

**EUROPEAN UNIVERSITY INSTITUTE, FLORENCE**

**DEPARTMENT OF HISTORY AND CIVILIZATION**

EUI Working Paper **HEC** No. 99/5

**Interest Rate Risk and Monetary Union  
in the European Periphery:  
Lessons from the Gold Standard, 1880-1914**

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Printed in Italy in December 1999  
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**Interest Rate Risk and Monetary Union in the European Periphery:  
Lessons from the Gold Standard, 1880-1914**

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Acknowledgements: The author would especially like to thank Michael Bordo, Charles Calomiris, Rudiger Dornbusch, Michele Fratianni, Jaime Reis, Hugh Rockoff, and Franco Spinelli for providing me with data. This paper has been carried out at the European University Institute as part of a TMR Marie Curie Research Training Grant Project financed by the European Commission.

## Abstract

I analyze time-varying risk premia in long-term government securities during the classical gold standard period 1870-1914. I employ a quasi-capital asset pricing model (CAPM) to analyze the time path of systematic risk for a cross section of six countries that adhered to the gold standard to varying degrees. The empirical results show that systematic risk was higher and more variable for the countries that shadowed the gold standard. The results are consistent with recent research that the gold standard was a signal of financial rectitude, "a good housekeeping seal of approval" (Bordo and Rockoff, 1996). Peripheral countries then benefited by participating in a monetary union as opposed to countries that pursue independent monetary policies. Countries adhered to the gold standard because they were able to obtain access to international capital markets at a lower price. In addition, there was a convergence of systematic risk for those countries that belonged to a certain monetary union. I also analyze the impact of the international crisis of 1890, or any other perceived financial crisis. Evidence indicates that there was a 'flight to quality' during the 1890's crisis. Countries that did not adhere to the gold standard generally experienced a larger increase in risk during the crisis period. Finally, the results indicate an overall decrease in the volatility of systematic risk during the early 1900s. I interpret this as evidence of a 'market wide' effect on the international monetary regime.

## I. Introduction

Economic and historical perspectives of the new Europe as it approaches the millennium raise many questions about the proceeds that will be needed towards greater integration among the member countries. One of the main challenges of deepening and widening the European Union is the economic and monetary system. The monetary authorities of all member countries look for a credible commitment to preserve the new European coin, the EURO, at fixed parities. However, peripheral countries of Europe can look at the benefits and costs this new monetary rule can introduce in their economies. Small countries, in the sense of being in the periphery, can benefit by participating in a monetary union as opposed to countries that pursue independent monetary policies. Comparisons of risk in interest rates for long-term securities for the European periphery provide policy insights into the benefits and costs of being a "small" country that follows or does not follow a certain monetary rule. What sort of benefits do we expect by adhering to a certain monetary regime? This question has particular policy relevance for the countries of the European periphery today. It examines the potential benefits that can accrue to small countries participating in the European Monetary Union.

Turning back the clock to the period 1880 to 1914, history has much to say about these new European economic issues. During the last years of the nineteenth century and the beginning of the twentieth century, most of the countries of the world operated under the same monetary regime, the classical gold standard. The gold standard was dependent on the specie flow mechanism where market forces stabilized exchange rates. Countries adhered to the international monetary rule to varying degrees. Some of them were under a monetary or currency union whereas others were pursuing independent monetary policies. Specifically, I examine risk premia in long term government bonds during periods of convertibility and suspension for a cross section of six European countries that followed the gold standard for the period 1880-1914. I pay especially close attention to the behavior of risk premia during the international crisis of 1890 as well as to any other crisis, or perceived financial crisis, during this sample period. I then take a depth look

into the relationship between adherence to the monetary rule and systematic risk during crisis periods. The purpose of this research is to provide then additional insight into the operation of the gold standard, and the benefits that peripheral countries can gather by adopting a predetermined monetary rule. Not only economic historians but contemporary policy makers in the European community of today can learn many lessons from a study of systematic risk during the gold standard because of the large number of countries that followed the gold standard (but to varying degrees) and the long 34 year time span.

