3   The gold standard as a commitment mechanism

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Introduction

The gold standard has been a subject of perennial interest to both economists and economic historians. Attention has focused on three aspects of the gold standard's performance: as an international exchange rate arrangement; as a provider of macroeconomic stability; and as a constraint on government policy actions.

The balance of payments adjustment mechanism, or the links between the money supplies, price levels, and real outputs of different countries under fixed exchange rates, has long been studied as the key aspect of the international exchange rate arrangement of the gold standard.[1] The durability of fixed exchange rates, the absence of exchange market crises, and the smooth adjustment to the massive transfers of capital in the decades before 1914 have been features stressed in monetary reform proposals ever since.

The gold standard has often been viewed as ensuring long-run, though not necessarily short-run, price stability via the operation of the Classical commodity theory of money. Recent comparisons between the classical gold standard and subsequent managed fiduciary monetary regimes suggest, however, that the record is mixed with respect both to price level and real output performance.[2]

Finally, the gold standard has also been viewed as a form of constraint over monetary policy actions – as a form of monetary rule. The Currency School in England in the early 19th century made the case for the Bank of England's fiduciary note issue to vary automatically with the level of the Bank's gold reserve ("the currency principle"). Following such a rule was viewed as preferable (for providing price level stability) to allowing the note issue to be altered at the discretion of the well meaning and possibly well informed directors of the Bank (the position taken by the opposing Banking School).[3]

In this chapter, we focus on the third aspect of the gold standard's performance – on the gold standard as a rule. However, our meaning of the

concept of a "rule" differs radically from what used to be the traditional one. In our view, a rule can be regarded as a way of binding policy actions over time. This view of policy rules, in contrast to the earlier tradition that stressed both impersonality and automaticity, stems from the recent literature on the time inconsistency of optimal government policy. Suppose the government calculates today an optimal plan, according to its objectives, for current and future policy choices. Now suppose that, some time in the future, the remainder of the plan is re-evaluated by calculating the optimal plan from then on. Assuming the objectives have not changed, is this plan simply the continuation of the original one? The answer generally is "no." This is what it means for government policy to be time inconsistent. Discretion, in this context, means setting policy sequentially, which then could lead to policies and outcomes that are very different from the optimal plan. The literature on time inconsistency has demonstrated that, in almost all intertemporal policy situations, the government would benefit from having access to a commitment mechanism preventing it from changing planned future policy. In this chapter, we use that literature as a framework for understanding the historical operation of the gold standard.

For the period from 1880 to 1914, the gold standard is often viewed as a monolithic regime where all countries religiously followed the dictates of the rule of a fixed price of gold. Before 1880, most countries were on a form of specie standard: either bimetallism or silver or gold monometallism. As we point out below, however, from our perspective the bimetallic standards that many countries followed were a variant of the gold standard rule. This is contrasted to the period since 1914, when central banks and governments to a great extent have geared their policies to satisfy more immediate objectives without considering intertemporal consequences in terms of lack of commitment to a long-run rule governing policy. In this chapter, we show that the rule followed by a number of key countries – England, the United States, and France – before 1914 was consistent with such a commitment. The experiences of these major countries suggest that the gold standard was intended as a contingent rule. By that, we mean that the authorities could temporarily abandon the fixed price of gold during an emergency (such as a war) on the understanding that convertibility at the original price would be restored when the emergency passed.

The next section presents a framework for discussing the benefits of being able to commit to future government policy. Moreover, it interprets the institutions of the gold standard era in light of this framework. We then survey the historical record on the adherence to the gold standard rule by three core countries: England, the United States, and France, and by a country that is generally believed not to have adhered to the rule: Italy. The final section attempts to draw some lessons from history.

The gold standard as a contingent rule

The value of commitment

A long-standing question in public finance is how to finance varying quantities of government expenditures in such a way as to minimize deadweight loss to society. In the last decade, this question, which dates back to the pioneering work by Ramsey (1927), has shifted more and more from static to dynamic environments. We shall argue that the intertemporal framework presented in this literature is the appropriate one for evaluating the operation of the gold standard.

The focus of this literature initially centered around the incentives (in the absence of a commitment mechanism to prevent the government from changing its policy rule in the future) for excessive taxation of capital income. Clearly, however, similar arguments can be made with respect to the taxation of (or default on) government debt. We discuss the source of time inconsistency of optimal policy in both contexts. We start with the former because capital income, at least in this century, probably would be a main source of emergency financing, for example during a war, for a government without the credibility to issue much debt. Then, we introduce government debt policy, which we contend is the major reason why the gold standard was adhered to in some countries for long periods of time.

Consider the following prototype model of optimal taxation.[4] The economy is inhabited by a large number of consumers who, for simplicity, are treated as identical. Each consumer maximizes infinite-horizon discounted utility,

$$E\Sigma_{t=0}^{\infty}\beta^t u(c_t, n_t, g_t, \sigma_t),$$

where c_t is consumption, n_t is hours of work, g_t is *per capita* government purchases, and β is the subjective discount factor. The parameter σ_t is stochastic and may indicate, for instance, how the value of defense expenditures varies over time depending on the political situation. There is little loss of generality, however, in simply assuming that the g_t process itself is exogenous. Thus, the typical consumer is assumed to maximize

$$E\sum_{t=0}^{\infty}\beta^t u(c_t, n_t, g_t) \tag{1}$$

subject to

$$k_{t+1} + c_t \leq k_t + (1-\theta_t)r_t k_t + (1-\tau_t)w_t n_t$$

and nonnegativity constraints. Here, w_t is the real wage rate, and θ_t and τ_t are the tax rates for capital and labor income, respectively. One can think

of k_t as including various forms of capital, with r_t being the rental income from owning the capital stock. With little modification, one could also include human capital, which in practice can be taxed more heavily, for example, by increasing the progressivity of the income tax schedule.

In this economy, consumers choose sequences of c_t, n_t, and k_{t+1}, while the government decides on sequences θ_t and τ_t. Interpreting aggregate quantities as measured in *per capita* terms, a formulation of the optimal taxation problem is: choose a sequence

$$\pi_0 = \{\theta_t, \tau_t\}_{t=0}^{\infty}$$

so as to maximize the typical consumer's utility function (1) subject to the government budget constraint

$$g_t \leq \theta_t r_t k_t + \tau_t w_t n_t$$

and the constraints implied by equilibrium aggregate behavior of the atomistic private agents. Their decisions can be written as sequences

$$x_0(\pi_0) = \{c_t(c_t(\pi_0), \quad n_t(\pi_0), \quad k_{t+1}(\pi_0)\}_{t=0}^{\infty};$$

in other words, the equilibrium aggregate private decisions at any time t depend on the entire sequence of government policy. The solution, π_0^*, to this optimal taxation problem, together with the associated equilibrium, $x_0(\pi_0^*)$, is sometimes called a Ramsey allocation.

The heart of the time consistency issue is as follows. Suppose π_0^* is the plan that solves the optimal taxation problem as of time zero. Imagine now that the analogous problem is contemplated as of time $s > 0$. The optimal taxation problem then has a solution π_s^*, which generally is different from the part of π_0^* that specifies the plan for periods $t = s, s+1, \ldots$. In other words, the original plan, π_0^*, is inconsistent with the passage of time. The reason is that π_0^* takes into account the effects of government policy planned for dates on or after period s on private behavior at dates before s. At time s, however, when π_s^* is computed, private behavior at earlier dates, of course, can no longer be affected.

This prototype model highlights two points. One is that the source of time inconsistency is not that the objective function of the government has a different form than the individuals' utility functions. Secondly, time inconsistency arises in spite of an unchanging objective function over time. Instead, the key factor is that decisions are made sequentially over time in environments in which future government policy affects current private behavior.

In the optimal plan, when an increase in g_t occurs, the effects on labor input of raising τ_t are weighed against the effects on savings behavior from changing θ_t. Once the capital stock is in place, however, the optimal plan

from then on, taking history up to that point as given, is to tax that capital more heavily, as it will be supplied inelastically, and to reduce future capital taxation. Of course, such an action by the government is likely to create the belief among the public that a similar change of plans will take place again some time in the future, government announcements to the contrary notwithstanding.

This framework assumes that the government balances its budget in every period. If the changes in government expenditures at times are large, for example during wars, the required changes in tax rates would severely reduce the incentives for economic activity just when the need for such activity is the greatest. Borrowing from the public gives the government the flexibility to smooth tax rates over time. The benefits of tax smoothing, not only during wars, but also under normal circumstances, are discussed in Barro (1979) and in Kydland and Prescott (1980b).

Introducing debt affects neither consumers' objectives nor those of the government. The key difference is in the budget constraints. To illustrate, we use notation that follows closely that of Chari and Kehoe (1989), who build upon the characterization of Ramsey policies with debt in Lucas and Stokey (1983). Consider the government budget constraint,

$$g_t + (1 - \delta_t)q_t \cdot b_t \le a_t + q_t \cdot b_{t+1}.$$

Here, a_t stands for tax revenue (the sum of revenue from capital and labor taxation and other sources, such as customs duties), δ_t is the rate of default on the government debt (usually because of inflation), and b_t is government debt of different maturities, treated as discount bonds, with prices q_t. We think of high-powered money (for example, greenbacks during the Civil War) as a form of debt and include it in b. Let $_s b_t$ be the amount of debt maturing in period s that is outstanding at the beginning of period t, and let $_s q_t$ be its corresponding price. Define the notation

$$q_t \cdot b_t = \Sigma_{s=t+1}^{\infty} {}_s q_t {}_s b_t.$$

In practice, the quantities $_s b_t$ will usually equal zero if s is large enough. In the case of a one-period bond, for example, the price $_{t+1} q_t$ of new debt issue is determined by

$$_{t+1} q_t = (1 - \delta_{t-1})/(1 + r_t),$$

where r_t is the interest rate between periods t and $t+1$, and δ_{t-1} is the default rate expected to prevail in period $t+1$.

The time consistency problem is that in the absence of a commitment mechanism, the government in period $t+1$ would like to default to a greater extent than the original plan specifies. Such default reduces the need for distortionary taxes, but also affects expectations of future defaults

and therefore the price q at which the public is willing to hold government debt. In Prescott (1977), for example, the government can finance a given stream of expenditures either through taxes on labor income (abstracting from capital) or by selling debt. For that model, Prescott finds that if the government has no commitment mechanism for future actions, the government will always default on outstanding debt to avoid levying distorting taxes. As a consequence, the equilibrium implies that government debt is zero and that the government always runs a balanced budget. This policy and the implied allocation are, of course, inferior to the Ramsey allocation for that model.

