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The Gold Standard As a Rule: An Essay in Exploration*

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In this paper, we show that the monetary rule followed by a number of key countries before 1914 represented a commitment mechanism preventing the monetary authorities from changing planned future policy. 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 wartime) on the understanding that convertibility at the original price of gold would be restored when the emergency passed. © 1995 Academic Press, Inc.

1. INTRODUCTION

The gold standard has long 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).[1]

In this paper we survey the history of the gold standard (or to be more accurate

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[1] For a discussion of the Currency Banking School debate, see Viner (1937), Fetter (1965), and Schwartz (1987).

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the specie standard) treated as a rule, but our meaning of the concept of a rule differs radically from what used to be the traditional one. We regard it 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.

In the simplest sense, government policy is said to be time inconsistent when a policy plan, calculated as optimal based on the government's objectives and expected to hold indefinitely into the future, is subsequently revised. Discretion, in this context, means setting policy sequentially. This could then lead to policies and outcomes that are very different from the optimal plan, as market agents rationally incorporate government actions into their planning. For that reason, the government would benefit from having access to a commitment mechanism to keep it from changing planned future policy.

Our approach to gold-standard history posits that adherence to the fixed price of specie, which characterized all convertible metallic regimes including the gold standard, served as a credible commitment mechanism (or a rule) to monetary and fiscal policies that otherwise would be time inconsistent. On this basis, adherence to the specie standard rule enabled many countries to avoid the problems of high inflation and stagflation that troubled the late 20th century.

Furthermore, we argue that the gold standard that prevailed before 1914 was a contingent rule. Under the rule, gold convertibility could be suspended in the event of a well-understood, exogenously produced emergency, such as a war, on the understanding that after the emergency had safely passed convertibility would be restored at the original parity. Market agents would regard successful adherence as evidence of a credible commitment and would allow the authorities access to seigniorage and bond finance at favorable terms.

According to this view the core countries of the gold standard—Britain, France, the United States, and Germany, as well as a number of other Western European countries and British Dominions—adhered strictly to convertibility rules in the period from 1880 to 1914. By contrast many peripheral countries did not. Some never adhered to the rule. Others joined it when conditions were favorable to them, ostensibly to obtain access to capital from the core countries, but they quickly abandoned it when economic conditions deteriorated.

Before 1880, most countries were on a form of specie standard: either bimetallism or silver or gold monometallism. However, from our perspective the bimetallic standards that many countries followed were a variant of the gold-standard rule, since it is convertibility that defines the rule.

The interwar gold standard can be regarded as an extension of the pre-1914 system because it was based on gold convertibility. However, it was less successful because the commitment to convertibility was often subordinated to other politically induced objectives.

The Bretton Woods international monetary system can be regarded as a distant relative of the classical gold standard in that the center country, the United States, maintained gold convertibility. It was also based on a contingent rule—parities

could be changed in the event of a fundamental disequilibrium. However, it differed from the basic specie standard rule in that a credible commitment to the fixed parity was not of such primary importance.

This essay is intended to provide a new perspective for examining many of the familiar issues of gold-standard history. As such, it is hoped that it will stimulate new research on different countries' gold-standard experience to either verify or reject our approach.

Section 2 discusses the concepts of time inconsistency, contingent rules, and discretion, applies it to the institutions of the gold standard, and thus lays out the framework for historical analysis. Section 3 briefly surveys the historical record on the adherence to the specie standard rule by both core and peripheral countries. Section 4 surveys recent research in gold-standard history for evidence consistent with the credibility of commitment to the gold convertibility rule and for the operation of the contingent variant of the rule posited in this essay. It ends with some suggestions for future research. Section 5 concludes with some lessons from history and speculations on why adherence to the rule disintegrated in the 20th century.

2. THE GOLD STANDARD AS A CONTINGENT RULE

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 meant defining a gold coin as a fixed weight of gold called, for example, 1 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 then was committed to keep the mint price of gold fixed through the purchase and sale of gold in unlimited amounts. It 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.[2]

This operational procedure 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 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

[2] Strictly speaking, the government needed to 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, p. 165). In most countries, however, the mint was under government authority.

fixed can be viewed as a variant of the basic gold standard, since it is a fixed value of the unit of account that is its essence.[3]

This paper views the operation of the gold standard from a new perspective. It is seen as intimately related to the public-finance question: How should the government finance fluctuating expenditures so as to minimize deadweight loss to society? In a general sense, this question dates back to the pioneering work of Ramsey (1927). In the context of a timeless environment, an important result of his work was that it is beneficial to tax relatively more heavily what is inelastically supplied.

Over the past two decades, economists more and more have come to realize that an intertemporal framework is essential for addressing such questions. Seen in this light, the principle just enunciated is precisely what may lead governments into trouble. If one can tax an asset (or the income therefrom) that had been accumulated for the purpose of yielding services or command of resources in the future, then the time-inconsistency literature shows that there will be a strong temptation to increase these taxes ex post. While they impose little distortion in the short run, in the sense that most of the accumulated capital will still be supplied and somebody will hold the government debt that already has been issued, the problem is the adverse effect on incentives for future accumulation. As a consequence, to reassure the public that the real value of the debt will not erode in the future as a result of inflationary policy, there is a need for a commitment mechanism constraining future monetary policy.

The main point of this paper is that the gold standard represented such a commitment mechanism. Moreover, we contend that nations were committed to the gold standard as a rule with war as a contingency. Operationally, the rule is to suspend the gold standard for the duration of a war plus a delay period. In all periods with no such emergency, the gold standard is maintained unconditionally. This policy is fully understood and anticipated by the public.

To understand the role of the gold standard as a commitment mechanism, we use as a framework an environment in which the government behaves so as to maximize an intertemporal, but unchanging, objective function.[4] There are two basic categories of taxes. One consists of taxes on already accumulated assets, such as productive capital or holdings of government bonds. For the other revenue source, in contrast, intertemporal linkages are relatively unimportant. Examples are customs duties or a proportional tax on labor income. Households and firms decide on consumption, investment, and labor input, while the government chooses tax rates and net borrowing, including the printing of high-powered money (for example, greenbacks during the Civil War).

[3] 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.

[4] If everyone were alike, a natural objective for the government would be to maximize the expected present value of a representative household's utility subject to the government budget constraint.

A government plan that maximizes the value of its objective function is called a Ramsey plan, and the corresponding sequence of private outcomes the Ramsey allocation. The Ramsey plan takes into account the private-economy behavior associated with alternative plans, assuming everyone believes them to be credible for the entire future. In particular, decisions to accumulate assets depend critically on the tax and inflation policies expected to be followed. In general, private decisions today depend on the entire sequence of present and future government policy.

The role of government debt is especially important if the changes in government expenditures are large at times, such as during wars. Without the issue of new debt, the required changes in tax rates would severely reduce the incentives for economic activity at a time when the need for maintaining such activity is the greatest. Issuing debt permits smoothing of tax rates over time. Such practice generally is beneficial not only during wars, but also in normal circumstances, as shown in Barro (1979) and Kydland and Prescott (1980). The equality between expenditures and tax revenues needs to hold only in a present-value sense, not in every time period. Net borrowing makes up the difference.

To understand the time-consistency problem, consider a government plan that is optimal (i.e., a Ramsey plan) starting at time zero. Imagine now that the analogous problem is contemplated as of a future date s. The solution to this optimal-taxation problem is different from the part of the original plan for the now-current and future periods, s, $s + 1$, and so on. In other words, the original plan is inconsistent with the passage of time. The reason is that while the Ramsey plan computed at time zero takes into account the effects of government policy, for example, capital–income taxation, planned for date s and subsequent periods on private behavior at dates before s, at time s, when the new plan is computed, private behavior prior to period s, of course, can no longer be affected.

Two points about time inconsistency should be emphasized. One is that its source is not the conflict between the form of utility function for the government and that of private individuals. Moreover, time inconsistency arises despite an unchanging objective function over time. The key factor is that decisions are made sequentially over time in environments in which future government policy affects current private behavior.

When issuing debt, the interest rate and therefore the price at which the government can sell its debt depend on the expectation of future inflation. In effect, the government can partially default ex post through a surprise inflation. The time-consistency problem is that if, in a future period, the government could default to a greater extent than specified by the original plan, then the need for distortionary taxes is reduced. But such an action also affects expectations of subsequent defaults and therefore the price at which the public is willing to hold future government debt.[5]

[5] In Prescott's model (1977), for example, the government finances a given stream of expenditures either through taxes on labor income (abstracting from capital) or by selling debt. He finds that if the

For some model environments, the Ramsey plan, along with the associated private-economy allocations, represents an equilibrium outcome.[6] What supports it as part of an equilibrium is the belief that as long as the government has followed this plan in the past, it will continue to do so.[7] This observation suggests that an explicit and transparent mechanism is needed to make it work.

To ensure the presence of a credible commitment mechanism, society in some cases has committed itself by law. An example is the patent law. It ensures sufficient incentives for inventive activity by giving 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 was set up with a similar motivation, namely as an explicit, transparent, well-understood rule.

In an uncertain world, the Ramsey plan generally is contingent. For any model environment, it includes as many contingencies as there are variables describing the state of the economy at any point in time. 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 credible rule may include only the contingency that is considered most important—a war in the case of the gold standard. A candidate for a second contingency, to go into effect in the event of a financial crisis, assuming the crisis has not been caused by the monetary authorities' own actions, may be to use temporary restrictions on convertibility of bank liabilities to reduce the extent of a banking panic.

