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**Alternative Monetary Constitutions
and the Quest for Price Stability**

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This article reviews the various means through which governments and central banks have sought to guarantee long-run price stability. Finn Kydland and Mark Wynne argue that monetary regimes or standards can all be viewed as more or less successful attempts to overcome the well-known time-consistency problem in monetary policy. The classical gold standard, which prevailed in the late nineteenth and early twentieth centuries, can be interpreted as a monetary policy rule that delivered long-run price stability. The fiat monetary standard adopted by countries following the abandonment of gold allows greater discretion on the part of monetary policymakers and has been characterized by greater long-run price instability. Countries have tried through a variety of means to regain the benefits of price stability that prevailed under the earlier gold standard by limiting the scope for discretionary actions on the part of central bankers. A close analogy exists between the gold standard and the currency board arrangements proposed for many emerging market economies in recent years.

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This article explores the ongoing quest of countries around the world for monetary stability through alternative monetary standards, regimes, or constitutions. Our benchmark regime is a fiat monetary standard that is managed by a central bank with limited independence. We use this as the benchmark not because it is ideal but because it has characterized most countries since the collapse of the Bretton Woods fixed-exchange-rate system in 1971 and is a model that many countries seem to be abandoning in one way or another. This article asks whether a better regime is possible.

The problem of monetary stability seems to be greatest under fiat monetary standards. The alternative to a fiat standard is a commodity standard of some sort.¹ The best-known example of such a standard is the gold standard. We think the gold standard is of interest more as an example of a rule than as a feasible alternative to current regimes. The gold standard did deliver price stability over long periods, as we will show, but it was also subject to a number of problems. The great virtue of the gold standard was its transparency. Under the gold standard, it was not difficult to tell whether the central bank or monetary authority was honoring its commitment to buy and sell gold in unlimited quantities at the announced price. Transparency also characterizes some other monetary regimes, in particular hard-exchange-rate pegs in the form of currency boards. Advocates of inflation targeting as a framework for monetary policy cite its transparency as an important argument in its favor.

Pegging to a large country's currency is feasible for a small country seeking a stable nominal environment. But what about the large country, the "peggee"? What rule or regime can a large country such as the United States, or a large single-currency area such as the euro area of the European Union, adopt to guarantee long-term price stability? The consensus in the academic literature is that the best guarantor of price stability under a fiat standard is institutional design. Specifically, an independent central bank with a clear mandate for price stability may be the closest we can come to a rule for monetary policy under a fiat money regime.²

THE PRICE LEVEL IN SELECTED COUNTRIES, 1850–2000

Figure 1 plots the price level in a group of countries over the past 150 years. This period encompasses the classical gold standard period (generally dated between 1870 and 1914) and the recent fiat money

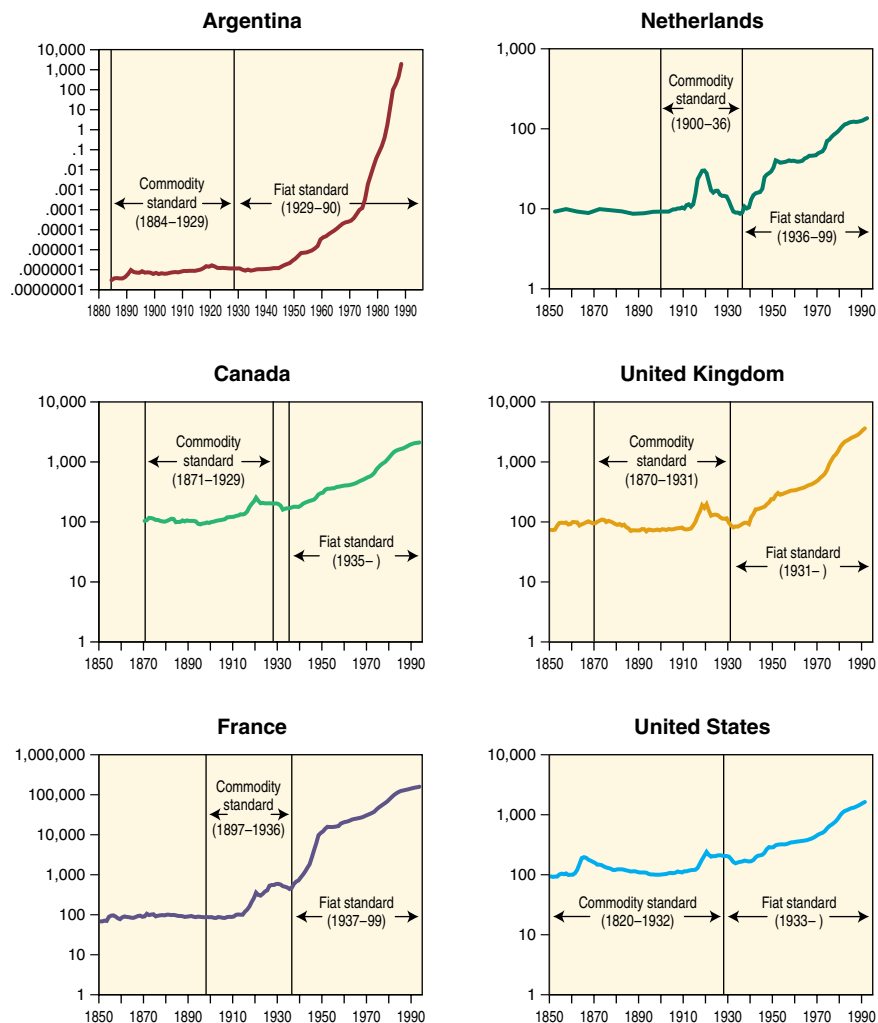
¹ Under a commodity monetary standard, money consists of, or is backed by, some intrinsically valuable commodity, such as gold or silver. Under a fiat monetary standard, money is intrinsically worthless and is valued only to the extent that holders of money expect to be able to exchange it for goods and services.

