand a premium to compensate for the additional uncertainty, so real rates of interest are higher than the rates in more certain environments. Real investment is lower; the capital stock is smaller. Real income and consumption remain below the level that could be achieved in a less uncertain environment.

Monetary reform cannot compensate for all shocks arising from political instability, uncertainty about tax and spending policies, or many other sources of uncertainty.³ But differences in monetary arrangements dampen or augment particular shocks to a greater or lesser extent and change the ways in which the shock is felt. An example is the difference in the effect of an unanticipated change in the size of a fiscal deficit. A rule requiring *constant* money growth prevents the deficit from being financed by money creation. A monetary rule that requires money growth to rise and fall in fixed relation to budget deficits and surpluses increases the money stock during recessions, when prices and output fall, and reduces the money stock when prices and output rise cyclically. Even if the two monetary

³This is recognized in proposals for reform by, *inter alia*, Simons (1948), Friedman (1948), Brennan and Buchanan (1980). Recent work by Brunner and Meltzer (1972), Christ (1979), McCallum (1982), and many others shows that some combinations of fiscal and monetary policy are unstable.

rules are accompanied by the same restriction on the growth of government spending and the same tax arrangements, they differ in the degree to which they reduce uncertainty. One reason is that the fiscal and monetary effects of real shocks differ.

If all shocks are temporary (e.g., unanticipated cyclical changes in aggregate demand), the two monetary rules generate indistinguishable long-term outcomes but different short-term outcomes. With constant monetary growth, deficits are financed by selling bonds, and surpluses are financed by retiring bonds. Under the rule requiring counter-cyclical issues of money, an unanticipated change in money finances part of an unanticipated deficit. Money is more variable and debt is less variable under the counter-cyclical monetary rule; but there is no differential uncertainty about future budgets or money growth under the two rules. People planning future consumption anticipate the same future tax rates, size of government, and price level under either rule.

The key assumption, implicit in the previous paragraph, is that changes in aggregate demand are drawn from a distribution with fixed mean and constant variance. The assumption permits investors to forecast the growth of aggregate demand, deficits, money, and output for an indefinite period. There is risk of fluctuations, but there is no uncertainty about the long-run position.

Suppose that, in addition to transitory or cyclical shocks to aggregate demand, there are permanent and transitory shocks to output. Technical innovation, weather, political disturbances, tariffs, and cartels are examples. A century or more ago, plagues or diseases that killed a significant fraction of the labor force would have a prominent place in the list of output shocks. When there are persistent changes in the growth rate of output or the level of output, there is uncertainty about future prices and rates of price change. This uncertainty is reflected in interest rates, exchange rates and, therefore, in portfolios.

Typically, the duration of a shock is not known at the time it occurs, so the duration of any shock may be uncertain at first. As time passes, information about the shock increases, and the shock can be classified as a permanent or transitory shock to output, or as a permanent shock to the growth rate of output.⁴ Since the two monetary rules require different responses of debt and money to finance any budget deficit or surplus that occurs, there are differences in uncertainty about the size and duration of the budget deficit, and about the future stocks

⁴A permanent shock to the level of output is a transitory shock to the growth rate of output.

of money and debt that will follow the shock. This uncertainty also is reflected in future prices and interest rates.

To pursue the example one step further, suppose the shock to output is a permanent, negative shock to the level of output. Immediately after the shock, prices are higher and output is lower. Whether the budget is in deficit or surplus depends on the fiscal rule and the relative responses of prices and output. If taxes are indexed for price level changes, there is a budget deficit. If not, there may be a deficit or a surplus. The size of the deficit or surplus depends on the progressivity of the tax system. The rule requiring constant money growth prevents any change in money. The alternative monetary rule requires money to change with the deficit. The effects on prices and output differ during the transition and, depending on the fiscal rule, the size and persistence of future budget deficits differ. The rule providing for changes in money to finance a deficit can close the deficit by raising prices and tax revenues. The rule that maintains constant money growth may require an increase in tax rates or a reduction in expenditures as part of the transition to an equilibrium at a cyclically balanced budget.