Long run adherence to a monetary rule is a signal of financial rectitude that allows countries to borrow at lower interest rates than they could otherwise in international capital markets. I examine the long-run benefits (and/or costs) of the gold standard by analyzing systematic risk in interest rates in long-term government securities for a cross section of countries during the classical gold standard period, 1880-1914. The degree to which countries adhered to the gold standard varied widely. As a result there were countries that strictly adhered to the gold standard, and countries that shadowed the gold standard. Comparisons within and between the countries that followed the rule - Scandinavia - and the countries that shadowed it - the Southern European countries of Italy, Portugal, and Spain - can provide new policy insights that contribute to the development of the Europe of tomorrow.

The empirical analysis employs the Kalman filter to provide point (yearly) estimates of systematic risk in a quasi-capital asset pricing model (CAPM). The results indicate that systematic risk was generally higher and more variable for countries that shadowed or did not follow the gold standard. This result is consistent with recent research that the gold standard was a signal of financial rectitude, "a good housekeeping seal of approval" (Bordo and Rockoff, 1996). Countries adhered to the gold standard because they obtained greater access to international capital markets at a lower price. Moreover, the empirical evidence shows that there is convergence of risk for the countries that belong to a certain monetary union (i.e., the Scandinavian Currency Union). I also find that systematic risk often fell for countries following the adoption of time-consistent monetary and fiscal policies. In addition, there appears to have been a 'flight to quality'

during the international financial crisis of 1890. Countries that did not adhere to the gold standard generally experienced a larger increase in risk during the crisis period. The increase in risk also tended to persist for the remainder of the 1890s for countries that did not adhere to gold. Finally, the results indicate an overall decrease in the volatility of systematic risk during the first decade of the twentieth century. This might reflect a fall in the price of risk in general, a 'market wide' effect of the international monetary regime.

First I examine the gold standard as a credible commitment mechanism as well as the record of adherence to the monetary rule for the countries used in the study. Then I analyze long-term interest rates and explain the econometrics approach. This is followed by a comparison of systematic risk's variability in each country. The paper concludes by noting the lessons that can be drawn from a study of the classical gold standard.

## **II. A Credible Commitment Mechanism**

The gold standard has been reinterpreted in the literature as a rule that ties the hands of the fiscal and monetary authorities of a country. The monetary rule is a credible commitment mechanism that solves the time inconsistency problem. Government policy is said to be time inconsistent when a policy plan that is determined to be optimal and to hold indefinitely into the future is subsequently revised. For example, suppose that the monetary authorities in a closed economy announce that their objectives are to maintain full employment and zero inflation. Under the assumption that the policy is credible, rational agents will set wage contracts according to announced policy. However, the monetary authorities now have an incentive to cheat and print money to increase seigniorage or to reduce unemployment. If this occurs, then agents and firms will bid up wages and prices in the following year. Inflation will increase, real cash balances and the inflation tax base will be reduced, and the economy will return to its original level of activity and unemployment (Bordo and Rockoff, 1996). On the other hand, policy that is set sequentially is said to be discretionary. Setting policy period by period can produce very different results than the optimal outcome of a time-consistent policy. Social welfare

is improved if there is a commitment mechanism that prevents the government from changing future policies. Therefore, it is beneficial for a government to have a credible pre-commitment mechanism that ensures long-run price stability.

The gold standard functioned as the commitment mechanism for many countries prior to World War I. It was the perfect mechanism to avoid pressure over the balance of payments, to satisfy the various objectives of the national monetary authority, and also to provide price and exchange rate stability. A stable exchange rate promoted international transactions. International trade and investment was undertaken with almost no risk to capital losses due to the exchange rate fluctuations. According to Eichengreen (1985), the basic characteristics of the gold standard were: (i) convertibility between domestic money and gold at a fixed official price; (ii) freedom for private citizens to export and import gold; (iii) a set of rules relating the quantity of money in circulation in a country to their gold stock.

These three features of the gold standard were applied for the years between 1870 and 1914. Before this period the international monetary system was based on bimetallic systems that switched between gold and silver. The main feature of bimetallic regimes was the ability to convert a national currency into a certain amount of gold or silver. It was a price stabilization system where the reserves of the two metals were used as a protection against bankruptcy. Money supplies in each country were associated with domestic reserves. The two precious metals and the adjustment of the balance of payments was possible because of international shipments of gold and silver.