² A variety of other proposals for monetary stability have been put forward at other times. Two in particular, by Milton Friedman, are worth mentioning. Friedman (1960) proposed that the best policy to pursue would be a constant k percent growth rate for some measure of the money stock. The problem with rules of this sort is that (apart from settling on a measure of the money stock) financial innovation may mean that over time a constant growth rate becomes more or less inflationary. Friedman (1969) also proposed that the optimal policy for the monetary authority to pursue is one that sets the nominal interest rate equal to zero. This latter proposal, known as the "Friedman Rule," has been the subject of a large academic literature. However, despite its popularity among academic economists, it does not seem to have generated serious interest on the part of central bankers.

period. The contrast between the price stability that prevailed in most countries under the gold standard and the instability under fiat standards is striking. This reflects the fact that under commodity standards (such as the gold standard), increases in the price level (which were frequently associated with wars) tended to be reversed, resulting in a price level that was stable over long periods. No such tendency is apparent under the fiat standards that most countries have followed since the breakdown of the gold standard between World War I and World War II.

The distinction between commodity and fiat monetary standards is probably the most important difference between monetary regimes. Under a commodity standard—whether gold, silver, some combination of the two, or something else—the monetary authority or central bank has absolutely no discretionary authority. Commodity standards are the most binding form of rule we consider. Since the collapse of the gold standard, no country that

Figure 1
The Price Level Under Commodity and Fiat Standards



NOTES: Log scale. Data are levels of consumer prices in the different countries.

SOURCE: Rolnick and Weber (1997).

we are aware of has adhered to a commodity standard.³ While many central banks continue to hold stocks of gold, the market value of these stocks bears no relation to the outstanding liabilities of the central banks.⁴

For part of the post–World War II period, the Bretton Woods system of fixed (but adjustable) exchange rates provided an alternative nominal anchor for most of the world. This system collapsed in 1971 and was followed by a decade or more of high inflation in most of the world's advanced economies and hyperinflation in some emerging market economies. Since the collapse of Bretton Woods, countries have tried many routes to price stability, which we review below. In the 1990s, a consensus emerged in the academic community that one of the most assured routes to price stability was to grant central banks greater independence from the political authorities, on the grounds that such independence seems to deliver better inflation performance at no cost in terms of real activity. This consensus grew out of the finding of Alesina and Summers (1993) that countries with independent central banks tended to have lower inflation and did not pay a price in terms of worse real outcomes. This finding has since been replicated for a larger number of countries.⁵ The greater independence that some central banks have been granted has in some cases been accompanied by the introduction of a formal inflation target, to constrain the central bank's actions and ensure that it remains accountable for its actions. Many economists argue that the combination of an inflation-targeting strategy for monetary policy and an independent central bank is the best route to price stability under a fiat monetary standard.

Fixed exchange rates can also be interpreted as an alternative monetary regime. However, in recent years, following the collapse of exchange rate pegs in Southeast Asia and other regions, fixed-exchange-rate regimes and exchange rate targeting have fallen out of favor as a strategy for monetary policy. A significant body of opinion argues that the only feasible exchange rate regimes for emerging market economies are either pure floats (where the monetary authorities allow the exchange rate to be fully determined by market forces) or hard pegs such as a currency board or outright dollarization.

This article views the various regimes as more or less successful attempts to resolve the time-consistency problem in monetary policy identified by Kydland and Prescott (1977) and elaborated upon by Calvo (1978), Barro and Gordon (1983), and numerous other authors. The adoption of one of these various rules or regimes can be viewed as an attempt on the part of national monetary authorities to tie their hands, to eliminate

³ There is some controversy about the exact date of the gold standard's demise. Some authors put it in 1914, at the outset of World War I, since the attempts to resume convertibility following the end of hostilities all ended in failure. Others put the date in 1931, when the United States formally abandoned the link between the dollar and gold. And others put it as late as 1971, when the United States stopped redeeming foreign central bank holdings of dollars for gold.

⁴ At the end of 2000, the United States held some 260 million ounces of gold reserves. Valued at market prices then prevailing (approximately \$270 an ounce), these reserves were worth about \$70 billion, while the outstanding stock of money base was \$612.7 billion. Indeed, in recent years many central banks have been selling their stocks of gold and investing the proceeds in alternative (income-generating) assets.

⁵ See, for example, Cukierman (1992). Banaian, Laney, and Willett (1983) is an early contribution to this literature.

the possibility of succumbing to the temptation to inflate their way out of a short-term crisis. The expectation is that by making such commitments, policymakers acquire credibility for their commitment to price stability, thereby creating a more favorable environment for real activity.

THE NEED FOR RULES: TIME INCONSISTENCY IN MONETARY POLICYMAKING

The theoretical potential for time inconsistency arises in any context in which a policymaker makes decisions so as to maximize some objective function over time, even if this function is unchanging over time and identical to that of the private sector. For example, the objective function could be the preferences of the average or representative household over consumption and leisure today and indefinitely far into the future. In other words, the source of the time-consistency problem is *not* preferences that change over time or preferences on the part of the policymaker that are at variance with those of the public. Rather, the problem arises because the optimal outcome takes into account the effect of *future* policy on the private economy's behavior in all periods between now and then. Once that future comes about, however, these earlier private-economy actions are already history, and without a commitment to those earlier decisions for the upcoming periods, the government in general will realize it can do better, conditional on that history, by altering the previously determined policy plan.

Examples of the time-consistency problem are the temptation to tax capital (physical or human) already accumulated, the temptation to eliminate patent protection on new products once they have been developed, and the temptation to reduce the value of outstanding government debt by running a surprisingly high inflation (in the sense that it's higher than that implied by the optimal policy determined at a much earlier date and also higher than the public expected when they purchased the government's debt). Of course, rational private-sector decisionmakers are unlikely to be fooled in this sense more than once or twice.