In the presence of non-neutral shocks, like the shocks to output just discussed, the two monetary rules produce different outcomes and different types and degrees of uncertainty. The outcomes depend on the distribution of shocks, about which little is known currently, and on the fiscal rules that interact with the monetary rules. One or the other rule may generate greater uncertainty, a lower capital stock, and a lower level of output. I see no way to choose between the two monetary rules until more is known about the interaction with fiscal rules and real shocks.⁵

Price and Quantity Rules Compared

A rule setting a growth rate for the quantity of money has two advantages over a rule setting the exchange rate. First, a monetary rule is likely to generate less uncertainty and, thus, produces a higher level of output. Second, the resource costs of the monetary rule are lower, as Friedman (1951) explained in detail. Less real output has to be stored as a monetary reserve. I accept Friedman's arguments for the case in which output is fixed, with the minor amendments noted below. This section emphasizes an issue that Friedman neglects,

⁵McCallum (1982), using an intertemporal model, finds that a rule for constant money growth and cyclically balanced budgets is unstable. See also Blinder and Solow (1976) and Christ (1979).

the effects of price and quantity rules on the uncertainty and risk that the economy bears.

A gold or commodity standard is extremely costly to operate unilaterally. All the real shocks and all the monetary shocks in the world that change the relative demand for the commodity that is used as money affect prices and output in the country that maintains the standard. For example, under a unilateral gold standard, whenever wars, revolutions, increases in inflation abroad, or other unanticipated events increase foreigners' demand for gold, the domestic stock of money falls and the home price level falls until the rise in the relative price of gold restores equilibrium in the gold market. The agreement to supply gold at a fixed price means that every unanticipated event that affects the gold market leaves its mark on real income and prices in the home country. The cost of providing the service is borne by the public in the home country. Income and prices are more variable; uncertainty is higher; and the capital stock, income, and wealth are lower. Hence, I assume that any gold, or commodity, standard is a multinational standard.

The price rule is assumed to be an international set of fixed exchange rates. Central banks and governments agree to buy and sell a specific commodity, gold, or a well-defined basket of commodities, at a fixed price. For the present, costs of maintaining the standard are ignored, and all money is full-bodied money subject to a 100 percent reserve requirement under either a price or a quantity rule.

The quantity, or monetary, rule is a unilateral rule set to keep the price level stable on average. Base money grows at a rate equal to the difference between the maintained rates of growth of real output and base velocity. The fiscal policies accompanying the monetary and exchange rate rules are designed to reduce the effects of fiscal disturbances to the minimum consistent with knowledge about the real and monetary shocks affecting the economy.⁶

A principal advantage of a monetary rule arises from the constancy of money growth. Constant money growth implies that there is no correlation between money growth and velocity growth, so the variance of nominal output growth equals the variance of velocity growth. The variance of velocity growth is, in this case, equal to the variance of inflation, plus the variance of the growth rate of real output, plus

⁶The price or exchange rate rule requires greater harmonization of fiscal rules and, therefore, increases opportunities for cheating. There are monitoring costs for the quantity rule but such costs are relatively small if the rule requires constant growth of the monetary base.

or minus any effect of correlation (covariance) between inflation and real growth.⁷

Fixed exchange rates are inconsistent with stable growth of money; money growth is endogenous. The variance of the growth rate of nominal output in a fixed exchange rate regime is equal to the sum of the variances of money growth and velocity growth plus or minus the effect of interaction (covariance) between the growth rates of money and velocity. The latter can be positive or negative, depending on the type of shocks that occur, the frequency with which the various shocks occur, and the location at which they occur—at home or abroad. I see no way to decide in advance whether money growth and velocity growth are positively or negatively correlated. In fact, the two typically move together cyclically but not always secularly.

Either of two conditions is required for lower variability of nominal output or income growth under fixed exchange rates. The growth rate of velocity must be less variable by an amount that compensates for the variability of money growth and any positive correlation between variability of the growth of money and velocity. Or, a negative correlation between velocity growth and money growth must be large enough to compensate for the variance of money growth.⁸ Neither condition is likely to be met, and the data below suggest neither was achieved in the late 19th or early 20th century.

The opposite is more likely to be true. A fixed exchange rate system raises, and a monetary rule lowers, the variability of velocity growth. The reason is that with fixed exchange rates, the rate of inflation is not constant from year to year or even from decade to decade. The expected rate of inflation can be zero, but there is nothing in the rules of the commodity or gold standard that makes this certain.