Both systems, the gold and bimetallic standards, served as commitment mechanisms with a contingency plan. Governments could stop specie payments during a well understood emergency such as a war. Suspension was used to print money for war finance or to sell bonds at nominal value. It was believed that following the end of the war and a reasonable delay period, there would be a return to gold parity. A government would then impose the necessary deflationary policies to restore convertibility and redeem liabilities in gold.



The escape clause could also be invoked if there was a financial crisis. As pointed out by Bordo and Rockoff (1996), suspension for a financial crisis was difficult to verify and might have been perceived as a breach of the rule. Other examples of discretion would be a government's failure to return to convertibility following a reasonable delay period after a war. Consequently, a government might find it difficult to sell debt during its next war.

The gold standard had enforcement mechanisms that might have prevented authorities from using discretionary policies. The international monetary regime was a signal of financial rectitude that gave peripheral countries access to capital from the core countries of the gold standard. Countries that closely adhered to the monetary rule were presumably charged lower interest rates than countries that frequently violated or did not follow the commitment mechanism. Although this paper focuses on risk premia in government securities, the literature has also identified additional factors that might have been important determinants of long term interest rates. Earlier studies have attempted to determine the role of pull factors (higher expected rates of return) and push factors (poor investment prospects and higher savings rates) of long-term capital flows in the core (Bordo and Rockoff, 1996). In the spirit of Bordo and Rockoff, this paper assumes that the key determinants of long-term capital flows are the expected real rates of return, the levels of real activity, the terms of trade, and the phase of the business cycle. I also believe that adherence to the gold standard rule is an important determinant of the cost of capital. Adherence often changed as a result of a change in government fiscal or monetary policy (perhaps a breach of the gold standard), war, financial crisis, or perceived financial crisis. Changes in these factors should be reflected in the market price of risk in long-term government securities for the respective country.

### **III. Historical Record of Adherence**

The gold standard worked successfully as a contingent rule for the core countries during the classical gold standard period: Britain, France, and the United States. A

number of other countries also followed the rule. These included Australia, Canada, Japan, the Netherlands, the Scandinavian countries, and Switzerland. The last group is the countries of Latin America and the Southern European countries for which gold convertibility was the exception rather than the rule. This paper compares systematic risk on long-term securities during periods of convertibility and suspension for two groups of European countries. The first group contains countries that always followed the gold standard, the Scandinavian countries of Denmark, Norway, and Sweden. Finland is not included in this sample because it was part of the Russian Empire during the period 1880-1914. In contrast, the second group of countries, Italy, Portugal, and Spain, did not adhere to the international regime but shadowed the gold standard. This sample was chosen on the basis of adherence to the monetary rule in addition to data availability.

The gold standard experience of the three Scandinavian countries can be analyzed as a whole just by looking at the development of the Scandinavian Currency Union which was established during the first years of the 1870s. Prior to the adoption of the gold standard, Denmark, Norway, and Sweden, operated under a silver standard. In 1872, an agreement to form a monetary union was signed. Denmark and Sweden joined the Union that year while Norway did it three years later, in 1875. The Scandinavian Monetary Union was based on gold and adopted a common unit, the krona, which circulated equally in the three countries. However, there was not a gold coin in circulation due to the public preferences of using notes instead of gold. The Swedish constitution guaranteed the convertibility of central bank's notes into gold. The three central banks agreed to allow each other to draw drafts on each other at par. All notes, gold coins, and token coins were accepted at par in the other countries which allowed the Scandinavian Monetary Union to be very successful. In 1905, a political conflict between Norway and Sweden concerning the abolition of their political union, led to a reduced monetary cooperation among the Scandinavian countries. The central banks were still accepting each other drafts but not necessarily at par. The three Scandinavian countries showed a common pattern of adoption of the gold standard between 1872 and 1875 and adhered to the system until the

outbreak of the World War I in 1914 (Bergman *et al.*, 1993; Henriksen and Kærgard, 1995; Jonung, 1984).