More formally, consider a government that formulates an optimal plan for policy actions (denoted by π) for the current and all future periods.⁶ Denote the optimal plan chosen at date 0 as $\{ {}_0\pi_t \}_{t=0}^{\infty} = \{ {}_0\pi_0, {}_0\pi_1, {}_0\pi_2, \dots \}$, where ${}_0\pi_t$ denotes the optimal choice for π_t as of date $t = 0$. At date $t = 1$, the government recalculates its optimal plan for the current and all future periods, and the new plan is denoted $\{ {}_1\pi_t \}_{t=1}^{\infty} = \{ {}_1\pi_1, {}_1\pi_2, {}_1\pi_3, \dots \}$. If the original choices for policy remain optimal when the plan is reconsidered one period later (and the policymaker has not received any new information)—that is, if ${}_1\pi_t = {}_0\pi_t$ for all $t \geq 1$ —the original plan is time consistent. If the original plan no longer appears optimal from the point of view of the future once the future arrives, the original plan is time inconsistent.

Our contention, which follows readily from economic theory, is that recent proposals to set up alternative institutional arrangements for monetary policy represent attempts to commit against future temptations to deviate from the optimal policy (through the creation of a monetary union, the adoption of a currency board to replace the central bank, outright dollarization, or the adoption of inflation, money, or exchange rate targeting by

⁶ The policy actions π may simply be tax rates or inflation rates or may be functions that determine tax rates or inflation rates as functions of the state of the economy.

a more or less independent central bank). Specifically, these arrangements can be viewed as attempts by governments to tie their hands in advance, so that when faced with the temptation to surprise the private sector, they find it difficult to do so.

THE EMPIRICAL IMPORTANCE OF THE TIME-CONSISTENCY PROBLEM IN ACCOUNTING FOR INFLATION

Since we use the time-consistency perspective to evaluate various monetary regimes, it is worth asking whether this perspective can account quantitatively for the inflation experience of countries that do not follow rules of one sort or another. Blinder (1998) argues that whatever chance the time-consistency problem has at explaining the acceleration in inflation in the United States from the mid-1960s through 1980, it can't explain the subsequent stabilization and decline in U.S. inflation. He argues that

...the real-world cure to the alleged "inflation bias" problem did not come from adopting rigid precommitment ("rules") or other institutional changes, as Kydland–Prescott and Barro–Gordon suggested. It came from determined but discretionary application of tight money. Rather than seeking short-term gains, central banks paid the price to disinflate. As in the Nike commercial, they just did it. (Blinder, 1998, 41)

Blinder goes on to argue that

Rarely does society solve a time-consistency problem by rigid precommitment or by creating incentive-compatible compensation schemes for decisionmakers. *Enlightened discretion is the rule.* (Blinder, 1998, 49, emphasis added)

Blinder (1999) provides further evidence to support this perspective. From surveying central bankers on their views about how central banks acquire credibility, he finds that most believe credibility can only be earned by building up a good track record. Few central bankers in Blinder's survey attribute much importance to theoretical ideas like precommitment or incentive-compatible contracts.⁷

Ireland (1999) makes one of the few attempts to examine the ability of the time-consistency perspective to account for the evolution of inflation. He argues that the positive model of time-consistent monetary policy developed by Barro and Gordon (1983) implies certain long-run restrictions on the empirical relationship between inflation and unemployment that cannot be rejected using U.S. data. Specifically, as the natural or long-run unemployment rate increases, so, too, will the pressure on monetary policymakers to use inflation to alleviate unemployment. This is exactly what we

⁷ Other recent critics of the importance of the time-consistency problem in accounting for the evolution of U.S. inflation include DeLong (1997) and Taylor (1997). Both argue that the key to explaining the acceleration of U.S. inflation in the 1970s and subsequent deceleration in the 1980s is learning on the part of policymakers about how the economy works. The acceleration was due to the spread of the belief that there is an exploitable Phillips curve trade-off between inflation and unemployment. The decline in the 1980s and 1990s was due to policymakers' growing acceptance of the natural-rate view that there is no long-run trade-off. This idea—that policymakers' gradually learning about the natural-rate hypothesis explains the history of inflation in the United States—is explored in more detail in Sargent (1999).

see in U.S. data for the 1970s. The decline in inflation in the 1980s and 1990s coincided with a decline in the natural rate of unemployment, again in keeping with the model. The Barro and Gordon model emphasizes the inflation bias that emerges from the attempt to stabilize output. In many settings, governments and central banks may succumb to the temptation to engineer a surprise inflation for other reasons, such as alleviating revenue shortfalls.⁸

COMMODITY STANDARDS: GOLD, SILVER, AND BRICKS

The earliest monies were all commodity monies.⁹ Over time, precious metals became the dominant form of commodity money, in particular gold and silver. A number of characteristics (durability, divisibility, portability, and so forth) made these metals particularly attractive as media of exchange. The emergence of the gold standard as the dominant basis for monetary systems in the late nineteenth century was to some extent an accident of history. However, the key features of the gold standard that made it a successful monetary constitution or regime are shared by commodity standards more generally. While the gold standard is the best known of the various commodity standards, there is no reason the backing of the money stock ought to be limited to gold or silver.¹⁰ The basic idea behind a commodity standard is that the monetary authority or government pegs the price of a particular commodity or bundle of commodities by standing ready to buy or sell units of the commodity or commodity bundles in unlimited quantities at a fixed national currency price.

