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The history of monetary regimes — some lessons for Sweden and the EMU

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Summary

■ This paper presents conclusions from the histories of international monetary regimes and some currency unions. It extracts lessons from economic history concerning Swedish membership in the EMU. It ends with six lessons:

1. An adjustable peg system is not compatible with nationally independent monetary and fiscal policy in the presence of high capital mobility.
2. Today's currency unions and international monetary regimes differ significantly from those of the past.
3. There is no clear and unambiguous historical precedence to the EMU.
4. Monetary unions founded on political unity and a politically united geographical area develop into permanent institutions.
5. Because monetary regimes and currency unions have been generally dominated by major economic powers at the center of the system, Sweden's influence in a future EMU would probably be limited.
6. Monetary unification is an evolutionary process. The future EMU will not be identical to the EMU under way today. ■

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Michael D. Bordo and Lars Jonung*

This study examines the record of different exchange-rate regimes over time and across many countries. The ongoing European Monetary Union (EMU) creation process has contributed to an interest in the establishment, the performance, and the demise of alternative forms of exchange-rate regimes. Monetary history, properly interpreted, may illuminate several issues in the present debate on a common European currency.

This paper is organized as follows: Section 1 considers the performance of monetary regimes and briefly discusses alternative monetary regimes. Section 2 presents a concise history of exchange-rate regimes and reviews the macroeconomic performance of four major periods in the history of the international monetary system: the classical gold standard (1880-1914), the inter-war period (1920-1938), the Bretton Woods system (1947-1971), and the post Bretton Woods period (1973-1994). Here, we compare the means and standard deviations of central macroeconomic time series for many countries and the presence or absence of demand and supply shocks and the responsiveness to disturbances under different regimes.

Next we examine the durability and the collapse of monetary regimes and conclude with history lessons from our analysis. Then we look at the establishment and performance of a few monetary unions. We make a distinction between national and multinational monetary unions. We focus on three national monetary unions: the

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U.S., Italy, and Germany; and two multinational unions: the Latin monetary union and the Scandinavian currency union. We conclude with some historical lessons.

In Section 3, we distill some lessons from our surveys of exchange-rate regimes and monetary unions to shed light upon the present debate about Sweden and the EMU. We stress that Swedish membership would mean a loss of monetary autonomy or independence to an extent previously unmatched. We conclude that history indicates that national monetary unions are fairly permanent phenomena, significantly more stable than international exchange-rate regimes and multinational monetary unions. To the extent that the future EMU will function as a national monetary union, a Swedish membership in the EMU should be regarded as a permanent and irrevocable step.

1. Performance of different monetary regimes

1.1. Alternative monetary regimes.

Which monetary regime is best for economic performance? Is it one based on convertibility into specie (commonly gold or silver), in which the monetary authority defines its monetary unit as a fixed weight of specie and ensures that paper-money claims on the specie monetary unit are always interchangeable for specie like the gold standard of the past?[1] Or is it one based on government fiat, that is, on paper money? Alternatively, in the international monetary sphere, which international monetary regime is superior? One based on fixed exchange rates? Or one based on floating (flexible) rates? Or is it some intermediate variant, such as the adjustable peg that characterized the Bretton Woods system and the European Monetary System (EMS)? Or is it the managed float, which prevails in the world economy today?

Before attempting to answer these questions, let us define a monetary regime as a set of monetary arrangements and institutions accompanied by a set of expectations—expectations by the public

[1] Gold and silver have commonly been used as metallic money. Because Sweden was the main copper producer of Europe in the 16th and 17th century, copper was the specie preferred during part of this period.

regarding policymakers' actions and expectations by policymakers about the public's reaction to their actions. For example, under a *convertible regime*, expectations about the long-run pattern of the price level tended to be mean-reverting. Here, the public expected periods of rising prices to be offset by periods of declining prices. (A convertible regime is a regime in which money can be exchanged for metal at a fixed price without restrictions, such as the classical gold standard that was characterized by long-run price stability.) By contrast, under a *discretionary fiat money regime*, inflation expectations would be extrapolative. The public would expect a rise in the inflation rate to continue into the future.

Two types of monetary regimes have prevailed in history: those based on convertibility into specie and those based on fiat. The former prevailed in various guises until Richard Nixon closed the gold window in August 1971, which terminated the gold convertibility feature of the Bretton Woods international monetary system. Today, the latter (a fiat or a paper standard) is the norm.

Monetary regimes have a *domestic* and an *international* aspect. The domestic aspect pertains to the monetary arrangements, which determine the domestic money supply. The international aspect relates to the monetary arrangements among countries. Two basic types of international monetary arrangements exist—*fixed* and *flexible* exchange rates, along with several intermediate variants that include adjustable pegs and managed floating.

For convertible regimes, if several countries define their currencies as the same precious metal, for example, gold, then they adhere to a fixed exchange rate. If countries define their monies as different metals, for example, some to gold and some to silver, then their exchange rates float. Under a fiat money regime, nations could follow either fixed or floating rates.

History has shown the emergence of several monetary arrangements. Table 1 summarizes them under three headings. Under the first heading of fixed exchange rates, we find irrevocably fixed exchange rates in the form of monetary unions—an extreme form of a fixed exchange-rate system. Specie standards and currency boards are also under the first heading. The second heading covers various types of pegged but adjustable rates, such as the Bretton Woods system and the European exchange-rate mechanism (ERM). Different monetary arrangements under floating or flexible rates are placed under the third heading.

Table 1. Alternative exchange-rate arrangements

1. Truly (irrevocably) fixed exchange-rate arrangements (with high credibility)
a. Monetary unions with a common currency (the U.S. and EMU)
b. Commodity standards (the gold standard)
c. Currency boards (Hong Kong, Argentina, Estonia)
2. Fixed but adjustable exchange rates (pegged rates)
a. Bretton Woods system
b. Currency baskets
c. ERM system
3. Floating exchange rates
a. Rule-based systems
- Price stabilization (Knut Wicksell's norm)
- Wage stabilization (David Davidson's norm)
- Monetary targeting
- Inflation targeting
- Other norms
b. Discretion-based systems
- Discretionary monetary standards

A key question is: which regime gives the best economic performance? Traditional theory posits that a convertible regime, such as the classical gold standard, is characterized by a set of self-regulating market forces that tend to ensure long-run price-level stability. (The gold standard prevailed from around 1880 till the outbreak of World War I.) These forces operated through the mechanism commonly described by the classical commodity theory of money (Bordo, 1984). According to that theory, changes in gold production will eventually offset any inflationary or deflationary price level movements. The problem is that unexpected shocks to the supply or demand for gold can have important short-run effects on the price level.

In an international convertible regime, pegging nations' currencies to the fixed price of gold provides a stable nominal anchor to the international monetary system. But such stability comes at the expense of exposure to foreign shocks, which in the presence of wage and price stickiness, can produce volatile output and employment. Adherence to the international convertible regime also implies a loss of monetary independence, because under such a regime, the monetary authorities' prime commitment is to maintain convertibility of

their currencies into the precious metal and not to stabilize the domestic economy.

In theory, in a fiat money regime, monetary authorities could use open-market operations or other policy tools to avoid the types of shocks that may jar the price level under a specie standard and thus provide short-run and long-run price stability. Besides giving monetary authorities the independence to pursue stable prices, adhering to a flexible exchange-rate fiat regime provides insulation against foreign shocks.[2]

As in a convertible regime, countries that follow fiat money regimes can adhere to fixed exchange rates with each other. Here, the advantage is the avoidance of transactions cost for exchange in international trade. But a fixed-rate system, based on fiat money, may not provide the stable nominal anchor of the specie-convertibility regime unless all members define their currencies in terms of the dominant country's currency, for example, the U.S. (under Bretton Woods) or Germany (in the EMS), where the dominant country follows a rule that requires it to maintain price stability. Or the members collectively formulate a mechanism to ensure world-price stability, for example, they create an international central bank constrained to maintain it.

In a fiat-money, flexible-rate regime, the absence of the nominal anchor of the fixed price of specie could mean that the monetary authorities use the printing press to engineer high inflation to satisfy the government's political goals (for example, its fiscal demands or demands to maintain full employment).

The theoretical literature concludes that it is difficult to unambiguously rank exchange-rate arrangements. So empirical evidence on the performance of alternative monetary regimes is crucial in assessing which regime is best for economic performance.

[2] Theoretical developments in recent years have complicated the simple distinction between fixed and floating exchange rates. In the presence of capital mobility, currency substitution, policy reactions, and policy interdependence, floating rates no longer necessarily provide insulation from either real or monetary shocks (Bordo and Schwartz, 1989). And according to recent real business-cycle approaches, there may be no relationship between the international monetary regime and the transmission of real shocks. (Baxter and Stockman, 1989).

1.2. The evolution of monetary regimes

1.2.1. The history of the gold standard

Under a gold standard, the monetary gold stock determines the money supply (and in some cases consists entirely or partially of the monetary gold stock). A gold standard provides a constraint to monetary growth because increasing cost relative to the existing stock limits new production of gold. This is compared to a fiat or paper monetary standard, where there is no limit to the expansion of the money supply other than the good performance of the monetary authorities. Under a gold standard, monetary authorities have considerably less flexibility in dealing with macroeconomic shocks— unlike a fiat (paper) standard.

Under a gold standard, the monetary authority defines the weight of gold coins or alternatively fixes the price of gold in terms of the national currency. The authority's willingness to freely buy and sell gold at the mint price maintains the fixed price. (It is assumed that the monetary authority either owns the mint or sells a license to a private mint, which operates under the government's standards.) It is also assumed that there are no restrictions on the ownership or use of gold or on the import and export of gold.

The gold standard evolved from earlier commodity money systems. The use of precious metals (gold, silver, copper) as money can be traced back to ancient Lydia. They were adopted as money because of their desirable properties (durability, recognizability, storability, portability, divisibility and the ability to be easily standardized). Earlier commodity money systems were commonly bimetallic—gold was used for high-valued transactions, silver for low-valued transactions. The bimetallic ratio (the ratio of the mint price of gold relative to the mint price of silver) was set close to the market ratio to ensure that both metals circulated. Otherwise, Gresham's Law would ensure that the overvalued metal would drive the undervalued metal out of circulation.

The simplest variant of the gold standard was a pure gold coin standard. Such a system produced high resource cost and consequently in most countries, substitutes for gold coin developed. In the private sector, commercial banks issued notes and deposits convertible into gold coins, which in turn were held as reserves to meet conversion demands.

Prototypical central banks (banks of issue) were commonly required to help governments pay for their expanding fiscal needs. Their notes were also convertible, backed by gold reserves. In war time, convertibility was generally suspended, but on the promise of renewal upon termination of hostilities. So the gold standard evolved into a mixed coin and fiduciary system based on the convertibility principle.[3]

1.2.2. The classical gold standard

The world switched from bimetallism to gold monometallism in the decade of the 1870s. Debate continues to swirl over the reason for this shift. Some argue that it was primarily political (Friedman, 1990; Gallarotti, 1995; Eichengreen, 1995). Nations wanted to emulate the example of England, the world's leading commercial and industrial power. And when Germany used the Franco-Prussian War indemnity to finance the creation of a gold standard, other prominent European nations followed. Sweden, Denmark, and Norway went jointly on gold as part of the Scandinavian monetary union established in the 1870s—see Section 2.2.

A key problem with the convertible system was the risk of conversion attacks—of internal drains when a distrustful public attempted to convert commercial bank liabilities into gold and of external drains when foreign demands on a central bank's gold reserves threatened its ability to maintain convertibility. In the face of this rising tension between substitution of fiduciary money for gold and the stability of the system, central banks learned to become lenders of last resort and to use the tools of monetary policy to protect their gold reserves (Redish, 1993). In Sweden, this process culminated at the end of the 19th century.

The gold standard, the pure coin variety and the more common mixed standards, were domestic monetary standards that evolved in most countries through market-driven processes. By defining their unit of account as a fixed weight of gold or by fixing the price of gold, each monetary authority also fixed its exchange rate with other gold-standard countries and became part of the international gold standard.

[3] See Fregert and Jonung (1996) for a discussion of the suspension policies of the Swedish central bank.

The international gold standard evolved from domestic standards by the common fixing of gold prices by member nations. Unlike later arrangements, the classical gold standard was not constructed and set up by international agreement but was driven largely by a spontaneous process.

Under the classical gold-standard, fixed exchange-rate system, the world's monetary gold stock was distributed according to the member nations demands for money and use of substitutes for gold. Disturbances to the balance of payments were automatically equilibrated. According to the price specie flow mechanism first described by David Hume, arbitrage in gold kept nations' price levels in line. Gold would flow from countries with balance of payments deficits to those with surpluses, in turn linking their domestic money supplies and price levels. Some authors stressed the operation of the law of one price and commodity arbritage in traded-goods prices (Bordo, 1984). Debate continues on the details of the adjustment mechanism. But there is consensus that it worked smoothly for the core countries of the world although not necessarily for the periphery (Ford, 1962; DeCecco, 1974; Fishlow, 1985). It also facilitated a massive transfer of long-term capital from Europe to the new world in the four decades before World War I in a manner that has yet to be replicated.

Central banks played an important role in the international gold standard. By varying their discount rates and using other tools of monetary policy, they were supposed to follow the rules of the game and speed up adjustment to balance of payments disequilibria. Many central banks violated the rules (Bloomfield, 1959) by not raising their discount rates or by using gold devices that artificially altered the price of gold in the face of a deficit. But the violations were never sufficient to threaten convertibility (Schwartz, 1984). They were tolerated because market participants viewed them as temporary attempts by central banks to smooth interest rates and economic activity, keeping within the overriding constraint of convertibility (Goodfriend, 1988).

An alternative to the view that the gold standard was managed by central banks in a symmetrical fashion is that it was managed by the Bank of England. By manipulating its bank rate, it could attract whatever gold it needed and other central banks adjusted their discount rates to its rate. They did so because London was the center for the world's gold, commodities and capital markets. Outstanding sterling-denominated assets were huge, and sterling served as an international

reserve currency (as a substitute for gold). There is considerable evidence supporting this view (Lindert, 1969; Giovannini, 1986; Eichengreen, 1987). There is also evidence, which suggests that France and Germany, the two other European core countries, had some control over discount rates within their respective economic spheres.

Although the gold standard operated very smoothly for close to four decades, periodic financial crises punctuated the episode. In most cases, when faced with an internal and an external drain, the Bank of England and other European Central banks followed Bagehot's rule of lending freely but at a penalty rate. On several occasions, for example, 1890 and 1907, even the Bank of England's adherence to convertibility was put to the test. And according to Eichengreen (1992), cooperation with the *Banque de France* and other central banks was required to save it. Whether this was the case is a moot point. The cooperation that did occur was episodic, ad hoc, and was not an integral part of the operation of the gold standard. Private capital flows aided the Bank during financial crisis periods, which is more important. Such stabilizing capital movements probably reflected market participants' belief in the credibility of England's commitment to convertibility.

By the start of World War I, the gold standard had evolved *de facto* into a gold-exchange standard. Besides substituting fiduciary national monies for gold to economize on scarce gold reserves, many countries also held convertible foreign exchange (mainly deposits in London). Thus the system evolved into a massive pyramid of credit built upon a tiny base of gold. As pointed out by Triffin (1960), the possibility of a confidence crisis, which triggered a collapse of the system, increased as the gold reserves of the center diminished. The advent of World War I triggered such a collapse because the belligerents scrambled to convert their outstanding foreign liabilities into gold. Although the gold standard was reinstated in two variants later in the 20th century, the world discovered that it was like Humpty Dumpty of the famous nursery rhyme—it could never be put together again.