How was the gold-standard rule enforced? A 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 contingen-

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 the value of 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.

[6] Chari and Kehoe (1989, 1990) consider this issue for environments in which time-consistency problems arise either because of capital taxation or because of the presence of government debt. A well-written overview appears in Chari (1988).

[7] The idea that reputation may support optimal policy has been explored in a different context by Barro and Gordon (1983).

[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.

cies. Thus, when an emergency occurred, the abandonment of the standard would be viewed by all to be a temporary event because from their experience, only gold or gold-backed claims truly served as money.

An alternative commitment mechanism, analogous to the case of patents, would have been to guarantee gold convertibility in the constitution. This was done 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, p. 368).

To reiterate, under the contingent gold-standard 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 circumstance 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 eventually will 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 return to the gold standard.[9]

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 discretion. By discretion, we mean any purposeful deviation, under whatever guise, from the rule. The excuse could be a "bad outcome," in the language of Grossman and Van Huyck (1988), which is not included as a contingency in the original plan. Deviations from the rule (perhaps accompanied by promises not to repeat the breach of the rule) are tempting because of the immediate benefits made possible because the public had anticipated continuation of the original plan. 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.

An example of discretion less extreme than a repeal is to decide at the end of the delay period to postpone further its resumption, perhaps as a result of the perceived current situation in terms of how much of the war has been paid for and the undesirable effects of the taxes needed to pay back the debt. This change is all the more tempting if the public had accepted the debt at a reasonably low interest rate in the expectation that the gold standard would be resumed as scheduled. If the government breaks the rule in effect by choosing a high default rate, then people's behavior, should there be another war within memory of the previous one, will be quite different from that in the previous war, even if the situation is

[9] This description is consistent with a result from a model of Lucas and Stokey (1983), in which financing of wars is a contingency rule that is optimal. 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 the war continues.

otherwise similar and the government claims to subscribe to the same fixed-delay rule.

2.1. 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 paper, 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 served to strengthen the credibility of the domestic commitment.[10]

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 success.

3. 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 actions of monetary authorities. We distinguish between the experience of the "core" countries and peripheral countries.[11] We then 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 until the late 1930s with the main focus on the classical period ending in 1914. Although the United

[10] The roll of spillover effects on reputation through multiple relationships is discussed in Cole and Kehoe (1991).

[11] For a more detailed discussion of the convertibility history of the core countries see Bordo and Kydland (1995) and for a more detailed discusion of the convertibility history of the peripheral countries see Bordo and Kydland (1990) and Bordo and Schwartz (1994).

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 only receive tangential reference in the survey.[12]

Table 1 presents a road map of the convertibility history of 21 countries from the early 19th century to the final breakdown of the gold exchange standard before World War II (see Bordo and Schwartz, 1994). The countries are divided into two main groupings, 4 core countries and 17 peripheral countries.

The table separates experience under a bimetallic or silver standard, which prevailed before the last quarter of the 19th century, from experience under the gold standard that followed. For each standard and each country the table shows dates when a commitment was made to convert the national currency into specie, dates of suspension of the commitment, and the reasons for suspension. For the gold standard an additional column indicates whether a change in parity was made on resumption of convertibility after suspension.

3.1. Core Countries

We first discuss the record for core countries and then turn to the peripheral countries. Although the table shows 1694, the year the Bank of England was founded, as the date for convertibility of the British pound into silver, Britain was on a silver standard as far back as the 13th century. De facto the country was on a gold standard from 1717 on, owing to the overvaluation of gold by Sir Isaac Newton, the Master of the Mint; de jure the country adopted the gold standard in 1816 while suspension of convertibility was still in effect. There had been banking crises in 1763, 1772, and 1783, but no suspensions until the war with France ended convertibility from 1797 to 1821. This again we regard not as a breach of the rule but proper invocation of the contingency not only for the duration of the war but for a period of adjustment thereafter.[13] Resumption at the prewar parity also respects the rule.

The UK's record before World War I is the epitome of proper conduct under the gold standard. As the country at the center of the system, operating with a small gold reserve, it nevertheless managed to serve both its domestic and international interests while maintaining convertibility. Three banking panics in 1847, 1857, and 1866 led to suspension of the Banking Act of 1844, which limited the Bank of England's fiduciary issue, but did no damage to the convertibility commitment.

[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] 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 (Acworth, 1925, Chap. VI; Feavearyear, 1963, pp. 224–225; Fetter, 1965, pp. 73–76; Laidler, 1987).

TABLE 1
Pre-World War II Dates of Specie Convertibility and Suspensions for 21 Countries in Seven Groupings

Country	Dates of bimetallic or silver convertibility	Dates of suspensions	Reasons for suspensions	Dates of gold convertibility	Dates of suspensions	Reasons for suspensions	Change in parity?
			Part 1. Core countries				
1. France	1803	1848–1850	Government overthrown	1878	1914	War	Yes
	1850	1870–1878	War	1928	1936	Depression	Yes
2. Germany				12/1871	1914	War	Yes
				1924	1931	Depression	Yes
3. UK	1694	1797–1821	War	1816–1821	1847[a]	Panic	No
					1857[a]	Panic	No
					1866[a]	Panic	No
					1914	War	No
				1925	1931	Crisis	Yes
4. United States	1792	1834[b]		1875/1879	1893	Panic[c]	No
	1834	1837[c]	Panic	1893	1907	Panic[c]	No
	1838	1857[c]	Panic	1908	1933	Depression	Yes
	1858	1862	War				
		1873[c]	Panic				
			Part 2. British dominions				
5. Australia	1829			1852	1915	War	No
				04/1925	12/1929	Crisis	Yes
				03/1930			
6. Canada	1821	1837	Crisis	1853	1914	War	No
	1839						No
				06/1926	09/1931	Crisis	Yes
			Part 3. Latin America				
7. Argentina	1822	1825	War	1863		Convertibility failed	
					05/1876	Lax fisc	No
				1881		Convertibility failed	
				1883	01/1885	Lax fisc	No
				1899	1914	War	Yes
				08/1927	1929	Crisis	Yes

TABLE 1—*Continued*

Country	Dates of bimetallic or silver convert-ibility	Dates of suspensions	Reasons for suspensions	Dates of gold convert-ibility	Dates of suspen-sions	Reasons for suspensions	Change in parity?
8. Brazil		1833	Lax Fisc	1846	1857	Crisis	
				~~1888~~	~~1889~~	~~Govern-ment over-thrown~~	~~Yes~~
				1906	1914	War	Yes
				1927	1930	Crisis	Yes
9. Chile	1818	1851					
	1851	1866		1887		Convert-ibility failed	Yes
	1870	1878	Crisis	1895	1898	War Threat	Yes
				1925	1931	Crisis	Yes
Part 4. Southern Europe							
10. Greece	02/1833	04/1848	Panic	01/1885	08/1885	Convert-ibility failed	No
	01/1849	12/1868	War				
				04/1910	12/1914	War	Yes
	08/1870	05/1877	War	05/1928	04/1932		Yes
11. Italy	1862	1866	Lax fisc; war	1884	1894	Lax fisc	Yes
				12/1927	10/1936	Depression	Yes
12. Portugal	1846			1854	1891	Crisis	Yes
				07/1931	09/1931	Crisis	Yes
13. Spain	1868	1883	Crisis				
Part 5. Scandinavian countries							
14. Denmark				12/1872	12/1914	War	No
				01/1927	09/1931	Crisis	Yes
15. Finland				1877	1914	War	Yes
				01/1926	10/1931	Crisis	Yes
16. Norway				1875	1914	War	No
				05/1928	09/1931	Crisis	Yes

TABLE 1—*Continued*

Country	Dates of bimetallic or silver convert-ibility	Dates of suspensions	Reasons for suspensions	Dates of gold convert-ibility	Dates of suspen-sions	Reasons for suspensions	Change in parity?
17. Sweden	1803	1809	War	1873	1914		No
	1834	1873		1922/1924	1931		Yes
			Part 6. Western Europe				
18. Belgium	1832	1848	Crisis	1878	1914	War	Yes
				10/1926	03/1935	Crisis	Yes
19. Netherlands	1847			1875	1914	War	No
				04/1925	10/1936		Yes
20. Switzerland	1850			1878	1914		No
				1929	1936		Yes
			Part 7. Japan				
21. Japan	1885	1897					
				1897	1917	Crisis	No
				12/1930	12/1931	Crisis	Yes

Sources. Bernanke and James (1991), Bordo and Kydland (1995), Butlin (1986), Cortes-Conde (1989), Eichengreen (1992b), Fratianni and Spinelli (1984), Fritsch and Franco (1992), Haavisto (1992), Jonung (1984), Lazaretou (1995), Llona-Rodriguez (1993), Martin Acena (1993), Pelaez and Suzigan (1976), Reis (1991), Shearer and Clark (1984), and Shinjo (1962).

[a] Suspension of Banking Act of 1844.

[b] Change in mint ratio.

[c] Restriction of payment by banks.

Thereafter the Bank acted to defuse panics before they emerged, as in 1890 and 1907. Convertibility was abandoned by the Bank in World War I (de facto in 1914 and dejure in 1919), taking advantage of the contingency, and the return to the gold standard at the prewar parity was delayed until April 1925, also consonant with the provisions of the contingency.[14] The convertibility commitment, however, lasted only for six years, and devaluation followed.