Determination of the price level under a commodity standard is relatively straightforward.¹¹ If we let q denote the nominal price at which the central bank stands willing to buy and sell the commodity backing the currency and Q_m denote the stock of the commodity held by the central bank, the stock of money outstanding is given by

$$M^s = \frac{1}{\lambda} q Q_m,$$

where $0 < \lambda \leq 1$ denotes the degree to which the money stock is backed by the commodity. If $\lambda = 1$, the currency is fully backed. Assume that the demand for nominal money balances depends on the general price level,

⁸ There do not appear to have been any attempts to evaluate quantitatively the ability of the time-consistency problem to account for inflation in countries where revenue raising may have been the dominant motive for inflation. However, casual inspection of data on the ratios of government deficits and government debt to GDP for a number of Latin American countries reveals a strong association with inflation rates, in keeping with the time-consistency story.

⁹ See Einzig (1930) for a thorough review of the range of commodities that have served as money in primitive societies.

¹⁰ A number of authors proposed general commodity standards, for example Benjamin Graham (1937, 1944) and Frank Graham (1942). Hall (1982) proposed a commodity standard based on a bundle of commodities that he termed the ANCAP standard (for the commodities in the bundle: ammonium nitrate, copper, aluminum, and plywood). One of the most unusual proposals for commodity backing of money was the brick standard of C. O. Hardy, which is discussed at some length in Buchanan (1962).

¹¹ For an extended exposition of the determination of the price level under the gold standard, see Barro (1979).

P , the level of real economic activity, y , the opportunity cost of holding nominally denominated assets, and possibly other factors, which we denote by z . For simplicity, assume that the opportunity cost of holding nominal money balances consists solely of expected inflation, π^e , so that the demand for money is given by

$$M^d = f(\pi^e, z)P_y,$$

where $f_1 < 0$ (higher expected inflation reduces the demand for nominally denominated assets). Equating the supply and demand for money, the price level is given by

$$P = \frac{qQ_m}{\lambda f(\pi^e, z)y}.$$

Examination of the condition for the equilibrium price level illustrates how the price level may fluctuate under a commodity standard. Growth of real economic activity, y , will require that the central bank expand its holdings of the commodity or commodities that back the currency, Q_m , at the same rate the economy is growing if the price level is not to fall.

Fixity of the price q at which the central bank stands ready to buy or sell the commodity backing the currency is the key to the interpretation of commodity standards as rules. The most common objection to a commodity standard is the resource cost of maintaining a commodity base.¹² As economies become more financially sophisticated, it becomes possible to replace some or even all the circulating medium with intrinsically worthless notes and coins. Indeed, most countries followed this path as they developed. The resource cost of backing these notes and coins is still incurred to the extent that the central bank continues to back the currency 100 percent. However, the bank may hold less than 100 percent reserves as it becomes more confident that not all currency holders are likely to try to redeem it at the same time.¹³ But in general, backing of the money stock by real resources (that is, any $\lambda > 0$) entails some cost to society.¹⁴

This cost should be weighed against the benefit from long-term price stability that adherence to a commodity standard may entail. Yet textbook comparisons of commodity and fiat monies rarely mention these potential benefits. Friedman (1986) draws attention to the real resource costs associated with the decline in long-run price predictability under fiat standards. He cites as examples the real resources that individuals use to insulate themselves against future inflation (including resources spent on financial planning and the accumulation of precious metals), the real resources that went into the development of new financial instruments to allow individuals with small asset holdings to benefit from higher interest rates, and the real resources that went into the development of new futures markets.

¹² For example, Friedman (1953, 1960).

¹³ Under the classical gold standard, many central banks were legally required to hold between 33⅓ percent and 50 percent gold reserves. See Bordo and Eichengreen (1998).

¹⁴ By comparison, under a fiat standard the resources tied up in the currency are trivial. During fiscal 2000, the Bureau of Engraving and Printing (BEP) billed the Federal Reserve System an average of \$.045 per note. The cost to the BEP of producing a note was \$.02265. During 2000 the BEP delivered just over 9 billion notes to the Federal Reserve System, with a face value of about \$67 billion. The average cost of producing a penny is currently \$.00835, while the cost of producing other coins (nickels, dimes, and quarters) is \$.03127.

Other authors compare the volatility of real activity under the gold standard with that under the fiat standard. Conventional wisdom holds that real activity is a lot less volatile under the postwar fiat standard than it was under the prewar gold standard. However, the conventional wisdom has been challenged. Comparing the pre- and postwar periods is difficult given the poorer quality of the statistics for the prewar period. In a series of influential papers, Romer (1986a, 1986b, 1989) points out that many of the supposed facts about the greater stability of the postwar period in the United States were artifacts of the way data on unemployment, industrial production, and gross national product were constructed for the prewar period. Watson (1994) provides further evidence to support the idea that real activity was not as volatile during the gold standard period as is commonly thought, showing that the apparent lengthening of business-cycle expansions in the postwar period compared with the prewar period was due to changes in the way the National Bureau of Economic Research chose prewar and postwar business-cycle reference dates.

Another argument made against commodity standards is the problem of fluctuations in the price of the commodity bundle relative to prices in general, and especially consumer prices. From a welfare perspective, it is the latter that we want to stabilize. Hall's ANCAP standard was devised with this consideration in mind: The choice of commodities was based on their correlation with the U.S. Consumer Price Index. However, this begs the question of why stop with just five commodities; why not broaden the basket of goods to include everything in the consumption bundle of the average household? Doing so would bring us close to the pure price-level-targeting variant of inflation targeting.

FIXED EXCHANGE RATE REGIMES AS COMMITMENT DEVICES

Perhaps the most common rule for monetary policy in the latter half of the twentieth century was some form of pegging or targeting of the exchange rate. The Bretton Woods system of fixed (but adjustable) exchange rates, which prevailed for about a quarter of a century (through 1971), delivered a modicum of stability for most countries. Following the collapse of this system, developed and developing countries adopted a variety of pegs. The European Monetary System (EMS)¹⁵ was created in 1979 and evolved into Economic and Monetary Union (EMU) (discussed in more detail below). Many other countries chose to peg to the currencies of large, low-inflation countries. By the mid-1990s, outside of Europe the dollar had become the currency of choice to which to peg, due in part to the superior inflation performance of the United States.