1.2.3. The gold standard as a rule

One of the most important features of the gold standard was that it embodied a monetary rule or commitment mechanism that constrained the actions of the monetary authorities. To the classical economists, forcing monetary authorities to follow rules was viewed as superior to subjecting monetary policy to the discretion of well-

meaning officials. Today, a rule is viewed as a way of binding policy actions over time. This view of policy rules stems from the recent literature on the time inconsistency of optimal government policy.

Based on the time-inconsistency approach, adherence to the basic convertibility rule served as a credible commitment mechanism (or a rule) to monetary and fiscal policies that otherwise would be time inconsistent. A 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. In this context, discretion 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.

According to this interpretation, which is founded on the literature on time inconsistency, adherence to the fixed price of gold served as a credible commitment mechanism to prevent government from following the otherwise time-inconsistent policies of creating surprise fiduciary money issues to capture seigniorage revenue, or from defaulting on outstanding debt (Bordo and Kydland, 1996; Giovannini, 1993). On this basis, adherence to the gold-standard rule before 1914 enabled countries to avoid the problems of high inflation and stagflation that troubled the late 20th century.

1.2.4. The inter-war gold standard

The gold standard was reinstated after World War I as a gold-exchange standard. The UK and other countries, alarmed by the post-war experience of inflation and exchange-rate instability, were eager to return to the halcyon days of gold convertibility before the war. The system reestablished in 1925 was an attempt to restore the old regime but to economize on gold in the face of a perceived gold shortage. Based on principles developed at the Genoa Conference in 1922, members were encouraged to adopt central bank statutes that substituted foreign exchange for gold reserves and discouraged gold holdings by the private sector. The new system only lasted for six years. It crumbled after the UK's departure from gold in September 1931. The system failed because of several fatal flaws in its structure and because it did not embody a credible commitment mechanism.

The fatal flaws included the:

- Adjustment problem (asymmetric adjustment among deficit countries (the UK) and surplus countries (France and the U.S.)).
- Failure by countries to follow the rules of the gold-standard game, (for example, the U.S. and France sterilized gold flows).
- Liquidity problem (inadequate gold supplies, the wholesale substitution of key currencies for gold as international reserves leading to a convertibility crisis when countries subsequently tried to convert the key currencies back into gold).
- Confidence problem leading to sudden shifts among key currencies and between key currencies and gold (Bordo, 1993b; Eichengreen, 1992).

After the collapse of the gold-exchange standard, the world in the 1930s retreated toward autarky. Policies widely followed included trade restrictions, exchange controls, bilateralism, and the resort to beggar-thy-neighbor devaluations. The planning that led to Bretton Woods aimed to avoid these evils.

A strong argument made for fixed exchange rates in the EMS is based on the perception that the devaluations that occurred in the 1930s, beginning with the devaluation of the pound in 1931, were competitive, involving considerable overshooting because of the destabilizing nature of short-term capital flows. It was commonly believed that devaluations were intended to beggar thy neighbor, although Nurkse (1944, p. 123-124) noted that in several cases when devaluation was accompanied by expansionary monetary policy, world trade increased.

More recently, Eichengreen and Sachs (1985) presented strong evidence against the prevalence of beggar-thy-neighbor devaluations in the 1930s. They showed that most devaluations were accompanied by expansionary monetary policy. Those, which were not, did not significantly reduce income in other countries.

1.2.5. The Bretton Woods system

Bretton Woods was the latest convertible global regime. It can be viewed within the context of the gold standard because the U.S. (the most important commercial power) defined its parity in terms of gold and all other members defined their parities in terms of dollars. The Articles of Agreement signed at Bretton Woods, New Hamp-

shire in 1944 represented a compromise between American and British plans. It combined the flexibility and freedom for policy makers of a floating-rate system, which the British team wanted, with the nominal stability of the gold-standard rule emphasized by the U S. The established system was a system of pegged exchange rates. But members could alter their parities in the face of a fundamental disequilibrium. Members were encouraged to use domestic stabilization policy to offset temporary disturbances, and they were protected from speculative attack by capital controls. The International Monetary Fund was to provide temporary liquidity assistance and to oversee the operation of the system.

Although based on the principle of convertibility and although it became an asymmetric system, with the U.S. rather than England as the center country, Bretton Woods differed from the classical gold standard in several fundamental ways:

- It was an arrangement mandated by an international agreement among governments, whereas the gold standard evolved informally from private arrangements.
- Domestic policy autonomy was encouraged even at the expense of convertibility—in sharp contrast to the gold standard, where convertibility was the key feature.
- Capital movements were suppressed by controls.

The Bretton Woods system for the advanced countries, in its convertible phase from 1959 to 1971, was characterized by exceptional macroeconomic performance for the advanced countries. (See Section 1.3.) It had the lowest and most stable inflation rate and highest and most stable real growth rates of any modern regime (Bordo, 1993b). But it was short lived. Moreover, it faced smaller demand and supply shocks than under the gold standard (Bordo, 1993a). This suggests that the reason for its brief existence was not the external environment but structural flaws in the regime (like the gold-exchange standard) and the lack of a credible commitment mechanism.

The flaws of Bretton Woods echoed those of the gold-exchange standard. Adjustment was inadequate, prices were downwardly inflexible, and declining output was prevented by expansionary fiscal and monetary policies. Under the rules, the exchange rate could be altered, but in practice, rarely was because of the fear of speculative attack, which in turn reflected market beliefs that governments would

not follow the policies necessary to maintain convertibility (Eichengreen, 1995). So the system in its early years was propped up by capital controls and in its later ones by G-10 cooperation. The liquidity problem echoed back to the inter-war, gold-exchange standard. As a substitute for scarce gold, the system relied increasingly on U.S. dollars, generated by persistent U.S. payments deficits. The French resented the resultant asymmetry between the U.S. and the rest of the world. The Bretton Woods confidence problem was the growing risk of a run on U.S. gold reserves, as outstanding dollar liabilities increased relative to gold reserves.

The Bretton Woods system collapsed between 1968 and 1971. The U.S. broke the implicit rules of the dollar standard by not maintaining price stability. The rest of the world did not want to absorb additional dollars that would lead to inflation. Surplus countries (especially Germany) were reluctant to revalue.

Another important source of strain on the system was the unworkability of the adjustable peg under increasing capital mobility. Speculation against a fixed parity could not be stopped by either traditional policies or international rescue packages. The Americans were forced by British and French decisions in the summer of 1971 to convert dollars into gold. President Richard Nixon's closing of the gold window on August 15, 1971 ended the impasse.

Bretton Woods, like the gold standard, can be interpreted as a regime following a contingent rule. But unlike the example of the UK under the gold standard, the commitment to maintain gold convertibility by the U.S. (the center country) lost credibility by the mid 1960s. Also the contingency aspect of the rule proved unworkable. Besides being ill defined, devaluations were avoided because they were viewed as an admission of incredible policy and because they were accompanied by speculative attack even in the presence of capital controls. Once controls were removed, the system was only held together by G-10 cooperation. And once inconsistencies developed between the interests of the U.S. and other members, even cooperation became unworkable.

In conclusion, under Bretton Woods, gold still served as a nominal anchor. This link to gold was probably important in constraining U.S. monetary policy (at least until the mid 1960s) and therefore that of the rest of the world. This may explain the low inflation rates and the low degree of inflation persistence observed in the 1950s and 1960s (Alogoskoufis and Smith, 1991; Bordo, 1993a). But credibility

was considerably weaker than under the gold standard. So the dollar gold standard was not as effective a nominal anchor as the classical gold standard (Giovannini, 1993). And when domestic interests clashed with convertibility, the anchor was stretched and then overthrown (Redish, 1993). This was evident in the U.S. reduction and removal of gold-reserve requirements (1965) and in the closing of the gold pool (1968) and of the gold window (1971). The absolute termination of a role for gold in the international monetary system was the Second Amendment to the Articles of Agreement in 1976.

1.2.6. Floating exchange rates

As a reaction to the flaws of the Bretton Woods system, the world turned to generalized floating exchange rates in March 1973. Though the early years of the floating exchange rate were often characterized as a dirty float, whereby monetary authorities extensively intervened to affect the volatility and exchange-rates levels, by the end of the 1970s, it evolved into a system where exchange-market intervention occurred primarily to smooth out fluctuations.

Again in the 1980s, exchange-market intervention was used by the Group of Seven (G7) countries as part of a strategy of policy coordination. In recent years, floating exchange rates have been assailed from many quarters for excessive volatility in nominal and real exchange rates, which in turn increase macroeconomic instability and raise the cost of international transactions.

Despite these perceived problems, the ability of the flexible regime to accommodate the problems of the massive oil-price shocks in the 1970s and other shocks in subsequent years without significant disruption, and the perception that pegged exchange-rate arrangements among major countries are doomed to failure, the prospects for significant reform of the present system on the world level seem remote. Indeed the lessons from recent history suggest that major countries are not willing to subject their domestic policy autonomy to that of another country whose commitment cannot be ensured in an uncertain world, nor to a supernational monetary authority they cannot control.

1.2.7. The European monetary system

After the breakdown of the Bretton Woods system, Europe has been moving steadily toward creating a monetary union with perfectly fixed exchange rates. This reflects the desire of the present 15 member countries of the European Union for economic and political integration. On the road to that end, the exchange-rate mechanism (ERM) within the European monetary system (EMS), established in 1979, was modeled after Bretton Woods (although not based on gold), with more flexibility and better financial resources (Bordo, 1993b). It appeared successful in the late 1980s when member countries followed policies similar to Germany, the center country. It then broke down in 1992-93 in a manner similar to the collapse of Bretton Woods in 1968-71. It also collapsed for similar reasons, because pegged exchange rates, capital mobility, and policy autonomy do not mix. It collapsed in the face of massive speculative attack on countries that followed policies inconsistent with their pegs to Germany and on countries that seemingly were following the rules, but whose ultimate commitment to the peg was doubted by the agents in financial markets in the face of rising unemployment.

1.3. The macroeconomic performance of monetary regimes

We present some evidence on different aspects of the macroeconomic performance of alternative international monetary regimes during the past 113 years. The comparison for 14 industrialized countries (the Netherlands, U.S., UK, Germany, France, Japan, Canada, Italy, Belgium, Switzerland, Sweden, Denmark, Finland, and Norway) is based on annual data for the:

- Classical gold standard (1881-1913)
- Inter-war period (1920-1938)
- Bretton Woods period (1947-1971)
- Present regime of floating rates between the principal currencies (1973-1994)

The Bretton Woods period (1947-1971) is divided into two subperiods: the preconvertible phase (1947-1958) and the convertible phase (1959-1971). This distinction reflects our judgment from other research that the Bretton Woods system really only began after the

European countries declared current account convertibility in 1959 (Bordo, 1993b).

One important caveat is that the presented historical regimes do not represent clear examples of fixed and floating-rate regimes or of convertibility rules versus discretion. The inter-war period is composed of three regimes: general floating from 1920 to 1925, the gold-exchange standard from 1926 to 1931, and a managed float for major countries to the outbreak of World War II.

The Bretton Woods regime cannot be characterized as a fixed exchange-rate regime throughout its history: the preconvertibility period was close to the adjustable peg envisioned by its architects; the convertible period was close to a *de facto* fixed-dollar standard. Although the period since 1973 has been characterized as a floating exchange-rate regime, at various times it has experienced varying degrees of management.

Tables 2 to 5 present descriptive statistics on four macro variables for each of the 14 countries; the data for each variable are converted to a continuous annual series from 1880 to 1994. The four variables are: the rate of inflation, real per capita growth, money growth and long-term nominal interest rates. The definition of the variable used, for example, M1 versus M2, was dictated by the availability of data over the entire period. In some cases, we have no data for the first few years of the periods. If more than half of the observations for a period is missing, we do not report the statistics. For each variable and each country, we present two summary statistics: the mean and standard deviation.

For the G-7 countries and for all the countries taken as a group, we show two summary statistics: the grand mean and a simple measure of convergence defined as the standard deviation of each country's summary statistic around the grand means of the group of countries. Next we comment on the four macro variables examined.

Table 2. Inflation during four monetary regimes, 1881-1994. Annual data: mean (M) and standard deviation (SD).

	Classic gold		Inter-war		Entire BW		Preconvertible BW	
	1881-1913		**1920-1938**		**1947-1971**		**1947-1958**	
Country	M	SD	M	SD	M	SD	M	SD
U.S.	0.1	2.1	-0.9	6.0	3.0	3.3	3.4	4.5
UK	-0.1	2.5	-1.5	6.7	4.4	2.5	4.9	2.6
Germany	0.9	2.4	-0.2	4.9	2.3	2.9	1.9	4.1
France	-0.1	6.3	5.6	18.2	9.5	14.2	15.2	19.3
Japan	4.2	5.8	-0.3	7.1	4.6	3.8	4.5	5.2
Canada	0.7	3.9	-1.1	6.1	3.3	3.4	4.2	4.7
Italy	0.1	2.2	3.0	10.2	5.9	11.9	8.4	17.1
Belgium	0.2	5.0	3.4	10.7	2.8	3.5	2.8	5.0
Netherlands	-0.2	3.6	-2.0	5.1	4.3	2.9	4.6	3.7
Switzerland	0.8	1.5	-2.4	5.2	2.4	2.0	1.6	2.0
Denmark	0.2	3.7	-1.0	8.1	4.3	2.5	3.6	2.8
Finland	0.6	4.8	0.9	6.7	7.7	8.9	10.9	11.9
Norway	0.7	3.2	-3.0	9.6	4.5	3.1	4.9	3.9
Sweden	0.4	3.2	-2.4	5.7	4.2	3.1	4.4	4.1
G7 mean	0.8	3.6	0.7	8.5	4.7	6.0	6.1	8.2
G7 convergence	1.5	1.8	2.6	4.6	2.4	4.9	4.5	6.9
All mean	0.6	3.6	-0.1	7.9	4.5	4.9	5.4	6.5
All convergence	1.1	1.4	2.5	3.5	2.0	3.9	3.7	5.5

Notes: Convergence is the standard deviation of the countries' means and standard deviations. BW = Bretton Woods.

Source: See the appendix.

Table 2. Continued ...

	Convertible BW 1959-1971		Floating rate 1973-1994		Post-war 1947-1994	
Country	M	SD	M	SD	M	SD
U.S.	2.6	1.8	6.0	3.2	4.4	3.5
UK	4.0	2.4	9.1	6.0	6.6	5.0
Germany	2.7	1.2	3.7	1.9	3.0	2.6
France	4.2	1.2	7.2	4.2	8.3	10.6
Japan	4.6	2.8	4.9	5.4	4.7	4.6
Canada	2.5	1.2	6.4	3.4	4.8	3.7
Italy	3.6	2.2	11.3	5.8	8.4	9.8
Belgium	2.8	1.4	5.7	3.3	4.2	3.6
Netherlands	4.1	2.2	4.3	3.1	4.4	3.0
Switzerland	3.2	1.8	3.9	2.5	3.2	2.4
Denmark	4.8	2.2	7.0	4.0	5.5	3.5
Finland	4.7	2.6	8.1	4.8	7.9	7.1
Norway	4.1	2.3	7.1	3.3	5.7	3.4
Sweden	4.1	2.0	7.9	3.0	5.9	3.5
G7 mean	3.4	1.8	6.9	4.3	5.7	5.7
G7 convergence	0.8	0.6	2.6	1.5	2.1	3.2
All mean	3.7	2.0	6.6	3.9	5.5	4.7
All convergence	0.8	0.5	2.1	1.2	1.8	2.6

Notes: Convergence is the standard deviation of the countries' means and standard deviations. BW = Bretton Woods.