The expected rate of inflation affects the demand for money and velocity, and the variability of expected inflation affects the variability of velocity. The increase in the variability of velocity may be large, or small, but the variability of expected inflation is larger under a fixed exchange rate system than under a monetary rule. This effect is offset, at least in part, by the lower variability of exchange rates.

⁷Let m , v , y , and p be the rates of change of money, velocity, real output and prices, and let V be a variance and C a covariance. Then,

$$V(m) + V(v) + 2C(m, v) = V(y) + V(p) + 2C(y, p).$$

The monetary rule sets $V(m)$ to zero, so $C(v, m)$ is zero also. The average expected rate of price change is zero, but prices change, so $V(p)$ is not zero.

⁸Using the notation in note 7, the first condition states that $V(v)$ must be smaller under fixed exchange rates by more than $V(m) + 2C(m, v)$. The second condition restricts $C(m, v)$ to be negative and restricts $|C(m, v)| - V(m)$ in relation to the difference in $V(v)$ under the gold standard and the monetary rule.

Under a monetary rule, differences between expected and actual exchange rates affect interest rates, the demand for money and velocity. This source of variability is dampened, however, by the operation of forward markets and the close relation between changes in spot and forward rates. See Mussa (1979).

Empirical data for the U.S. under the gold standard and during the recent period of fluctuating rates (without a monetary rule) show (1) weak positive correlation between the money growth and velocity growth under the gold standard and (2) higher variability of velocity growth under the gold standard. These data suggest that the variability of nominal output is higher under a gold standard.

Bernholz (1982, Tables 2 and 3) computed the variance of output growth and the average rate of growth of output for five countries under the gold standard to 1913, and during selected periods after 1913. The variability of real growth is 1.5 to 4.5 times higher under the gold standard than during the period 1951–79. The growth rate of output under fluctuating exchange rates from 1967–79 is higher than under the gold standard to 1913 in Germany, Italy, and France. For Britain and the U.S., Bernholz shows two measures of real growth under the gold standard, one for a shorter and one for a longer span. In both countries, growth for the longer period is higher, and for the shorter period is lower, than in the years of fluctuating exchange rates. Despite the oil shocks in 1974 and 1979, which lowered real income in the 1970s, these data suggest that there is: (1) A negative relation between variability or uncertainty and the level of income; and (2) greater variability under a gold standard than under a regime of fluctuating exchange rates.

Additional evidence on the costs of a gold standard is the relative size of expansions and contractions in the U.S. economy. One of the most regular features of U.S. peacetime cycles is that, on average, there are four years between peaks and four years between troughs, according to the dating of peaks and troughs by the National Bureau. The averages differ little for 24 peacetime cycles, 10 peacetime cycles under the gold standard (1879–1919), and 5 peacetime cycles between 1945 and 1980. In contrast, there is a notable difference in the lengths of expansions and contractions. The gold standard cycles are evenly divided between months of contraction and months of expansion. Since 1945, peacetime expansions are one-third longer,⁹ and peacetime contractions are less than one-half their average length under the gold standard.

⁹The longest expansion, 106 months, includes the Vietnam war, so it is not a peacetime expansion and is excluded.

A study of annual velocity growth from 1869 to 1949 using a broad definition of money, and from 1915 to 1949 using a narrow definition of money, shows a weak contemporaneous positive relation between money growth and velocity growth. See Gould, Miller, Nelson, and Upton (1978). On average, changes in money growth were positively related to changes in velocity growth under the pre-World War I and interwar gold standard. A shift from the gold standard to fluctuating exchange rates and constant money growth would have eliminated the variability of income arising from the positive covariance and from the variability of money growth.

The rate of change of base velocity and monetary velocity was considerably more variable under the gold standard than under the Bretton Woods system, or in the recent period of fluctuating exchange rates. Calculations reported in Brunner and Meltzer (1982) show that the variance of the quarterly rate of growth of base velocity during the decade of the '70s was about two percent at annual rates. This is less than half of the variance of base velocity under the gold standard and, as shown in Gould et al. (1978), a fraction of the variance of monetary velocity (M_2) for 1869–1949 or (M_1) for 1915–49.