Italy, Portugal, and Spain shadowed the gold standard instead of strictly adhering to the monetary rule. Italy adopted a bimetallic standard in 1862, although the monetary regime was a *de facto* gold standard. Three years later, Italy became a member of the Latin Monetary Union but war against Austria and fiscal profligacy forced Italy to abandon convertibility. Fiscal and monetary discipline was restored along with exchange rate parity in 1874. The central authorities resumed convertibility on April 12, 1884, but money was only convertible into silver because silver was overvalued. Italy adopted a fiduciary standard in 1894 and remained on this system until 1914 (Fратиanni and Spinelli, 1984).

Portugal operated under a bimetallic standard since the 1680s, alternating between gold and silver. In 1854, Portugal joined the international monetary regime and was a member until 1891. The Baring international crisis in conjunction with poor government policies forced Portugal to abandon the gold standard in 1891. Portugal suffered from a deep political, economic, and financial crisis during the 1890s and remained inconvertible until after World War I (Reis, 1996).

Spain shadowed the gold standard for the entire period but operated under different monetary and fiscal regimes during the last half of the nineteenth and the beginning of the twentieth centuries. In 1848, Spain adopted a bimetallic standard that did not become fully operational until a monetary reform in 1868. During the 1870s when the gold standard was adopted by many countries, Spain moved towards a fiduciary system with flexible exchange rates. Silver production increased and the price of silver in terms of gold fell during these years. Spain, which was then on a bimetallic system, operated under a *de facto* silver standard where the intrinsic value of the coin was smaller than the face value. Convertibility of paper was finally suspended in 1883 and resumption never took place before or after World War I. However, Spain did enact fiscal and monetary reforms in the early part of the twentieth century to reverse the fiscal problems that emerged as a result of the Spanish-American War.

The brief monetary histories discussed above indicate that adherence to the gold standard changed over time mainly for the Southern European countries. In contrast, the Scandinavian countries were always under the international monetary rule since they adhered to the gold standard at the beginning of the 1870s until the outbreak of World War I. Table 1 provides a summary of the record of adherence to the gold standard. The table also includes events that precipitated suspension of convertibility and denotes whether there were changes in parity. Figure 1 shows the exchange rates for the Southern European countries in terms of pound sterling relative to gold parity. The Scandinavian countries are not graphed because they never departed from parity. The general pattern that emerges from figures is that countries that closely adhered to the gold standard experienced fewer fluctuations from parity.

**Table 1**  
**Adherence to the Gold Standard, 1880-1914**

<b>Country</b>	<b>Period</b>	<b>Standard</b>	<b>Reason For Change</b>	<b>Change in Parity</b>
Denmark	1872-1914	Gold	War	No
Norway	1875-1914	Gold	War	No
Sweden	1873-1914	Gold	War	No
Italy	1862-1866	Bimetallic	Lax Fiscal Policy War	No
	1866-1884	Paper	-----	-----
	1884-1894	Gold	Lax fiscal Policy	Yes
	1894--1914	Paper	-----	-----
Portugal	1854-1891	Gold	Crisis	Yes

	1891-1914	Paper	-----	-----
Spain	1868-1883	Silver	Crisis	Yes
	1883-1914	Paper	-----	-----

Source: Bordo and Kydland (1995), p. 434.

Bordo and Rockoff (1996), p. 401.

#### **IV. Empirical Analysis of Long-Term Interest Rates**

The data employed in this study consist of a sample of annual interest rates for six countries that followed the gold standard to varying degrees between 1880 and 1914. Our sample is divided into two groups. Figure 2 plots interest rates for Denmark, Norway, and Sweden, countries that closely followed the monetary rule, against the risk-free interest rate, British consols. The long-term rate used for Denmark is the interest rate on gold bonds quoted in *The Economist*. Unfortunately, long-run interest rates for Denmark are not available until 1896. As result, I cannot analyze the effects of the 1890s international crisis in Denmark. The spread between Denmark gold rates and consol yields remained quite stable for the whole period 1896-1914. This probably reflects the country's strict adherence to the gold standard.