Table 3. Real GDP growth per capita during four regimes, 1881-1994. Annual data: mean (M) and standard deviation (SD).

	Classic gold		Inter-war		Entire BW		Preconvertible BW	
	1881-1913		1920-1938		1947-1971		1947-1958	
Country	M	SD	M	SD	M	SD	M	SD
U.S.	1.5	5.0	0.5	8.0	1.9	2.8	1.3	3.5
UK	1.1	2.4	1.0	4.4	2.0	1.8	1.6	2.2
Germany	1.7	2.9	4.0	8.7	5.2	3.5	6.9	4.2
France	1.9	4.7	1.9	7.6	4.4	2.2	4.9	2.8
Japan	1.6	3.9	2.6	6.5	7.9	3.1	5.6	1.2
Canada	2.3	2.8	0.8	8.6	2.7	2.7	2.1	3.4
Italy	0.9	3.9	1.5	4.1	5.2	2.6	5.9	3.1
Belgium	-	-	-	-	3.2	2.2	2.1	2.4
Netherlands	-	-	1.3	3.8	4.4	3.4	4.4	4.2
Switzerland	1.4	4.0	-	-	3.0	3.1	2.4	4.1
Denmark	2.4	3.1	2.1	4.2	3.2	2.7	2.3	2.9
Finland	1.8	2.8	3.9	3.5	4.0	2.7	3.5	3.0
Norway	1.5	1.7	2.8	5.0	3.9	2.3	3.7	3.3
Sweden	2.2	2.2	3.4	3.8	2.9	1.8	2.7	1.2
G7 mean	1.6	3.7	1.8	6.8	4.2	2.7	4.1	2.9
G7 convergence	0.5	1.0	1.2	1.9	2.2	0.6	2.3	1.0
All mean	1.7	3.3	2.2	5.7	3.9	2.6	3.5	3.0
All convergence	0.4	1.0	1.2	2.0	1.6	0.5	1.8	1.0

Notes: Convergence is the standard deviation of the countries' means and standard deviations. BW = Bretton Woods.

Source: See the appendix.

Table 3. Continued ...

	Convertible BW 1959-1971		Floating rate 1973-1994		Post-war 1947-1994	
Country	M	SD	M	SD	M	SD
U.S.	2.6	1.8	1.5	2.3	1.8	2.6
UK	2.3	1.3	1.8	2.6	1.9	2.2
Germany	4.1	2.7	2.1	1.9	3.6	3.1
France	4.0	1.5	1.8	1.6	3.2	2.4
Japan	9.0	3.2	2.9	2.0	5.3	3.6
Canada	3.1	1.8	1.8	2.9	2.3	2.8
Italy	4.6	2.1	2.4	2.3	3.9	2.8
Belgium	4.2	1.4	2.0	2.0	2.7	2.2
Netherlands	4.4	2.7	1.6	1.7	3.1	3.0
Switzerland	3.6	1.7	0.8	2.3	2.0	2.9
Denmark	4.0	2.3	1.8	2.0	2.6	2.5
Finland	4.4	2.5	1.8	3.4	3.1	3.2
Norway	4.0	0.9	3.0	2.0	3.5	2.2
Sweden	3.1	2.3	1.2	1.9	2.1	2.0
G7 mean	4.3	2.1	2.0	2.2	3.1	2.8
G7 convergence	2.3	0.7	0.5	0.4	1.3	0.5
All mean	4.1	2.0	1.9	2.2	2.9	2.7
All convergence	1.6	0.6	0.6	0.5	1.0	0.5

Notes: Convergence is the standard deviation of the countries' means and standard deviations. BW = Bretton Woods.

Table 4. Money-supply growth during four regimes, 1881-1994. Annual data: mean (M) and standard deviation (SD).

	Classic gold		Inter-war		Entire BW		Preconvertible BW	
	1881-1913		1920-1938		1947-1971		1947-1958	
Country	M	SD	M	SD	M	SD	M	SD
U.S.	6.6	4.9	2.2	8.5	7.4	6.9	7.5	10.0
UK	2.1	1.7	1.3	4.8	4.1	3.5	2.3	3.1
Germany	5.7	4.9	4.5	10.3	14.8	6.7	19.1	6.8
France	2.2	3.5	6.7	9.1	12.6	8.3	16.4	8.6
Japan	6.3	15.9	2.9	10.5	23.2	23.3	29.0	32.4
Canada	7.5	5.7	1.5	4.7	6.8	4.3	5.6	3.4
Italy	3.3	3.2	4.6	6.6	16.6	9.7	19.8	13.4
Belgium	3.1	5.2	6.3	10.1	4.8	3.5	3.9	2.3
Netherlands	1.8	3.5	0.0	8.1	6.2	5.2	3.5	6.0
Switzerland					6.7	4.9	3.8	3.8
Denmark	4.9	4.7	-0.7	4.5	7.0	4.7	3.9	3.7
Finland	7.2	6.6	5.7	6.4	12.0	4.8	12.7	6.2
Norway	5.1	3.1	-1.9	5.4	6.7	3.6	5.0	2.7
Sweden	5.7	3.8	-0.3	4.9	7.6	3.7	6.5	3.3
G7 mean	4.8	5.7	3.4	7.8	12.2	9.0	14.2	11.1
G7 convergence	2.2	4.7	2.0	2.4	6.6	6.7	9.5	10.1
All mean	4.7	5.1	2.5	7.2	9.7	6.7	9.9	7.5
All convergence	2.0	3.5	2.8	2.3	5.4	5.2	8.2	7.8

Notes: Convergence is the standard deviation of the countries' means and standard deviations. BW = Bretton Woods.

Source: See the appendix.

Table 4. Continued ...

	Convertible BW 1959-1971		Floating rate 1973-1994		Post-war 1947-1994	
Country	M	SD	M	SD	M	SD
U.S.	7.2	2.1	7.1	3.7	7.4	5.6
UK	5.8	3.1	13.2	5.0	8.8	6.8
Germany	11.8	4.9	7.6	3.6	11.3	6.4
France	9.0	6.5	8.8	4.4	10.9	6.9
Japan	17.8	7.6	9.0	4.3	16.6	18.3
Canada	7.9	4.8	10.9	5.1	8.4	5.4
Italy	13.6	2.3	12.8	6.6	14.9	8.5
Belgium	5.6	4.3	9.0	4.1	6.9	4.4
Netherlands	8.7	2.8	12.0	17.9	9.1	12.9
Switzerland	9.5	4.3	3.6	6.4	5.3	5.8
Denmark	9.9	3.6	8.7	8.0	7.8	6.4
Finland	11.3	3.3	11.7	6.3	12.0	5.6
Norway	8.4	3.7	10.8	4.7	8.5	4.6
Sweden	8.5	4.0	8.2	4.8	7.9	4.2
G7 mean	10.5	4.5	9.9	4.7	11.2	8.3
G7 convergence	4.2	2.1	2.4	1.0	3.5	4.6
All mean	9.7	4.1	9.5	6.1	9.7	7.3
All convergence	3.2	1.5	2.6	3.6	3.1	3.9

Notes: Convergence is the standard deviation of the countries' means and standard deviations. BW = Bretton Woods.

Table 5. Long-term interest rates during four regimes, 1881-1994. Annual data: mean (M) and standard deviation (SD).

	Classic gold		Inter-war		Entire BW		Preconvertible BW	
	1881-1913		**1920-1938**		**1947-1971**		**1947-1958**	
Country	M	SD	M	SD	M	SD	M	SD
U.S.	3.8	0.3	4.2	0.6	4.1	1.4	3.0	0.4
UK	2.9	0.2	4.1	0.7	5.4	1.8	4.0	0.7
Germany	3.7	0.2	6.8	1.7	6.4	0.8	5.9	0.5
France	3.2	0.3	4.6	0.9	5.8	0.9	5.8	0.5
Japan								
Canada	3.5	0.4	4.6	0.8	4.7	1.6	3.3	0.5
Italy	4.2	0.5	5.9	0.6	6.1	0.7	6.4	0.4
Belgium	3.2	0.2	4.7	0.8	5.4	1.1	4.5	0.2
Netherlands	3.2	0.3	4.0	0.7	4.4	1.4	3.4	0.4
Switzerland	3.7	0.3	4.7	0.9	3.5	0.9	3.0	0.3
Denmark	3.7	0.2	4.9	0.6	6.3	1.9	5.0	0.7
Finland								
Norway	4.0	0.3	5.0	0.7	4.2	1.1	3.4	0.9
Sweden	3.8	0.3	4.5	0.4	4.5	1.7	3.0	0.3
G7 mean	3.5	0.3	5.0	0.9	5.4	1.2	4.7	0.5
G7 convergence	0.5	0.1	1.1	0.4	0.9	0.5	1.5	0.1
All mean	3.6	0.3	4.8	0.8	5.1	1.3	4.2	0.5
All convergence	0.4	0.1	0.8	0.3	1.0	0.4	1.3	0.2

Notes: Convergence is the standard deviation of the countries' means and standard deviations. BW = Bretton Woods.

Source: See the appendix.

Table 5. Continued ...

	Convertible BW 1959-1971		Floating rate 1973-1994		Post-war 1947-1994	
Country	M	SD	M	SD	M	SD
U.S.	5.2	1.2	9.1	2.1	6.5	3.0
UK	6.8	1.4	11.4	2.7	8.2	3.7
Germany	6.8	0.8	7.9	1.4	7.2	1.4
France	5.9	1.1	10.2	2.4	8.0	2.8
Japan	7.1	0.2	6.7	1.8	6.8	1.6
Canada	5.9	1.1	10.3	2.0	7.3	3.3
Italy	5.8	0.8	13.1	3.3	9.3	4.2
Belgium	6.2	1.0	9.5	1.9	7.3	2.6
Netherlands	5.4	1.3	8.3	1.4	6.2	2.4
Switzerland	4.0	0.9	5.0	1.0	4.2	1.2
Denmark	7.6	1.8	12.6	3.5	9.3	4.1
Finland	7.9	0.6	10.2	1.4	9.4	1.6
Norway	4.9	0.6	10.1	2.6	7.0	3.5
Sweden	5.8	1.2	10.7	1.8	7.4	3.6
G7 mean	6.2	0.9	9.8	2.3	7.6	2.9
G7 convergence	0.7	0.4	2.1	0.6	1.0	1.0
All mean	6.1	1.0	9.6	2.1	7.4	2.8
All convergence	1.1	0.4	2.2	0.7	1.4	1.0

Notes: Convergence is the standard deviation of the countries' means and standard deviations. BW = Bretton Woods.

Table 6. Persistence of inflation rate during four regimes, 1881-1994. Annual data: autoregressive coefficient—AR(1), standard error (SE) and t-value for test of unity (T).

	Classic gold 1881-1913			Inter-war 1920-1938		
Country	AR(1)	SE	T	AR(1)	SE	T
U.S.	0.27	0.18	4.05	0.05	0.19	4.91
UK	0.30	0.17	4.03	0.19	0.20	4.02
Germany	0.52	0.16	3.07	0.51	0.22	2.27
France	-0.22	0.18	6.88	0.42	0.24	2.38
Japan	0.08	0.18	5.06	0.09	0.26	3.46
Canada	0.08	0.18	5.12	0.04	0.19	4.95
Italy	0.28	0.14	4.99	0.47	0.16	3.39
Belgium	0.11	0.18	4.82	0.50	0.20	2.49
Netherlands	0.07	0.18	5.10	0.11	0.23	3.97
Switzerland	0.14	0.18	4.76	0.35	0.23	2.78
Denmark	0.26	0.18	4.12	0.04	0.21	4.57
Finland	0.46	0.16	3.40	0.05	0.25	3.80
Norway	0.44	0.17	3.28	0.24	0.22	3.39
Sweden	0.39	0.17	3.64	0.56	0.21	2.11
G7 mean	0.19	0.17	4.74	0.25	0.21	3.63
All mean	0.23	0.17	4.45	0.26	0.22	3.46

Notes: Absolute t-values. The critical value is 3.0 for test of unity at a significance of 5 percent for 25 observations. BW = Bretton Woods.

Source: See the appendix.

Table 6. Continued ...

	Entire BW 1947-1971			Preconvertible BW 1947-1958		
Country	AR(1)	SE	T	AR(1)	SE	T
U.S.	0.32	0.14	5.00	0.24	0.20	3.76
UK	0.43	0.21	2.67	0.16	0.34	2.49
Germany	0.00	0.21	4.79	-0.07	0.31	3.40
France	0.55	0.16	2.86	0.60	0.27	1.48
Japan	0.19	0.18	4.60	0.22	0.23	3.39
Canada	0.40	0.18	3.36	0.35	0.29	2.24
Italy	0.05	0.05	18.21	0.04	0.06	14.76
Belgium	-0.08	0.21	5.15	-0.16	0.33	3.58
Netherlands	0.29	0.21	3.42	0.21	0.33	2.37
Switzerland	0.39	0.21	2.87	0.06	0.29	3.25
Denmark	0.38	0.20	3.12	0.21	0.34	2.30
Finland	0.36	0.17	3.84	0.34	0.27	2.46
Norway	0.30	0.20	3.42	0.32	0.31	2.17
Sweden	0.12	0.22	4.09	0.09	0.33	2.76
G7 mean	0.28	0.16	5.93	0.22	0.24	4.50
All mean	0.26	0.18	4.81	0.19	0.28	3.60

Notes: Absolute t-values. The critical value is 3.0 for test of unity at a significance of 5 percent for 25 observations. BW = Bretton Woods.

Table 6. Continued ...

	Convertible BW 1959-1971			Floating rate 1973-1994			Post-war 1947-1994		
Country	AR (1)	SE	T	AR(1)	SE	T	AR(1)	SE	T
U.S.	0.87	0.15	0.86	0.78	0.15	1.43	0.62	0.10	3.76
UK	0.83	0.26	0.64	0.77	0.16	1.45	0.77	0.10	2.40
Germany	0.62	0.31	1.21	0.77	0.12	1.91	0.31	0.14	4.96
France	0.61	0.27	1.41	0.93	0.11	0.65	0.72	0.10	2.89
Japan	0.10	0.29	3.05	0.73	0.15	1.84	0.55	0.12	3.79
Canada	0.81	0.16	1.23	0.90	0.14	0.67	0.69	0.11	2.89
Italy	0.52	0.21	2.26	0.89	0.12	0.88	0.34	0.08	7.86
Belgium	0.77	0.22	1.06	0.78	0.15	1.51	0.41	0.14	4.37
Netherlands	0.40	0.29	2.09	0.86	0.10	1.34	0.60	0.12	3.34
Switzerland	0.38	0.25	2.49	0.63	0.16	2.33	0.63	0.12	3.14
Denmark	0.51	0.26	1.90	0.87	0.13	0.99	0.74	0.10	2.59
Finland	0.09	0.30	3.05	0.91	0.12	0.77	0.47	0.12	4.57
Norway	0.28	0.30	2.42	0.85	0.15	0.96	0.62	0.12	3.20
Sweden	0.27	0.31	2.39	0.61	0.21	1.88	0.51	0.13	3.80
G7 mean	0.62	0.24	1.52	0.82	0.14	1.26	0.57	0.11	4.08
All mean	0.50	0.26	1.86	0.81	0.14	1.33	0.57	0.11	3.82

Notes: Absolute t-values. The critical value is 3.0 for test of unity at a significance of 5 percent for 25 observations. BW = Bretton Woods.