Exchange rate pegs have fallen from favor in recent years. The 1990s saw a series of financial crises in countries that followed exchange rate pegs, starting with the Exchange Rate Mechanism crisis in Europe in 1992–93, followed by the Mexican crisis in 1994, the Asian crisis in 1997, Brazil and Russia in 1998, and Turkey in 2000–01. Some have argued (for example, Mishkin 1999) that a key reason for the failure of exchange rate pegs is that in many cases, they don't alleviate the time-consistency problem confronting monetary policymakers. Instead of providing a commit-

¹⁵ The EMS had two key components: the Exchange Rate Mechanism (ERM), which limited fluctuations in participants' currencies, and the European Currency Unit (ECU), a basket of the currencies of twelve European countries, used for setting exchange rates and accounting within the European Union.

ment mechanism that allows governments to resist the temptation to inflate their way out of problems, exchange rate pegs exacerbate the time-consistency problem by making central bank actions less transparent and less accountable. The reason is that with a pegged exchange rate, the central bank loses useful information (the daily value of the currency on the foreign exchange markets) about the stance of monetary policy. In the absence of a peg, the fear of depreciation may make a central bank less likely to pursue a time-inconsistent inflationary monetary policy.

The experience of the 1990s has led many to argue that any form of exchange rate peg short of a currency board, dollarization, or monetary union is doomed to collapse. We now turn to these options.

CURRENCY BOARDS AND DOLLARIZATION AS EXTREME FORMS OF PEGGING

During the 1990s there was a revival of interest in the use of currency boards as an option for creating monetary stability in developing countries. Currency boards originated in the British colonies but fell from favor over the course of the twentieth century. Many newly independent nations saw currency boards as holdovers from the colonial era and replaced them with central banks.¹⁶ Argentina reversed this trend in 1991 with the adoption of the Convertibility Law, which tied the peso to the U.S. dollar at parity through a currency board arrangement.¹⁷ Subsequently, a number of countries have adopted the currency board model, linking their currencies to the Deutsche mark/euro (Estonia, Bulgaria, Lithuania, and Bosnia-Herzegovina).

A currency board works much like a commodity standard. Under a currency board, the stock of domestic money in circulation is backed by foreign currency reserves, and the central bank or monetary authority commits to buying or selling the domestic currency in unlimited quantities at some pre-announced exchange rate. That is,

$$M^s = \frac{1}{\lambda} q Q_m,$$

where λ denotes the degree to which the domestic currency is backed by foreign currency, q denotes the exchange rate between the domestic currency and the foreign currency to which it is linked, and Q_m denotes the monetary authority's holdings of foreign currency. Under a textbook currency board arrangement, the domestic base is fully backed by foreign reserves, so $\lambda = 1$. However, it is not unusual for currency boards to have less than 100 percent backing: For example, the Convertibility Law governing Argentina's currency board only required 80 percent backing of the base.¹⁸

¹⁶ See Ghosh, Gulde, and Wolf (2000) for a review of the historical performance of currency boards.

¹⁷ See Zarazaga (1995, 1999) for a discussion of the Argentine experience.

¹⁸ Indeed, this feature of Argentina's currency board made it even more like the contingent rule interpretation of the gold standard proposed by Bordo and Kydland (1995, 1997). The reason for allowing less than complete backing of the currency with foreign reserves was to give the Argentine central bank some leeway in responding to domestic financial crises. In early 1995 Argentina was confronted with just such a crisis, and the central bank responded by acting as a lender of last resort to stem the crisis.

The U.S. dollar is used alongside the peso in Argentina, and some have suggested that Argentina take the extra step of replacing the peso altogether and relying only on the dollar to achieve greater price stability. The gain in stability over that obtained under a currency board is difficult to quantify but is presumably real.¹⁹ The cost is the loss of seigniorage revenue that the country would otherwise earn from issuing its own currency. The quantitative significance of seigniorage revenue differs greatly across countries. Fischer (1982) presents estimates that show the typical order of magnitude of seigniorage income relative to GDP is around 1 percent, although it tends to be somewhat higher in less-developed economies. To the extent that a decision on the part of, say, Argentina, to dollarize increases the demand for U.S. currency, the U.S. taxpayer would benefit in the form of increased seigniorage revenue, and the Argentine taxpayer would lose.²⁰

MONETARY UNION

Dollarization is essentially an asymmetric monetary union, because one country adopts another country's currency as its own but does not have any say in the management of that currency. In symmetric monetary union, a group of countries shares a common currency and jointly manages the currency. Monetary unions of either type are relatively rare. Until recently they have typically existed between very small countries and a larger neighbor. One of the oldest asymmetric monetary unions was that between Belgium and Luxembourg. All the European microstates (Andorra, Liechtenstein, Monaco, San Marino, and Vatican City) use the currencies of their larger neighbors. Symmetric monetary unions are even rarer. The recent launch of Economic and Monetary Union (EMU) in Europe is thus of enormous significance: This is the first time in history that a group of large and small sovereign nations has pooled sovereignty over money to share and jointly manage a common currency.²¹

A symmetric monetary union is at least as strong a commitment mechanism as a currency board or dollarization and has the further advantage that participating countries obtain some share of the seigniorage revenue generated by the common currency along with a say in the conduct of

¹⁹ Fischer (1982) presents one of the earliest discussions of how dollarization might help resolve the time-consistency problem in monetary policy, noting, "There is no absolutely guaranteed way of providing discipline for governments determined to avoid it. But the discipline imposed by use of a foreign currency is greater than that imposed by fixity of the exchange rate, which is greater than that imposed under a flexible-rate system. This is, therefore, a serious argument for use of a foreign money" (Fischer, 1982, 300).

²⁰ However, Senator Connie Mack introduced a bill (S.2101) that would reimburse countries adopting the U.S. dollar.