Under a fixed exchange rate, the variability of money growth is higher; partly as a response to variable money growth, the variability of velocity growth appears to have been higher, by a large factor, during the years of the gold standard. The correlation between money growth and velocity growth further increased the variability of nominal output growth. The gold standard added to fluctuations in prices and output; uncertainty was greater; and the demand for capital lower than would have been achieved under a rule requiring constant money growth. Consequently, real output was lower than would have been achieved with less variability.

Friedman (1951) discusses the resource costs of a commodity reserve currency and the relative advantages of several types of standard. He estimates the annual resource cost to be as much as half of the average growth rate of annual output, using data for the late 1940s and assuming that, on average, there is no inflation. A similar computation—using the current ratio of money to income in the U.S. as a reference—reduces the cost to about 16 percent of the average, annual growth rate of output. Unless there is a reason to anticipate a dramatic decline in average cash balances, the resource cost of a full commodity standard remains high.

Resource costs of an international standard are probably higher. The ratio of money to income in much of the world is above the U.S. ratio, so a larger fraction of world commodity stocks would have to be held as monetary stocks, and a larger fraction of the growth rate

of output would be added to the stocks on average. If gold and other metals are exhaustible resources, their prices rise over time relative to the prices of reproducible commodities. The rise in price encourages private holding of gold (or commodity money) instead of productive capital, but also lowers the resource cost of increasing monetary gold stocks.¹⁰

It is difficult to estimate the size of the price increase. We cannot separate, or hold constant, the policies of the principal governments that control most gold production so as to obtain an estimate of returns to scale in gold production. The crude data in Schwartz (1982) and Fellner (1981) do not show evidence of constant returns to scale in gold production. Fellner (1981) notes that the price elasticity of the supply of gold has been low, and possibly negative, during the past several decades.

A further complication in evaluating the costs of a gold standard arises from changes in the demand for industrial and commercial use. Growth of these demands absorbed much of the new production in recent years but, again, it is difficult to separate the effect of expected inflation on the demand for jewelry from other determinants of the demand for gold. See Schwartz (1982, pp. 176–8).

Friedman (1951, pp. 215–8) suggests that, in the past, the relatively high resource cost of holding gold as reserves encouraged a steady decline in the ratio of gold to circulating money. The introduction of paper money raises monitoring costs and increases uncertainty about convertibility and about the future price level. Uncertainty adds to the real costs of maintaining the system.

“Free” Competitive Banking

A gold standard or commodity money standard requires the government to control a price. A monetary rule gives the power to control money to a government monopolist, but limits the monopolist’s freedom to set a price or choose a quantity other than the prescribed quantity or growth rate. General economic reasoning does not support price control and does not support the grant of monopoly power, even limited power, except under a very limited set of circumstances. Proposals for unregulated, competitive banking are attempts to avoid both price fixing and government monopoly.

The usual argument for fixing a price or granting a monopoly is

¹⁰With constant returns, all of the additional gold is provided by new production and with totally inelastic supply by a rise in the price of gold relative to commodities. Between these extremes the amount of additional resources used for gold production depends on the elasticity of supply.

that "free," competitive banking is too costly. There are three main reasons for the alleged excess social cost. One is the claim that costs of monitoring private producers are high. The second is the social cost of an epidemic of bank failures. The third is the risk of a change in relative prices or the risk of fraud or default.

The first cost arises because profit maximizing, "free" competitive bankers will reduce the reserve ratio to less than 100 percent. The opportunity to reduce the cost and the competitive price of the service arises because the marginal cost of resources used to produce paper money is less than the exchange value of the additional money. It costs no more to print a \$10 bill than to print a \$1 bill, but the former exchanges for 10 times as much as the latter. If all producers follow this strategy, prices rise and real value of the bills falls. If producers follow widely different strategies, some will fail. The community loses by bearing the additional uncertainty. The same quantity of real balances can be produced at lower resource cost and with lower default risk by a government monopolist that maintains a pre-announced, constant rate of money growth.