The classical gold standard had the lowest rate of inflation of any monetary regime for all 14 countries. The inter-war period displayed mild deflation for all countries as well. The rate of inflation during the Bretton Woods period was on average, and for every country except France, Japan, and the Netherlands, lower than during the subsequent floating exchange-rate period. The average inflation rate in the Bretton Woods preconvertible period was considerably higher for the 14 countries.

Evidence based on country and period averages of very low inflation in the gold-standard period and of a lower inflation rate during Bretton Woods than the subsequent floating period is consistent with the traditional view on price behavior under fixed (commodity based) and flexible exchange rates. The inflation rates had the highest degree of convergence among the 14 countries during the classical gold standard and to a lesser extent, during the Bretton Woods convertible subperiod compared to the floating-rate period and the mixed inter-war regime.

The Bretton Woods convertible subperiod had the most stable inflation rate of any regime. By contrast, the preconvertible Bretton Woods period had greater inflation variability than either the gold standard or the recent float. Evidence of a high degree of price-stability in the convertible phase of Bretton Woods is consistent with the traditional view that convertible fixed-rate (commodity-based) regimes provide a stable nominal anchor. But the remarkable price stability during this period may also reflect the absence of major shocks.

Generally, the Bretton Woods period, especially the convertible period, had the most rapid output growth of any monetary regime for 14 countries. Output variability was also lowest in the convertible subperiod of Bretton Woods, but because of higher variability in the preconvertible period, the Bretton Woods system, as a whole, was more variable than the floating period. Both pre-World War II regimes had higher variability than their post-World War II counterparts.

The Bretton Woods regime also had the lowest divergence of output variability between countries of any regime, with the inter-war regime the highest. The greater convergence of output variability under Bretton Woods may reflect conformity between countries' business fluctuations, created by the operation of the fixed exchange-rate regime. It may also be due to the use of fiscal policies to counteract business fluctuations.

Monetary growth was considerably more rapid across all countries after World War II than before the war. There was not much difference between Bretton Woods and the subsequent floating regime, nor between the preconvertibility period and the convertibility period.

Money growth rates had the least divergence during the fixed exchange-rate gold standard and the greatest divergence in the preconvertible Bretton Woods period. Like inflation and real output variability, money-growth variability was lowest in the convertible Bretton Woods period. But this was not the case for the preconvertible period, which was the most variable of any regime. It also had the greatest divergence in variability between countries. To the extent that one of the properties of adherence to a fixed exchange-rate regime is conformity of monetary-growth rates among countries, the Bretton Woods system probably started in 1959.

Long-term interest rates were most closely related, that is, they had the highest degree of convergence of the means, in the classical gold standard. These findings are similar to McKinnon's (1988), who views them as evidence of capital-market integration under fixed exchange rates. The lack of convergence in the preconvertible Bretton Woods period reflects the presence of pervasive capital controls. Convergence of nominal interest rates would not be expected under floating exchange rates. Convergence of standard deviations is also highest in the gold-standard period. Long-term rates were also most stable and least divergent under the classical gold standard.

The evidence that nominal interest rates are more stable and convergent between countries under the fixed, exchange-rate (commodity-based) gold-standard regime is consistent with the traditional view.

In summary, the gold standard and convertible Bretton Woods regime had the most stability of financial variables for the 14 countries. The Bretton Woods convertible regime had the best overall macroeconomic performance of any regime. As the summary statistics in the tables show, nominal and real variables were most stable in this period. But the floating-rate regime on most criteria, was not far behind the Bretton Woods convertible regime.[4]

These results agree with the views of Axel Leijonhufvud (see Bordo and Jonung, 1996) and others that convertibility rules, in the past, have been associated with superior performance of nominal variables. But there is little evidence that adherence to convertibility rules has been associated with better real performance as can be seen in a comparison between the recent float and the gold standard.

1.3.1. Inflation persistence

A second piece of evidence on regime performance is the persistence of inflation. Evidence of persistence in the inflation rate suggests that market agents expect the monetary authorities to continually follow an inflationary policy or a discretionary monetary standard; its absence would be consistent with the belief that the authorities are following a stable monetary rule, such as the gold standard's convertibility rule.

[4] Our results differ from those of Baxter and Stockman (1989) and Flood and Rose (1993) who find little differences between macroeconomic variables across regimes. The differences with our results reflect the use of different filters and econometric techniques.

Table 6 presents the inflation-rate coefficient—from the type of AR(1) regressions on CPI inflation that was estimated by Alogoskoufis and Smith (1991)—to capture the effects of persistence for the 14 countries over successive regimes since 1880 and the standard errors and the Dickey-Fuller tests for a unit root.

The results, as in Alogoskoufis and Smith (1991), show an increase in inflation persistence for most countries between the classical gold-standard and the inter-war periods, and between the inter-war and the post-World War II periods as a whole. Within the post-World War II period, inflation persistence is generally lower (with the exceptions of France, Japan, Sweden, Denmark, and Finland) in the preconvertible Bretton Woods period than the convertible period. This suggests that though rapid inflation characterized the immediate post-World War II period, market agents may have expected a return to a stable price regime. The higher persistence degree in the convertible regime suggests this expectation lost credence. Evidence that persistence was generally highest during the float may imply the public's realization that there was no longer a stable nominal anchor.

1.3.2. Demand and supply disturbances

An important issue is the extent to which the performance of alternative monetary regimes (as shown by data in the preceding tables) reflects the operation of the monetary regime in constraining policy actions or the presence or absence of shocks to the underlying environment. One way to shed light on this issue, following earlier work by among others Bayoumi and Eichengreen (1994), is to identify underlying shocks to aggregate supply and demand. According to them, aggregate supply shocks reflect shocks to the environment and are independent of the regime. But aggregate demand shocks probably reflect policy actions and are specific to the regime.

The approach used here to calculate aggregate supply and demand shocks is an extension of the bivariate structural vector autoregression (VAR) method developed by Blanchard and Quah (1989). Following Bayoumi and Eichengreen (1994), we estimated a two-variable VAR in the rate of change of the price level and output. Aggregate demand disturbances and aggregate supply disturbances are identified from the estimated VAR residuals by assuming that the demand and supply disturbances are orthogonal (uncorrelated) and that the demand disturbances have only temporary impact on output. Both disturbances may have a permanent impact on prices, and the supply

disturbances may also have a permanent impact on output. Over-identifying restrictions, that demand shocks are positively correlated with prices and that supply shocks are negatively correlated with prices, can be tested by examining the impulse response functions to the shocks.[5]

The method has important limitations, which suggest that the results should be viewed with caution. The key limitation is that one can easily imagine frameworks in which demand shocks have permanent effects on output, while supply shocks have only temporary effects.

We estimated supply (permanent) and demand (temporary) shocks using annual data for each of the 14 countries during alternative regimes in the 1880-1994 period. The VAR estimates are based on four separate sets of data (to the extent available): 1881-1913, 1920-1938, 1947-1971, and 1971-1994.[6] (The war years are omitted primarily not because of missing data but because of exceptional political conditions.) The VARs have two lags. We also did the estimation for aggregated price and output data for the 14 countries.[7]

Table 7 presents the standard deviations of supply and demand shocks for the 14 countries by regimes. We also present the standard deviations of the G7 and total aggregate demand and supply shocks. We show, following Bayoumi and Eichengreen (1994), the weighted average of the individual country shocks.

Table 7 shows for the total aggregate and the G7 aggregate that the convertible Bretton Woods regime was the most tranquil of all the regimes—neither supply nor demand shocks dominated. But it was not that much less turbulent than the succeeding float. Unsurprisingly, the inter-war period shows the largest supply and demand shocks. The classical gold standard was characterized by supply and demand shocks considerably greater than the recent Bretton Woods convertible period.

[5] These results are available upon request from the authors.

[6] We included a linear trend in the estimated VARs to capture the general decline in inflation rates during the floating exchange period. The inflation rate is far from being stationary in several countries during this period, which the results in Table 6 support (persistence of CPI-inflation). The linear trend is included for every country and period to retain symmetry. But only the results for the floating exchange period are significantly different.

[7] The aggregated data is computed for the different periods using GDP weights in 1913, 1938, 1970, and 1994. Maddison (1995) provides real GDP in common currency.

Table 7. Demand (D) and supply (S) disturbances, 1881-1994. Annual data: standard deviation.

	Classic gold		Inter-war		Entire BW		Preconvertible BW	
	1881-1913		1920-1938		1947-1971		1947-1958	
Country	D	S	D	S	D	S	D	S
U.S.	2.48	4.45	5.72	5.70	2.16	1.97	3.05	2.73
UK	2.54	2.14	1.20	3.68	1.74	1.94	1.82	2.79
Germany	2.27	2.27	2.83	4.84	1.78	1.88	1.57	2.63
France	4.38	3.69	5.44	4.99	2.35	1.65	3.47	2.05
Japan	4.86	3.29	5.12	3.64	2.89	2.08	3.78	2.32
Canada	1.90	1.93	5.54	5.63	2.31	2.27	3.50	2.89
Italy	2.67	2.42	6.75	4.05	2.59	2.21	3.60	2.68
Belgium					2.01	1.58	3.02	1.39
Netherlands			1.72	3.16	2.60	2.54	3.04	2.93
Switzerland	2.06	3.56			1.81	2.22	1.73	2.86
Denmark	2.65	2.81	3.28	1.87	1.84	2.39	2.17	2.12
Finland	2.24	2.22	3.53	2.83	6.03	2.40	8.89	2.39
Norway	2.44	1.34	4.79	3.53	4.42	1.61	6.33	1.67
Sweden	2.77	1.92	2.38	3.38	3.89	1.93	5.92	1.92
G7 total	1.99	2.09	3.11	3.27	2.22	1.73	3.33	2.40
G7 average	1.84	2.11	2.26	3.54	1.31	1.24	1.84	1.73
G7 spread	4.67	5.23	7.99	6.60	3.41	2.84	4.10	3.33
All total	1.86	1.94	2.82	3.03	2.21	1.68	3.32	2.33
All average	1.74	1.95	2.06	3.28	1.33	1.17	1.89	1.61
All spread	5.73	6.39	9.47	8.37	4.62	4.02	5.69	4.75

Notes: Total = Estimated VAR with the weighted mean of growth and inflation. Average = Weighted average of shocks in the individual countries. Spread = Mean of weighted standard deviation of the individual country's shocks.

The VAR model is estimated only for the Bretton Woods (BW) periods.

Source: See the appendix.

Table 7. Continued ...

	Convertible BW 1959-1971		Floating rate 1973-1994		Post-war 1947-1994	
Country	D	S	D	S	D	S
U.S.	1.45	1.26	1.60	1.85	1.89	1.89
UK	1.73	1.14	2.78	2.69	2.27	2.29
Germany	1.85	1.47	1.56	1.46	1.64	1.65
France	1.79	1.60	1.51	1.47	1.93	1.53
Japan	3.14	1.91	1.77	2.30	2.34	2.17
Canada	0.70	1.78	2.07	2.35	2.18	2.26
Italy	1.65	1.68	2.60	1.69	2.57	1.94
Belgium	1.17	1.47	1.65	1.96	1.82	1.76
Netherlands	2.35	2.33	1.49	1.62	2.11	2.10
Switzerland	1.62	2.01	1.74	1.91	1.78	2.06
Denmark	1.56	2.17	1.39	1.88	1.66	2.14
Finland	2.55	2.63	3.35	2.39	4.88	2.49
Norway	2.55	1.87	3.21	1.67	3.82	1.60
Sweden	0.92	1.74	2.78	1.44	3.39	1.68
G7 total	0.96	0.91	1.35	1.53	1.82	1.63
G7 average	0.99	0.78	1.24	1.47	1.26	1.33
G7 spread	3.10	2.52	2.67	2.62	2.98	2.67
All total	0.95	0.91	1.30	1.49	1.80	1.58
All average	0.97	0.77	1.23	1.42	1.27	1.28
All spread	4.00	3.55	3.56	3.46	4.01	3.67

Notes: Total = Estimated VAR with the weighted mean of growth and inflation. Average = Weighted average of shocks in the individual countries. Spread = Mean of weighted standard deviation of the individual country's shocks.

The VAR model is estimated only for the Bretton Woods (BW) periods.

For individual countries, the Bretton Woods convertible period had the lowest demand shocks in nine countries and flexible rates in most others. Supply shocks were lowest in most countries in the floating period. But the difference between the convertible Bretton Woods period and the float was not great in any country. The inter-war period was the most volatile. Both types of shocks were the largest in virtually every country. In most countries, supply shocks and to a lesser extent, demand shocks were greater in the gold-standard period than in the post-World War II period.

Dispersion of demand shocks across countries is somewhat higher when comparing the gold standard with the post-World War II re-

gimes. Here, the floating regime displays the highest degree of convergence. (Dispersion is measured by the GNP-weighted standard deviation of individual country shocks around the total aggregate.) Dispersion is much greater in the inter-war period. Dispersion of supply shocks is considerably greater during the gold standard and the inter-war periods than in any of the post-World War II regimes.

So demand and supply shocks evidence complements the evidence above on stability and persistence. For the 14 countries, higher demand and especially higher supply shocks characterized the gold standard more than post-World War II regimes. Within that period, the convertible Bretton Woods and the float were relatively stable.

1.4. The durability and collapse of international exchange-rate regimes

Evidence in Section 1.3. raises the question of why the classical gold standard was so durable in the face of substantial shocks (it lasted about 35 years), whereas Bretton Woods was so fragile (the convertible phase lasted only 12 years) in the face of the mildest shocks in the past century.

One possible answer is a more rapid price and output adjustment to shocks during the gold standard than during post-war regimes. As a measure of responsiveness of prices and output to the aggregate supply and aggregate demand shocks in Table 7, we calculated the mean absolute lag of the impulse response functions underlying the calculations of the shocks in Table 7.[8] Table 8 presents these measures and shows that the response of output to demand shocks for the total aggregate and for several individual countries was more rapid during the gold standard than during the post-war regimes—and within the post-war regimes was slightly more rapid under the Bretton Woods than under the float.

[8] For a description of the calculations see Bordo (1993a, note 55). The underlying impulse response functions are available from the authors upon request.

Table 8a. Average adjustment time, 1883-1994. Annual data.