Some more recent papers investigate circumstances under which Ramsey policies are sustainable in the sense of being an equilibrium arising endogenously within the environment considered. Chari and Kehoe (1989, 1990) have studied this issue for situations in which time consistency problems can arise either because of capital taxation or because of the presence of government debt. An expository introduction is in Chari (1988). The typical finding is that a Ramsey allocation will not occur in equilibrium when the horizon is finite. When the horizon is infinite, on the other hand, the Ramsey allocation may be one among a large, usually infinite, number of equilibriums. The conditions that have been used to achieve this result restrict the applicability severely. What supports Ramsey policies as equilibriums in those cases is the belief by consumers that as long as the government has chosen Ramsey policies in the past, it will continue to do so.[5]

To overcome the shortcomings associated with the lack of an endogenous commitment mechanism, society may attempt to design such mechanisms, for example in the form of laws that are hard to change. Such is the case with patent protection. The law may ensure sufficient incentives for inventive activity by allowing firms the exclusive use of new inventions for a period of time without fear that the government will remove the patent right and allow the price of the product to be driven toward the competitive price. Our thesis is that, although the gold standard is easier to change than, for example, the patent law, this institutional arrangement has the potential for working as an explicit, transparent, well understood rule.

In an uncertain world, the Ramsey plan generally would be a contingent plan or rule. Strictly speaking, in a realistic environment the Ramsey plan would include many contingencies, some of which may make little difference to society's welfare. In the patent case, one can imagine that an optimal arrangement occasionally, under special circumstances, would permit non-exclusive use. Drawbacks of including many contingencies, however, are lack of transparency and possible uncertainty among the public regarding the will to obey the original plan. Thus, a practical rule may include only the contingency that is considered most important. In this sense, the rule

does not quite reach the maximum of the social welfare function, but the sacrifice is small. By discretion, then, we mean any purposeful deviation, under whatever guise, from such a rule. The excuse for such a deviation could be a "bad outcome," in the language of Grossman and van Huyck (1988), that is not included as a contingency in the original plan. Deviations are tempting because of their immediate benefits (perhaps accompanied by promises not to repeat the breach of the rule). Because of the effect on future beliefs, however, these benefits are outweighed by the long-run implications of having given up on the original, nearly optimal, rule.

The gold standard

The essence of the gold standard rule is that each country would define the price of gold in terms of its currency and keep the price fixed. This involves defining a gold coin as a fixed weight of gold called, for example, one dollar. The dollar in 1792 was defined as 24.75 grains of gold with 480 grains to the ounce, equivalent to $19.39 per ounce. The monetary authority was then committed to keep the mint price of gold fixed through the purchase and sale of gold in unlimited amounts. The monetary authority was willing to convert into coin gold bullion brought to it by the public, to charge a certain fee for the service – called brassage – and also to sell coins freely to the public in any amount and allow the public to convert them into bullion or export them.[6]

This rule applies to a pure gold coin standard. In fact, the standard that prevailed in the 19th century was a mixed standard containing both fiduciary money and gold coins. Under the mixed standard, the gold standard rule required that fiduciary money (issued either by private banks or by the government) be freely convertible into gold at the fixed price.

Most countries, until the third quarter of the 19th century, maintained bimetallic systems using both gold and silver at a fixed ratio. Defining the weight of both gold and silver coins, freely buying and selling them, and maintaining the ratio fixed can be viewed as a variant of the basic gold standard rule, since it is a fixed value of the unit of account that is the essence of the rule.[7]

A variant of the gold standard rule that we believe is particularly pertinent applies to the case of a war. Assume for the moment that a country finds the gold standard rule to have good operating characteristics if the gold standard is maintained under all circumstances except for a war. Let z_t equal one if the country is on the gold standard at time t and zero otherwise. Let h_i represent the start of war i and e_i its end. A reasonable rule could be to choose $z_t = 0$ if $t \in [h_i, e_i + d]$ for all i and $z_t = 1$ otherwise; in other words, it is understood that in order to finance the war, the gold standard will be

suspended for the duration of the war plus a delay period d, which is the same in every war. Such a policy, if implemented as planned, is consistent with a gold standard rule. It is clear that when people foresee a war in the near future, this rule will result in different prices q_t for the issue of new debt than under the unconditional $z_t = 1$ rule. These effects would be regarded as negative, although they presumably would be outweighed by the benefits of being better able to finance the war.

This description is consistent with the results of Lucas and Stokey (1983), in which financing of wars is a contingency rule that is optimal in one of their environments. In their example, where the occurrence and duration of the war are uncertain, the optimal plan is for the debt not to be serviced during a war. Under this policy, people realize when they purchase the debt that effectively it will be defaulted on in the event that the war continues. Under the rule, the sovereign maintains the standard – keeps fixed the price of its currency in terms of gold – except in the event of a major war, in which circumstances it can suspend specie payments and issue paper money to finance its expenditures, and it can sell debt issues in terms of the nominal value of its currency on the understanding that the debt will eventually be paid off in gold. The rule is contingent in the sense that the public understands that the suspension will last only for the duration of the wartime emergency plus some period of adjustment; it assumes that, afterward, the government will follow the deflationary policies necessary to resume payments.

In this situation, an example of discretion is, after war i has ended, to decide at time $e_i + d$ to delay further the resumption of the gold standard, perhaps as a result of the perceived current situation in terms of the fraction of the war that has been paid for and the undesirable effects of alternative means of financing, such as by raising taxes. This change is all the more tempting if the public had accepted the debt at a reasonably high price q in the expectation that the gold standard would be resumed as scheduled. If the government breaks the rule by effectively choosing a high default rate δ in the future, it is obvious that, should there be another war within memory of the previous one, then people's behavior would be quite different from that in the previous war, even if the situation is otherwise similar and the government claims to subscribe to the same fixed delay rule.

Finally, a second contingency aspect of the rule could arise during financial crises. Temporary restrictions on convertibility of bank liabilities could be used to reduce the extent of a banking panic.

Commitment mechanisms

How was the gold standard rule enforced? One possible explanation focuses on reputational considerations within each country. Long-run adherence to

the rule was based on the historical evolution of the gold standard itself. Gold was accepted as money because of its intrinsic value and desirable properties such as durability, storability, divisibility, portability, and uniformity. Paper claims, developed to economize on the scarce resources tied up in commodity money, became acceptable only because they were convertible into gold.[8]

In turn, the reputation of the gold standard would constrain the monetary authorities from breaching convertibility, except under well understood contingencies. Thus, when an emergency occurred, the abandonment of the standard would be viewed by all to be a temporary event since, from their experience, only gold or gold-backed claims truly served as money.

An alternative commitment mechanism was to guarantee gold convertibility in the constitution. This was the case in Sweden before 1914, where laws pertaining to the gold standard could be changed only by two identical parliamentary decisions with an election in between (Jonung, 1984, 368).

With respect to outright suspension of convertibility, it is difficult to distinguish between a suspension as part of the operation of a contingent rule as mentioned above, or as evidence of a change in regime. As we discuss below, statements by the monetary authorities, debates in Parliament, frequency of suspension, and changes in expectations as reflected in people's decisions all can be used to distinguish between the two.

Technical adjustments, or opportunity for discretion?

There are some aspects of the operation of a gold standard that are not so clear-cut. In designing its details (for example, the gold/silver ratio under bimetallism – a variant of the gold standard), it can be difficult to anticipate exactly what the optimal ratio is. New knowledge may be gained over time that would have been helpful when the standard was designed. When the new information is revealed, a potentially difficult question is what happens if the government goes ahead and makes the technical adjustment in the standard. If most people accept the claim that new information is the reason for the change, then the associated private behavior should be approximately the same as if this had been the standard from the very beginning. On the other hand, the greater the suspicion among the public that the change is partly a form of discretion, for which the government certainly has a strong incentive, the greater will be the change in private behavior reflecting the adjustment in the public's beliefs about likely future discretionary actions by the government. The same argument can be made regarding the choice of a different price when the gold standard is resumed after a temporary abandonment.[9]

An international rule

The gold standard rule also has an international dimension. Under the rule, there would be no restriction on the nationality of individuals who presented bullion to the mint to be coined, or who exported coin or bullion to foreign countries. Moreover, because every country following the rule fixed the price of its currency in gold, this created a system of fixed exchange rates linking all countries on the same standard. The international aspect of the gold standard may have been particularly important to the countries that were relatively less developed and therefore depended on access to international debt markets. The thesis of this chapter, however, is that the essence of the gold standard rule was as a domestic commitment mechanism. To the extent that the commitment was honored in relation to other countries, this served to strengthen the credibility of the domestic commitment.[10]

An aspect of the international gold standard given considerable attention in the literature is the operation of the "rules of the game." According to the traditional story, central banks or the monetary authorities were supposed to use their monetary policy to speed up the adjustment mechanism to a change in external balance. To the extent that the "rules" were followed, this presumably would strengthen the commitment to convertibility.

The enforcement of the international gold standard seems to have taken a particular form that was conducive to making it credible. A key factor may have been the role of England – the leading financial and commercial center of the gold standard era. The financial institutions of London provided the world with a well defined and universally accepted means, based on gold, of executing bilateral trades and obtaining credit. As we shall argue later, the gold standard provided England with the necessary benefits to enforce it and for many other countries to follow England's lead. Exchange in both goods and capital was facilitated if countries adhered to a standard based on a rule anchored by the same commitment mechanism. This arrangement may also have contributed to making the commitment mechanism a transparent one, a condition that we think is important for its likely success.

History of the gold standard as a rule

In this section, we discuss the history of the gold standard, viewed first as a domestic rule binding the monetary authorities. In this context, we survey in some detail the operation of the gold standard as a contingent rule in four countries: England and the United States – two key nations under the standard; and France and Italy – the former a "core" country of the

Classical gold standard, the latter an important peripheral country.[11] We also summarize briefly the gold standard experience of other countries. Then, we survey the record of the gold standard as an international rule governing the interrelationships between nations.

Our survey extends primarily from the early 19th century to 1933, with the main focus on the Classical period ending in 1914. Although the United States continued to maintain gold backing for the dollar until 1971 and although the Bretton Woods system from 1945 to 1971 was based in part on gold, we view the period after World War II as far enough removed from the gold standard rule to be omitted from this survey.[12]

The gold standard as a domestic rule

England, 1717–1931

England can be viewed as the most important country to follow the gold standard rule. The gold standard in England, as in other Western European countries, evolved from the use of a commodity as money. Standardization of coins of specific weight evolved by the early 18th century from a rudimentary bimetallic specie standard where coins frequently circulated by weight, not tale (face value).[13] England adopted a *de facto* gold standard in 1717, after having been on a *de facto* silver standard at least back to the 13th century. Over the 500-year period on silver, the price of silver and the bimetallic ratio were rarely changed – the principal exception being the Great Debasement of the 16th century. According to Glassman and Redish (1988), this episode represented an attempt to gain seigniorage – to follow discretionary policy – rather than a technical adjustment in the coinage.[14]

The early standard was plagued by the problems of deterioration in quality and counterfeiting. This was especially serious for small-denomination silver coins and may explain periodic recoinage and occasional debasement in the early modern era (Glassman and Redish, 1988). The emergence of the standard in its modern guise reflects the development of milling and other techniques of producing high-quality coin. The gold standard emerged in England *de facto* by the unintended overvaluation of gold at the mint from 1717 by the Master of the Mint, Sir Isaac Newton. It became *de jure* in 1816.[15]

The gold standard prevailed, with the price of gold fixed at £3.85 per ounce, from 1717 to 1931, with two major departures: 1797–1821 and 1914–1925. The first departure, referred to as the "Suspension Period" or the "Paper Pound" during the Napoleonic wars, is generally viewed as an example of the operation of a contingent rule (Barro, 1987). The suspension

of payments on February 26, 1797, whereby the Bank of England received permission from the government not to have to redeem its notes in terms of gold, followed a run on the country banks and the depletion of the Bank of England's gold reserve with the threat of a French invasion.[16] Figure 3.1 portrays monthly movements in the price of the pound in terms of the Hamburg Schillingen Banco, the only exchange rate series continuously available over the entire period. (The par of exchange before suspension was approximately 35.)[17]

The suspension was universally viewed as a temporary event, initially expected to last for a period of months.[18] As the French wars dragged on, however, and the Bank of England freely discounted government securities to finance military expenditures, the pound depreciated on the foreign exchange market. Consequently, the Bank repeatedly requested an extension of the suspension. Concern about the depreciation of the paper pound led to the *Bullion Report* of 1810, which attributed the depreciation to the Bank of England's note issue.