[14] 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 (Moggridge, 1969), vociferous opposition to it was voiced by Keynes (1925) and other academics, by labor (not the official Labor 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 (Pollard, 1970; Brown, 1929; Sayers, 1960; Hume, 1963). 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.

The year 1803 is the entry in the table for the date of convertibility of the French franc into gold or silver. A bimetallic system nevertheless predated that entry by centuries, but before 1803, France had endured devaluations, revaluations, John Law's inflationary inconvertible paper money experiment, 1716–1720, and the revolutionary war assignat hyperinflation, 1789–1795. Thus 1803 marks the beginning of a stable system, with only two interruptions until 1878, when France switched to gold. The two interruptions were suspensions in 1848–1850, following the overthrow of the July monarchy, and 1870–1878, following the Franco–German War (Lacroix and Dupieux, 1973). Both of these interruptions qualify as consistent with adherence to specie rules, since the suspensions were valid exercises of the contingency.

For the bimetallic/silver standard period, there are no entries for Germany, since it was not unified until 1871. The individual German states, however, were on a bimetallic or silver standard, as were also the other three core countries.

Under the classical gold standard both France and Germany observed specie rules until the outbreak of World War I. Each then suspended convertibility, and both devalued before resuming in the 1920s. Convertibility by France lasted for eight years and by Germany for seven years, and then both devalued after suspending in 1931. The public probably regarded suspension per se because of war and financial crisis as permissible under contingency as evidenced, e.g., by speculators' purchases of German marks in 1919 (Hawtrey, 1926). The change in parity, however, diluted the credibility of the countries' attachment to specie rules.

Turning to the United States, the U.S. Coinage Act of 1792 defined the bimetallic standard at a mint ratio of 15 to 1. In 1834 and again in 1837 the mint ratio was altered, remaining unchanged thereafter at 16 to 1.[15]

Banking panics in 1837 and 1857 led to temporary restriction of payments by banks but no suspension of convertibility. The Civil War, however, occasioned suspension from 1862 through 1878. In 1873 there was a banking panic, like the earlier ones, in which the banks restricted payments of high-powered paper money. Despite contentious political opposition to deflation that resumption enforced (Sharkey, 1959; Unger, 1964), on January 1, 1879, resumption was achieved at the prewar parity, in line with the declaration of the Resumption Act of 1875.

Apart from the silver threat to gold convertibility in the mid-1890s stemming from the silver agitation and legislation of 1878 and 1890, convertibility from

[15] 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 $15\frac{1}{2}$:1 (the French ratio) 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 Act of 1834 was also passed at the urging of the gold-producing states of South Carolina, North Carolina, and Georgia (Friedman, 1990a).

1879 to 1914 in the United States was never in doubt.[16] It was preserved even during two banking panics in 1893 and 1907 when banks restricted payments.

In World War I the United States embargoed gold exports, 1917–1919, but did not otherwise attenuate the gold standard. Specie rules were, however, flouted by the devaluation of the dollar in 1933. The changed parity legislated in 1934 remained in effect until 1971.

The record of commitment by the core countries to specie rules is unblemished under the pre-World War I gold standard. Neither France nor Germany played by those rules during the interwar period, having resumed convertibility with devalued gold content of their currencies. The UK reverted to its prewar parity when it resumed convertibility in 1925 but by 1931 devalued and abandoned rules for discretion. The United States followed the UK in devaluing in 1933 and adopted a gold standard in 1934 that diverged in fundamental ways from the pre-World War I standard.

3.2. Peripheral Countries

3.2.1. British dominions. Australia and Canada, the two countries in our sample that were settled by the UK were as faithful as the core countries in adhering to the gold standard before 1914, but deviated in the post-World War I period. Silver was the metallic medium in Australia before it adopted the gold standard. Convertibility at a fixed Australian price of gold dated from 1852. Despite severe banking problems in the 1890s, Australia did not suspend convertibility until July 1915 during World War I. It resumed, along with the UK in 1925, at its prewar parity, and suspended at the end of 1929, when the world depression began. It devalued in March 1930 (Butlin, 1986).

In Canada the first bank charters in 1821 required convertibility of bank notes into silver. A financial crisis and political instability in 1837 led to suspension. Resumption occurred in 1839. Canada adopted the gold standard in 1853 and, although it experienced a sharp cyclical downturn in 1907–1908, it did not suspend convertibility until 1914. Canada restored legal convertibility at the prewar parity in July 1926, making the monetary adjustments to return to parity without a central bank. The de facto date of Canada's suspension of gold convertibility was 1929 (Shearer and Clark, 1984). De jure suspension occurred in September 1931 when both internal and external gold convertibility ended.

3.2.2. Latin America. The record of the three Latin American countries, Argentina, Brazil, and Chile, does not match that of Australia and Canada.

Before it adopted the gold standard, from 1822 to 1825 Argentina had a brief spell of convertibility of bank notes. The metallic medium was silver and gold.

[16] Treating the United States as part of the core differs from the views of Eichengreen (1992b, 1994), Grilli (1990), and Giovanni (1993) who treat the silver episode as evidence of a lesser commitment to gold convertibility than the other three members. If lasting damage to U.S. commitment credibility as a result of the threat had resulted, we would concur. Since the threat was a temporary one, and convertibility was never suspended, we conclude that the United States, by the end of the 19th century a colossus on the world stage, belongs with the core.

Convertibility ended at a time of large government expenditures related to a war with Brazil. For the following 35 years, a period of continuing fiscal improvidence, there was no convertibility. Between 1862 and 1865 contractionary monetary policy was in force.

Gold convertibility in Argentina began in February 1867 after a failed attempt in 1863 (Cortes-Conde, 1989). Convertibility was suspended in May 1876 after several years of political unrest and rising government deficits. Although the exchange rate reached parity by 1881, resumption that year failed. Convertibility was restored in 1883 but lasted only until January 1885, at a time of financial crisis in Europe and following a period of expansionary fiscal policy. Again inconvertibility thereafter until 1899 was associated with lax fiscal policy leading to debt default in 1890. In 1899 convertibility was restored with the return to fiscal orthodoxy in 1896 and the establishment of a form of currency board. Argentina suspended convertibility in 1914 on the outbreak of war. At a changed parity Argentina resumed in August 1927 and suspended it again in 1929. Inconvertibility prevailed during the balance of the interwar period.

From 1808 onward Brazil followed a bimetallic standard at the colonial ratio of 16:1. From then until 1846, when it was altered to favor gold, the ratio was changed three times. Gold convertibility was suspended in November 1857 in the wake of a banking crisis and resumed in 1858. It was subsequently abandoned on several succeeding occasions (notably during the war with Paraguay) (Pelaez and Suzigan, 1976). It lasted for slightly more than a year in 1888–1889. A republican revolution in November 1889 coincided with the ending of convertibility (Fritsch and Franco, 1992). In 1906 Brazil restored convertibility to prevent continued appreciation of the milreis exchange rate that was harmful to coffee and rubber exporters. In addition it created a Conversion Office with a limit set to its issue of convertible notes at a newly established parity. Brazil's external position deteriorated in 1913, owing to falling coffee and rubber prices and shrinking international capital flows following the Balkan wars. A cyclical decline lasted until the outbreak of World War I, when convertibility ended to preserve the gold holdings of the Conversion Office.

As was the case in 1906, resumption in 1926 was sought to prevent appreciation of the exchange rate. The collapse of coffee prices in 1929 and the contraction in capital inflows led in late 1930 to an almost complete loss of gold reserves by the Stabilization Office. Convertibility was then abandoned for the duration of the remaining interwar years.

Chile was on a bimetallic standard from 1818 to 1851; it then made a technical change in the mint ratio, continuing on the bimetallic standard until 1866, when it suspended. It resumed in 1870, but by the end of 1874 with the fall in the price of silver, it was on a de facto silver standard. Bad crops during the next three years, and accompanying balance of payments deficits, were followed by bank runs in 1878. The authorities made bank notes inconvertible on July 23, 1878 (Llona-Rodriguez, 1992).

For the next 17 years, Chile remained on a paper standard. In 1879 the War of

the Pacific began, with Chile opposing Bolivia and Peru, and ended in 1883 with Chile the victor. The war was financed by government note issues.

The first attempt to return to a metallic standard was made in 1887, but it failed. An eight-month Civil War from January to August 1891 resulted in further monetary expansion and exchange rate depreciation. A second conversion law in November 1892 was strictly implemented and the exchange rate appreciated, but again the government responded to political discontent by issuing notes. The exchange rate thereupon depreciated. A new conversion law of February 11, 1895, set June 1 as the day for redemption of government notes, devalued the gold content of the peso, and authorized loans and sales of nitrate fields to accumulate a gold reserve. Following rumors of war with Argentina and a run on the banks in July 1898, the legislature ended convertibility and, to deal with the panic, bank notes were declared government obligations. Chile did not resume until 1925, when it again devalued, and in 1931 it abandoned the gold standard.

Common elements in the experiences of the Latin American ABC countries that made their adherence to the gold standard chancey were war and threats of war and fiscal and monetary policies incompatible with fixed exchange rates. It is difficult, however, to isolate policy from balance of payments problems that were their lot as exporters of primary products whose prices were set in world markets. Whereas for core countries war was a contingency that justified abandonment of the standard, it was a temporary abandonment with the commitment to return to it; for the Latin American peripheral countries, not only the aftermath of war but deflation generally were reasons for absence of commitment to convertibility.