²¹ Prior to the launch of EMU, the only other symmetric monetary unions were the Eastern Caribbean Monetary Union (ECMU) and the CFA franc zone in West Africa. The ECMU consists of Antigua and Barbuda, Dominica, Grenada, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines. The countries all use the Eastern Caribbean dollar, which is pegged to the U.S. dollar at the rate EC\$4.80 = US\$1. The common currency is managed by the Eastern Caribbean Central Bank. (See van Beek et al. 2000 for a review of the Eastern Caribbean Monetary Union.) The CFA franc zone consists of Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Comoros, Republic of the Congo, Ivory Coast, Gabon, Mali, Niger, Senegal, Togo, Equatorial Guinea, and Guinea-Bissau. The CFA franc is pegged to the French franc at a rate of 100 CFA francs = 1 French franc through a currency board arrangement.

monetary policy for the common currency area. The loss of monetary sovereignty is less than under either a currency board arrangement or outright dollarization, which may make symmetric monetary union a more attractive alternative. However, shifting responsibility for monetary policy from the national to the supranational level leaves open the question of how the central bank managing the common currency will conduct monetary policy.

One option would be to create a super currency board along the lines of the Eastern Caribbean Central Bank. But this simply raises the awkward issues about monetary sovereignty (albeit in a weaker form) once again, except at a higher level. The challenges facing the central bank managing the common currency of a symmetric monetary union are almost identical to those facing the central banks managing the currencies of the larger industrial economies. As noted at the outset, there is a consensus in the academic literature that institutional design can alleviate the problems of time consistency for central banks operating under a fiat standard. This is what we consider next.

INSTITUTIONAL ARRANGEMENTS: CENTRAL BANK INDEPENDENCE

Why was the Bundesbank so much more successful at preserving the purchasing power of the Deutsche mark during the fifty-odd years of its existence than were other central banks at preserving the purchasing power of the currencies in their care? If the institutional design of the Bundesbank was the key contributor to price stability in Germany, that design presumably could be implemented equally successfully in other settings. But if it was something else (for example, a stronger aversion to inflation on the part of the German public than elsewhere), merely copying the Bundesbank model could not be expected to lead to equally good outcomes.

One response to the time-consistency problem is to delegate control over monetary policy to an independent central bank and mandate that the central bank conduct policy in a manner conducive to long-term price stability. As noted above, a significant body of research documents a strong positive correlation between central bank independence and desirable inflation outcomes, with no cost in terms of real performance. This has led to a global trend toward greater central bank independence, along with, in many cases, a clear mandate for the pursuit of price stability. Perhaps the most dramatic recent example of this is the decision by twelve countries of the European Union (EU) to cede control over monetary policy to the European Central Bank (ECB).²² The ECB enjoys an extraordinary degree of independence from EU political authorities. The legislation governing the ECB is an international treaty rather than an act of a national parliament.²³ The treaty can only be changed with the unanimous consent of all signatories, making alterations very difficult. The treaty itself also guarantees the ECB's independence. Article 108 states:

When exercising the powers and carrying out the tasks and duties conferred upon them by this Treaty and the Statute of the ESCB, neither the ECB, nor a national central bank, nor any member of their decision-

²² The twelve are Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain.

²³ The treaty was originally known as the Maastricht Treaty and was subsequently amended by the Amsterdam Treaty. The EU publication "Selected Instruments Taken from the Treaties" refers to the relevant treaty as the Treaty on European Union.

making bodies shall seek or take instructions from Community institutions or bodies, from any government of a Member State or from any other body. The Community institutions and bodies and the governments of the Member States undertake to respect this principle and not to seek to influence the members of the decision-making bodies of the ECB or of the national central banks in the performance of their tasks.

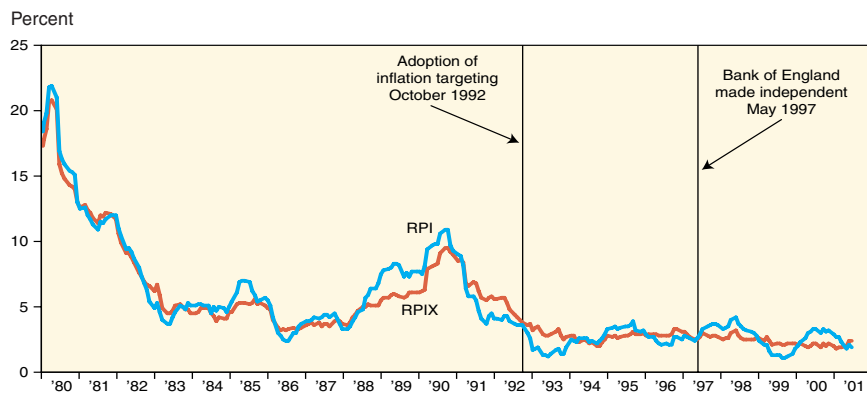
The ECB’s ability to pursue a monetary policy focused on long-run price stability is enhanced by the treaty provision that the ECB’s primary objective will be price stability and that the ECB will only be required to support other EU economic policies to the extent that doing so does not compromise its primary objective (Article 105). These and other aspects of the legislation governing the ECB are modeled on the legislation governing the Bundesbank, and the expectation is that with similar institutional design the ECB will deliver as good a performance in terms of price stability as the Bundesbank did.

The adoption of an inflation-targeting strategy for monetary policy has accompanied the trend toward greater central bank independence. Inflation targeting originated in New Zealand in 1990 and has since been adopted by the UK, Sweden, Canada, and several other countries.²⁴ Figure 2 shows the UK’s impressive inflation performance since the adoption of inflation targeting. Other inflation-targeting central banks have posted comparable performances during the same period. Interestingly, none of the three biggest central banks (the Federal Reserve, the ECB, and the Bank of Japan) has adopted inflation targeting, despite significant research extolling the virtues of this approach.