The *Bullion Report* recommended that immediate steps be taken to resume payments in two years from the date of the report at the presuspension parity.[19] The debate that ensued in Parliament and in the press revolved around the themes of the extent, if any, of depreciation, and responsibility for the depreciation – the Bank of England blaming it on external real factors.[20] There was little discussion of the possibility of not resuming payments or of resuming at a depreciated level of the pound in the ensuing ten years.

Despite the government's opposition to resumption during wartime conditions, there exists considerable evidence that the government wished to confirm its commitment to a return to the gold standard once hostilities ceased (Bordo and White, 1991).[21] Several attempts were made to pick a date for resumption (1816, 1818), but as each occasion approached, the Bank requested a postponement on the grounds that the exchanges were unfavorable. It is important to note that this occurred after the wartime emergency ended in 1815.[22] Finally, Parliament agreed on July 2, 1819 (Peel's Act) on resumption in stages from February 1, 1820, to full redemption on demand on May 1, 1823,[23] and it was agreed that the government would retire its outstanding securities held by the Bank and the Bank would reduce its note issue to achieve the aim. During the year preceding resumption, considerable opposition to the plan emerged in Parliament by interests (especially agriculture and the Birmingham industrial area) hurt by deflation. They advocated return to parity at a depreciated pound. This opposition was not sufficient, however, to prevent resumption from being achieved (Feavearyear, 1963, 224–225; Fetter, 1965, 73–76; Laidler, 1987).
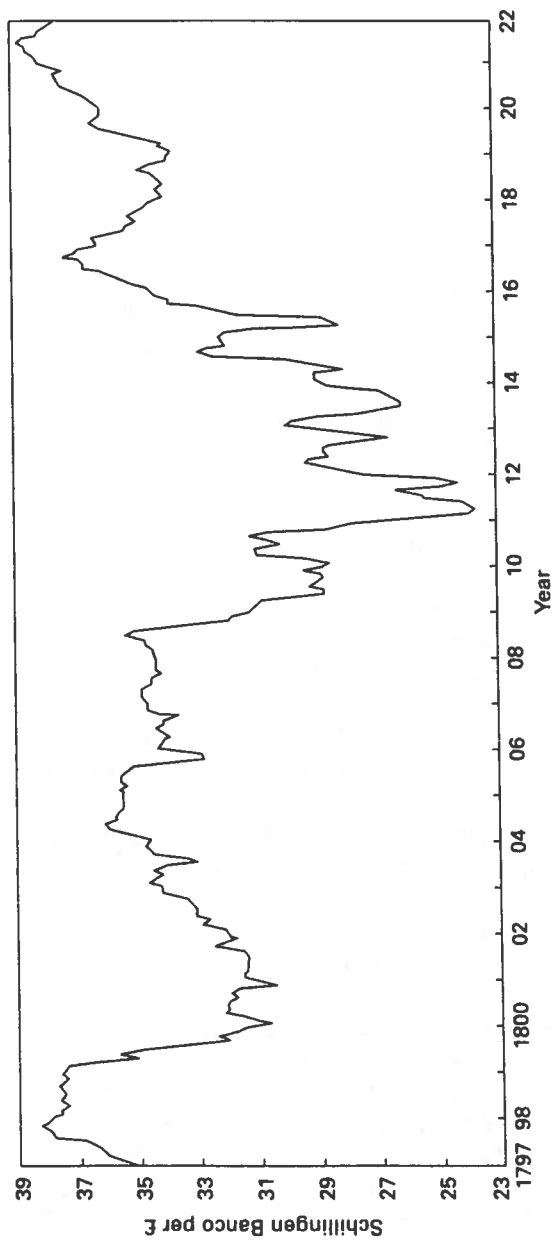
Figure 3.1 London exchange rate on Hamburg Schillingen Banco, 1797–1822, monthly
Source: Gayer, Rostow and Schwartz (1983)

We interpret the repeated requests for postponement, especially after the end of hostilities in 1815, as the use of discretionary policy.[24] Moreover, each postponement gave a negative signal to the public of the government's intention of ever resuming. Nevertheless, the fact that resumption was achieved suggests that observing the rule was paramount.

Evidence for the credibility of the commitment to the gold standard in the Napoleonic War is provided in Bordo and White (1991). There it is shown that although the British government pursued a policy of tax smoothing (setting tax rates over time so as to minimize deadweight losses), it did not follow a policy of revenue smoothing (smoothing revenue from both taxes and seigniorage). These results suggest that, although specie payments were suspended, the commitment to resume prevented the government from acting as it would have done under a pure fiat regime.

The Bank Charter Act 1844 and the separation of the Bank of England, into the Issue department to regulate the currency and the Banking department to follow sound commercial banking principles, further demonstrated England's commitment to the gold standard rule. The Issue department, by varying directly its fiduciary issue (over and above a statutory limit of £14 million) with the level of gold reserves ("the currency principle"), was designed to make the long-run maintenance of the (mixed) gold standard more credible.[25]

A second contingency aspect of the rule developed with experience of financial crises. Restrictions on convertibility of bank liabilities for gold were used to reduce the extent of a banking panic. The Bank was authorized to expand its unbacked note issue in the face of a depletion of its reserves without suspending convertibility of its notes into gold.

From 1821 to 1914, the gold standard rule was continuously honored. However, on three occasions – the crises of 1847, 1857, and 1866 – the second contingent aspect of the rule came into play. The policy was successful in alleviating the pressure, and the Bank retired the excess issue shortly thereafter.[26]

The Overend Gurney crisis of 1866 was the last real financial crisis (that is, banking panic) in British financial history (Schwartz, 1986). After that point, the Bank of England learned to follow Bagehot's rule – in the face of both an external and an internal drain "to lend freely but at a penalty rate." Although Bagehot intended the Bank to use its discretion (in the traditional sense) to avert a financial crisis, it can be argued that the successful performance of the Bank as lender of last resort actually served to strengthen the credibility of the Bank's commitment to the gold standard rule, because a key threat to the maintenance of convertibility was removed. Evidence of the credibility of England's commitment to the gold standard

Table 3.1 *The financing of wartime expenditures in the French wars and World War I*

	French wars 1793–1815 (Great Britain)	World War I 1914–1918 (United Kingdom)[a]
Percentage of total wartime expenditures financed by:		
Taxes[1]	58.0	31.8
Bonds[2]	40.5	64.4
High-powered money[3]	1.5	3.8

Note:
[a] Wartime expenditures are calculated as total government expenditures *less* 1903–1913 annual average of total government expenditures.
Source:
1. 1793–1815: O'Brien (1967, table 4); 1914–1918: Mitchell and Deane (1962, 392–395, 396–398).
2. 1793–1815: O'Brien (1967, table 4); 1914–1918: Mitchell and Deane (1962, 392–395, 396–398).
3. 1793–1815: Mitchell and Deane (1962, 441–443); 1914–1918: Capie and Webber (1985, table 1(1), 52–59).

rule is provided by private short-term capital inflows during the incipient crises of 1890 and 1907 (Eichengreen, 1992).

The 1914–1925 episode was similar in many respects to the earlier suspension period, although the extent of the inflation and the depreciation of the pound were considerably greater. Indeed, it appears that the successful resumption of 1821 may have been a factor enabling the British to finance an even larger share of the World War I expenditures by debt finance and the issue of fiat money (see table 3.1).[27]

Figure 3.2 shows monthly movements in the dollar/sterling exchange rate from 1914 to 1925. Note that from the beginning of hostilities in August 1914 until March 1919, the country was still formally on the gold standard, but the monetary authorities prevented conversion and pegged the pound close to the old parity (Crabbe, 1989).

After hostilities ended, the official view in the *Cunliffe Report* (1918) and other documents was for an immediate resumption at the old parity of $4.867. Consequently, the Bank of England began following a deflationary policy in early 1920. The exchange rate was close to parity by December 1922, but resumption was delayed because of unfavorable events on the continent (the Germans' refusal to pay reparations and the Belgian–French
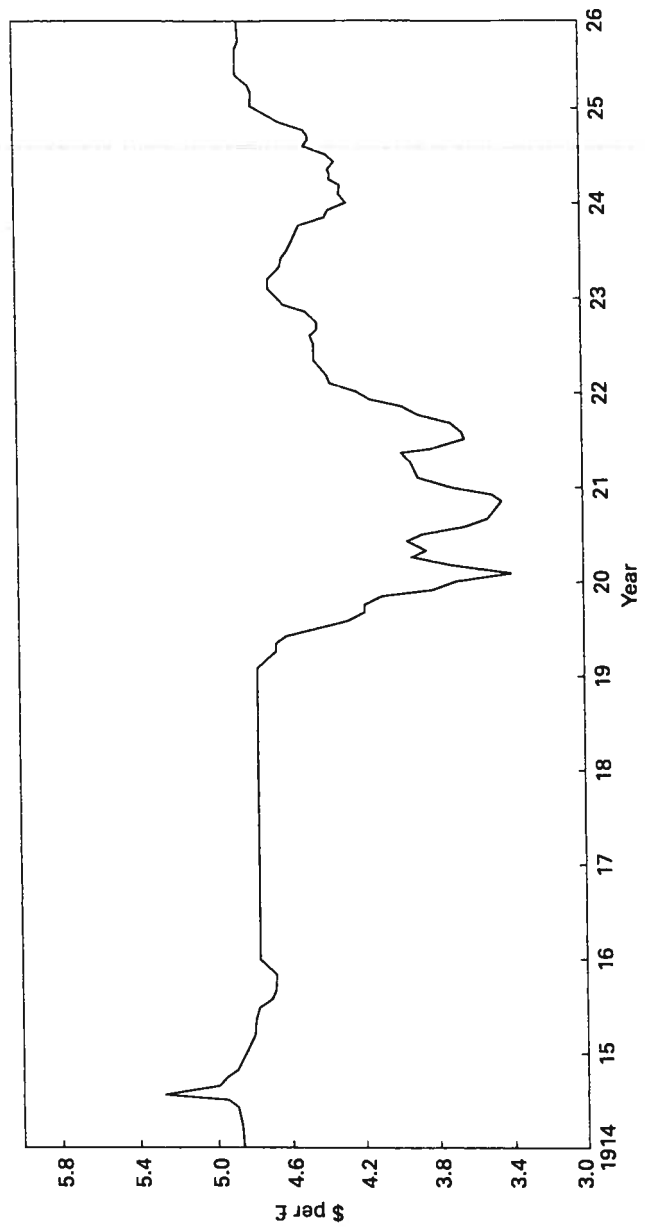
Figure 3.2 Dollar/sterling exchange rate, 1914–1926, monthly
Source: Board of Governers of the Federal Reserve System (1944)

occupation of the Ruhr in 1923). By the end of 1924, the pound was again close to parity and resumption was announced by Winston Churchill in the Budget Speech of April 28, 1925.