3.2.3. Southern Europe. For 42 out of the 52 years between 1833 and 1884, when it adopted the gold standard, Greece was on a bimetallic standard. Until 1828 it had no national currency; Turkish coins were the medium of exchange (Lazaretou, 1995).

Convertibility prevailed from February 1833 to March 1848, when suspension was declared for the balance of the year in response to panic worldwide. Resumption in January 1849 lasted through December 1868. Although Greece signed on as a member of the Latin Monetary Union in April 1867, it did not formally participate until November 1882, when it defined 1 drachma as equivalent to 1 French franc.

Greece suspended for a year and a half until July 1870 because of revolution in Crete, and it resumed in August 1870 until May 1877, which marked the end of its bimetallic experience. From June 1877 through December 1884, suspension was associated with the Russian–Turkish War of 1877–1878. After the war ended, Greece made several attempts to resume. In 1882, it devalued the drachma.

Greece adopted the gold standard in 1884 but convertibility failed in the face of massive gold outflows, and by September 1885 Greece reverted to a paper money standard and floating exchange rates.

The defeat of Greece in 1897 in the war with Turkey, which saddled it with a huge war indemnity payable in funds convertible into gold, was the spur for the appointment in 1898 of an International Committee for Greek debt management.

The Committee imposed fiscal prudence on the government, and a loan of 150 million gold French francs was arranged to enable Greece to pay the war indemnity to Turkey. These measures restored confidence in Greek monetary and fiscal policies. A law of March 1910 required note circulation above a statutory ceiling to be backed by gold or foreign exchange. In April 1910 Greece resumed convertibility on the gold exchange standard.

The new standard was successful until December 1914. Money creation then financed wartime spending. Exchange rate parity was maintained until reserves were depleted by August 1919. Exchange rates floated until May 1928, when Greece returned to the gold exchange standard. It instituted foreign exchange controls in September 1931 and devalued in April 1932, when convertibility ended.

Italy, unlike Greece, adhered to a specie standard only for 14 years during the 52 years before World War I but operated a paper standard during most of the rest of the period as if subject to specie constraints. In 1862 it adopted the bimetallic standard, although de facto the standard was gold. In 1865 Italy joined the Latin Monetary Union. Fiscal improvidence and war against Austria in 1866, however, ended convertibility (Fratianni and Spinelli, 1984).

Fiscal and monetary discipline was achieved by 1874, and exchange rate parity was restored. The government announced on March 1, 1883, that it would restore convertibility on April 12, 1884, but convertibility took place only in silver because silver was overvalued at the mint. Public finances then deteriorated and unlawful bank issues indicated an absence of monetary discipline. By 1894 Italy was back on a paper standard, and floating exchange rates. Inconvertibility lasted until 1913. After periods of laxity, the government embraced fiscal and monetary rectitude as if it were on a gold standard.

Italy did not return to the gold standard until December 1927. It resorted to foreign exchange controls in May 1934, and devalued in October 1936.

Portugal was runner-up to Greece in the number of years it adhered to specie rules (Reis, 1991). It had been on a bimetallic standard since the 1680s with de facto gold predominance alternating with de facto silver predominance. In 1846 it was a weak country facing a civil war and in no position to mint its own coin to any great extent. Instead, Portugal legalized silver coinage from other countries and set a new gold parity for the milreis at 4.5 to the pound sterling that effectively ensured that English money would mainly be the foreign inflow. The decision to shift to a gold standard in 1854 was made by the government as the most convenient for Portugal since gold circulation was ample. The parity with the pound was unchanged from 1854 until 1891, during which there were no convertibility crises. Furthermore, the mint ratio the law established favored gold. All this came to a halt in 1891 after an increase in the ratio of its debt service payments to revenues, and government support of failing Portuguese enterprises clouded its reputation as a creditworthy nation. Portugal's suspension of convertibility in 1891 lasted until after World War I. It returned to gold in July 1931 at a devalued parity and suspended two months later with England.

Although Spain adopted a bimetallic regime in April 1848, it was not until the currency reform of 1868 that established the peseta as the monetary unit that the regime was fully operative (Martin Acena, 1993). In 1868 the gold–silver ratio was set at 15.5:1, as in the Latin Monetary Union (which Spain did not join), whereas the 16:1 ratio set in 1848 was followed by six reductions in the intervening years.

With the fall in the market price of silver in the 1870s, the 15.5:1 ratio undervalued gold. Gold was driven out of circulation, and the gold reserves of the Bank of Spain declined, but until mid-1883 trade surpluses and capital imports sustained convertibility. A declining trade balance and capital outflows from 1881 to 1883 led Spain to end convertibility to avoid deflation.

Between 1888 and 1900 the peseta exchange rate depreciated, a budget deficit arose in every year but three from 1884 to 1899, the war with Cuba in 1898–1899 was financed largely by money creation, and Spanish prices until 1905 fell much less than world prices—all factors hostile to resumption. These factors mainly after 1900 turned favorable to resumption, but it did not take place. Efforts by finance ministers to restore convertibility and adopt the gold standard before World War I foundered on the opposition of the Bank of Spain. Unlike other countries, Spain did not turn to gold convertibility during the interwar period, not even briefly. It adopted foreign exchange controls in May 1931.

3.2.4. Scandinavia. The Scandinavian countries were as faithful adherents to the classical gold standard as were the core countries. Sweden had a silver standard from 1803 to 1809. Large budget deficits to finance a war with Russia in 1808 bloated the money supply. In 1809 convertibility was suspended. A silver standard was not restored until 1834. It lasted until 1873 when Sweden adopted gold. The four Scandinavian countries show a common pattern of adoption of the gold standard between 1872 and 1877 and adherence to the standard until 1914.

The Swedish constitution guaranteed the convertibility of the central bank's notes into gold. For a change in gold standard arrangements to be adopted Parliament had to give its assent at two different dates with an election intervening (Jonung, 1984). The central bank's decision in 1914 to make the notes inconvertible was unconstitutional since the bank disregarded the provision for Parliamentary approval.

Only Finland devalued on resumption in 1926 (Haavisto, 1992). The others resumed at their prewar parities. Sweden returned to gold de jure in March 1924, but de facto the prewar par rate of the krona in gold was restored in 1922. All the Scandinavian countries suspended in 1931 and devalued. In June 1933 the Swedish krona was fixed to the British pound, and the exchange rate was unchanged until after the start of World War II.

3.2.5. Western Europe. The three Western European countries, Belgium, the Netherlands, and Switzerland, adopted the gold standard in the second half of the 1870s and adhered to it until World War I.

A note-issuing bank was established in Belgium in 1822 before it became independent in 1832, when it was a bimetallic adherent. It suspended convertibil-

ity in 1848 in the face of French political and financial problems. The Netherlands went on a bimetallic standard in 1847, Switzerland in 1850.

All three countries suspended convertibility in 1914. Belgium lost the right of note issue when the Germans took over. Switzerland declared bank notes legal tender in 1914. The Netherlands prohibited gold export in 1914. Belgium devalued when it returned to gold in October 1926 and devalued again in March 1935. The Netherlands returned to gold at the prewar parity in April 1925 and devalued in October 1936. Switzerland did not devalue in 1929 when it returned to gold but when it left the standard in 1936 it did.

3.2.6. Japan. Convertibility was not firmly established in Japan until 1885, when it was on a silver standard (Shinjo, 1962). The Coinage Act of 1897 established the gold standard. The act governing the Bank of Japan was revised to require convertibility of its notes into gold instead of silver.

Japan adhered to the gold standard until September 1917, without interruption despite runs on banks in 1901 and 1907–1908, war with Russia in 1904–1905, extraordinary government expenditures financed by foreign loans, and an unfavorable balance of payments during most of the period. The decrease in the specie reserve prompted flotation of foreign bonds in London and Paris in every year from 1906 to 1915. Foreign capital maintained Japan's gold standard.

In September 1917 Japan followed the United States in embargoing gold and silver export. Bank of Japan notes became inconvertible. Japan lifted the gold embargo and returned to gold at the prewar parity in January 1930. Speculative transactions to sell yen and buy dollars once the gold standard was restored reflected the market's belief that the yen would have to be devalued. The suspension of the gold standard in December 1931 came after huge gold losses by Japan.

In sum, a number of peripheral countries also followed the rule as well as the United States and Britain. These included Canada, Australia, Sweden, The Netherlands, Switzerland, and Japan. In marked contrast to this group are the ABC countries of Latin America and the countries of Southern Europe. The Latin American countries suspended convertibility in wartime and also in the face of declining economic activity. They usually returned to gold at a depreciated parity. Their experience was characterized by higher money growth rates, higher fiscal deficits and higher inflation rates than the other countries (Bordo and Schwartz, 1994). For them gold convertibility was the exception rather than the rule. For the Southern European countries, adherence to the gold standard was an important objective, but for most of them, difficult to achieve. Their experience of low money growth, of low fiscal deficits, with the principal exception of Italy, and of exchange rates that never drifted far from parity suggests that following the rule was important (Bordo and Schwartz, 1994).

3.3. 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

monometalism, and paper to gold as the basis of their currencies (Eichengreen, 1985). 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. The fixed price of domestic currency in terms of gold provided a nominal anchor to the international monetary system.

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 in Section 2, 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, the hegemonic power of England, and central bank cooperation.