WHAT MAKES FOR A GOOD RULE?

One of the gold standard’s most important features was its *transparency*. When countries were continually on the standard, it was easy to

Figure 2
United Kingdom Inflation, 1980–2001



NOTES: Annual (year-over-year) increase in selected measures of consumer prices in the UK. The Retail Price Index (RPI) is the primary measure of consumer inflation in the UK. The Bank of England’s inflation target is defined in terms of the RPI less mortgage interest costs (RPIX).

SOURCE: Haver Analytics.

²⁴ See Bernanke et al. (1999) for a good overview of inflation targeting in the past decade.

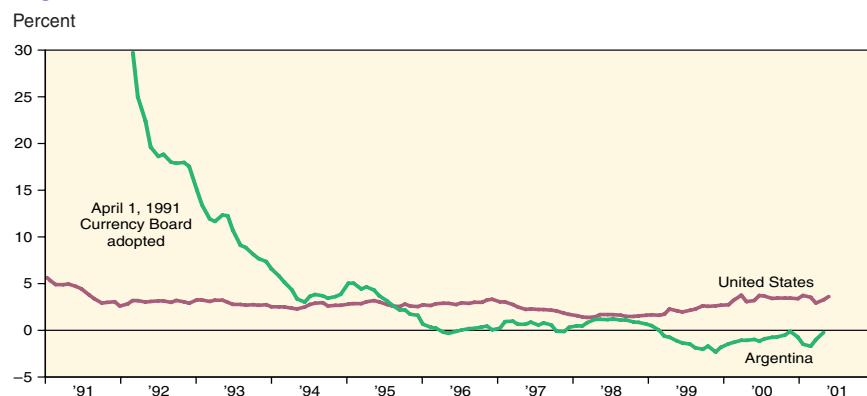
assess whether the promised policy was indeed being carried out. The essence of the gold standard was that each country would define the price of gold in terms of its currency and keep the price fixed. This involved defining a gold coin as a fixed weight of gold, called, for example, one dollar. Thus, in the United States during the gold standard period, one dollar was defined to be equal to 0.04838 ounces of gold. The monetary authority was committed to keeping the mint price of gold fixed through the purchase and sale of gold in unlimited amounts.

A possible detraction from its transparency was the fact that the gold standard rule was a *contingent* one. When a major national emergency arose—usually a war but in a few instances a severe financial crisis—the gold standard was suspended, supposedly as a temporary measure, on the presumption that after the emergency had passed, the gold standard would be resumed at its former parity after a reasonable delay. The key is that the contingency was well understood. Britain, France, and the United States took advantage of such suspensions during wartime. They suspended specie convertibility, issued fiat currency, and sold government bonds denominated in fiat currency. They also restored parity after the emergency (except, of course, after World War I, when the gold standard finally broke down).

Transparency is also a characteristic of exchange rate pegs, especially hard pegs of the currency board variety. There is abundant evidence that currency board arrangements deliver superior inflation performance. (See Ghosh, Gulde, and Wolf 2000 for a comprehensive review.) Figure 3 shows Argentina's inflation performance under the currency board. It is not difficult to argue that it is a significant improvement over what went before.²⁵ Other countries employing currency board arrangements have also done well.

The parallels between the gold standard and currency boards, while illuminating, are incomplete. The choice of anchor currency matters: Argentina would not have been as successful at controlling inflation in the 1990s had it linked the peso to a currency that was more prone to inflation than

Figure 3
Argentine Inflation, 1991–2001



NOTE: Rate of increase in CPI for Argentina and All Items CPI-U for the United States.

SOURCES: Haver Analytics; International Financial Statistics.

²⁵ The subsequent collapse of Argentina's currency board in January 2002 was accompanied by an acceleration of inflation.

the U.S. dollar. Yet it would appear that the U.S. dollar should not have been as stable a currency in the post–gold standard era as it has been. The Federal Reserve System tends to score well in international comparisons of central bank independence, yet it remains a creature of Congress. What might account for the ability of the Fed to deliver relative price stability over long periods?

It is important to remember that monetary policy cannot be divorced from fiscal policy. For one thing, the two are intimately connected via the government budget constraint. For example, during the heyday of the gold standard, the sources of emergency taxation were quite limited. Hence, not only was it natural to make the gold standard contingent on wars, one can even argue that the gold standard was essential to protect the nation in case of a war. At the time of the gold standard's abandonment, however, other sources of emergency financing had become much more plentiful, at least in developed economies. Two examples are the taxation of human capital (through the progressiveness of income taxes) and physical capital. The United States relied heavily on both sources of revenue to finance World War II and repay the extraordinary government debt accumulated during the war. Not all countries are in such a strong fiscal position. In nations that have experienced severe hyperinflations, such as Germany after World War I and several Latin American countries in the 1970s and 1980s, the need to finance large budget deficits helped bring on those hyperinflations.

The benefit a country like Argentina expected to derive from anchoring its currency to the dollar in part reflected a belief that the United States is fiscally sound. Consequently, there is little likelihood that fiscal pressure will compromise the pursuit of a stability-oriented monetary policy. For example, all but one state (Vermont) require balanced budgets by law. In contrast, a perennial source of difficulty in Argentina has been the provinces' ability and inclination to spend more than they raise in tax revenues, requiring subsequent bailouts by the federal government (Zarazaga 1999). There are interesting parallels here with the institutional framework for the ECB. To immunize the ECB from pressure to monetize debts built up by the member states, Article 104 of the Maastricht Treaty (Article 101 of the Amsterdam Treaty) prohibits the ECB from offering overdraft facilities to the governments of the member states and from purchasing debt instruments directly from them. Recognizing the importance of fiscal policy for monetary policy, the Maastricht Treaty also requires national governments to adhere to deficit guidelines, and the Growth and Stability Pact provides for a series of penalties if a country fails to meet these guidelines.