Country		Classic gold 1881-1913	Inter-war 1920-38	Bretton Woods 1947-71	Floating exchange 1973-94	Post-war 1949-94
U.S.	a	3.28	2.92	1.89	3.09	2.03
	b	1.59	2.36	1.67	2.87	2.17
	c	1.98	2.01	1.56	2.94	1.61
	d	2.50	2.15	2.14	2.84	1.95
UK	a	2.57	2.30	3.14	3.12	3.62
	b	2.06	2.18	2.30	3.19	6.10
	c	1.96	1.27	2.73	2.37	2.06
	d	3.18	3.14	2.74	2.90	3.13
Germany	a	3.02	3.92	4.37	2.69	3.22
	b	2.30	2.82	3.33	2.51	2.93
	c	2.01	2.42	3.05	2.88	1.92
	d	2.33	3.18	4.89	3.54	2.50
France	a	1.89	3.34	3.51	2.10	2.24
	b	1.56	2.77	3.19	2.71	2.42
	c	1.86	2.14	2.01	1.89	1.70
	d	2.32	4.45	4.15	2.10	1.93
Japan	a	2.74	9.30	3.46	3.08	3.22
	b	1.81	8.76	2.47	3.10	2.63
	c	2.24	9.21	3.10	2.31	2.14
	d	1.60	7.29	4.23	2.86	1.35
Canada	a	2.43	3.11	3.05	2.53	2.73
	b	2.16	2.74	1.80	2.45	2.41
	c	1.61	1.69	2.33	2.07	1.53
	d	2.49	1.94	2.99	2.32	2.82
Italy	a	2.56	5.47	3.10	2.01	2.71
	b	2.60	3.79	3.01	1.81	4.19
	c	3.00	4.87	3.19	1.46	2.89
	d	2.72	3.36	3.77	2.23	4.38
Belgium	a	-	-	3.50	3.15	1.82
	b	-	-	3.37	2.14	1.91
	c	-	-	3.63	2.52	1.66
	d	-	-	4.17	2.64	3.61
Netherlands	a	-	2.91	1.91	3.64	2.49
	b	-	2.65	1.85	3.06	2.45
	c	-	1.74	1.55	1.99	1.54
	d	-	3.28	2.47	4.43	2.69

Notes: a = temporary (demand) shocks' effect on real GNP, b = temporary (demand) shocks' effect on the price level, c = permanent (supply) shocks' effect on real GNP, d = permanent (supply) shocks' effect on the price level.

Table 8b. Average adjustment time, 1883-1994. Annual data.

Country		Classic gold 1881-1913	Inter-war 1920-38	Bretton Woods 1947-71	Floating exchange 1973-94	Post-war 1949-94
Switzerland	a	2.36	-	4.32	3.91	3.59
	b	1.82	-	3.12	3.23	2.92
	c	1.45	-	2.99	2.98	2.42
	d	2.21	-	3.18	4.05	3.02
Denmark	a	3.08	5.34	3.44	3.34	3.19
	b	2.27	4.34	2.26	2.05	6.31
	c	1.85	3.62	2.66	2.05	1.97
	d	2.29	4.16	3.52	2.52	6.38
Finland	a	4.01	2.17	5.07	5.11	3.60
	b	3.84	2.22	1.69	2.52	1.78
	c	2.97	2.18	4.14	4.07	2.64
	d	4.30	2.05	3.17	4.85	3.53
Norway	a	2.29	3.52	1.83	2.55	2.83
	b	1.53	3.32	1.16	1.28	2.09
	c	1.96	1.82	1.48	1.82	1.54
	d	2.61	4.44	2.18	1.77	2.71
Sweden	a	2.22	4.32	2.47	5.30	2.54
	b	1.60	3.13	2.04	4.38	1.80
	c	1.58	2.64	2.22	4.03	1.81
	d	2.09	4.42	3.05	4.03	2.24
G7 average	a	2.64	4.34	3.22	2.66	2.82
	b	2.01	3.63	2.54	2.66	3.26
	c	2.09	3.37	2.57	2.27	1.98
	d	2.45	3.64	3.56	2.68	2.58
All average	a	2.70	4.05	3.22	3.26	2.85
	b	2.09	3.42	2.38	2.66	3.01
	c	2.04	2.97	2.62	2.53	1.96
	d	2.55	3.65	3.33	3.08	3.02
G7 total	a	2.42	2.81	2.66	3.35	2.24
	b	1.28	2.40	2.61	3.28	2.36
	c	1.91	1.93	1.76	2.60	1.60
	d	1.74	2.10	1.82	2.77	1.61
All total	a	2.43	2.94	2.61	3.31	2.26
	b	1.28	2.53	2.59	3.32	2.41
	c	1.93	1.93	1.67	2.51	1.60
	d	1.74	2.24	1.93	2.56	1.60

Notes: a = temporary (demand) shocks' effect on real GNP, b = temporary (demand) shocks' effect on the price level, c = permanent (supply) shocks' effect on real GNP, d = permanent (supply) shocks' effect on the price level.

In the case of supply shocks the responsiveness of output was most rapid in the Bretton Woods period. The response of prices to demand and supply shocks was more rapid during the gold standard than the post-war regimes for the aggregate and most countries. Within the post-war period, it was considerably more rapid under Bretton Woods than under the floating period.

Perhaps the gold standard was able to endure the greater shocks that it faced owing to greater price flexibility and greater factor mobility before World War I. Or, the gold standard was more durable than Bretton Woods because before World War I the suffrage was limited. Central banks were often privately owned, and before Keynes, there was less understanding of the link between monetary policy and the economic-activity level. So there was less of an incentive for the monetary authorities to pursue full-employment policies, which would threaten adherence to convertibility.

An alternative explanation for the relative longevity of the international gold standard and the short life of Bretton Woods may be attributed to the design of the monetary regime and specifically the presence or absence of a credible commitment mechanism (or a monetary rule).

Both the classical gold standard and the Bretton Woods systems can be viewed as following a series of rules based on the convertibility of domestic currency into gold. Under the classical gold standard, the monetary authorities committed themselves to fix the prices of their currencies in terms of a fixed weight of gold and to buy and sell gold freely in unlimited amounts. The pegged gold price served as a commitment mechanism to prevent monetary authorities from pursuing otherwise time-inconsistent policies (Bordo and Kydland, 1995)—see Section 1.2.

The gold-standard rule followed in the century before World War I can be viewed as a form of contingent rule or rule with escape clauses (Bordo and Kydland, 1995). The monetary authority would maintain the standard—keep the price of the currency in terms of specie fixed—except if a well understood emergency, such as a major war, occurs. In wartime, it may suspend gold convertibility and issue paper money to finance its expenses, and it can sell debt issues in terms of the nominal value of its currency, on the understanding that debt will eventually be paid off in specie. The rule is contingent in the sense that the public understands that the suspension will only last for the duration of the wartime emergency plus some period of ad-

justment. It assumes that afterward, the government will follow the deflationary policies necessary to resume payments at the original parity.

The classical gold-standard regime was successful until it was suspended at the outbreak of World War I. It worked because the credible commitment by the monetary authorities of the core countries to maintain convertibility above all else, allowed the contingency clause to accommodate major shocks, and because central-bank cooperation eased market pressure in the face of speculative attacks.

The inter-war gold-exchange standard, which prevailed for only six years was an attempt to recreate the classical gold standard with lower gold reserves and greater freedom for domestic financial policy. Because monetary policy was highly politicized in many countries, the commitment to credibility was not believed by the public, and devaluation would have led to destabilizing capital flows. Unlike the prewar gold standard, central-bank cooperation was ineffective (Eichengreen, 1992). The system collapsed in 1931 and subsequent years in the face of the shocks of the Great Depression.

Bretton Woods was the world's last convertible regime. It can be viewed within the context of the gold-standard rule, although it is a distant variant of the original gold standard. The architects of the 1944 Bretton Woods conference created an adjustable-peg exchange-rate system. John Maynard Keynes (the U.K.) and Harry Dexter White (the U.S.) wanted to combine the flexibility and freedom of a floating-rate system with the nominal stability of the gold-standard rule for policymakers. Under the rules of Bretton Woods, only the U.S. 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 (Bordo, 1993b).

They were encouraged to use domestic stabilization policy to offset temporary disturbances. The Bretton Woods system had an escape clause for its members. A change in parity (the adjustable peg) was allowed in the face of a fundamental disequilibrium, which could encompass the contingencies under the gold-standard rule. But it was not the same as under the gold standard, because it did not require restoring the original parity. Capital controls were encouraged to give members a degree of policy autonomy. The rule for members (other than the U.S.) was enforced, as under the gold standard, by access to U.S. capital and to the IMF's resources.

Ultimately the system was successful as long as the U.S.—the nominal anchor to the system—maintained its commitment to convertibility, that is, 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 U.S. attached more importance to domestic concerns than to its role as the center of the international monetary system, thus weakening the system until its collapse in 1971.

Although the Bretton Woods system can be interpreted as one based on rules, the system did not provide a lasting credible commitment mechanism. The U.S. was unwilling to subsume domestic considerations to the responsibility of maintaining a stable nominal anchor. At the same time, other major industrialized countries became increasingly unwilling to follow the dictates of the U.S.-imposed world inflation rate.

1.5. Lessons from the history of international monetary arrangements

We draw two lessons from the history of international monetary arrangements. First, although the classical gold-standard regime provided a credible commitment mechanism before World War I, a return to the gold standard is not a likely prospect for the international monetary system today. The many problems associated with a gold standard discussed in Section 1.2 suggest that alternative credible rules would be superior. Indeed, in the absence of the credible nominal anchor provided by the gold convertibility, major countries can design credible monetary-policy rules to get domestic price stability without the cost of giving up their policy autonomy. In addition, the economic and political environment during the gold standard differed from today's environment.

Proposals, such as Knut Wicksell's price-stability norm and David Davidson's constant, nominal-wage-level norm, Milton Friedman's (1960) constant money-growth rule, and the McCallum (1989), Meltzer (1987) and Feldstein and Stock (1994) recommendations for a monetary-base rule with feedback, could provide a credible commitment mechanism to ensure a greater price-stability degree than under the variants of the gold standard. Or institutional arrangements recently adopted by several countries to create an independent central bank, whose sole responsibility is to preserve price stability (inflation

targeting), may also provide the needed foundations for a credible commitment to price stability (Leiderman and Svensson, 1995).

The second lesson, stemming from the experience of Bretton Woods and the EMS, is that pegged (but adjustable) exchange-rate systems do not work for long no matter how well they are designed. Pegged exchange rates, capital mobility, and policy autonomy just do not mix. True, European countries may form a currency union with perfectly fixed exchange rates if member countries are wholeheartedly willing to give up domestic-policy autonomy but the likelihood that the U.S, Japan, and even Germany (or a future EMU) would be willing to accept the loss of sovereignty entailed by moving back to a global system like Bretton Woods, as has been recently advocated, seems remote to us.

The advent of general floating in 1973 and its longevity suggests that the lessons of Bretton Woods have been well learned. Major countries, such as the U.S., are not willing to subject their domestic policy autonomy to that of another country whose commitment they cannot be sure of in an uncertain world, nor to a supernational monetary authority they cannot control. The key advantage of floating stressed a generation ago by Milton Friedman and Harry Johnson—the freedom to pursue an independent monetary policy—still holds today, at least for major countries.

2. The history of monetary unions

A monetary union or a unified currency area is the extreme version of a fixed exchange-rate monetary regime (see Table 1). The essence of a monetary union is that all the member states or entities adopt the same currency as a unit of account, medium of exchange, and store of value. This implies that the monetary union has one exchange rate toward the rest of the world.

We suggest that the history of monetary unions is most easily understood if we make a distinction between national monetary unions and multinational monetary unions. By a national monetary union we mean that political and monetary sovereignty go hand in hand. Roughly speaking, the borders of the nation-state are the borders of the monetary area. For example, within the British monetary union comprising England, Scotland, Wales, and Northern Ireland, Scottish commercial banks still issue bank notes. These notes are perfectly interchangeable for Bank of England notes. Or in the U.S., each of the Federal Reserve Banks issues dollar bills perfectly acceptable in

every reserve district—a five-dollar bill issued by the Federal Reserve Bank of Richmond is always and perfectly interchangeable with a five-dollar bill from any of the other Federal Reserve Banks. A national monetary union has, as a rule, one single monetary authority, commonly a central bank.

By a multinational monetary union we mean an international monetary cooperation among several independent countries based on permanently fixed exchange rates between their currencies. Multinational monetary unions occur when independent nation states link their monies together through a perfectly fixed exchange rate so that one country's money is perfectly exchangeable for another member country's at a fixed price. Indeed an extreme example of this would be that all the member states use the same currency. Generally, there is no common monetary authority in a multinational monetary union. An example of such a union is the Scandinavian monetary union, which had one common currency, the Scandinavian crown, and three members: Sweden, Norway, and Denmark. Each member maintained its own central bank.

Next, we would like to stress a distinction between the monetary union per se and the type of monetary policy pursued within the union. Adoption of a common money by several states (members) can be consistent with alternative sets of institutional arrangements governing monetary policy, ranging from complete laissez-faire to monolithic central banking. This distinction is illustrated in the following account, which shows that monetary unions, once created, differed substantially depending on the evolution of monetary institutions or arrangements. The currencies could be unified without specifying any particular rule for governing monetary policy as seen from the following account, which focuses on three national monetary unions: the U.S., the Italian and the German monetary unions and two multinational monetary unions: the Latin and the Scandinavian monetary unions. Here, we deal primarily with the monetary experience of the late 18th century and the 19th century.

2.1. National monetary unions

2.1.1. The U.S. monetary union

Because all the colonies were founded, chartered, and to some extent administered by the English government, English monetary regulations and practices strongly influenced their monetary systems. The

principle medium of exchange in the colonies, as in England, was silver coins denominated in pounds, shillings, and pence. No banks in the modern sense existed, so there were no deposits or bank notes (McCallum, 1989, Chapter 15).

One problem from the beginning was that the British Navigation Acts discouraged the export from England of English silver coins and the colonies were prohibited from setting up their own mints. So the bulk of coins used were Spanish silver coins, called *pieces of eight* or *dollars*. All the colonies throughout the 17th and 18th centuries complained of a perennial shortage of silver. This may have reflected the tendency of developing countries to run chronic balance of payments deficits. It may also have reflected deterioration in the quality of Spanish silver coins in an era before modern milling and minting techniques had been invented (Redish, 1984).

To counteract the shortage of specie, which was commonly believed to be a deterrent to continuous growth and prosperity, colonial governments resorted to several techniques. One was to legally declare that an ounce of silver in a specified coin was worth more shillings in the colony in question than elsewhere, which was equivalent to a modern devaluation. The English government prohibited the practice in 1692. A second device was the use of commodity money.

The third device, and the one most commonly used, was the issue of paper money in one of two forms: land-bank bills, which were IOUs based on the security of mortgages and bills of credit—notes issued by the colonial government promising to repay the holder in specie at some future date based on the collection of taxes. These bills were freely transferable without endorsement from holder to holder, were issued in convenient denominations, and were printed in a form similar to today's money. These bills of credit came to be quickly accepted as a medium of exchange and served as a major form of colonial currency.

In the first half of the eighteenth century, the New England colonies and South Carolina issued sufficient amounts of paper monies to displace all specie from the money supply and thus force the colony off the fixed exchange-rate specie standard. This led to rapid inflation and depreciating exchange rates (Michener, 1987; McCallum, 1992). Other colonies (most notably the Middle Atlantic states) did not issue enough paper money to displace specie, so their experiences were associated with low inflation and stable exchange rates.

In reaction to the New England experience of high inflation from 1720-50, the British Board of Trade imposed the Currency Act of 1751, which prohibited those colonies from issuing bills of credit not fully backed by specie. The prohibition on paper money issue was extended to the other colonies in 1764—although not universally followed (Perkins, 1994, pp. 42-55).