Support for the international gold standard likely grew because it provided improved access to the international capital markets of the core countries. Countries were eager to adhere to the standard because they believed that gold convertibility would be a signal to creditors of sound government finance and the future ability to service debt.

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 the commitment mechanism played under the international gold-standard rule. To the extent the rules were followed and adjustment facilitated, the commitment to convertibility was strengthened and conditions conducive to abandonment were lessened.

Evidence on the operation of the rules of the game questions their validity. 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.[17] In addition, a number of countries used gold devices—practices to prevent gold outflows.[18]

One can reconcile the violation of the rules of the game and the use of gold devices, with maintenance of credibility in the commitment to gold, by viewing the gold points as a form of target zone (Eichengreen, 1994). Belief that intervention would occur at the upper and lower gold points created a honeymoon effect whereby stabilizing capital flows caused the market exchange rate to revert toward parity before reaching the gold points (Krugman, 1991). Within the zone, the monetary authorities could alter discount rates to affect domestic objectives such as stabilizing real activity and smoothing interest rates (Svennson, 1994).

[17] According to Giovannini (1986), however, the Bank of England did not follow the rules, while the Reichsbank did.

[18] According to Goodfriend (1988), central banks operating under the gold standard did so to achieve "interest rate smoothing" through the use of gold stockpiling.

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 to 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 a powerful influence 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) treats the Bank of England as engaged in a leadership role in a Stackelberg strategic game with other central banks as followers.[19] 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. Thus, the monetary authorities of many countries may have been constrained from following independent discretionary policies that would have threatened adherence to the gold-standard rule.[20]

The benefits to England as leader of the gold standard—from seigniorage earned on foreign-held sterling balances, from returns to financial institutions 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.

Finally, Eichengreen (1992b) argues that episodic central bank cooperation may have also strengthened the credibility of the gold standard. Lines of credit arranged between the Banque de France, other central banks, and the Bank of England during incipient financial crises such as 1890 and 1907 may in turn have encouraged private stabilizing capital movements to offset threats to convertibility.

3.4. The Classical Gold Standard, the Gold Exchange Standard, and Bretton Woods

Eichengreen (1994) posits three prequisites for a successful international monetary arrangement: the capacity to undertake relative price adjustment,

[19] However, he does not consider a dynamic environment nor analyze the time inconsistency inherent in a Stackelberg game. See Kydland (1977).

[20] Indeed, according to Giovannini (1989), the gold standard was an asymmetric system. England was the center country. It used its monetary policy (bank rate) to maintain gold convertibility. Other countries accepted the dictates of fixed parities and allowed their money supplies to respond passively. His regressions support this view—the French and German central banks adapted their domestic policies to external conditions, whereas the British did not.

adherence to robust monetary rules, and ability to contain market pressures. According to him the classical gold-standard contingent rule satisfied these criteria for the core countries because the credible commitment to maintain convertibility above all else allowed invoking the contingency to accommodate major shocks, and because central bank cooperation eased market pressures in the face of speculative attacks. By contrast, for peripheral countries the credibility of commitment to the gold standard was considerably weaker, reflecting strong domestic political pressures to alter exchange rates (Frieden, 1994).

Though gold convertibility was restored by 1926 by most countries, the interwar gold exchange standard was a much less successful application of the specie standard rule. The contingency could not be invoked (lest it lead to destabilizing capital outflows) absent a credible commitment to maintain gold parity in the face of a politicized money supply process and, according to Eichengreen (1992b), the failure of cooperation.

The Bretton Woods international monetary system can also be viewed within the context of the specie standard rule, although it is a distant variant of the original specie standard. Under the rules of Bretton Woods, only the United States, as central reserve country and provider of the nominal anchor, was required to peg its currency to gold; the other members were required to peg their currencies to the dollar (McKinnon, 1993). They also were encouraged to use domestic stabilization policy to offset temporary disturbances. The Bretton Woods system had a contingency for its members—a change in parity was allowed in the face of a fundamental disequilibrium, which could encompass the contingencies under the specie standard rule—but it was not the same as under the specie standard because it did not require restoring the original parity.[21] The rule for members (other than the United States) was enforced, as under the gold standard, by access to U.S. capital and to the IMF's resources. For the United States, there was no explicit enforcement mechanism other than reputation and the commitment to gold convertibility. Capital controls were viewed as a method to contain market pressures.

The system was successful as long as the United States maintained its commitment to convertibility (i.e., maintained price stability). But the contingent aspect of the rule quickly proved defective since the fundamental disequilibrium contingency was never spelled out and hence parity changes would be accompanied by speculative attacks which became more serious as capital controls became increasingly ineffective. Ultimately, by following highly expansionary monetary and fiscal policies beginning in the mid-1960s, the United States attached greater importance to domestic concerns than to its role as the center of the international monetary system and the system collapsed.

Thus, although the Bretton Woods system can be interpreted as one based on

[21] The United States could change the dollar price of gold if a majority of members (and every member with 10% or more of the total quotas) agreed.

rules, the system did not provide a credible commitment mechanism.[22] The United States was unwilling to subsume domestic considerations to the responsibility of maintaining a nominal anchor. At the same time other G-7 countries became increasingly unwilling to follow the dictates of the U.S.-imposed world inflation rate.

4. EVIDENCE FOR THE GOLD STANDARD AS A RULE

In this section we survey the recent literature for evidence on the credibility of the commitment to gold convertibility and of the contingent aspect of the gold standard rule. We focus on three separate lines of inquiry: the gold standard as a credible commitment mechanism for core countries, commitment to the gold standard as facilitating access to capital by peripheral countries, and the gold standard as a contingent rule in wartime.

4.1. The Gold Standard as a Credible Commitment Mechanism for Core Countries

A number of recent research efforts have used statistical methods to reveal the credibility of the commitment by the monetary authorities of the core countries to preserving gold credibility at fixed parities during the period 1880 to 1914. These studies include evidence on the persistence of inflation, on the credibility bands of short-term interest rates within the gold points, on the reaction functions of gold-standard central banks, and on the durability of the commitment to gold convertibility based on speculative attack models.

4.1.1. Inflation persistence. Barsky (1987) presents evidence for the UK 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, consistent 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.

Bordo and Kydland (1995) extended Barsky's approach using annual wholesale prices to three core countries: the UK 1730 to 1938, the United States 1793 to 1933, and France 1803 to 1938, and one peripheral country—Italy 1861 to 1913. Their results that inflation in all four countries was very nearly white-noise confirm those of Barsky. Moreover the results hold for different subperiods when the countries concerned followed the bimetallic variant of the rule and for subperiods when they departed from convertibility following the contingent aspect of the rule. As did Klein (1975) and Barsky (1987), they observe negative

[22] Indeed, Giovannini's (1993) calculations show that during the Bretton Woods convertible period credibility bounds on interest rates for the major currencies, in contrast to the classical gold standard, were frequently violated.

serial correlation at a large number of lags in all the subperiods.[23] This is consistent with the commodity money adjustment mechanism of the gold standard discussed by Rockoff (1984) and Barsky and Summers (1988). They also tested for a unit root in the inflation series using the Dickey-Fuller test. In only one episode—the United States, 1862 to 1878—could one be detected at the 10% significance level.

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

More recently, Alogoskoufis and Smith (1991) show, based on AR(1) regressions of the inflation rate, that inflation persistence in the United States and UK increased between the classical gold-standard period and the interwar period and between the interwar period and the post-World War II period.[24] Table 2 presents the inflation rate coefficient from the type of AR(1) regressions on annual CPI inflation estimated by Alogoskoufis and Smith, for the 21 countries in Table 1. The regressions, as well as the standard errors and the Dickey-Fuller tests for a unit root,[25] are run on four successive monetary regimes since 1880: the classical gold standard 1880–1914, the interwar period 1919–1939, Bretton Woods 1946–1970, and the recent managed float 1974–1990.

The results, as in Alogoskoufis and Smith, show an increase in inflation persistence for most countries (both core and peripheral) between the classical gold standard and the interwar period. This evidence is consistent with the view that the credibility of commitment to the gold-standard rule was strong under the classical gold standard but weakened after World War I. For 12 countries, most notably the UK, Germany, and Japan, persistence declined under Bretton Woods. This is consistent with a restoration of credibility upon the return to some link with gold convertibility. However, the fact that it rose in 9 countries, most notably the United States and France suggests that credibility under Bretton Woods was weaker than under the gold standard (evidence consistent with Giovannini's (1993) findings). Finally for virtually all countries inflation persistence increases between Bretton Woods and the float. This suggests that whatever the commitment to low inflation that remained under Bretton Woods evaporated upon cutting the final link to gold convertibility.

4.1.2. Credibility bands. Under the classical gold standard, the official parity rate was bounded by the gold points, upper and lower limits reflecting the arbitrage (transactions, transportation, interest, and risk) costs of shipping gold between international centers in the face of balance of payment disequilibria. Evidence by Officer (1986) for the London–New York exchange rate on demand bills showed that, although exchange rates frequently departed from par, viola-

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

[24] Also see Alogoskoufis (1992), who attributes the increase in persistence to the accommodation by the monetary authorities of shocks. This evidence is also consistent with the results of Klein (1975).

[25] The regression run was $\Delta \log P_t = B_0 + B_1 \Delta \log P_{t-1} + \epsilon_t$. We ran the same regression for the GNP deflators, with similar results.