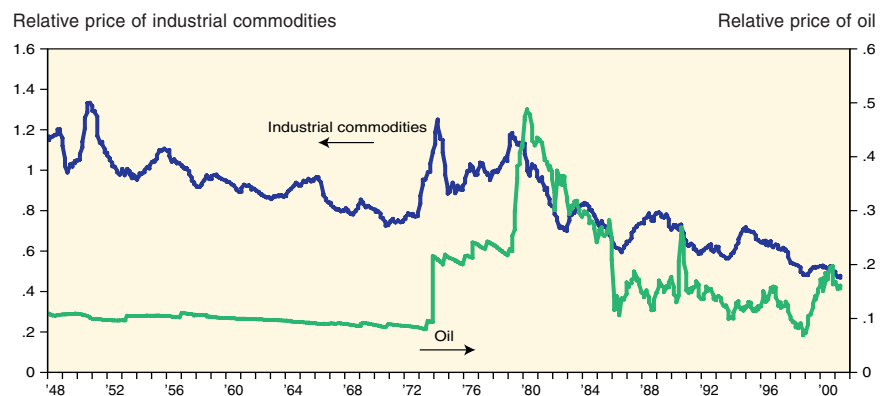
It is tempting to compare the gold standard rule with the less strict targeting of either an inflation rate or a (possibly slow-growing) price level. Because the inflation rate is simply the rate of growth of the price level, it may seem that these two alternatives would lead to the same outcome. This could happen if shocks to the demand for money are small. Most of the 1990s may have been such a period. Fluctuations in real activity were mild by historical standards. However, suppose we were to enter a period with variation in real activity more similar in magnitude to that seen in the 1970s and 1980s. Quantitative analysis using model economies tells us that smooth growth of the money stock would then be associated with substantial variation in the price level (and as a consequence, the inflation rate). The central bank certainly would not be able to offset these price fluctuations while maintaining a transparent policy. Under such circumstances, does it matter whether the price level itself or, alternatively, its rate of growth (the inflation rate) is the subject of the targeting?

While neither of these two alternatives is as firm a commitment or as transparent as the gold standard, targeting the price level, in the hands of the right central bank, could come reasonably close. The central bank would set a target path for the price level into the indefinite future. With real shocks affecting the demand for money, this path would presumably include a band of acceptable movement away from the target path (quantitative economic theory, combined with the history of price movements, would suggest how wide the band should be), and the central bank would tighten or loosen monetary policy as the boundaries of the path are approached. (Here's where some transparency may be lost.) As long as the price level is brought back to the target path in the aftermath of shocks, the outcome may resemble that under the gold standard (where gold discoveries caused some fluctuation in the price level as well).

Suppose, as an example, we set the target growth rate of the price level at 3 percent per year. Wouldn't a target inflation rate of 3 percent accomplish the same thing as a price-level target path? The problem is that it's hard to think of an operational and transparent way to carry out inflation targeting and at the same time avoid considerable permanent drift away from the price-level path corresponding to a 3 percent rate of increase. If real shocks occur, either raising or lowering the inflation rate, how does the central bank decide whether to tighten or loosen monetary policy, and if so, by how much? Is it possible to define situations analogous to those arising under price-level targeting in which nothing is done in response to a shock because it leaves the price level sufficiently close to the center of the target band? Can the public tell whether the announced policy is being followed, and can the central bank thus maintain its credibility?

In practice, some central banks appear to have experienced considerable success with inflation targeting (New Zealand, UK, Sweden, and others). As alluded to above, we conjecture that this apparent success is primarily due to the benign real environment experienced in the 1990s, an environment that has no counterpart in previous decades. What if we again experience shocks like those in the 1970s and 1980s? Figure 4 is a useful reminder of just how difficult were the challenges faced by monetary

Figure 4
Real Price of Oil and Industrial Commodities, 1948–2001



NOTES: Real price of oil is the price of West Texas Intermediate deflated by the U.S. All Items CPI-U.
 Real price of industrial commodities is the *Journal of Commerce* industrial commodities price index deflated by the U.S. All Items CPI-U.

SOURCE: Haver Analytics.

policymakers in the 1970s and how benign the policy environment has been in recent years. Recent oil price increases have been minor compared with what the industrial world experienced in the 1970s, and commodity prices have also behaved in a generally favorable manner.

CONCLUSIONS

There is no obvious hierarchy of monetary regimes. Typically, monetary economists draw a distinction between commodity money standards and fiat money standards. Under a commodity standard, money consists of or is backed by some intrinsically valuable commodity. The best known such standard is the gold standard. Under a fiat standard, money is unbacked. Most of the world has operated under such a standard since 1971. However, under fiat standards countries have pursued different strategies to stabilize the purchasing power of their currencies. One approach is to isolate the central bank from short-term political pressures by granting it independence. An alternative is to link the currency to a more stable one through exchange rate pegging, a currency board, or formal dollarization. Monetary union along the lines of EMU is an attempt to resolve the time-consistency problem by outsourcing monetary policy to a supranational institution. In this article we use the time-consistency perspective on optimal economic policy as a framework for thinking about different monetary regimes or constitutions. Our review of various countries' experiences and their varying degrees of success suggests that we may come close but will never fully solve this problem.

The Swedish experience under the gold standard illustrates the impossibility of tying one's own hands completely. During the period in which Sweden adhered to the gold standard (1873–1914), the Swedish constitution guaranteed the convertibility into gold of banknotes issued by the Bank of Sweden.²⁶ Furthermore, laws pertaining to the gold standard could only be changed by two identical decisions of the Swedish Parliament, with an election in between. Nevertheless, when World War I broke out, the Bank of Sweden unilaterally decided to make its notes inconvertible. The constitutionality of this step was never challenged, thus ending the gold standard era in Sweden.

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²⁶ See Jonung (1984).

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