The second, and possibly larger, cost of "free," competitive production of money arises from the absence of a central bank that acts as lender of last resort to the financial system. The existence of a lender of last resort reduces the uncertainty that the community bears and reduces the size of the optimal reserve held by banks. The reduction in uncertainty (and cost) can be achieved, without an offsetting cost, if the lender charges the borrower a penalty rate. The penalty rate assures that borrowers will choose to repay the loans promptly and borrow only when there are large, transitory changes in demand for currency or commodity money. A monopoly central bank, operating under a monetary rule, cannot fail. Again, the monopolist reduces risk and cost.

A central bank operating in a fractional reserve system issues default-free currency and can buy securities from the market when unanticipated shocks induce all private issuers to sell securities simultaneously. Experience in the 19th century, reported and analyzed in Bagehot's *Lombard Street*, shows the benefits of having a lender of last resort. The failure of the Federal Reserve to act as lender of last resort in the early '30s, reported and analyzed in Friedman and Schwartz's *Monetary History*, shows the costs that society bears when the lender of last resort fails to carry out this responsibility.

Neither private insurance nor a commodity reserve is a perfect substitute for the lender of last resort. A private insurance company has no special advantage that permits it to sell securities when the banks that it insures are unable to do so. Holding reserves, in gold

or commodities, is more costly than issuing currency that is free of default risk.

A government monopoly of the issue of base money rests on a real advantage of government as a debtor. Governments can tax to pay debts and never are forced to default on the (nominal) value of their domestic debts. This advantage permits the government to reduce the default risk on the nominal value of money to zero.

The government can reduce or even eliminate its advantage as lender of last resort by abusing the power to issue money. Some advocates of "free" banking believe this is a fatal flaw in proposals for a monetary rule. They claim, correctly, that there must be either some limitation on the issue of base money by the lender of last resort or some strict definition of the conditions under which the central bank can depart from the monetary rule.

The problem can be eliminated by defining precisely the conditions under which the central bank departs from the monetary rule. A proper definition eliminates ambiguity, for example, by specifying that the central bank must lend at a penalty rate (above the market rate) on specified collateral (eligible paper) such as Treasury bills or prime commercial paper. Banks that do not hold "eligible paper" should be permitted to fail. The purpose of the lender of last resort is not to prevent all failures; the purpose is to prevent the type of bank runs described by Bagehot (1873), Friedman and Schwartz (1963), and others.¹¹

Discussions of competitive banking often point to the experience of the Scottish banks during the 18th and part of the 19th century (Vera Lutz 1936; Hayek 1978; and Pedro Schwartz 1982). The experience shows only that a private banking system can function for long periods of time without repeated failures. It does not show that a private banking system is efficient or that the risks borne by the Scottish community were reduced to a minimum. Further, the lessons to be learned from the Scottish experience are ambiguous. There is reason to question whether the Scottish banks were fully independent of the Bank of England.¹²

¹¹If there is always a market for eligible paper at higher price (lower discount) than the central bank's penalty discount rate, the lender of last resort serves as a standby facility that reduces perceived risks at low cost. In this case, the monetary rule is never violated. Either the subjective (perceived) risk of bank runs, "panics" and temporary market failures would decline, eventually, or we would learn more about the optimal rule for contingencies and the conditions under which "panics" occur.

¹²The Scottish experience is open to different interpretations. Tim Congdon points out in correspondence that some earlier students of Scottish banking history recognized that the Bank of England served as lender of last resort to the Scottish banks. In Congdon (1981, n. 52), Congdon refers to Clapham's account of the failure of the Ayr Bank. His letter provides additional references suggesting that the Bank of England was lender of last resort to Scottish banks.

If experience with competitive money does not reduce risk and uncertainty to the minimum attainable, investment in real capital and the level of output are lower than attainable. Greater uncertainty induces banks and the public to hold more gold and commodity money than they would choose to hold in a society with lower risk of bank failure and lower uncertainty. Interest rates remain above the marginal product of capital by a risk premium equal to the cost of bearing uncertainty. People hold a smaller share of wealth in the form of productive real capital, so output and consumption are lower.

Survival is not the proper standard of comparison. Economic history shows that many arrangements survived for long periods. Where there are differences in the social costs of different monetary systems, particularly in the relative costs of bearing uncertainty and the comparative resource costs of maintaining the systems, the best system is the one that minimizes cost.