Though the official view from 1920 to 1925 was in favor of resumption, and a key argument made was the maintenance of credibility by returning to gold at the old par,[28] vociferous opposition to it was voiced by J. M. Keynes ([1925] 1972) and other academics, by labor (not the official Labour Party), and by industry groups. Most of the opposition, however, with the principal exception of Keynes, was opposed not to resumption at the old parity *per se* but to the deflationary policies used to attain it.[29] The successful resumption in 1925 and the painful deflation that accompanied it can be viewed as evidence of the British commitment to the gold standard rule.[30]

The United States, 1792–1933

The US Constitution (Section 8) gave Congress power over the currency – "to coin money and regulate the value thereof." The Coinage Act 1792 defined US coinage as both gold and silver. Thus, the original monetary standard was a bimetallic standard. One dollar was defined as 371.25 grains of silver or 24.75 grains of gold. This yields a bimetallic ratio of the value of gold to silver of 15:1. Soon after instituting the 15:1 ratio, the market ratio increased to 15½:1. Consequently, silver became overvalued at the mint, gold became undervalued, and, via the operation of Gresham's Law, the United States after a few years was on a *de facto* silver standard.

The situation was altered by a new Coinage Act in 1834 and another in 1837, which changed the bimetallic ratio to 16:1, presumably in an attempt to restore bimetallism. As it turned out, gold became overvalued at the mint, silver became undervalued, and the United States switched to a *de facto* gold standard. If we interpret periodic adjustment of the bimetallic mint ratio to the market ratio as an example of a contingent rule, and if the public expects such adjustments, then the question arises whether the switch from 15:1 to 16:1 rather than to 15½:1 was a mistake or a deliberate use of discretionary policy. Indeed, O'Leary (1937) viewed this episode as a deliberate attempt by the Jacksonians to discredit the Second Bank of the United States. The resultant flood of gold coins would obviate the necessity for its notes. The 1834 Act was also passed at the urging of the gold producing states of South Carolina, North Carolina, and Georgia (Friedman, 1990a).

Figure 3.3 shows the dollar/pound exchange rate on an annual basis from 1792 to 1925. The market exchange rate is defined in terms of gold, so that during the period when the United States was on a bimetallic standard it varied, reflecting changes in the market bimetallic ratio, changes in

the official ratio, and other forces in the market for foreign exchange.[31] As can be seen in figure 3.3, the exchange rate in the bimetallic era before the Civil War was much less stable than during the pure gold standard period, from 1879 to 1913.

The fixed price of $20.67 per ounce prevailed from 1837 to 1933 with one significant departure – the greenback episode in 1862–1879. Figure 3.4 plots the greenback price of gold over that period. It can be viewed in conjunction with the exchange rate in figure 3.3

The greenback episode, at least at the outset, can be interpreted as the operation of a contingent rule. The federal government originally intended to finance its expenditures through borrowing and taxation, but within a year resorted to the issue of paper notes. Under the Legal Tender Acts, these notes were issued on the presumption that they would be convertible, but the date and provisions for convertibility were not specified.

Shortly after the war, the government made its intentions clear to resume payments at the prewar parity in the Contraction Act of April 12, 1866, which provided for the limited withdrawal of US notes. Declining prices from 1866 to 1868 led to a public outcry and to repeal of the Act in February 1868. Over the next seven years a fierce debate raged between the hard money forces – advocates of rapid resumption – and the soft money forces, some of whom were opposed to restoring the gold standard, others who wanted to restore it at a devalued parity, and yet others who just wanted to prevent any undue deflation and allow the economy to grow up to its money supply (Unger, 1964; Sharkey, 1959). Alternating victories by the conflicting forces were manifest in legislation, alternately contracting and expanding the issue of greenbacks (the Public Credit Act 1869 contracting it, the reissue of $26 million of retired greenbacks in 1873 expanding it) and, in Supreme Court decisions, initially declaring the Legal Tender Acts unconstitutional (*Hepburn* v. *Griswold*, February 1870), and then reversing the decision (*Knox* v. *Lee*, May 1871). Finally, the decision to resume payments on January 1, 1879, was made in the Resumption Act 1875, which the lame-duck Republican Congress passed by a majority of one. Despite the announcement of resumption, however, and of steps taken by the Treasury to accumulate a gold reserve and to retire greenbacks, the bitter election of 1876 was fought between Cooper (the greenback candidate, who was opposed to resumption), Tilden (a soft money Democrat), and Hayes (a hard-money Republican). Hayes won by one electoral vote. Yet, had Tilden won, according to one authority, resumption would not have been prevented; only the date may have been changed (Unger, 1964, 310–311).

Though the ferocity of the reversals in policy suggest to us that many features of the post-Civil War period can be interpreted as incorporating
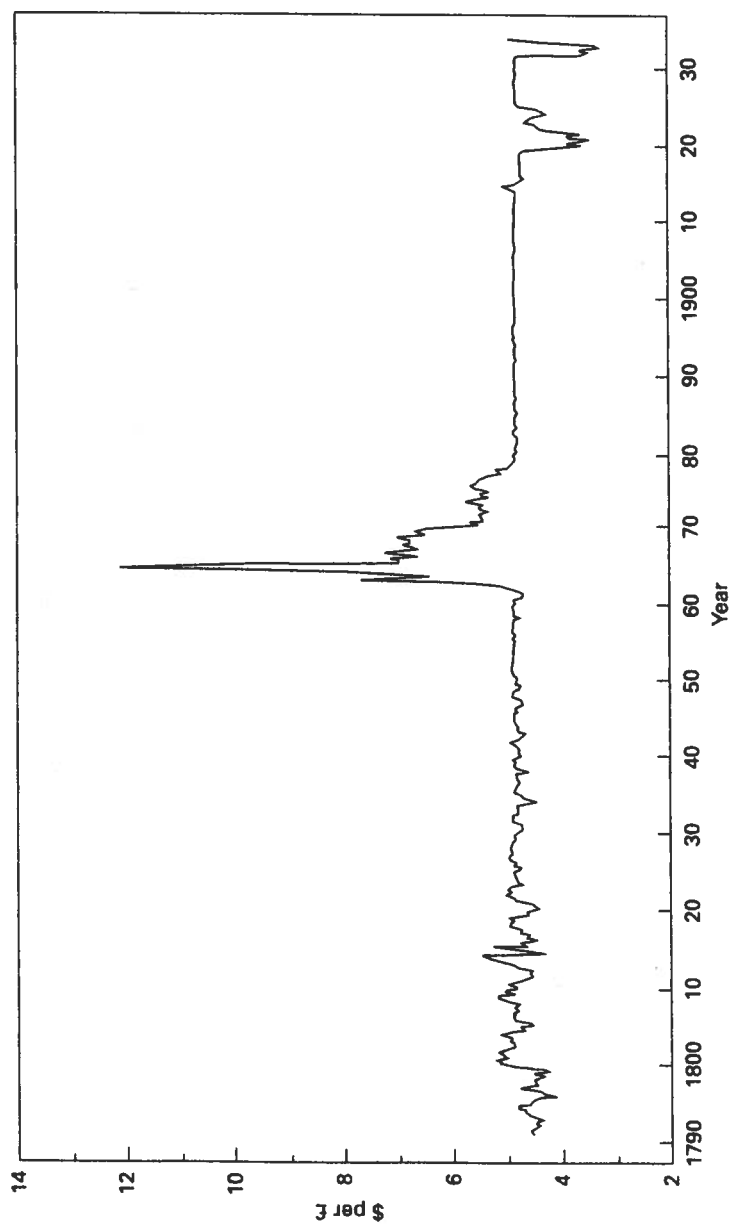
Figure 3.3 Dollar/pound exchange rate, 1792–1925, quarterly
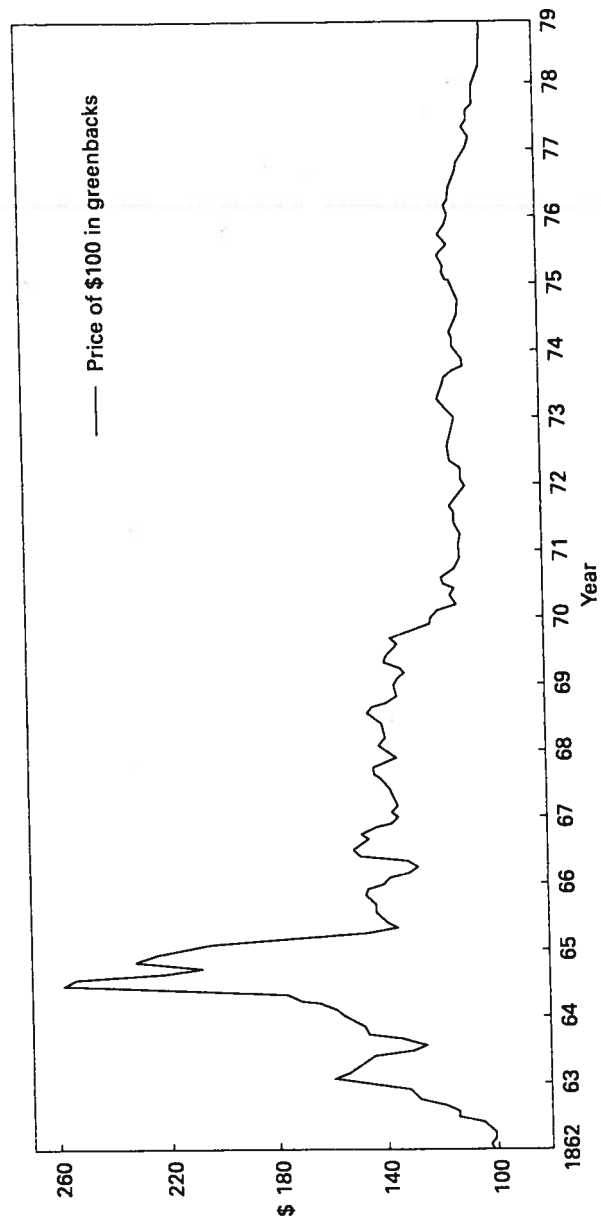Source: Friedman and Schwartz (1982); Officer (1983, 1985)

Figure 3.4 Price of gold in greenbacks, 1862–1879, monthly
Sources: Mitchell (1908); Friedman and Schwartz (1963)

elements of a discretionary regime, other evidence argues in favor of the contingent gold standard rule. As Calomiris (1988) points out, credibility in the restoration of the gold standard rule was probably established in 1869 by the actual redemption of bond principal in gold by the Act of March 18, 1869, guaranteeing payment in gold, and the Supreme Court decision in *Venzie Bank* v. *Fenno*, which supported the constitutionality of gold clauses (Calomiris, 1988, 208fn).[32]

Moreover, both Roll (1972) and Calomiris (1988) present evidence of expected appreciation of the greenback based on a negative interest differential between bonds that were paid in greenbacks and those paid in gold. Calomiris (see table 3.2) calculates the appreciation forecast error on a semi-annual basis from January 1869 to December 1878, defined as the difference between his calculation of expected appreciation and actual appreciation. The errors are close to zero for most of the periods, with two exceptions: January–June 1869, when the error is 1.53, and January–June 1876, when it is −1.49. The former positive exchange rate surprise reflects the credibility of the government's commitment to the redemption of bond principal in gold; the latter negative surprise reflects the temporary threat to resumption by the election of 1876.