TABLE 2
Persistence of CPI Inflation: 21 Countries, 1880–1990

	AR1	S.E.	*t*	AR1	S.E.	*t*	AR1	S.E.	*t*	AR1	S.E.	*t*
1. Core Countries												
	United States			United Kingdom			Germany			France		
Gold standard	0.27	(0.18)	4.05	0.30	(0.17)	4.03	0.51	(0.16)	3.06	−0.22	(0.18)	6.78
Interwar	0.45	(0.17)	3.18	0.35	(0.19)	3.37	0.51	(0.21)	2.33	0.42	(0.24)	2.42
Bretton Woods	0.49	(0.19)	2.68	0.33	(0.20)	3.38	−0.03	(0.21)	4.90	0.56	(0.16)	2.75
Floating exchange	0.68	(0.18)	1.76	0.69	(0.19)	1.67	0.83	(0.14)	1.21	0.85	(0.16)	0.94
2. British dominions												
	Australia			Canada								
Gold standard	0.39	(0.19)	3.19	0.08	(0.18)	5.11						
Interwar	0.23	(0.19)	4.13	0.35	(0.20)	3.25						
Bretton Woods	0.60	(0.19)	2.09	0.39	(0.19)	3.21						
Floating exchange	0.60	(0.18)	2.27	0.75	(0.17)	1.47						
3. Latin America												
	Argentina			Brazil			Chile					
Gold standard	0.29	(0.30)	2.37	0.47	(0.17)	3.11	0.23	(0.31)	2.48			
Interwar	−0.17	(0.19)	6.14	0.53	(0.19)	2.53	0.16	(0.23)	3.68			
Bretton Woods	0.27	(0.20)	3.61	0.81	(0.12)	1.58	0.56	(0.16)	2.66			
Floating exchange	0.74	(0.22)	1.18	1.29	(0.08)	−3.62	0.85	(0.14)	1.11			
4. Southern Europe												
	Greece			Italy			Portugal			Spain		
Gold standard	na		—	0.28	(0.14)	5.14	0.14	(0.19)	4.54	−0.22	(0.11)	10.60
Interwar	0.18	(0.24)	3.37	0.28	(0.18)	4.00	0.63	(0.36)	1.02	0.14	(0.24)	3.63
Bretton Woods	0.72	(0.26)	1.08	0.21	(0.12)	6.58	−0.13	(0.17)	6.77	0.13	(0.23)	3.75
Floating exchange	0.30	(0.18)	3.89	0.75	(0.17)	1.47	0.63	(0.18)	2.03	0.61	(0.20)	1.92
5. Scandinavia												
	Denmark			Finland			Norway			Sweden		
Gold standard	0.27	(0.17)	4.21	0.46	(0.17)	3.08	0.44	(0.17)	3.23	0.42	(0.17)	3.53
Interwar	0.24	(0.25)	3.04	0.64	(0.25)	1.45	0.31	(0.31)	2.21	0.50	(0.11)	4.44
Bretton Woods	−0.12	(0.16)	7.20	0.30	(0.30)	2.37	0.10	(0.20)	4.42	0.13	(0.21)	4.26
Floating exchange	0.61	(0.14)	2.73	0.57	(0.12)	3.51	0.45	(0.19)	2.92	0.53	(0.21)	2.25

TABLE 2—*Continued*

	AR1	S.E.	t	AR1	S.E.	t	AR1	S.E.	t	AR1	S.E.	t
					6. Other Western Europe							
	Belgium			Netherlands			Switzerland					
Gold standard	0.11	(0.18)	4.83	−0.36	(0.26)	5.14	na					
Interwar	0.49	(0.20)	2.57	0.34	(0.16)	4.14	0.16	(0.15)	5.77			
Bretton Woods	−0.09	(0.22)	5.07	0.31	(0.15)	4.58	0.24	(0.20)	3.75			
Floating exchange	0.78	(0.16)	1.40	0.88	(0.11)	1.05	0.69	(0.18)	1.80			
					7. Japan							
Gold standard	0.22	(0.18)	4.33									
Interwar	0.70	(0.25)	1.20									
Bretton Woods	0.52	(0.18)	2.67									
Floating exchange	0.70	(0.19)	1.58									

Source: See Data Appendix to Bordo and Schwartz (1994).

Note. Annual data: coefficient of AR1 regression, (standard error), and t statistic for unit root test. Five percent significance level for unit root test with 25 observations is 3.00.

tions of the gold points were rare—making the case for the efficiency of the gold standard.[26]

More recently Giovannini (1993) has calculated credibility bands (bands within which uncovered interest arbitrage prevails consistent with gold point arbitrage efficiency). For sterling, the mark, and the franc in the period 1899–1909, these bands lie within the limits set by the gold points—evidence which he interprets as consistent with market agents' expectations of a credible commitment by the core countries to the gold-standard rule in the sense of this paper. For the United States, credibility bands pierce the gold export point in 1893 and 1895–1896 at the height of agitation over silver. Officer (1993) made similar calculations for the interwar dollar sterling exchange rate, finding serious violations only in 1931, at the very end of the gold exchange standard.

4.1.3. The durability of the commitment to gold convertibility based on speculative attack models. The recent literature on speculative attacks on fixed exchange rates (Flood and Garber, 1983) has been applied to the gold standard. According to that approach any fixed exchange rate regime will collapse once the fundamentals of money supply relative to money demand predict an exchange rate that departs from the fixed exchange rate consistent with purchasing power parity.

Based on this approach, Grilli (1990) calculated 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) as not much greater than 6%. Calomiris (1993) disputes these calculations. Using the interest differential between short-term interest rates in New York and London as an estimate of the expected rate of exchange rate depreciation, he finds no evidence of significant

[26] Officer's calculations effectively overturned those in earlier studies by Clark (1984) and Morgenstern (1959).

short-term depreciation risk in the period November 1893 to late 1895. Only in June 1893 is there a slight risk of a temporary suspension of gold convertibility. This evidence buttresses the case for the United States as a credible core gold-standard adherent.

4.1.4. Reaction functions. A substantial literature in the 1980s tested whether core country central banks violated the rules of the game in the sense that the discount rate and other policy tools responded to domestic economic objectives at the expense of maintaining convertibility (see Bordo, 1986). Eschweiler and Bordo (1994) estimated a reaction function for the Reichsbank using monthly data over the period 1883–1913. They found that the central bank's pursuit of an interest rate smoothing policy (an obvious violation of the rules of the game) was subordinate to its commitment to keep the exchange rate within the gold points. This evidence as well as the earlier evidence by Dutton (1984), Pippenger (1984), and Giovannini (1986) of significant violation of the rules in the short term, with paramount importance placed on convertibility in the long run, is consistent with the view that the gold points represented a form of target zone within which central banks could, over short horizons, pursue domestic objectives without threat to convertibility (Svensson, 1994).

4.2. Access to Foreign Capital as a Commitment Mechanism by Peripheral Countries

One of the enforcement mechanisms of the specie standard rule for peripheral countries was presumably access to the capital needed for their economic development from the core countries. Adherence to the convertibility rule would be viewed by lenders as evidence of financial probity—i.e., membership in the international gold standard would be like "the good housekeeping" seal of approval. It would signal that a country followed prudent fiscal and monetary policies and would only temporarily run large fiscal deficits in well-understood emergencies. Moreover, the monetary authorities would be willing to go to considerable lengths to avoid defaulting on externally held debt. It would also presumably be a signal to the lenders in London and other metropolitan areas that the groups in power observed similar standards of financial rectitude.

This suggests that adherence to the specie standard rule, ceteris paribus, would make a difference in the volume of capital a country attracted from abroad. Presumably loans would only be made with gold clauses (or be sterling denominated) so that currency risk would not matter. But there still would be a risk of abrogation of the gold clauses or of total default on the debt. That eventuality would be reflected in a risk premium on the loan. In that case it would be attractive to a potential borrower to adhere to the specie standard rule as a signal of financial responsibility to induce the lender to lower the risk premium. But a more fundamental problem could arise in a world of asymmetric information with the possibility of a "lemons premium" (Akerlof, 1970; Stiglitz and Weiss, 1981). In that case, charging a high interest rate might attract borrowers willing to engage in unduly risky projects. Lenders faced with imperfect information on the

borrowers' likely actions would then be reluctant to lend at any price. A credible commitment to the specie standard rule, as evidenced by the holding of substantial gold reserves, would provide a signal to lenders of the costs borrowers would be willing to bear to avoid default and hence would circumvent the aversion to lending imposed by asymmetric information.

There is considerable evidence that access to capital was indeed a key determinant of peripheral countries attempts to maintain convertibility. This was the case both for developing countries seeking access to long-term capital, such as Austria–Hungary (Yeager, 1984) and Latin America (Fishlow, 1989), and for countries seeking short-term loans, 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, these countries feared the consequences of suspension (Eichengreen, 1992a, p. 19; Fishlow, 1987, 1989). By contrast, Spain, according to Martin Acena (1993), suffered a significant loss in potential output because its failure to join the gold standard precluded her from access to foreign capital at favorable terms. Finally, the fact that England, the most successful country of the 19th century, and "progressive" countries were on the gold standard, was probably a powerful argument for joining (Friedman, 1990; Gallarotti, 1993).