Nothing in this section should be read as opposition to private money. Individuals or groups should be permitted to issue and use privately produced money or monies, including foreign money and specie, if they choose to do so. The objective of policy rules is to reduce the uncertainty that the community must bear, not to prevent voluntary risk taking.

Conclusion

The right to own gold is a valuable right. The fact that many people choose to exercise the right is informative about the uncertainty or risks that people perceive. They may fear inflation, or confiscation of their assets, or some type of political restriction on property. They may fear default on the note issue following a wave of bank failures. Whatever the reason, ownership of gold or precious metals reduces the uncertainty that individuals perceive and bear, but also reduces the demand for productive assets and the capital stock. Society is poorer because of the uncertainty that leads individuals to hold gold instead of productive capital.

The choice of a monetary standard is a decision to reduce some private risks by incurring costs that are borne by society as a whole. These costs include the resource cost of maintaining and operating the standard and the cost of bearing the risk that the standard imposes. The basis for rational, economic choice between monetary standards, or the choice between so-called "free" competitive banking and a central bank, is relative efficiency. The most efficient monetary arrangement minimizes the cost and maximizes the benefits to individuals subject to the standard.

The efficiency criteria is more difficult to apply to the choice of monetary standards than to many other choices. An international commodity standard requires a cartel arrangement to keep the commodity's price at a set level. A monetary rule that fixes the growth rate of money depends for its execution on a monopoly central bank. Economic efficiency is rarely compatible with either price-fixing or monopoly arrangements. Yet, in the case of money, a monopoly central bank can be the most efficient method of producing money.

The principal reasons are that a monopoly central bank lowers the resource cost of the standard by substituting inconvertible paper money for commodity money, by reducing some monitoring or enforcement costs, and by lowering the levels of risk and uncertainty that society bears. On the other hand, the rule limiting the issue of inconvertible paper money requires monitoring to prevent inflation. And, a fluctuating exchange rate introduces risks of exchange rate changes in place of the risk of price fluctuations inherent in a system of fixed exchange rates.

For a small country, the cost of exchange rate fluctuations often exceeds any gain from controlling the price level of domestic commodities. Such countries can fix their exchange rate by pegging to the currency of a larger country that chooses a monetary rule. They benefit from price stability elsewhere by paying the cost of maintaining a fixed exchange rate.

A "free" competitive banking system has higher resource cost, higher monitoring cost, and greater cost of uncertainty than a monetary rule that fixes the growth of inconvertible paper money. Competitive producers have an incentive to lower the ratio of commodity reserves to money so as to reduce the cost of producing money and the price of their services. The reduction in resource cost increases default risk. The absence of a lender of last resort increases the cost of maintaining "free," competitive banking. A competitive producer of money bears an avoidable risk. To survive, the producer must receive compensation. Interest rates are raised by the risk premium, so the capital stock is smaller and income is lower under competitive banking.

Friedman (1951) analyzed the resource cost of various commodity standards on the assumption that output is given. His analysis shows that the resource cost of producing money is higher for commodity money standards than under a properly specified rule for the production of inconvertible paper money.

The risks borne by a country on a unilateral or multinational commodity standard also appear to be larger. Money growth is endogenous and is more variable. Velocity growth and the growth of output

are likely to be more variable also. Available data support this conclusion. The growth rates of output and velocity were more variable under the classical gold standard than during the period after World War II, or during recent years of fluctuating exchange rates. Real output rose more slowly in several countries during the gold standard than in the '70s. Contractions were longer absolutely and relative to expansions. These findings are consistent with higher uncertainty and higher real rates of interest.

Monetary reform can be a means of increasing efficiency and lowering the uncertainty that society bears. If society adopts a rule for money growth that is properly specified, enforceable and compatible with a fiscal rule, interest rates will be lower, capital stock larger, and output higher. A monetary rule without a fiscal rule cannot assure stability.

Democratic societies do not choose rules or establish institutions solely to achieve efficiency and lower risk. Often, the current generation of voters has other aims. Political economy or social choice may eventually explain why we do not have properly specified monetary and fiscal rules. Or, we may not have demonstrated the full range of benefits, or pointed out the welfare gains, from monetary and fiscal reform.

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