In the ensuing seventeen years, though the United States was back on a gold basis, the battle between hard and soft money forces continued over the issue of free coinage of silver. Silver advocates can be classified into several groups. There were those who believed that, had silver not been demonetized by the "Crime of '73" (the Coinage Act of February 1873), then bimetallism at 16:1 would have yielded less deflation than actually occurred from 1873 to 1896, as relatively more abundant silver was substituted for increasingly scarce gold. Such a position is consistent with maintenance of a rule. Other silver advocates (such as the Populist party), however, viewed the issue of silver certificates as a potential engine of inflation to stimulate the economy, as well as to reverse the redistribution of income from debtors to creditors. In this sense, the pressure in favor of discretion did not disappear.

The free-silver forces succeeded in passing two pieces of legislation that increased the outstanding stock of silver coins: the Bland–Allison Act 1878 and the Sherman Silver Purchase Act 1890. The latter increased the stock of high-powered money sufficiently to threaten convertibility into gold (Friedman and Schwartz, 1963). As Grilli (1989, figure 3) shows, however, the probability of a speculative attack on the gold dollar at the height of the agitation over silver in 1893 (before the repeal of the Sherman Silver Purchase Act) was not much greater than 6 percent.[33]

A second departure from the gold standard, an embargo during World War I (1917–1919) on gold exports, did not affect internal convertibility of

Table 3.2 *Expected and actual appreciation of the greenback dollar, 1869–1878*

		Average differential between gold and greenbacks' yield[a]	Expected appreciation (current differential *less* differential for July–December 1878) (1)	Average actual rate of greenbacks' appreciation to 1881[b] (2)	Appreciation forecast error ((2)-(3)) (3)	(4)
January–June	1869	1.33	3.53	2.00	1.53
July–December	1869	0.49	2.69	1.85	0.84
January–June	1870	−0.52	1.68	0.93	0.75
July–December	1870	−0.42	1.78	0.93	0.85
January–June	1871	−1.01	1.19	1.09	0.10
July–December	1871	−0.95	1.25	1.10	0.15
January–June	1872	−0.02	2.18	1.26	0.92
July–December	1872	0.01	2.21	1.40	0.81
January–June	1873	−0.09	2.11	1.90	0.21
July–December	1873	−0.26	1.94	1.39	0.55
January–June	1874	−0.65	1.55	1.60	−0.05
July–December	1874	−0.45	1.75	1.50	0.25
January–June	1875	0.07	2.27	2.36	−0.09
July–December	1875	0.09	2.29	2.30	−0.01
January–June	1876	−1.19	1.01	2.50	−1.49
July–December	1876	−1.07	1.13	1.76	−0.63
January–June	1877	−1.22	0.98	1.36	−0.38
July–December	1877	−1.21	0.99	0.84	0.15
January–June	1878	−1.32	0.88	0.40	0.48
July–December	1878	−2.20	0.00	0.10	−0.10

Notes:

[a] $\frac{1}{n}\sum[i_{ap}(j)-i_{er}(j)]=d.$

[b] The average of monthly exchange rate closings for the period was used to measure current gold price of greenbacks. The 6s of 1881 were redeemable June 1, 1881.

Source: Calomiris (1988, table 5).

gold. Hence, we believe it should be viewed as merely a temporary adjustment in the standard.[34]

Financial crises characterized by banking panics were frequent in US monetary history until the establishment of the Federal Reserve System.

Before 1914, pressure on the banking system's reserves was often relieved by a restriction on convertibility of bank notes and deposits into high-powered money. The restrictions in 1837–1838, 1839, and 1857 did involve suspensions of convertibility into gold. It could be argued, however, that such temporary departures were viewed as a contingent aspect of the rule. The restrictions of 1873, 1893, and 1907–1908 did not involve suspension of convertibility into gold and hence cannot be viewed as breaking the gold standard rule.

Franklin Roosevelt's decision to devalue the dollar in 1933 (in order to raise the price level) represents a clear departure from the gold standard rule and a clear case of discretion. Though the price of gold was again fixed, at $35 per ounce, gold ownership by US residents was prohibited, and the standard that reemerged has been described as "a discretionary fiduciary standard" with gold just a commodity whose price was fixed by an official support program (Friedman and Schwartz, 1963).

France

France followed a bimetallic standard from the Middle Ages until 1878. From the 13th to the 15th century, the rule was honored in the breach more than the observance, with frequent debasements, devaluations, and revaluations. This reflects internal political instability, frequent wars, and the lack of an adequate tax base (Bordo, 1986). By the 16th century, France had developed a stable bimetallic system, although the ancient regime was punctuated by several devaluations and revaluations (Murphy, 1987), and the infamous system of John Law – a paper-money-induced inflation – from 1716 to 1720 (Bordo, 1987a).

The French revolution spawned the assignat hyperinflation from 1789 to 1795 – the aftermath of which led to the establishment of official bimetallism with the fixing of the ratio of silver to gold at 15½:1 in 1803, a rule that was successful for 75 years (Bordo and White, 1991). Until the late 1840s, abundant supplies of silver threatened to displace gold, but with gold discoveries in California and Australia the process was reversed until the 1860s, when major silver discoveries again threatened the bimetallic standard. In 1865, France formed the Latin Monetary Union with Belgium, Switzerland, and Italy (later joined by the Papal States, Greece, and Romania). By agreeing to mint silver coins of the same fineness, these countries expanded the size of the bimetallic currency area. The Latin Monetary Union continued the free coinage of silver until, swamped by massive supplies of new silver from discoveries in the Americas and by the abandonment of the silver standard in Germany and other European countries emulating the gold standard example of Britain, the leading commercial power (Friedman, 1990b), it limited silver coinage in 1874 and fully demonetized silver in 1878 (Bordo, 1987b).

France followed the gold standard rule (albeit in its bimetallic form until 1878) until World War I. Figure 3.5 shows the pound/franc exchange rate from 1821 to 1938. As can be seen, the rate was very stable until 1914, rarely departing more than one percentage in gold points from the parity of 25.22 francs to the pound. France, like the other two countries in this period, suspended specie convertibility in times of national emergency. On two occasions, the Bank of France announced *Cours Forcé* — the first from March 15, 1848 to August 6, 1850, following the February 1848 revolution, and the second during and after the Franco–Prussian war from August 12, 1870 to January 1, 1878. It is interesting to note that during these periods, the exchange rate varied close to parity. On both occasions, the Bank of France limited its note issue, acting as if it were constrained by the gold standard rule (Lacroix and Dupieux, 1973).

Like other belligerents in World War I, France switched to fiat-money issue to finance the war, intending to resume payments after hostilities ended. Unlike the British case, the aftermath of the war was a period of rapid inflation and depreciation of the franc. The forces of discretion carried the day even with the ultimate return of the franc to gold convertibility at a vastly depreciated level in 1928.[35] France stayed on the gold standard until 1936.

Italy

In contrast to England, France and the United States, Italy departed from the gold standard rule more than it followed it. The newly unified Italian state adopted a gold standard in 1865 but abandoned it in May 1866 and did not return to convertibility until March 1883. According to Fratianni and Spinelli (1984), inconvertibility was a consequence of both financing the war against Austria in 1866 and conducting the government's subsequent liberal fiscal policy. According to Fratianni and Spinelli, "Politicians had no difficulties in throwing off the straitjacket of the gold standard when it stood in the way of large budget deficits" (419). A return to sound fiscal policy permitted restoration of gold payments from 1883 to February 1894, after which the Italian currency remained inconvertible until December 1927, when gold convertibility was resumed at a depreciated value of the lira.[36] During the pre-World War I period, however, the monetary authorities acted as if they were on the gold standard. The exchange rate with France returned close to parity in 1903 and remained there until the outbreak of war. Money growth was low, and the budget was often in surplus (Tonniolo, 1990, 188). This episode suggests that commitment to the gold standard rule was of considerable importance to the Italian monetary authorities.

Evidence for the credibility of the commitment to the gold standard can
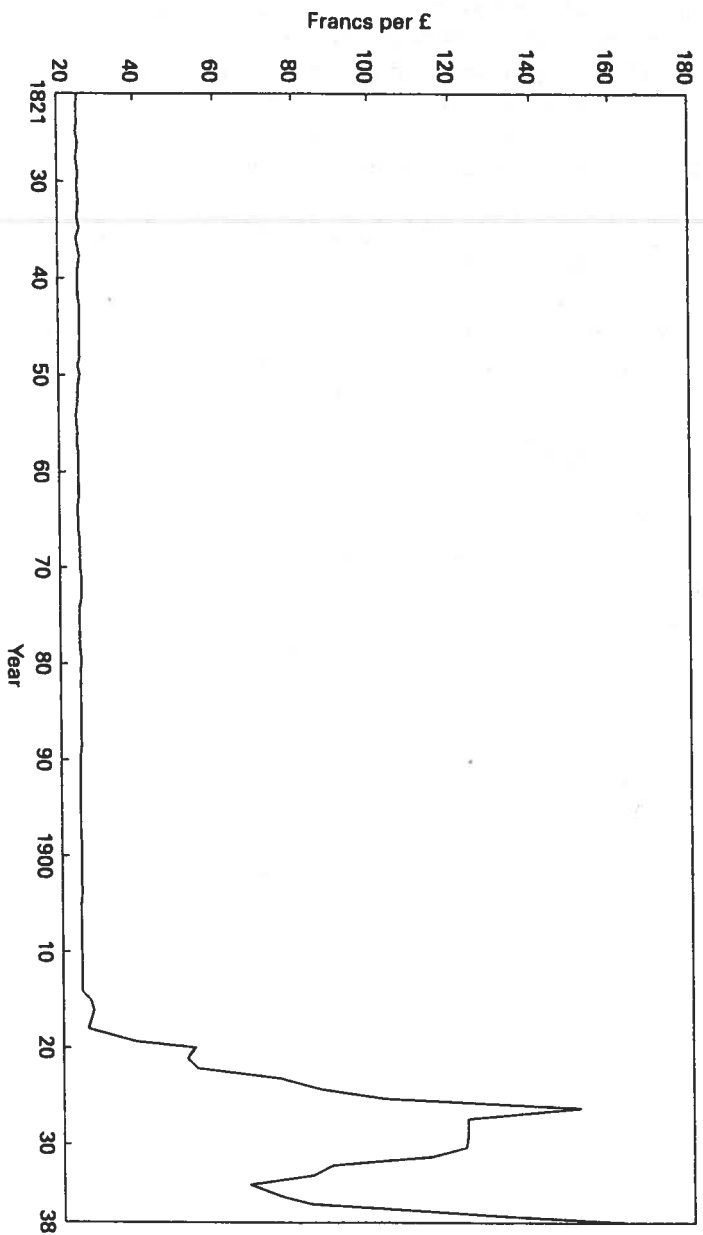
Figure 3.5 Pound/franc exchange rate, 1821–1938, annually

Sources: Gayer, Rostow and Schwartz (1953); British Parliamentary Papers (1888); St. Marc (1983)

be seen in the risk premium on Italian government long-term securities relative to their French counterparts over the period 1866 to 1912, shown in figure 3.6.[37] In the first period of inconvertibility (1866–1883), the risk premium averaged more than 2 percent per year; in the gold standard period (1884–1894), it average close to zero; and in the second inconvertibility period (1894–1912), it declined from 2 percent in the first half of the period to 0.5 percent after 1902.