The American revolutionary war was largely financed by the issue of fiat money by the Congress (the continentals) and by the states (bills of credit). During the War of Independence (1776-1783) paper money issues (at the rate of 50 percent per year in the first five years of the war) generated a very rapid inflation rate of over 65 percent per year and rapid depreciation of the exchange rate. The inflation ended after a currency reform in 1780 under which the federal government stopped issuing bills of credit, and the states agreed to accept outstanding bills in payment of taxes at 40 dollars to 1 in specie (a value much lower than the exchange rate of 1780) until 1783, after which date the continental would become worthless.

After the war during the Confederation period (1783 to 1789), the states continued to issue bills of credit, some of which were credibly backed by future taxes and some of which were not. So problems similar to the colonial era reemerged. Rolnick et al (1994) focus on two: excessive volatility of exchange rates leading to exchange-rate risks and high transactions costs; and competitive seigniorage.[9]

The U.S. monetary union was created with the signing of the Constitution in 1789. The constitution gave the Congress the sole power to coin money and regulate the value thereof. Moreover, the Coinage Act of 1792 defined the U.S. dollar in terms of fixed weights of gold and silver coins, placing the country on a bimetallic standard. In 1792, establishment of a national mint in Philadelphia secured the foundations for an effective currency area.

While the Congress was given the exclusive power to coin money, the states were allowed to charter commercial banks and to regulate their note issuing activity. All bank notes had to be convertible into specie. In the early decades of the 19th century, bank note issue varied considerably and various bank notes circulated at a discount. And there is evidence that the price level may have been higher in the West than in the East (Fraas, 1974).

[9] Rolnick et al. (1994) discuss the examples of Rhode Island and North Carolina, which required out-of-state creditors to be paid only in depreciating local currency.

The movement to a complete monetary union with a more uniform nation-wide price level was aided by the practices of the First Bank of the U.S. (1791-1811) and the Second Bank of the U.S. (1816-1836). Neither Bank was designed as a modern central bank but as a public bank. Both banks were sufficiently well capitalized to be able to provide the government with medium-term bridge loans to finance shortfalls in government tax receipts. Both were also intended to provide loans to the private sector to spur economic development. It was deemed imperative that they hold sufficient specie reserves to always maintain convertibility of their notes. One of the practices of both banks was to enforce the convertibility of state bank note issues and to transfer specie among regions. One authority (Fraas, 1974) argues that the policies of the Second Bank of the U.S. created an effective unified currency with a uniform national price level by 1830.

In 1836, after the demise of the Second Bank of the U.S., the U.S. had no form of a central bank until the establishment of the Federal Reserve System in 1914. But the U.S. Treasury served as a monetary authority and maintained specie convertibility. Although the 19th century was characterized by considerable banking instability, the monetary union remained intact except for the Civil War period (1861-65) when the Confederate states issued their own fiat currency. So monetary unification of the U.S. was not finalized until long after political unification.

2.1.2. The Italian monetary union

In the 1860s, the main reason for the establishment of a currency union on the Apennine peninsula was that the area now known as Italy was politically unified. In 1861, the political unification process, led by the Kingdom of Sardinia, was completed.[10] Before 1861, financial matters were widely disparate among the various small Italian states. In 1859, as many as 90 different metallic currencies were legal tender.[11] Major banks in the small states also issued bank notes that served as legal tender in their respective regions. The vast amount of different currencies was commonly regarded as a trade barrier. To get

[10] Venetia was incorporated in 1866 after Italy had participated on the Prussian side in her war against Austria. The Papal States were incorporated in 1870 when France, which until then had acted as a protector of the sovereignty of the Papal States, was engaged in war with Prussia.

[11] Sannucci (1989, 260).

more than a *de jure* unified Italy, measures were also taken to turn the country into a monetary union.

The issue of coins was quickly resolved. During a brief transition period, four currencies were accepted, while all other old currencies were exchanged into these. In 1862, a new, unified coinage system was introduced based on the lira of Sardinia. All pre-unification coins and paper monies were abolished and exchanged for coins denominated in the new lira, incidentally equal in value to the French franc. A bimetallic currency standard was preferred, primarily to conform to the monetary system of Italy's major trading partners and to accommodate the dominance of silver coins in southern Italy.[12] The currency ratio between silver and gold was set at the European standard of 15.5. When Italy introduced the lira, the price of gold was falling, which created a shortage of silver coins. The legislators acted by lowering the silver content of coins to 83.5 percent instead of the customary 90 percent. This led to an export of silver coins, a phenomenon that was enhanced by the suspension of convertibility a few years later.[13]

No immediate action was taken to set up one monetary authority. Several regional banks were issuing notes and performing central bank functions. But the *Banca Nazionale nel Regno d'Italia* (BNR) held a leading position among banks, partly by being the largest bank in operation and partly by being the bank of the state that led the political unification process. The BNR was formed by the previous national bank of Sardinia, which absorbed some other state banks in the process.

Italian monetary research does not clearly explain why one monetary authority was not created after unification. Apparently, it was not due to opposition toward monetary unification. Given that Sardinia imposed its system on the rest of the country in a wide range of areas, neglecting the preferences of other states, it seems unlikely that it would have backed down if it wanted to set up the BNR as the central bank of Italy. Several explanations have been put forward. Fratianni and Spinelli (1985) suggest that it was simply a result of the general belief at the time that banking was like any other industry. So Italy would gain from competition among issuing banks just as competition in other industries was considered to enrich the economy.

[12] See also the section on the Latin monetary union.

[13] For an account of the fineness of coins, see the section on the Latin monetary union.

As another possible explanation, Sannucci (1989) argues that before unification, regional commercial banks were credit institutions and note issuers. The general concept of Italian banking of the time was to combine these two functions. Money was created as bank notes, in response to demands for credit. The central government may have concluded that the creation of one central bank would have destroyed or severely impaired the functioning of commercial banks at the local level and that the cost of this would exceed the benefits of control of the supply of paper money by a central bank.

When Italian monetary unification occurred in 1862, almost the entire money stock consisted of coins. Because the supply of gold and silver regulated the supply of coinage, the fluctuations in the Italian money stock followed the international pattern. The share of coins in the money supply remained stable until the mid 1860s, which indicated that as long as bank notes were convertible into specie the multiplicity of issuing banks did not create a problem.

But in the first half of the 1860s, the government fiscal deficit rose sharply, which worsened the strain already put on public finances by the central government that assumed responsibility for the debt of the previous states. Italian bond prices fell abroad, which drove specie out of Italy, leaving the reserves of the commercial banks dangerously low and restricting their ability to lend to the government. To come to terms with the new situation, the government declared bank notes inconvertible into specie in 1866, *corso forzoso*, in the language of the day.[14] The government received a large loan in notes from the BNR after this step. In return, the position of the BNR was strengthened. The notes of other banks were made legal tender and at the same time convertible into BNR notes. But BNR notes were not convertible into their notes. Thus BNR notes served as reserves for other banks.

The Italian money stock rose by 29 percent in 1866 and by 9 percent in 1867, which produced a depreciation of the lira.[15] The arrangement with BNR notes as reserves gave the government an instrument to control the money supply and was initially successful in lowering inflation and increasing the value of the lira. But because the government deficit rose again, the money supply was once again allowed to rise. And the issuing and inconvertibility of paper money drove coins out of the country. The ensuing shortage of small de-

[14] *Corso forzoso* translates broadly as forced circulation.
[15] Fratianni and Spinelli (1985, p. 484).

nomination coins led many smaller banks to put notes illegally in circulation. In 1874, these developments led to legislation, which stated that the remaining six currency-issuing banks held the right to print legal-tender bank notes. The government restricted the volume.[16]

In 1884, the *corso forzoso* ended. Convertibility resumed, and the lira returned to gold parity. The notes of the six remaining note-issuing banks exchanged for each other, on a one-to-one basis, although the parity was not stipulated by law. As a consequence of the *de facto* fixed exchange rate between the notes, any bank had an incentive to increase its stock of notes. The risk of the government discovering an over-issue was small. And deteriorating government finances increased the likelihood that any illegal over-issue of notes would be legalized.

In 1891, a liquidity crisis was pending because of the low levels of reserves relative to outstanding notes. The government, as expected, responded by legalizing the total volume of notes in circulation by lowering the reserve requirements. An ensuing enquiry into the state of the banking system, completed in 1893, led to a major restructuring of the banking system. The *Banca d'Italia* was formed as an amalgamation between the BNR and two Tuscan banks. The three remaining note-issuing banks were put under direct state supervision.[17] Despite these measures, specie continued to flow out of Italy. The lira depreciated, mainly due to the failure to reduce the excess issue of notes. The outflow triggered another liquidity crisis. In 1894, bank notes once again were declared inconvertible into specie.

As part of the 1893 reshaping of the banking system, the government and the banks agreed to restrict the note issue to three times the volume of specie. In the long run, this proved successful. The success mainly occurred because the *Banca d'Italia* was established as the leading note issuer with 75 percent of total circulation. Fiscal discipline contributed to making the period up until World War I one of monetary stability with an appreciating lira.

[16] The six banks were the BNR, the southern banks *Banco di Napoli* and *Banco di Sicilia*, the *Banca Romana* (previously the bank of the Papal States), *Banca Nazionale Toscana* and *Banca Toscana di Credito.*

[17] The newly created *Banca d'Italia*, the *Banco di Napoli* and the *Banco di Sicilia.* The *Banca Romana* went into liquidation in 1893. The BNR took over its business.

The formation of the Italian monetary union, as the formation of the U.S. monetary union, occurred after political unification.

2.1.3. The 19th-century German monetary union

The German monetary—and political—unification process proceeded stepwise. So scholars do not agree when the most important step toward monetary unification occurred. Holtfrerich (1993) suggests that the unification of coinage in 1857 represents the major, if not the final, achievement toward a monetary union. Others, such as Kindleberger (1981) thinks that the creation of the *Reichsbank* in 1875 was the most important step. The disagreement has important implications; in the former case, monetary unification preceded political unification and in the latter case, vice versa.

Before German monetary unification, each principality and free town issued its own coins and, in some cases, paper money. Because many of the principalities were small, it was inevitable that their coins spread across their borders, as an accompaniment of the free flow of migration within the *Deutscher Bund.* Many foreign coins, not least of French origin, also circulated within Germany. Money exchanges were common and profitable.

The diversity of coins was perceived as a great nuisance. Merchants and industrialists, often with a liberal orientation, became the main proponents of unified economic and monetary conditions to reduce transaction costs emanating from the monetary disarray, while the governments of the principalities resisted, safeguarding their seigniorage gains.

In 1834, all internal customs barriers were removed. This agreement, known as the *Zollverein*, also proposed that the various coinage systems should be integrated into a common standard. So far, Germany could roughly be divided in two areas, each using the same unit of account and, apart from Bremen, each operating on a silver standard.[18] The southern states were the first to respond to the spirit of the *Zollverein* by signing the Munich Coin Treaty in 1837. One year later, the statutes of this treaty became part of a more general agreement among all the states of the *Zollverein*, the Dresden Coinage Convention, which provided further standardization. This treaty stipulated that each state had to choose between the thaler, the unit

[18] The two areas did not have a common currency because the metal content of coins and system of fractional money differed across regions.

of account of the north and the gulden, the unit of account of the south. The thaler and the gulden were explicitly linked to silver and to each other with one thaler being valued at 1.75 gulden. All member states were required to withdraw from circulation all coins not adapted to the new standard, whether due to wear and tear or debasement at the mint.

The Dresden Convention created a double currency standard virtually all over Germany. But some states had not joined the *Zollverein* and did not participate in the convention.[19] Each state still retained the right to determine how to divide the currency into petty coins. In practice, following the Dresden treaty, the Prussian one-thaler coin dominated the circulation throughout Germany, even gaining general acceptance in the southern regions that were on the gulden standard.

The Vienna Coinage Treaty of 1857 constituted a further step toward monetary unification. The treaty incorporated Austria into the Dresden arrangement by fixing the exchange rate of 1 thaler to 1.5 Austrian gulden and to 1.75 south German gulden.[20] The amount of small-change coins that each state could issue was regulated. The old fractional coins issued at the century's start were withdrawn. All existing one-thaler coins were granted legal tender status and every state was given the right to mint one-thaler Vereinsmünze. Gulden coins and thaler coins of other denominations remained legal tender in their respective regions. The new one-thaler Vereinsmünze was rapidly placed into circulation and almost completely overtook the gulden.[21] The treaty also prohibited uncontrolled circulation of subsidiary coinage by limiting the amount each state could issue and by declaring subsidiary coins convertible into full-value coins. In effect, a system of double currencies was established.

Apart from the standardization of the silver coin system, the Vienna Treaty included two major steps toward monetary unification:

1. The circulation of gold coins, previously left to the discretion of each state, became subject to stringent rules. No gold coins other

[19] These states included the cities of Bremen, Hamburg, and Lübeck and Schleswig-Holstein. They also included Austria and Liechtenstein, which were to remain outside the unification process.

[20] Austria was subsequently forced to withdraw in 1867 following defeat in the war against Prussia.

[21] Holtfrerich (1989, p. 224) states that before 1857, the south German states minted 90 percent gulden and 10 percent Vereinsmünze, whereas after 1857, the relation was the opposite.

than special Vereinshandelsgoldmünze, designed for foreign trade, were to be minted. The exchange of gold coins into silver at a fixed parity was also forbidden, which avoided the risk of turning the currency standard into a bimetallic one.

2. The treaty dealt with paper money (the first international monetary arrangement ever to do so) by prohibiting the granting of legal tender status to inconvertible paper money.[22] The decision was aimed at Austria, where inconvertible notes had been issued since 1848. But no measure was taken to limit the circulation of convertible bank notes issued in several states. The demand for paper money (bank notes and state paper money) had grown primarily in the most industrialized regions of Germany. The number of note-issuing banks rose to about 30 by the mid-1850s and the amount of notes in circulation grew rapidly.[23]

In the 1860s, although the coinage in Germany had been put on a common standard in 1857, voices were raised to continue monetary unification. In 1870, the North German Federation (founded in 1867) prohibited new issues of state paper money and fixed the volume of note issues for most banks. These measures left the control of the future growth of paper money in the hands of the Prussian Bank.

In 1871, the establishment of the new unified German Reich following the Franco-Prussian War induced further steps. The coinage acts of 1871 and 1873 unified coinage throughout the Reich and introduced the mark as the unit of account, based on the decimal system. To link the German currency to the British pound (at the time the leading international currency), the gold standard was adopted with silver being reduced to use in coins of small denominations with less metal content than their face value.[24]

In 1875, a new banking act transformed the Prussian Bank into the *Reichsbank* and forced most other banks to choose ordinary banking business.[25] The *Reichsbank* was to serve as the central bank for the new Germany.

[22] Holtfrerich (1989, p. 225)

[23] Holtfrerich (1989, p. 228)

[24] But there was an exception to the rule because outstanding silver thalers remained legal tender.

[25] The termination of other banks' right to issue notes was not as straightforward as simply enacting a law forbidding it. Instead, the government opted to allow other

So political unification was combined with three major changes in the German monetary system: the conversion of the currency standard from silver to gold, the replacement of the thaler with the mark as the unit of account, and the formation of one central bank that, in practice, monopolized the issuing of paper money. These changes meant that Germany, after a long process, was a full-fledged national monetary union.

From the 1870s until the outbreak of World War I, Germany was part of the international gold standard. International developments determined German monetary developments. Money growth and prices moved in line with adherence to the gold standard.