Bordo and Schwartz (1994) provide limited evidence based on a descriptive analysis of Davis and Huttenback's (1986) capital calls on new issues on the London Stock Exchange—a measure of access to capital—for the United States and Argentina in the period 1865 to 1914. Their narrative suggests that adherence to the rule by Argentina may have had some marginal influence on capital calls on new issues of securities in London before 1890, but that the key determinant was the opening up of the country's vast resources to economic development once unification and a modicum of political stability were achieved. The 1890 Baring crisis was a major shock to investor confidence and it took years of austerity, the restoration of convertibility, and the establishment of a currency board before British investors' confidence was restored.

For the United States, events suggesting the restoration of convertibility during the suspension episode (the Resumption Act of 1875) and threats to convertibility during adherence (the 1893 Silver Crisis) are associated with increases and declines in capital calls on new issues of securities in London.

For Italy, Fratianni and Spinelli (1984) provide evidence for the credibility of the commitment to the gold standard in the risk premium on Italian government long-term securities relative to their French counterparts over the period 1866 to 1912. When Italy adhered to gold, from 1884–1894, it averaged close to zero. After suspending convertibility in 1894 it rose to 2%, but at the turn of the century and a return to monetary and fiscal conservatism (Toniolo, 1990, p. 188), with the monetary authorities acting as if they were on the gold standard, the premium fell to 0.5%. In a similar vein, Della Paolera (1993) shows that the spread between Argentine government bonds and both British consols and the Rendita Italiana began a steep decline, from its post Baring crisis peak in 1894, to low levels once

orthodox financial policies were restored and the intention of restoration was made known—well before convertibility was actually restored in 1899.

Finally, a case study of Canada during the Great Depression provides evidence for the importance of the credible commitment mechanism of adherence to gold. Canada suspended the gold standard in 1929 but did not allow the Canadian dollar to depreciate nor the price level to rise for two years. Canada did not take advantage of the suspension to emerge from the depression because of concern for its credibility with foreign lenders (Bordo and Redish, 1990).

4.3. The Gold Standard as a Contingent Rule in Wartime

A key aspect of the gold-standard rule was the contingency in the event of a well-understood emergency. As discussed in Section 3 above, Britain, France, and the United States all took advantage of it during wartime. They suspended specie convertibility, issued fiat currency, and sold government bonds denominated in fiat currency. They also restored parity once the emergency passed.

An important question that arises from these experiences is whether during the suspension periods market agents believed that they were only temporary, i.e., whether the commitment to restore convertibility at the original parity was credible. We survey three pieces of evidence for the credibility of the contingent rule: the behavior of interest rates and exchange rates during suspension periods in the United States and Britain, the pattern of shares of finance in government expenditures during wartime periods, and evidence on revenue smoothing.

4.3.1. The behavior of interest rates and exchange rates during suspension periods. Calomiris (1988 and 1993), following a study by Roll (1972), presents evidence of expected appreciation of the greenback dollar well before resumption of specie payments occurred in January 1, 1879, based on a negative interest differential between bonds that were paid in greenbacks and those paid in gold. Calomiris (see Table 3) 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 three exceptions: January to June 1869, when the error is 0.43, January to June 1871, when the error is −1.00, and January to June 1876, when it is −1.49. The first positive exchange rate surprise reflects the credibility of the government's commitment to the redemption of bond principal in gold; the second followed a change in treasury policy which was perceived as a signal of a possible significant increase in the supply of greenbacks; the third negative surprise reflects the temporary threat to resumption by the election of 1876.[27]

In the case of Britain's return to gold in 1929, Smith and Smith (1990) and Miller and Sutherland (1992, 1994), using models from the stochastic process-switching literature, find that the increasing likelihood that resumption would

[27] Also, see Smith and Smith (1993) who demonstrate, using a stochastic process-switching model, that movements in the premium on gold from the Resumption Act of 1875 until resumption was established in 1878 were driven by a credible belief that resumption would occur.

TABLE 3
Expected and Actual Appreciation of the Greenback Dollar, 1869–1878

	(1) Average differential between gold and greenbacks yield[a]	(2) Expected appreciation (current differential less differential for July–December 1878)	(3) Average actual rate of greenbacks appreciation to 1881[b]	(4) Appreciation forecast error (2)–(3)	(5) Appreciation forecast error allowing time-varying risk premium[c]
January–June 1869	1.33	3.53	2.00	1.53	0.43
July–December 1869	0.49	2.69	1.85	0.84	−0.26
January–June 1870	−0.52	1.68	0.93	0.75	−0.35
July–December 1870	−0.42	1.78	0.93	0.85	−0.15
January–June 1871	−1.01	1.19	1.09	0.10	−1.00
July–December 1871	−0.95	1.25	1.10	0.15	−0.95
January–June 1872	−0.02	2.18	1.26	0.92	−0.18
July–December 1872	0.01	2.21	1.40	0.81	−0.29
January–June 1873	−0.09	2.11	1.90	0.21	−0.89
July–December 1873	−0.26	1.94	1.39	0.55	−0.55
January–June 1874	−0.65	1.55	1.60	−0.05	−0.05
July–December 1874	−0.45	1.75	1.50	0.25	0.25
January–June 1875	0.07	2.27	2.36	−0.09	−0.09
July–December 1875	0.09	2.29	2.30	−0.01	−0.01
January–June 1876	−1.19	1.01	2.50	−1.49	−1.49
July–December 1876	−1.07	1.13	1.76	−0.63	−0.63
January–June 1877	−1.22	0.98	1.36	−0.38	−0.38
July–December 1877	−1.21	0.99	0.84	0.15	0.15
January–June 1878	−1.32	0.88	0.40	0.48	0.48
July–December 1878	−2.20	0.00	0.10	0.10	0.10

Source. Calomiris (1988, Table 5, and 1993, Table 4.1). Reprinted with the permission of Oxford University Press and Cambridge University Press.

[a]
$$\frac{1}{6}\sum_{j=1}^{6}[i_{sp}(j) - i_{gr}(j)] = d.$$

[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.

[c] This calculation sets the risk premium equal to 1.10 for 1869–73, and 2.20 for 1874–78.

occur at the original parity gradually altered the path of the dollar–pound exchange rate toward the new ceiling several months in advance. Their models differ, however: Smith and Smith's is state dependent—driven by an expectation of the restoration of purchasing power parity—while Miller and Sutherland's is time dependent—driven by a strong belief that resumption would occur by expiration of the Gold and Silver (Export Control) Act at the end of 1925.

4.3.2. The pattern of shares of finance in government expenditure during wartime. According to the gold-standard contingent rule, a temporary suspension of convertibility allows the government to follow a feasible fiscal policy in which

TABLE 4
The Financing of Wartime Expenditures in the French Wars and World War I

	Percent of total wartime expenditures financed by:	
	A. French Wars 1793–1815 (G.B.)	B. World War I 1914–1918 (UK)[a]
(1) Taxes	58	31.8
(2) Bonds	40.5	64.4
(3) High-powered money	1.5	3.8

[a] Wartime expenditures are calculated as total government expenditures less 1903–1913 annual average of total government expenditures.

Sources. (1) 1793–1815: O'Brien (1967), table 4; 1914–1918: Mitchell and Deane (1962), pp. 392–395, 396–398. (2) 1793–1815: O'Brien (1967) table 4; 1914–1918: Mitchell and Deane (1962), *ibid.* (3) 1793–1815: Mitchell and Deane (1962), pp. 441–443; 1914–1918: Capie and Webber (1985), table 1 (1), pp. 52–59.

it smooths revenue by financing its expenditures with a combination of taxes, bond finance, and seigniorage. This is predicated on the assumption of a credible commitment to restore convertibility once the emergency has passed.

In a case study comparing British and French finances during the Napoleonic Wars, Bordo and White (1993) show that Britain was able to finance its wartime expenditures by a combination of taxes, debt, and paper money issue—to smooth revenue, because after previous wars in the 18th century government debt was successfully serviced. By contrast, France had to rely primarily on taxation. France had to rely on a less efficient mix of finance than Britain because she had used up her credibility by defaulting on outstanding debt at the end of the American Revolutionary War and by hyperinflating during the Revolution. Napoleon ultimately returned France to the bimetallic standard in 1803 as part of a policy to restore fiscal probity, but because of the previous loss of reputation France was unable to take advantage of the contingent aspect of the bimetallic standard rule.

One implication of the theory is that after the emergency has passed and successful resumption and debt retirement has been achieved, access to bond finance on favorable terms would be possible in the event of another war. Indeed, this may have been the case for the British where it appears that the successful resumption of 1821 may have been a factor enabling them to finance an even larger share of World War I expenditures by debt finance and the issue of fiat money than during the Napoleonic Wars. See Table 4.

4.3.3. Revenue smoothing. The theory of tax smoothing implies that an optimizing government will set tax rates over time so as to minimize deadweight losses (Barro, 1979). The theory also predicts that in an uncertain world, tax rates should follow a martingale process. An extension of this theory to the case of two fiscal instruments—taxes and seigniorage (the theory of revenue smoothing)—

implies that both should follow a martingale process and furthermore that a regression of the inflation rate on the average tax rate should have a positive and significant coefficient (as Mankiw, 1987; Poterba and Rotemberg, 1990; and Trehan and Walsh, 1990; found for the post-World War I United States).[28]

Bordo and White (1993) tested the theories of tax smoothing and revenue smoothing for Great Britain during the Napoleonic War suspension period. See Table 5. The evidence does not reject the hypothesis of tax smoothing but it does reject the hypothesis of revenue smoothing. Similar results are found in a study by Goff and Toma (1993) for the United States under the classical gold standard and by Lazaretou (1995) for Greece during periods of inconvertibility in the 19th century. As Goff and Toma (1993) argue, seigniorage smoothing would not be expected to prevail under a specie standard where the inflation rate does not exhibit persistence (as was the case during the 1797–1815 period and during the Greek inconvertibility episodes). The Bordo and White, and Lazaretou results suggest that, although specie payments were suspended, that the commitment to resume prevented the government from acting as it would under the pure fiat regime postulated by the theory.