A number of other countries followed the gold standard rule until 1914 as strictly as the three core countries just discussed.[38] These include Germany (the fourth "core" country), the Scandinavian countries, and the British Dominions. The latter two sets of countries, like England, returned to gold at the original parity in the mid-1920s. A number of countries that were not formally on the gold standard acted as if they were, by maintaining price levels as stable as the gold standard countries. These include Spain and the Austro–Hungarian empire before 1892. Finally, a number of countries, most notably Argentina, followed the example of Italy by alternately following and then abandoning gold convertibility during the period of falling prices, 1880–1900, and of rising prices, 1900–1913 (Ford, 1962).[39]

Some evidence for the credibility of the gold standard rule

We have described the gold standard experience of four important countries: three "core" countries (England, the United States, and France) that followed the gold standard rule, and Italy, a country that, though officially on the gold standard, suspended convertibility more than half the time. One way to summarize this experience is to present evidence on the persistence of inflation.

Barsky (1987) presents evidence for the United Kingdom and the United States that inflation under the gold standard was very nearly a white noise process. This is compared to the post-World War II period, when the inflation rate exhibited considerable persistence. Evidence for the absence of inflation persistence does not prove that countries followed the gold standard rule. It is, however, not inconsistent with the suggestion that market agents expect that the monetary authorities will not continuously follow an inflationary policy – an expectation that is also consistent with belief in following a convertibility rule.

To develop this further, following Barsky's approach, we examine in table 3.3 the autocorrelations of inflation using annual wholesale price indices for the four countries for different periods covering the entire gold standard experience. The results in table 3.3 confirm those of Barsky: inflation in all four countries was very nearly white noise, as seen in the low autocorrelations. These results hold for different subperiods when the countries concerned followed the bimetallic variant of the rule and for subperiods when
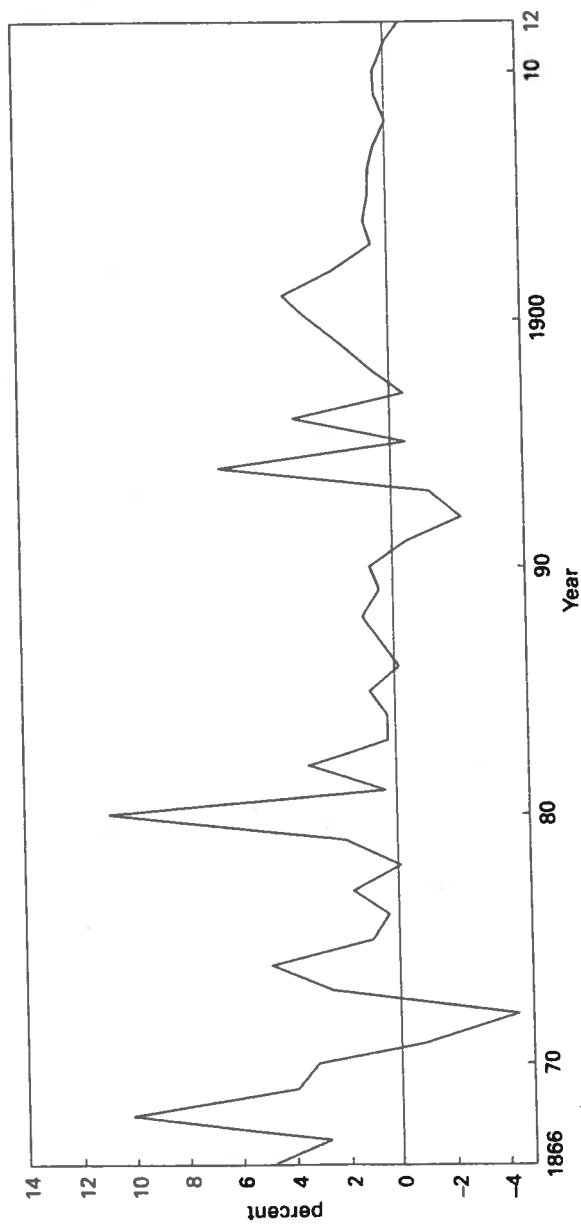
Figure 3.6 Risk premium, lira/franc exchange rate, 1866–1912, Italian government bond yield *minus* French 3 percent *rentes*
Source: Fratianni and Spinelli (1984)

Table 3.3 *Autocorrelations of inflation (wholesale prices, annual data)*

Sample period	Regime	Ljung–Box Q-test 5% critical value (standard error)	Lags	Autocorrelations			
United Kingdom							
1730–1796	*de facto* Gold	$Q(18)=16.79$ $C(18)=28.87$ (0.12)	1–4 5–8 9–12	−0.02 0.11 0.04	−0.59 −0.05 −0.04	−0.13 0.02 0.12	−0.32 0.09 0.02
1797–1821	Paper pound	$Q(12)=15.21$ $C(12)=21.03$ (0.20)	1–4 5–8 9–12	0.26 0.37 0.12	−0.37 −0.03 −0.10	−0.41 −0.12 −0.19	0.11 0.03 0.08
1822–1913	Gold standard	$Q(24)=25.50$ $C(24)=36.42$ (0.10)	1–4 5–8 9–12	0.04 −0.20 0.17	−0.01 0.01 0.04	−0.14 0.13 −0.07	−0.22 0.14 −0.10
1914–1931	Paper and gold exchange	$Q(6)=3.71$ $C(6)=14.07$ (0.24)	1–3 4–6	0.32 −0.05	0.09 −0.10	0.03 −0.29	
1730–1913	Mixed	$Q(24)=44.50$ $C(24)=36.42$ (0.07)	1–4 5–8 9–12	0.12 0.10 0.07	−0.15 0.08 −0.05	−0.24 0.04 −0.02	−0.15 0.09 0.02
1730–1931	Mixed	$Q(24)=35.69$ $C(24)=36.42$ (0.07)	1–4 5–8 9–12	0.20 0.05 0.09	−0.05 −0.05 −0.02	−0.11 0.00 −0.07	−0.10 0.10 −0.03
United States							
1793–1861	Bimetallic	$Q(24)=34.69$ $C(24)=36.42$ (0.24)	1–4 5–8 9–12	0.16 −0.04 0.14	−0.10 −0.20 0.09	−0.13 −0.34 0.05	0.12 0.13 −0.15
1862–1878	Greenback	$Q(6)=5.53$ $C(6)=14.07$ (0.24)	1–3 4–6	0.51 −0.04	0.17 −0.05	−0.07 −0.17	
1879–1913	Gold standard	$Q(12)=3.75$ $C(12)=21.03$ (0.17)	1–4 5–8 9–12	0.05 0.01 0.02	0.18 −0.07 0.09	0.04 0.16 0.02	−0.16 −0.02 −0.06
1914–1933	Gold exchange	$Q(6)=3.76$ $C(6)=14.07$ (0.22)	1–3 4–6	0.23 −0.33	0.05 −0.15	0.02 0.02	
1793–1913	Mixed	$Q(24)=55.97$ $C(24)=36.42$ (0.09)	1–4 5–8 9–12	0.26 −0.06 0.18	−0.01 −0.23 0.15	−0.12 −0.17 −0.07	−0.02 0.13 −0.08
1793–1933	Mixed	$Q(24)=50.12$ $C(24)=36.42$ (0.09)	1–4 5–8 9–12	0.25 −0.08 0.13	0.01 −0.15 0.18	0.07 −0.10 −0.03	−0.11 0.11 −0.11

Table 3.3 (*cont.*)

Sample period	Regime	Ljung–Box Q-test 5% critical value (standard error)	Lags	Autocorrelations			
France							
1803–1869	Bimetallic	$Q(18)=10.98$ $C(18)=28.87$ (0.12)	1–4 5–8 9–12	0.11 0.06 −0.03	0.04 −0.12 −0.01	−0.04 0.11 −0.19	−0.09 −0.02 −0.10
1870–1878	Suspension	$Q(3)=1.34$ $C(3)=7.82$ (0.33)	1–3	0.18	−0.26	−0.22	
1879–1913	Gold standard	$Q(12)=9.49$ $C(12)=21.03$ (0.17)	1–4 5–8 9–12	0.35 −0.06 0.00	0.01 −0.04 0.20	−0.07 0.21 0.20	−0.11 0.09 0.15
1914–1938	Paper and gold exchange	$Q(8)=4.68$ $C(8)=15.51$ (0.20)	1–4 5–8	0.27 −0.15	0.18 −0.07	0.14 −0.10	−0.14 0.08
1803–1913	Specie	$Q(24)=17.28$ $C(24)=36.42$ (0.10)	1–4 5–8 9–12	0.15 0.05 −0.00	0.02 −0.11 0.03	−0.05 0.12 −0.14	−0.07 −0.00 −0.07
1803–1938	Mixed	$Q(24)=33.25$ $C(24)=36.42$ (0.09)	1–4 5–8 9–12	0.29 −0.03 0.08	0.16 −0.02 0.06	0.11 −0.01 0.02	−0.07 0.11 −0.04
Italy							
1861–1913	Mixed	$Q(18)=16.38$ $C(18)=28.87$ (0.14)	1–4 5–8 9–12	0.06 0.21 0.02	−0.26 0.09 −0.12	−0.17 −0.13 0.03	0.01 −0.06 0.19

Sources:
United Kingdom: Mitchell and Deane (1962).
United States: Jastram (1977).
France: Mitchell (1975).
Italy: Mitchell (1975).

they departed from convertibility following the contingent aspect of the rule. As did Klein (1975) and Barsky (1987), we observe negative serial correlation at a number of lags in all the subperiods.[40] This is consistent with the commodity money adjustment mechanism of the gold standard discussed by Rockoff (1984) and Barsky and Summers (1988). The Q-statistics, which test the joint hypothesis that the first n autocorrelations are all zero for specified n, do not reject the white noise hypothesis for any of

the subperiods. Over the entire period 1730–1938 for the United Kingdom and the entire periods 1793–1913 and 1793–1933 for the United States, however, the hypothesis is rejected at the 5 percent significance level. These periods represent conglomerates of different regimes that had different mean rates of inflation. Aggregation then may induce serial correlation.