2.2. Multinational monetary unions

2.2.1. The Latin monetary union[26]

Before the establishment of the Latin monetary union, France, Belgium, Switzerland and, to some extent, Italy had a history of recognizing each other's currencies as means of payment. The basis of this arrangement was the French bimetallic system, in operation since 1803, which stipulated that the fineness of each coin, regardless of whether it was a gold or a silver coin, was to be 90 percent and which fixed the relative value between gold and silver to 15.5.

In the 1850s, a fall in the price of gold relative to the price of silver made gold coins overvalued at the mint. So it became profitable to melt silver coins and sell silver for gold at the market rate. As the price of gold continued to fall, even worn coins with low silver content started to disappear. The process left the countries virtually with a gold-standard currency because gold was the only medium of exchange that remained in circulation. But the lack of silver coins meant a lack of small-denomination monies to use in minor transactions.

Switzerland was the first country to enact a feasible solution by reducing the silver content to 80 percent in all coins except the five-franc coin, thus ensuring that it was no longer profitable to export the new reduced-value silver coins. Switzerland also recognized that it

state banks to continue issuing notes but to stipulate stringent rules concerning the denominations of the notes and the total amount issued. Private banks were forced to choose between issuing notes valid only in the region of the bank or performing their business nationwide.

[26] This section is based on Griffiths (1991) and Redish (1993).

was now in effect operating on a gold standard. In 1860, it formally approved of gold as the basis of its currency.

Upon monetary unification, Italy decided to lower the silver content of every coin smaller than one franc to 83.5 percent. The result of the actions of Italy and Switzerland was that mainly France, but also Belgium, were invaded by debased silver coins from their neighboring countries, which created seigniorage gains for the issuers. In 1864, France reacted by reducing the silver content in every silver coin, except the five-franc coin, to Italy's 83.5 percent and by suspending the acceptance of Swiss coins by its customs offices.

There was an apparent need for coordination. The acute shortage of small denomination coins constituted a hindrance to trade within and among countries and forced the countries into action to remedy the problem. The unilateral response by each country of creating token coins of varying fineness created an additional problem in the form of one country reaping seigniorage benefits at the expense of the others. To deal with this situation Belgium proposed a joint monetary conference, held in 1865, which created the Latin monetary union.

The main issues at the 1865 conference were to secure and standardize the supply of subsidiary coinage for smaller transactions and the formal adoption of gold as the currency standard. The first issue was unanimously resolved by deciding that all silver coins lesser in value than the five-franc coin were to be token coins with 83.5 percent silver fineness, which the state treasuries had to accept as payment up to 100 francs regardless of the country of origin. Each state treasury was then obliged to exchange the other state treasuries' holdings of its token coins into gold or silver five-franc coins at par. The figure 83.5 percent was chosen because of the dominant share of French and Italian token coins already in circulation compared to the amount of Swiss. The total value of token coins that each country was permitted to mint was restricted to six francs per capita. Due to strong French opposition and although the other countries favored such a move, the adoption of a gold standard was rejected in favor of retaining the bimetallic standard.[27]

[27] Two possible explanations for the French resistance have been put forward. One (mainly political) suggests that Napoleon III was planning a world monetary conference in 1867, where he hoped to be able to exchange a willingness to adopt the gold standard for a universal adoption of the French monetary standard. So he was unwilling to convert to a gold standard at this stage. According to the other expla-

The existing currencies continued to be in use (virtually unchanged) as parallel currencies. Each state treasury remained ultimately responsible for the redemption of its own coins. Apart from solving the problem of the scarcity of small-denomination coins, the purpose of the standardization of the dimension and metal content of the coins was to end the possibility of seigniorage gains through the minting of debased coins. While aiming to restrict the amount of money in circulation, the conference failed to consider restrictions that prevent the member countries from issuing other forms of money—a failure that was to be exploited by the issue of paper notes. So the members still had considerable monetary independence.

Initially, the union achieved what it had set out to achieve. But two problems soon emerged. After the inauguration of the union, the price of gold started to rise again, which led to silver five-franc coins returning in circulation and gold coins being melted or exported. At the same time, France and Italy began to issue inconvertible paper money. For France, it was a temporary measure due to the war with Germany in 1870-71. Italy's chronic government deficit preserved inconvertibility of the lira until 1881 and then introduced it again in 1894. The increased money supply in Italy led to a depreciation of the lira. So Italian silver coins were exported to the other member countries where they were legal tender. Obviously, this enabled the Italian government to pay for part of its deficits with seigniorage, the cost of which was shared among all four countries.

An 1874 conference of the members decided to maintain the bimetallic standard but to restrict the minting of silver five-franc coins. In 1878, the members agreed to cease issuing five-franc silver coins although those already in circulation were to remain legal tender. This arrangement established the *limping gold standard.* In the discussions preceding the decision of 1874, Belgium and Switzerland were originally in favor of terminating the union and the Belgian delegates argued for an adoption of a gold standard. But France and Italy were against both proposals, probably because the Bank of France and the Italian government feared the huge cost of redeeming in gold all the five-franc silver coins in circulation. The other three nations also feared that a termination of the union might lead to Italy refusing to

nation, the Bank of France was concerned with redeeming the outstanding silver coins in gold. This would stretch the bank's reserves to the limit and Napoleon III, dependent on the bank for loans, had to follow the bank on this account.

redeem the other countries' large holdings of Italian token coins. Instead, Italy had to agree to withdraw its token coins from international circulation for as long as it retained its inconvertible paper money.

In 1885, as the relative price of gold continued to rise, the union considered full adoption of the gold standard and thus withdrawing the five-franc silver coins. Once again, the main problem was the cost of redeeming silver in circulation because the intrinsic value of the silver was now far below its face value. In the end, this proved too great an obstacle to overcome and a new agreement was signed, which stipulated that any party leaving the union must exchange the others' holdings of its silver coins into gold.

The main cause of the breakup of the Latin monetary union was World War I. The sharp increase in military cost left the members with no choice but to issue paper money. The large quantities of paper money issued during the war remained in circulation after the end of the hostilities. Because paper money was not recognized as legal means of payment in any country other than the issuing one, the union was, in effect, put out of practice. During the war, silver coins were melted or exported. Remaining coins constituted a small share of the total money supply. Belgium was the first member to act accordingly, declaring in 1925 that it would leave the union at the start of 1927. The other countries followed and the union was dissolved.

2.2.2. The Scandinavian monetary union

Before the formation of the Scandinavian monetary union in 1873, the three Scandinavian countries had a long history of similar units of account and exchange of notes and coins among them.[28] They were all on a silver standard. Indeed, in the years leading up to the 1870s, all used the riksdaler as the unit of account. One Norwegian specierigsdaler was roughly equal to two Danish rigsdaler, which in turn was roughly equal to four Swedish riksdaler. As an effect of this, considerable parts of the coin circulation in either of the three countries consisted of coins minted in the other two. The difference in value separating these simple exchange rates from the exchange rates based on the currencies' values in silver was small enough regarding the Danish and Norwegian currencies for any profits that could have

[28] At the time, Finland was a grand-duchy of Russia. Denmark governed Iceland. Norway was formally engaged in a political union with Sweden but enjoyed far-reaching political independence.

arisen from arbitrage to be negligible. This was not the case for the Swedish currency. Its value exceeded 0.5 Danish or 0.25 Norwegian rigsdaler by an amount sufficiently large to produce an inflow of Danish and Norwegian coins into Sweden to be perceived as a nuisance in Sweden.[29]

But this currency flow was by no means the only reason, not even the most important one, for aiming at a unified coinage. In all Scandinavian countries, a lively debate regarding the most suitable specie standard—gold or silver—and regarding the merits of the decimal system for dividing the unit of account, had created an intellectual climate in favor of converting the Nordic currencies into a common gold standard based on the decimal system.[30] The decimal system was favored on the grounds of rationality. A currency based on the gold standard was deemed appropriate because Scandinavia's leading trading partners, the UK and Germany, were on gold. In addition, nationalistic sentiments running through Europe in the latter half of the 19th century took the form of *Scandinavism* in Scandinavia, a social and political willingness to bring the Nordic countries closer together in many areas.

All these factors—the disequilibrium in currency flows, the perceived superiority of the gold standard and the decimal system and the political climate of the day—contributed to Sweden, Denmark and Norway creating a common currency union in 1873. Norway did not formally sign the agreement until 1875, but in practice, its monetary standard was altered in 1873.[31]

The formation of the Scandinavian monetary union in 1873 replaced the old unit of account, the riksdaler, with a new one, the crown (krona). The value of a Scandinavian crown was specified in terms of gold and was to be equal in all three countries where the new gold coin was minted. Subsidiary coins were to be minted in silver and copper with a fineness of 80 percent and no restrictions were placed on the amount of subsidiary coins each country was allowed

[29] The law proposed in the Swedish parliament in 1873 specifically mentioned the permanent costs emanating from the inflow of Danish and Norwegian silver coins.
[30] The issue was debated at three meetings of Scandinavian economists: in 1863 in Gothenburg, in 1865 in Stockholm, and in 1872 in Copenhagen.
[31] The reasons for Norway's initial refusal to join the monetary union are not entirely clear. In any case, Norway joined the union two years later and in doing so, accepted all the terms of the agreement. This was not particularly surprising because in 1873, Norway had already introduced all measures except the granting of legal tender status to Swedish and Danish coins.

to mint. All coins were given legal tender status throughout the three Scandinavian countries. The state treasuries accepted unlimited amounts of coins irrespective of their country of origin. The only restrictions were a maximum amount stipulated for the settlement of private debts.

Because of the larger denominations of the gold coins compared to the denomination of bank notes, notes remained widely in use.[32] Inter-country circulation consisted of notes and subsidiary coins. This caused some dissatisfaction because notes were not covered by the union agreement and thus did not always circulate at par. But this shortcoming was eventually remedied.

The first enlargement of the Scandinavian monetary union occurred in 1885. The three central banks decided to set up inter-country drawing rights. Transactions between the central banks were made free of interest and other charges. It is unlikely that the central banks would have entered such an agreement if they felt that the currency flows would create a permanent disadvantage. So the 1885 agreement indicates that no country sought to gain seigniorage benefits at the expense of the others. The smooth functioning of the union led Sweden and Norway to further extend the scope of the union in 1894 by accepting each others' notes at par without restrictions. The Danish central bank did not join the new agreement until 1901.[33]

No particular economic strains to the union seem to have appeared before World War I. The gold standard, by requiring convertibility into gold, ensured stability in the money supply. All three countries avoided issuing excessive amounts of subsidiary coins.[34] The money supply in the member countries expanded in line with economic growth. Inflation rates and interest rates exhibited identical

[32] Jonung (1984).

[33] The comparatively less widespread note circulation in Denmark may have led the Danish central bank to treat the issue as less urgent. Notes represented 26 percent of the circulation in Denmark, 41 percent in Norway and 57 percent in Sweden, according to Henriksen et al. (1994).

[34] But one event suggests underlying political strains. In 1905, the Swedish central bank canceled its participation in the 1885 agreement. But a new renegotiated agreement quickly followed, which allowed each central bank to charge the other banks when selling drawing rights. This option was not used for five years, and then by Norway and Denmark, suggesting that the action of the Swedish central bank in 1905 was motivated by a desire to demonstrate against Norway which had secured independence from Sweden that year.

patterns in Scandinavia during the union.[35] The effects of the union on intra-Scandinavian trade is an issue that needs more research. According to contemporary sources, the border trade between the countries benefited from the union. But intra-Scandinavian trade declined during the union period. And the monetary union was not combined with a Scandinavian free-trade area.

Like the Latin monetary union, World War I introduced the Scandinavian monetary union's collapse. At the outbreak of war, Scandinavian notes were declared inconvertible into gold. At the same time, to prevent an outflow of gold, the export of gold was prohibited. The growth of the money supply thereby ceased to be tied to the supply of gold, and the basis for the exchange of Scandinavian notes at par was eliminated. Monetary policy was more expansive in Denmark and Norway than in Sweden. In 1915, the official exchange rates changed accordingly with one Swedish crown buying more than one Danish or Norwegian crown.

Because the legal tender status of Scandinavian coins in all Scandinavian countries was still in force, Danish and Norwegian gold coins were exported to Sweden. The governments in Denmark and Norway often granted exemptions from the prohibition of gold exports. The Swedish central bank objected to the inflow of gold coins. Negotiations were opened to suspend the legal-tender arrangement. But neither Denmark nor Norway wanted to end it. And instead, the outcome in 1917 was a strict enforcement of the prohibition of gold exports.

After the war, the three Scandinavian currencies were no longer traded at par. Gold coins could not circulate across borders because of the ban on gold exports. In virtually all respects, the Scandinavian monetary union had been rendered ineffective by the war. The only remaining parts of the original agreement were the legal tender and equal value status and unrestricted minting and flow of subsidiary coins. Because the Swedish coins were more valuable than Danish and Norwegian coins, subsidiary coins flowed into Sweden. To come to terms with this situation, a supplementary agreement was put in force in 1924, which stated that without regard to the coinage treaty of 1873, each country could only issue new subsidiary coins that was legal tender in the issuing country, thus phasing out the common

[35] Bergman et al. (1993, pp. 512-14).

subsidiary coins in circulation. The 1924 decision effectively ended the union.

2.3. Other monetary unions[36]

In the 19th century, currency boards developed as a common monetary arrangement in many colonies, in particular in British colonies. A typical currency board issued notes and coins at least fully backed by reserves denominated in the currency of the colonial power (see Table 1). Currency boards were a method of economizing on the use of notes and coins of the colonial power.[37] A currency board represented a form of monetary union, more precisely an exchange-rate union, between the colony and the home country.

Most colonies abolished their currency boards and established central banks of their own when they gained independence in the 1950s and 1960s. In a few cases, the currency board system was maintained and made more sophisticated, such as Hong Kong, Singapore, the East African Currency Area (emanating from British colonial rule but dissolved in 1977), and the East Caribbean Currency Area consisting of seven small island nations.[38]

The currency board institution has experienced a renaissance in the 1990s because Argentina, Estonia, and Lithuania have recently adopted currency boards. So far, these experiments appear to have worked well for establishing monetary stability and credibility relative to alternative monetary arrangements. But it remains to be seen how well they will function in the long run.

Several monetary unions have been established in the 20th century. The CFA Franc Zone is one example, which was formed in 1959 by former French colonies in west and central Africa and actually have much in common with a currency-board agreement.[39] In practice, the zone is two monetary unions covered by the same arrangement, with each union having its own monetary authority. Each union uses a unit of account called the CFA franc, which in 1948 was

[36] This section is based on Cohen (1993) and Graboyes (1990).

[37] For a description of the workings and history of currency boards see Hanke et al. (1993) and Schwartz (1992).

[38] Cohen (1993) and appendix C in Hanke et al. (1993).

[39] More specifically, the members are Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea, Gabon, Ivory Coast, Mali, Niger, Senegal, and Togo.

set equal to 1/50 of a French franc.[40] The CFA francs are legal tender within their respective monetary unions and are convertible into French francs. France's influence over monetary policy in the region is substantial. The CFA Franc Zone has provided lower inflation rates than neighboring African countries, primarily by limiting credit to national governments. The union is still in operation.

The East Caribbean Currency Area provides an example of a multinational monetary union with one monetary authority. The East Caribbean Currency Area comprises seven small countries in the Caribbean Ocean that were previously British colonies.[41] Under British rule, the British Caribbean Currency Board controlled monetary matters. Since then, it evolved into the East Caribbean Central Bank. It is the sole issuer of the currency for the union, the Caribbean dollar, which is legal tender in the seven member states. The seven member countries also cooperate in other matters, for example, through the East Caribbean Common Market. The union is still in operation.