4.4. Suggestions for Future Research

Although theoretical research in the past decade in the literature on time inconsistency has mushroomed (Persson and Tabellini, 1990), historical research is still in its infancy. This essay has explored the historical implication of just one aspect of this subject, the use of the gold (specie)-standard rule as a form of commitment mechanism. Historical research on other aspects of time-inconsistent policies, especially fiscal policy, is also on the rise (see, e.g., Calomiris, 1993 and Motomura, 1994).

Within the framework of convertibility rules as commitment mechanisms we can offer some suggestions for future research. The first is to devise a test which can empirically distinguish a time-consistent gold-standard policy from a time-inconsistent policy that switches on and off a rigid gold standard where suspensions are not permitted.

The second is to examine the convertibility history of diverse countries in more detail than the brief overview we present in Section 2. It would be of great interest to know why particular countries adapted and abandoned convertibility rules when they did. Detailed case studies such as those of Reis (1991), Martin Acena (1993), Fritsch and Franco (1992), Llona-Rodriquez (1992), and Lazaretou (1995) could be done for other countries. Of interest in this regard would be an exegesis of official views, statements from parliamentary debates, newspaper editorials, and the like, to ascertain the tone of feeling for the convertibility rule

[28] However, according to Chari *et al.* (1991) this result applies strictly to partial equilibrium models that assume a constant rate of return on debt and a loss function for the government which depends directly on the tax rates rather than the allocations. Further assumptions are required for it to hold in a general equilibrium model.

TABLE 5

A. Tax Smoothing in Great Britain, 1700–1815

Variable	Period	Coefficients of independent variables B_0	B_1	$\bar{R}^2$	SEE	D–W
		$T/Y = B_0 + B_1 \cdot (T/Y)_{t-1} + e_t$				
Taxes/Commodity output	1715–1815	0.876	0.978	0.87	2.81	1.84
		(0.918)	(25.94)[a]			
Taxes/National income	1700–1815	1.69	0.947	0.81	3.16	1.85
		(1.46)	(22.39)[a]			
		$\Delta\, T/Y = B_0 + B_1\Delta(T/Y)_{t-1} + e_t$				
Taxes/Commodity output	1715–1815	0.312	0.049	0.002	2.82	1.92
		(1.09)	(0.47)			
Taxes/National income	1700–1815	0.29	0.017	−0.008	3.20	1.19
		(0.98)	(0.177)			

Note. t values in parentheses.

[a] t value not significantly different from 1 at the 5% level of significance.

B. Revenue Smoothing in Great Britain

1797–1815

Regression equations (t values)

(1) $\Delta \log P_t = -1.81 - 0.0008\,(T/Y) + 0.001\,(\text{time})$
$(-0.12)\,(1.27) \qquad (0.14)$
$R^2 = 0.016$ SEE $= 0.119$ $D - W = 1.60$ $\rho = 0.33$

(2) $\Delta \log p_t = -7.77 - 0.007\,(T/\text{CO}) + 0.004\,(\text{time})$
$(-0.40)\,(-1.27) \qquad (0.42)$
$R^2 = 0.004$ SEE $= 0.120$ $D - W = 1.56$ $\rho = 0.35$

(3) $\Delta^2 \log p_t = 0.007 - 0.01\,\Delta\,(T/Y)$
$(0.207)\,(-1.87)$
$R^2 = 0.121$ SEE $= 0.137$ $D - W = 1.77$

(4) $\Delta^2 \log p_t = 0.01 - 0.01\,\Delta\,(T/\text{CO})$
$(0.31)\,(-2.03)^*$
$R^2 = 0.148$ SEE $= 0.135$ $D - W = 1.74$

Source: Bordo and White (1993). Reprinted with the permission of Cambridge University Press.

Note. (T/Y) represents tax revenues divided by national income. (T/CO) represents tax revenues divided by commodity output.

* Signifies statistically significant at the 5% level.

during periods of suspension. Finally, an analysis of central bank laws and constitutions may reveal explicit statements of the contingencies under which the rule could be suspended.

The third suggestion is to extend the type of empirical analysis pioneered by Roll (1972) and Calomiris (1988), using available data on interest rates and

exchange rates for diverse periods of suspension of convertibility, to ascertain market agents' expectations of their permanence. One possible approach is to use a pooled time-series cross-country sample of a number of countries' experiences. Related to this would be more effort devoted to measuring risk premia on long-term securities during periods of convertibility and suspension for both core and peripheral countries. Can a significantly different pattern be detected?

A fourth suggestion would be serious studies on long-term capital flows from the core to the periphery. Did adherence to gold convertibility make a significant contribution in addition to that of the fundamental determinants of capital movements (such as expected real rates of return, levels of real activity, the terms of trade, and the phase of the business cycle) as isolated in earlier studies by Ford (1962) and Edelstein (1982). Alternatively, were risk premia significantly related to specie standard adherence?

Finally more research would be of value in testing with historical data the target zone approach to pegged exchange rates. Although one early investigation comparing the implications of Krugman's (1991) model for the gold standard, Bretton Woods, and the EMS (Flood *et al.*, 1991) found only limited support, the studies by Giovannini (1993) and Officer (1993) deriving credibility bonds suggest the opposite. Empirical/historical extensions of Svensson's (1994) analysis of the compatibility of stabilization policy and convertibility rules under a commitment regime, as in Eschweiler and Bordo (1994), may also prove fruitful, as would theoretical and historical application of the target zone methodology to the contingent aspect of the gold-standard rule.

5. THE LESSONS FROM HISTORY

The history of the gold standard suggests that the gold (specie) 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 to 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 during periods of wartime suspension 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.[29]

[29] Grossman's (1990) interpretation of the historical record, though emphasizing different factors,

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.[30] 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.[31]

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, by the importance of England as a hegemonic power, and by international cooperation between central banks.

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

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accepts this view. Thus, according to him, the ratio of government debt to gross national product 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.

[30] 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.

[31] An alternative and complementary explanation to that offered in this paper 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.

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 desirable features of the classical gold standard while allowing a greater role for domestic stabilization policy.

As an application of the contingent rule it was much less successful. Because monetary policy was highly politicized in many countries, the commitment to credibility was not believed and devaluation would have led to destabilizing capital flows. Unlike the prewar gold standard, central bank cooperation was ineffective. The system collapsed in 1931 and subsequent years in the face of the shocks of the Great Depression.[32]

Bretton Woods was our last convertible regime. It can be viewed within the context of the specie standard rule, although it is a distant variant of the original specie standard. The architects of Bretton Woods wanted to combine the flexibility and freedom for policy makers of a floating rate system with the nominal stability of the gold-standard rule. Under the rules of Bretton Woods, only the United States, as central reserve country and provider of the nominal anchor, was required to peg its currency to gold; the other members were required to peg their currencies to the dollar. They were also encouraged to use domestic stabilization policy to offset temporary disturbances.

The Bretton Woods system had a contingency for its members—a change in parity was allowed in the face of a fundamental disequilibrium, which could encompass the contingencies under the specie standard rule—but it was not the same as under the specie standard because it did not require restoring the original parity. The rule for members (other than the United States) was enforced, as under the gold standard, by access to U.S. capital and to the IMF's resources. For the United States, there was no explicit enforcement mechanism other than reputation and the commitment to gold convertibility. Capital controls were viewed as a method to contain market pressures.

Ultimately the system was successful as long as the United States—the nominal anchor to the system—maintained its commitment to convertibility, i.e., maintained price stability. As events turned out, by following highly expansionary monetary and fiscal policies to finance the Vietnam War beginning in the mid-1960s, the United States attached greater importance to domestic concerns

[32] As is well known, the gold exchange standard suffered from a number of fatal flaws (Kindleberger, 1973; Eichengreen, 1992b; Temin, 1989). These include the use of two reserve currencies, the absence of leadership by 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.

than to its role as the center of the international monetary, thus weakening the system and contributing to its collapse.[33]

While the gold-standard rule was widely upheld before 1914, it has not been since, although, as we briefly document, to a lesser extent both the short-lived gold exchange standard and the Bretton Woods system incorporated a number of its features. The breakdown in the rule may reflect a number of important underlying factors including the rise in democracy and especially the move to universal suffrage in a number of countries—this in turn implied a decline in the power of groups in society who benefited from adherence to the gold standard (Gallarotti, 1993; Frieden, 1994) and an increase in the influence of previously disenfranchised groups who may have suffered in the face of external shocks brought on by adherence to the rule; a growing understanding of the use of the tools of monetary policy to shield the domestic economy from external disturbances (Eichengreen, 1992b); the breakdown in overall political stability (including the important role played by England) which in turn fostered the high degree of mobility of capital, labor, and commodities so complementary to the smooth operation of the gold standard.

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 policy makers to use discretionary policy. For example, marginal tax rates for people with above-average human capital rose dramatically during and after 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.

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[33] For a detailed discussion of the collapse of Bretton Woods see Bordo (1993) and Garber (1993).

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