We also tested for a unit root in the inflation series using the Dickey–Fuller test. In only one episode – the United States, 1862–1878 – could one be detected at the 10 percent significance level.

In sum, we interpret this evidence as consistent with agents' beliefs in the credibility of the commitment to the gold standard convertibility rule. Because the power of the tests is admittedly low, however, this evidence is only suggestive.

The gold standard as an international rule

The classical gold standard emerged as a true international standard by 1880 following the switch by the majority of countries from bimetallism, silver monometallism, and paper to gold as the basis of their currencies.[41] As an international standard, the key rule was maintenance of gold convertibility at the established par. Maintenance of a fixed price of gold by its adherents in turn ensured fixed exchange rates. Recent evidence suggests that, indeed, exchange rates throughout the 1880–1914 period were characterized by a high degree of fixity in the principal countries. Although exchange rates frequently deviated from par, violations of the gold points were rare (Officer, 1986), as were devaluations (Eichengreen, 1985).[42]

The international gold standard was a successful example of a fixed exchange rate system, although gold convertibility is not required to operate a fixed exchange rate system successfully (as is evident from the case of the European Monetary System (EMS) in the late 1980s, see Giavazzi and Giovannini, 1989). The gold standard rule was primarily a domestic rule with an important international dimension. This dimension in turn may have served to make the domestic gold standard rule more credible in a number of significant ways. In addition to the reputation of the domestic gold standard and constitutional provisions as discussed on p. 63, adherence to the international gold standard rule may have been enforced by other mechanisms. These include improved access to international capital markets, the operation of the "rules of the game," and the hegemonic power of England.

Many countries viewed maintenance of gold convertibility as important in obtaining access at favorable terms to the international capital markets of the "core" countries, especially England and France. It was believed that creditors would view gold convertibility as a signal of sound government

finance and the future ability to service debt. This was the case both for developing countries wishing to have access to long-term capital, such as Austria–Hungary (Yeager, 1984) and Latin America (Fishlow, 1989), and for countries wishing to finance war expenditures, such as Japan, which financed the Russo–Japanese war of 1905–1906 with foreign loans seven years after joining the gold standard (Hayashi, 1989). Once on the gold standard, such countries feared the consequences of departure.[43] The fact that England, the most successful country of the 19th century, as well as other "progressive" countries were on the gold standard was probably a powerful argument for joining (Gallarotti, 1991; Friedman, 1990b).

The operation of the "rules of the game," whereby the monetary authorities were supposed to alter the discount rate to speed up the adjustment to a change in external balance, may also have been an important part of the commitment mechanism to the international gold standard rule. Thus, for example, when a country was running a balance of payments deficit and there was a gold outflow, the monetary authority, observing a decline in its gold reserves, was supposed to raise its discount rate in order to reduce domestic credit. The resultant drop in the money supply would reduce the price level. The adjustment process would be aided by higher short-term domestic interest rates attracting capital from abroad. To the extent the "rules" would be followed and adjustment facilitated, this would strengthen the commitment to convertibility, as conditions conducive to abandonment would be lessened.

There exists considerable evidence on the operation of the "rules of the game." Bloomfield (1959), in a classic study, showed that, with the principal exception of England, the rules were frequently violated in the sense that discount rates were not always changed in the required direction (or by sufficient amounts) and in the sense that changes in domestic credit were often negatively correlated with changes in gold reserves.[44] In addition, a number of countries used gold devices – practices to prevent gold from leaving.[45] According to Goodfriend (1988), central banks operating under the gold standard did so to achieve "interest rate smoothing" through the use of gold stockpiling. Such practices, in our approach, could be viewed as a form of discretion, because following them could lead the public to believe that ultimately convertibility would be abandoned.

For the major countries, however, at least before 1914, such policies were not used extensively enough to threaten the convertibility into gold – evidence for commitment to the rule (Schwartz, 1984). Moreover, as McKinnon (1993) argues, to the extent that monetary authorities followed Bagehot's rule and prevented a financial crisis while seemingly violating the "rules of the game," the commitment to the gold standard in the long run may have been strengthened.

An additional enforcement mechanism for the international gold standard rule may have been the hegemonic power of England, the most important gold standard country (Eichengreen, 1989). A persistent theme in the literature on the international gold standard is that the Classical gold standard of 1880–1914 was a British-managed standard (Bordo, 1984). Because London was the center for the world's principal gold, commodities, and capital markets, because of the extensive outstanding sterling-denominated assets, and because many countries used sterling as an international reserve currency (as a substitute for gold), it is argued that the Bank of England, by manipulating its bank rate, could attract whatever gold it needed and, furthermore, that other central banks would adjust their discount rates accordingly. Thus, the Bank of England could exert powerful influences on the money supplies and price levels of other gold standard countries.

The evidence suggests that the Bank did have some influence on other European central banks (Lindert, 1969). Eichengreen (1987) views the Bank of England as engaged in a leadership role in a Stackelberg strategic game with other central banks as followers. The other central banks accepted a passive role because of the benefits to them of using sterling as a reserve asset. According to this interpretation, the gold standard rule may have been enforced by the Bank of England.[46] Thus, the monetary authorities of many countries may have been constrained from following independent discretionary policies that would have threatened the adherence to the gold standard rule.[47]

The benefits to England as leader of the gold standard – from seigniorage earned on foreign-held sterling balances, from returns to activities generated by its central position in the gold standard, and from access to international capital markets in wartime – were substantial enough to make the costs of not following the rule extremely high.

The lessons from history

The history of the gold standard suggests that the gold convertibility rule was followed continuously by only a few key countries – the best example being England from 1821 to 1914. Most major countries, however, did follow the rule during the heyday of the Classical gold standard, 1880–1914. Peripheral countries and several fairly important nations – Italy and Argentina – alternately followed and then departed from the rule, but even they were constrained in a looser sense.

The gold standard rule also proved to be successful as a commitment mechanism for England, the United States, and France in preventing default on debt and ensuring that paper-money issues were not permanent.

It may have been successful as a commitment device because it had the virtues of being simple and transparent.

We have suggested a number of reasons why the gold standard rule was so successful as a commitment mechanism before 1914. First, as a contingent rule it permitted nations to have access to revenue in times of wartime emergency. The commitment to return to gold parity after the war would enable the authorities to issue debt and to collect seigniorage at more favorable terms than otherwise.[48]

Second, in England and possibly in other countries, gold emerged early on as a way of certifying contracts. This certifying characteristic of gold carried forward to the relationship between the private and public sectors. Abandoning gold convertibility was viewed as a serious breach of contract. The gold standard emerged in the stable political environment of England after the 17th century, where the rule of law sanctified private contracts.[49] Only a few countries had comparable stability. Countries fraught with more unstable internal politics found it more difficult to refrain from running budget deficits, ultimately financed by paper-money issue (for example, Italy and Argentina), although the benefits of convertibility placed some constraints on their behavior.[50]

The gold standard was also successful as an international rule: by pegging their currencies to gold, countries became part of a fixed exchange rate system. The international aspect of the gold standard may have reinforced the domestic commitment mechanism because of the perceived advantages of more favorable access to international capital markets, by the operation of the "rules of the game," and by the importance of England as a hegemonic power.

The advantages accruing to England as the center of the gold standard world – the use of sterling as a reserve asset and the location in London of the world's key asset and commodity markets – made the costs of not following the gold standard rule (except in wartime emergency) extremely high. Furthermore, because England was the most important country in the gold standard era and access to the London capital market was considered to be of great benefit to developing countries, it is likely that many countries adhered to the gold standard that otherwise would not have, given the high resource costs of maintaining gold reserves. Also, because of the Bank of England's leadership role, other central banks may have been prevented from using discretionary policies, threatening adherence to the rule.

A comparison of the pre-1914 period with the subsequent period is of great interest. The gold exchange standard, which prevailed for only a few years from the mid-1920s to the Great Depression, was an attempt to restore the essential features of the Classical gold standard while allowing

a greater role for domestic stabilization policy. It also attempted to economize on gold reserves by restricting its use to central banks and by encouraging the use of foreign exchange as a substitute. As is well known, the gold exchange standard suffered from a number of fatal flaws (Kindleberger, 1973; Eichengreen, 1992; Temin, 1989). These include the use of two reserve currencies, the absence of leadership by a hegemonic power, the failure of cooperation between the key members, and the unwillingness of its two strongest members, the United States and France, to follow the "rules of the game," instead exerting deflationary pressure on the rest of the world by persistent sterilization of balance of payment surpluses. The gold exchange standard collapsed, but according to Friedman and Schwartz (1963), Temin (1989), and Eichengreen (1992b), not before transmitting deflation and depression across the world.

While the gold standard rule was widely upheld before 1914, it has not been since, although to a lesser extent both the short-lived gold exchange standard and the Bretton Woods system incorporated a number of its features. Today, one could characterize most nations as following a discretionary standard, although rhetoric over the importance of rules abounds. This may seem surprising, since the benefits of having a commitment mechanism seem more relevant today than 100 years ago. On the other hand, there may have been the perception that government debt was, and is, less important as an emergency source of funds than it was in the gold standard era. For example, the stocks of physical and human capital have risen substantially. The time inconsistency literature has taught us that the incomes therefrom have broadened the scope for policymakers to use discretionary policy. For example, marginal tax rates for people with above-average human capital rose dramatically during World War II. In the absence of a commitment mechanism, these rates were not returned to prewar levels.

The gold standard rule was simple, transparent, and, for close to a century, successful. Even though it was characterized by some defects from the perspective of macroeconomic performance, a better commitment mechanism has not been adopted. Despite its appeal, many of the conditions that made the gold standard so successful vanished in 1914, and the importance that nations attach to immediate objectives casts doubt on its eventual restoration.