Some unions deal with the case of a very small country adopting the monetary system of a large country, most commonly a close neighbor, for example Luxembourg-Belgium, Andorra-France, Monaco-France, the Vatican City-Italy, San Marino-Italy and Liechtenstein-Switzerland. In each case, the larger country entirely exercises monetary authority.

There are a few cases of a small country unilaterally adopting the monetary system of a country far away. Examples include Liberia, where the Liberian dollar was fixed to the U.S. dollar at a one-to-one rate and U.S. bank notes were made legal tender in 1944, and Panama, which, one year after the country was formed in 1904, fixed the exchange rate of the domestic currency, the balboa, to the U.S. dollar and made the U.S. dollar legal tender.

The monetary union between Ireland and the UK, formed after Irish Home Rule in 1922, represented a currency board institution.[42] When Ireland was part of the UK, sterling was used in Ireland. This arrangement was initially prolonged in 1922. With the UK as Ireland's largest trading partner, the Irish government, by taking no action to

[40] But in 1994, the CFA Franc was devalued by 50 percent.

[41] The members are Anguilla, Antigua and Barbuda, Dominica, Grenada, St. Kitts-Nevis, St. Lucia and St. Vincent and the Grenadines.

[42] The section on the monetary union between Ireland and Britain is based on Bradley and Whelan (1992).

change the monetary system, indicated that the advantages of maintaining close monetary links to the UK outweighed the advantages of monetary sovereignty. In 1925, a new unit of account, the Irish pound, was introduced. The Irish pound was explicitly linked to sterling. It had to be backed by gold or sterling assets one-to-one and sterling remained legal tender. The union was not ended until 1979 when, due to the strong inflationary tendencies of the British economy, Ireland decided to join the newly formed EMS instead.

In the 20th century, several national monetary unions have been terminated: the Austro-Hungarian empire after World War I, the Soviet Union, Yugoslavia, and Czechoslovakia in the 1990s. These episodes reflect far-reaching political events leading to the breakup of existing states into smaller territories. Such national dissolutions were accompanied by monetary turmoil and high inflation for Austro-Hungary, the Soviet Union, and Yugoslavia.

2.4. Lessons from the history of monetary unions

In this study, we focused on five monetary unions: one created at the end of the 18th century and the other four in the 19th century. The historical record suggests a few conclusions.

1. The creation of national monetary unions was closely associated with the establishment of independent nation states. In the U.S., monetary unification followed briefly after political unification. In Italy, the pattern was similar, while in Germany, monetary unification primarily preceded political unification.
2. The three national monetary unions were primarily arrangements to reduce seigniorage competition among states or regions, to standardize coinage and set up a national unit of account. The different monetary entities (member states) of the new nation states turned over their monetary, and thus part of their political, sovereignty to the new nation. Eventually, they gave up the right of seigniorage—an important form of taxation at the time. A national monopoly of seigniorage was preferred to competition. And although it was not important at the time, they also gave up their ability to influence their regional (domestic) economies by monetary policy. The national monetary unions should thus be viewed primarily as a way of reducing transaction costs and uncertainty about exchange rates. The existence of many kinds of monies within a politically united area was regarded as a hindrance for trade and commerce.

3. The Latin and the Scandinavian monetary unions, the two multinational unions examined, were set up to standardize coinage among independent countries. Both were based on the international specie standard of the day, and they represented a closer degree of monetary integration than the mere adherence to the specie standard. Each member continued to maintain a domestic monetary authority, which facilitated the breakup of the union once it was subjected to large disturbances. These unions broke up as a consequence of differences in domestic monetary policies during World War I, after the currencies of the member countries had been made inconvertible into gold. The breakup was fairly easy to administer—as opposed to the case of the collapse of national monetary unions. The termination of the latter type of monetary union has commonly been associated with major political disturbances and shocks.

The post-World War II experience of the breakups of monetary unions is consistent with the previous conclusions on two accounts. First, the termination of multinational monetary unions, such as various currency-board arrangements seems a fairly simple and expedient affair, given the existence of a national monetary authority that may be transformed into a full-fledged central bank. Second, the break-up of national monetary unions, such as the Soviet Union and Yugoslavia, suggests that this is a cumbersome process, which results from the disintegration of nation states. These events show the political foundations of national monetary unions.

3. Lessons from the past for Sweden and the EMU

Our review of the history of international exchange-rate regimes and monetary unions invites a few conclusions that have a bearing on the present debate about Sweden and the EMU.

First, pegged but adjustable exchange-rate regimes, such as the Bretton Woods and the EMS do not permit independent monetary and fiscal policies in the face of open capital markets. As soon as financial market participants perceive inconsistencies between policies (present and future) and the existing fixed exchange parities, they precipitate speculative attacks.

The implication is that the choice for Swedish policymakers is between either perfectly fixed exchange rates with no escape clauses (exceptions), for example, a monetary union, such as the EMU (or a

currency board) that is, a fixed rate *without* independent monetary and fiscal policies or flexible exchange rates. Halfway measures such as pegged exchange-rate systems do not appear sustainable in a world of well-integrated financial markets if there are policy inconsistencies.[43] This suggests that Sweden faces the choice of either joining the EMU or having a floating rate in the future.

The Swedish economy, the private and the public sector, depends on access to international capital markets; an attempt to reintroduce capital controls would damage the export industry and seriously weaken Sweden's credibility as a debtor nation. In addition, such controls cannot become effective. The old regulations were undermined and surmounted by the financial agents of the day. Today, they have access to much more sophisticated technology. A reintroduction of capital controls would also clash with Sweden's international obligations.

Second, the monetary unions of the past, the creation of national and multinational monetary unions, are different from the present process leading to the creation of a common European currency in an important respect. The monetary unifications of the 18th and 19th century were based on specie standards. Specie standards provided a nominal anchor tied to a physical commodity, that is, the volume of specie. The more or less fixed ties between specie reserves and the outstanding money stock limited the scope for discretion in monetary policy.

It was comparatively easy to create national or multinational monetary currency unions because the members in the ensuing union, regardless of whether they were different regions or different countries, already had their currencies tied to a metal, such as silver or gold. The monetary system remained a specie standard after unification. Multinational currency unions proved to be fairly simple to dissolve—once they were the subject of a major shock—as each country maintained its own central bank and currency unit.

The relevance for today is that EU countries that want to join the EMU are on a fiat—not a specie—standard. These countries must create a nominal anchor through some form of common monetary and political agreement to pursue and to enforce a rule, such as monetary or inflation targeting. The future European monetary unification will be based on a commonly accepted politically decided

[43] Schemes to reimpose capital controls (Eichengreen et al. 1995) will be outwitted and will only misallocate resources.

commitment mechanism as opposed to the gold standard of yesterday, which had gold convertibility as a common focal point and commitment mechanism. The statutes of the future European Central Bank set out price stability as its principal objective. But it remains to be seen how this goal will be achieved.

Under the gold-standard regime, there was no dispute about the character of the anchor, the process leading to monetary unification or the gold standard itself once it was in place. Today the policy framework is different. There is considerable uncertainty on this account, although potential EMU members are obliged to fulfill the convergence criteria. But cross-country differences must be ironed out via a political process that forces independent countries to follow common policies once they are members in the EMU.

Cooperation and harmonization of policies under the gold standard was episodic and not by design—in contrast with Bretton Woods, the EMS, and the EMU. A precondition for the EMU plan to succeed is that the individual members of the EMU must display similar commitment to their common goal as did the advanced nations to the gold-standard rule more than a century ago. This is a major challenge facing the EMU. At this point, it is unclear how well the EMU will succeed in creating such a convergence in policy preferences.

Third, we have not found any clear and unambiguous historical precedence to the EMU, where a group of monetary and politically independent countries have surrendered their national currencies to form a common monetary union based on a new unit of account under the leadership of a common monetary authority—while still retaining political independence.

In our opinion, the closest historical parallel is the national monetary unions, which evolved in the U.S., Italy, and Germany. These cases show that a complete monetary union remains functional in the long run when combined with far-reaching political integration (here, a complete monetary union involves the use of the same money and a common monetary policy across all jurisdictions). A prerequisite is that the members of the currency union give up their monetary sovereignty, which is an essential part of political sovereignty.

This suggests that a step toward successful monetary unification might also be associated with closer political cooperation and coordi-

nation. If Sweden joins the EMU, it is reasonable to expect the country to become part of this political integration.

Fourth, the history of national monetary unions suggests that such unions are permanent institutions. Their durability is a consequence of the political process that created the nation state. As a rule, monetary unions collapse when the political union that constituted the foundation of the monetary union disintegrates. To the extent that the political system is stable, the national monetary union has proved to be stable and lasting.

What are the implications of this for Sweden and the EMU? Joining the EMU should be regarded as a permanent step for Sweden. It might be a cumbersome process to reestablish Swedish monetary independence once it is given up to an institution that will function like a national monetary union—and the organization of the EMU seems close to that of a national monetary union.

Fifth, the political economy of international monetary regimes and national monetary unions suggests that such arrangements are dominated by one or a few major economic powers in the center, not by countries or members in the periphery. The history of international exchange-rate regimes indicates such a pattern: the UK was the hegemon of the classical gold standard, sometimes working in cooperation with France and Germany. The short-lived inter-war gold standard was dominated by the actions of the UK, the U.S. and France. The U.S. played the key role in the Bretton Woods system. The ERM arrangement that failed in 1992-1993 was based on the policies of the *Bundesbank*.

The history of national monetary unions suggests a similar pattern with the center having a strong influence on monetary policies. In the U.S., within the Federal Reserve system established in 1914, the Federal Reserve Bank of New York plays, by tradition, the most important role. In Italy, the *Banca Nazionale nel Regno d'Italia* eventually emerged into the central bank. And in Germany, the state Bank of Prussia was the major element in the new *Reichsbank*, set up in 1876.

This center-periphery pattern has implications for Sweden joining the EMU. An obvious qualification to the loss of monetary sovereignty from joining the EMU is that Sweden will take part in the policy framing at the future European central bank. But judging from monetary history, we should not expect a peripheral country and thus a minor voice member, such as Sweden, to have a major voice in the decision-making. The political economy of the EMU will primarily be

determined by the major powers among the members of the monetary union. And Sweden will not be a major power due to the relative small size of its economy. Sweden will have some influence and may enlarge it by forming coalitions with other members of the EMU.

Sixth, monetary history suggests that monetary unification is an evolutionary process. It is hardly possible to set up a detailed plan for the process in advance—and expect the plan to work. The founders of the Federal Reserve System in the U.S. could not have foreseen the rocky path that it followed in its first 40 years before it became a truly effective central bank. We should not expect the future EMU to be the EMU that is presently being designed. It will develop over time in ways we cannot imagine today.

What are the implications of this evolutionary perspective for Swedish membership in the EMU? The conclusion most readily at hand is that it invites to a wait-and-see strategy. Judging from history, Swedish membership today would be an irrevocable step with Sweden ceding its monetary independence. To wait and see means that the choice can be made at some time in the future when more information will be available, partly about how a future EMU will function and partly about the development of the Swedish economy outside a future EMU.

It is not obvious that a small country's decision (such as Sweden) to remain outside the EMU will bring significant costs with it. Economic history contains several examples of small countries with their own currency—and thereby monetary independence—bordering to large countries with a currency of their own without it being harmful to the smaller state. Switzerland and Canada are current illustrations of this interpretation.

Regardless of the direction Sweden chooses—to become a member or remain outside the EMU—it is impossible to get a full picture of the implications of the decision with certainty. To wait and see is a way to gather more information. Monetary history does not end with the formation of the EMU.

Appendix

This appendix summarizes the sources, coverage, and definitions of the basic dataset. The GDP deflators, used in the calculations of the demand and supply shocks, are calculated from the same sources as the real GDP per-capita growth.

The gold standard, the inter-war, and the Bretton Woods periods (1881-1971)

Rate of inflation (CPI):

Country	*Source*
U.S.	Bordo (1993b)
UK	Bordo (1993b)
Germany	Bordo (1993b), 1920-1924: excluded due to hyperinflation
France	Bordo (1993b)
Japan	Bordo (1993b), 1881-1885: not available, 1886-1938: GNP-deflator, 1947-1950: not available
Italy	Bordo (1993b)
Canada	Bordo (1993b)
Belgium	Bordo & Jonung (1996), 1920: not available
Netherlands	Mitchell (1992)
Switzerland	Mitchell (1992), 1881-1890: not available
Denmark	Mitchell (1992)
Finland	Hjerppe (1989)
Norway	Bordo & Jonung (1987)
Sweden	Statistics Sweden (1993) P 15 SM 9301

Real per-capita income growth rate:

Country	*Source*
U.S.	Bordo (1993b)
UK	Bordo (1993b)
Germany	Bordo (1993b), 1920-1925, 1947-1950: not available
France	Bordo (1993b), 1920: not available, 1947: not available
Japan	Bordo (1993b), 1881-1885: not available, 1947-1952: not available
Italy	Bordo (1993b), 1921-1922: not available
Canada	Bordo (1993b)
Belgium	Bordo & Jonung (1996), 1881-1934: not available, 1947: not available
Netherlands	Bordo & Jonung (1996), 1881-1900: not available
Switzerland	Federal office of statistics (1996), 1920-1930: not available
Denmark	Mitchell (1992)
Finland	Hjerppe (1989)
Norway	Bordo & Jonung (1987)
Sweden	Krantz & Nilsson (1975), 1881-1949; Statistics Sweden (1993) N 14 SM 9301, 1950-

Money-stock growth rate:

Country	*Source*
U.S.	Bordo (1993b), M2
UK	Bordo (1993b), M2
Germany	Bordo (1993b), M2, 1920-1925: not available, 1947-1949: not available
France	Bordo (1993b), M1, 1920: not available
Japan	Bordo (1993b), M1
Italy	Bordo (1993b), M2
Canada	Bordo (1993b), M2
Belgium	Delbeke (1988), M1, 1920: not available
Netherlands	Mr. W.F. Vanthoor at De Nederlandsche Bank, 1881-1899, currency; Bordo & Jonung (1996), 1900-, M1
Switzerland	Bordo & Jonung (1996), 1881-1938: not available
Denmark	Kærgård (1991), M2
Finland	Haavisto (1992), M2
Norway	Bordo & Jonung (1987), M2
Sweden	Jonung (1976), M2

Long-term interest rate:

Country	*Source*
U.S.	Bordo (1993b)
UK	Bordo (1993b)
Germany	Bordo (1993b), 1922-1923: not available, 1947: not available, 1954-1955: not available
France	Bordo (1993b), 1947-1948: not available
Japan	OECD Economic Outlook, 1881-1965: not available
Italy	Bordo (1993b)
Canada	Bordo (1993b)
Belgium	Bordo & Jonung (1996)
Netherlands	Bordo & Jonung (1996)
Switzerland	Federal office of statistics (1996)
Denmark	Danmarks statistik (1969)
Finland	OECD Economic Outlook, 1881-1959: not available
Norway	Bordo & Jonung (1987)
Sweden	Bordo & Jonung (1987)

The floating exchange-rate period (1972-1994)

All data are from OECD machine-readable sources. The inflation rate is from *OECD Main Economic Indicators*. The real income growth, money growth and long-term interest rates are from *OECD Economic Outlook*. Data for Germany refers to Western Germany until 1991 and unified Germany after 1991.

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