Notes

1. For surveys of this literature, see Bordo (1984) and Eichengreen (1985, 1992a).
2. See Bordo (1981), Cooper (1982), and Meltzer and Robinson (1989).
3. For a discussion of the Currency Banking School debate, see Viner (1937), Fetter (1965), and Schwartz (1987).
4. The following framework is essentially identical to that in Kydland and Prescott (1980a). Also in the main example of Kydland and Prescott (1977) time inconsistency is the result of the effects of tax policy on the incentives for capital accumulation.
5. The idea that reputation may support optimal policy has been studied in a different context by Barro and Gordon (1983).
6. Strictly speaking, the government need define a gold coin only in terms of the unit of account. Private mints could then supply the demand for coin. Indeed, this was the case shortly after the California gold discoveries (Bancroft, 1890, 165). In most countries, however, the mint was under government authority.
7. Viewed, however, as a rule in the traditional sense – as an automatic mechanism to ensure price stability – bimetallism may have had greater scope for automaticity than the gold standard because of the additional cushion of a switch from one metal to the other. See Friedman (1990b). Garber (1986) regards bimetallism as a gold standard with an option.
8. Goodfriend (1989) describes how the evolution of contractual arrangements in the financial system in 18th- and 19th-century England had to overcome the problem of fraud. Private markets developed an elaborate system of monitoring financial arrangements, but ultimately convertibility into gold lay behind them.
9. An additional source of discretion was government policies to regulate gold production, such as taxation, the enforcement and relaxation of environmental regulations, and subsidies to encourage gold production in periods of depression. For examples of the use of such policies, see Rockoff (1984, 632–639).
10. The role of spillover effects on reputation through multiple relationships is discussed in Cole and Kehoe (1991).
11. We do not include Germany, the fourth "core" country of the Classical gold standard, in the survey because its history as a unified nation on the gold standard – from 1871 to 1914 – did not include a period of contingent suspension of payments (McGouldrick, 1984).
12. See Bordo (1993). McKinnon (1993), however, views the Bretton Woods system as a dollar standard with a set of rules that incorporated many of the features of the classical gold standard.
13. Even under the pre-1914 gold standard, however, weight mattered for sovereigns. Bankers had tiny scales for weighing sovereigns, which might be credited at less than 20 shillings. Loss on light gold was clearly a consideration for

George Rae, himself a leading banker at the time (*The Country Banker*, 1885, Letter XIX). (Our thanks to Leslie Presnell for bringing this to our attention.)

14. By contrast to England, monetary authorities in medieval France and Burgundy would often change arbitrarily the face value of silver coins to raise revenue – a discretionary breach of the rule, a policy that would succeed until the public caught on, raising prices in proportion to the change in unit of account.

15. One interpretation of England's early abandonment of bimetallism is the continuous difficulties encountered in providing a fractional silver coinage (Redish, 1990). Alternatively, Lord Liverpool's decision to adopt gold may have been strongly influenced by Ricardo's ([1819] 1952) belief that technical change in silver mining would lead to a massive increase in its supply. See Friedman (1990b).

16. Though the Bank of England was a private institution until 1946, we treat its policies as not independent of the wishes of the government. The government had two powerful checks over the Bank: periodic renewal of its charter, and its role as the government's banker. For a contrary view, see Gallarotti (1991).

17. In interpreting this exchange rate, adjustments must be made to allow for the Hamburg currency being on silver and sterling being effectively on gold, as well as the interest charge implicit in the prices of bills of exchange used to derive the series. As Ricardo pointed out, when these factors are taken into account, the Hamburg exchange rate understated the depreciation of the Bank of England note in terms of gold (Fetter, 1965, 28).

18. The Order in Council of February 26, suspending the specie convertibility of Bank of England notes, recommended resumption by June 24, 1797.

19. The report's exact words were:

> Your Committee would suggest, that the restriction on cash payments cannot safely be removed at an earlier period than two years from the present time; but your Committee is of the opinion, that early provision ought to be made by parliament for terminating, by the end of the period, the operation of the several statutes which have imposed and continued that restriction. (*Report from the Select Committee on the High Price of Bullion; Bullion Report* [1810] 1978, cclxi)

    It went on to stress that, even if peace came in less than two years, two years should be allowed for resumption because of the increase likely, both in mercantile activity on the coming of peace, and in demands on the Bank for discount. But, "even if the war should be prolonged, cash payments should be resumed by the end of that period [of two years from the date of the Report]."

20. The "Bullionist debate" pitted the Bullionists, who blamed the depreciation of the pound on the excessive issue of Bank of England notes, against the anti-Bullionists, who attributed the depreciation to extraordinary wartime foreign remittances and other real factors. See Laidler (1987) and Viner (1937).

21. The government's failure to confront the *Bullion Report*'s criticism directly can be understood in this light. The government felt unable to argue that continued suspension was justified by wartime fiscal needs because it was concerned

that this position would weaken both internal and external confidence in the paper pound. Instead, the government took the much maligned position of both disputing the facts of depreciation and presenting a list of nonmonetary causes (O'Brien, 1967, chapter 6).

22. According to Neal (1991), the Bank was opposed to resumption after hostilities ceased because it feared the loss of its gold reserves as capital was repatriated to the continent.

23. Initially, resumption would be at £4. 15s. 0d. on gold bars. The price would then be reduced in stages and the terms extended finally to include coin at mint par of £3. 17s. 10½d. (Clapham, 1944, 71).

24. Although one could argue that the war did not really end until reparations were paid and the Allies ended their occupation of France in 1818. See White (1991).

25. The Bank Charter Act was criticized on two grounds: (1) the currency principle ignored the role of deposits as an increasingly important component of the money stock; and (2) the Banking department, in operating on a sound commercial banking basis, could not act responsibly as a central bank. The latter criticism was at the heart of the traditional case for "discretion." This criticism culminated in the 1860s with the formulation by Walter Bagehot, the influential editor of *The Economist*, of the "responsibility doctrine" and the establishment of guidelines for a central bank under a gold standard (Bordo, 1984, 45–46).

26. On all three occasions, the Treasury issued a letter allowing the Bank to expand its fiduciary issue, but only in 1857 did it actually do so. On the other two occasions, the announcement alone was sufficient to allay the panic (Clapham, 1944, vol. II, 208–209).

27. The contribution of high-powered money to the finance of wartime expenditure is a lower bound estimate of the contribution of money to wartime finance, since in both episodes the banking system participated in the operation.

28. According to Moggridge (1969), the key reason cited was the maintenance of London's prominent position in international finance.

29. See Pollard (1970, editor's Introduction), and especially Brown (1929), Sayers (1960), and Hume (1963).

30. Smith and Smith (1990) view resumption in 1925 as an example of a stochastic process switch. Their numerical estimates suggest that, contrary to some contemporary views, the appreciation of sterling prior to April 1925 appears to have been due to fundamentals, such as restrictive monetary policy, rather than to the expectation of a change in regime.

31. See Officer (1983, 1985) for a valuable discussion on measuring both the par of exchange and the market exchange rate.

32. According to Calomiris (1988), following Mitchell (1903) and Roll (1972), the pace and timing of resumption depended solely on fiscal news – legislation and policy announcements affecting the government's budget. Rolnick and Wallace (1984) also view interpretation of this episode as dependent only on overall government fiscal expectations.

33. Garber and Grilli (1986) present estimates of silver risk in the yields of dollar-denominated assets in this period. Also see Garber (1986) for estimates of the value of the silver option on bimetallic bonds.

34. The United States, unlike the British example comparing World War I to the French wars, did not finance a larger fraction of its expenditures in World War I by debt and fiat money issue than in the Civil War. The fractions are:

	Civil War 1861–1865	World War I 1917–1918
	Percentage of wartime expenditure financed by:	Percentage of wartime expenditure financed by:
Taxes[1]	21	25
Bonds[2]	61	61
High-powered money[3]	18	14

Sources: 1.–3. 1861–1865: Friedman (1952).
1.–3. 1917–1918: Walton and Rockoff (1989, 443).

35. According to Eichengreen (1992b), following Alesina and Drazen (1991), the rapid inflation in the early 1920s and the *de facto* stabilization of the franc at an undervalued rate in 1926 reflected a compromise outcome from a war of attrition between debtors and creditors. By contrast, Britain's return to the old parity represented a victory by the creditor class.

36. This did not occur until after wartime inflation was in large part reversed by Mussolini's contractionary policies. See Kindleberger (1984, 383).

37. Following Fratianni and Spinelli (1984), we calculate the country risk premium as
$$D_t = \ell n(1 + i_{I,t}) - \ell n(1 + i_{F,t}) - \ell n E_{t+1}^T + \ell n E_t,$$
where $i_{I,t}$ is the yield on Italian bonds at time t; $i_{F,t}$ is the yield on French bonds, E_{t+1}^T is the lira/franc exchange rate for $t+1$ expected at t, and E_t is the exchange rate at t. Their calculation holds constant transactions costs and assumes perfect foresight in the exchange market, that is, $\ell n E_{t+1}^T = \ell n E_{t-1}$. We also calculated the risk premium using an alternative measure of the expected change in the exchange rate, $\ell n E_t - \ell n E_{t-1}$, and the picture was virtually the same.

38. See Bordo and Kydland (1990) for a more detailed discussion.

39. Other Latin American countries also had experiences of alternating adherence to gold convertibility. See Fishlow (1987).

40. Klein (1975) also presents evidence for mean reversion of the price level under the gold standard.

41. See Eichengreen (1985, 5) for a chronology of countries adopting gold.

42. Giovannini (1993) views the facts that both exchange rates and short-term interest rates varied within the limits set by the gold points in the 1899–1909 period as consistent with market agents' expectations of a credible commitment by the four "core" countries to the gold standard rule in the sense of this chapter.

43. See Eichengreen (1992a, 60) and Fishlow (1987, 1989).
44. According to Giovannini (1986), however, the Bank of England did not follow the "rules," while the Reichsbank did.
45. Alternatively, the gold devices could be interpreted as an effort to strain every nerve to *avoid* abandoning convertibility.
46. According to Eichengreen (1992a), the Bank of England's ability to ensure convertibility was aided by cooperation with other central banks. In addition, as mentioned above, belief based on past performance that England attached highest priority to convertibility encouraged stabilizing private capital movements in times of threat to convertibility, such as in 1890 and 1907.
47. According to Giovannini's (1989) regressions, the French and German central banks adapted their domestic policies to external conditions, whereas the British did not. This can be interpreted as evidence for British management.
48. Grossman's (1990) interpretation of the historical record, though emphasizing different factors, accepts this view. Thus, according to him, the ratio of government debt to GNP increased during major wartime episodes in Britain and the United States from the mid-18th century until after World War I, reflecting intertemporal substitution. Such borrowing represented a temporary effort to shift resources from the future to the present. Following each war, the ratio of debt to income would then be reduced by contractionary fiscal policy accompanied by deflationary monetary policies that maintained the real rate of return on outstanding bonds. According to Grossman, such a policy was an investment in the credibility capital of the sovereign borrower – a reputation for responsible repayment of the principal and for preservation of the real value of interest payments that enhanced the probability of being able to borrow heavily again at favorable rates in the event of a future war.
49. According to North and Weingast (1989), this process was complete by the Glorious Revolution of 1688. After that date, capital markets developed in an environment free of the risk of sovereign appropriation of capital.
50. An alternative and complementary explanation to that offered in this chapter relates to political economy considerations and the distribution of income. The configuration of political interest groups in the 19th century was favorable to the hard money, pro-gold standard rule position. This may have been related to the more limited development of democracy and less-than-universal suffrage. Thus, a comparison of the debates over resumption in England from 1797 to 1821 and in the United States from 1865 to 1878 suggests that the more limited suffrage in England in the early period served as a brake on the soft money forces favoring permanent depreciation. In the United States, the soft money forces favoring redistribution of income to debtors and other groups (such as Midwestern manufacturers) almost carried the day.

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