Interest rates for Norway and Denmark possessed similar trends. In the Norwegian case, I have to use two different long-term interest rates on gold bonds due to data availability. The first one was quoted until 1894. Afterwards, a new bond series was issued. This explains the large decline of Norwegian interest rates in 1894. However, as a general rule, Norwegian interest rates are quite stable and gold bonds remained quite close to the yield on consols for the sample period, especially after 1894 when the new interest rates bonds were issued. The effects of the international crisis of 1890 as well as the break of the political union between Norway and Sweden in 1905 are practically inexistent. Again, this possibly explains the strict adherence to the gold standard for the whole period.

Swedish interest rates for long-term government gold bonds followed the same pattern than the other two Scandinavian bonds. There is no change in Swedish long-term interest rates for the entire period, even though they were not as close to yields on consols as the Danish and Norwegians bonds. This again reflects the country strict adherence to the gold standard as it was the case in the other two Scandinavian countries.

Interest rates for countries that shadowed the gold standard displayed a markedly different pattern than countries that followed the gold standard. Rates were generally higher for the countries that shadowed the gold standard than countries that followed the

international monetary regime. Figure 3 is a graph of long-term interest rates for Italy, Portugal, and Spain versus consols. The time path of Italian interest rates is quite interesting because of the narrow spread between gold and paper bonds. Italian interest rates were quite stable when the country was on the gold standard, but displayed a surprisingly upward trend. The upward movement in rates continued until Italy left the international monetary regime in 1894. Thereafter, Italy's long-term rates converged toward the consol rate. Overall, the Italian experience does not appear to conform well with the hypothesis that the gold standard was a signal of financial rectitude.

Long-run interest rates for Portugal are not available until 1891. As a result, I cannot compare the behavior of Portuguese rates before and after the country left (1891) the gold standard. However, long-run interest rates for paper bonds did fall in the early 1900s as the country enacted sensible government fiscal and monetary policies, moving closer to the gold standard.

Spanish interest rates for long-term government paper bonds followed a pattern consistent with the "good housekeeping hypothesis." Long-term rates initially rose at the beginning of the sample and then fell precipitously for several years after the Treasury minister Camacho enacted a reform in 1881. Spanish long-term rates then display an upward movement that culminated with the Spanish-American War. Long-term rates were then stable for the remainder of the period following the implementation of fiscal and monetary reform by the Treasury minister Villaverde in the early 1900s.

As noted by Bordo and Rockoff, a prominent feature of long-term interest rates in the gold standard period prior to World War I is convergence. Most yields on government securities converged towards yields on the British perpetuity bond (i.e., Scandinavian bonds). This probably reflects adherence to the gold standard in addition to several other factors. Friedman and Schwartz (1963) suggest that the fall in spreads between short-term United States and British interest rates was a result of the fact that the free silver movement lost popularity in the United States. The death of the free silver movement is a symbol of growing confidence in the international financial system and the decline in the market price of risk (Bordo and Rockoff, p. 404). Another factor might have been factor

price equalization that shows high mobility of labor and capital (O'Rourke and Williamson, 1992). Nevertheless, I believe that long-term commitment to the gold standard was a fundamental determinant of long-term government bond yields. Adherence to the gold standard will be considered in the forthcoming empirical analysis.

## V. Econometric Approach

I analyze systematic risk in this sample of long-run interest rates using the following model (see Bordo and Rockoff, 1996).

$$R_{it} - R_{UKt} = \beta_0 + \beta_{i1} (R_t^* - R_{UKt}) + \varepsilon_{it} \quad (1)$$

$$\varepsilon_{it} = \rho_i \varepsilon_{it-1} + u_{it}, \quad i = 1, 2, \dots, 12 \quad (2)$$

where  $R_{it}$  represents the long term interest rate for country  $i$  in the sample.  $R_{UKt}$  is the risk-free interest rate measured by the consol rate in year  $t$ .  $R_t^*$  proxies for the return on the efficient market portfolio that is given as the average of interest rates of a representative countries' sample.<sup>1</sup> As pointed out by Bordo and Rockoff (1996), the  $R_t^*$  variable is "far removed" from the theory (p. 405). Nevertheless, equation (1) is a quasi-capital asset pricing model (CAPM) where  $\beta_{i1}$  measures systematic risk for country  $i$ . Equation (2) is employed to capture first-order serial correlation in equation (1). The Cochrane-Orcutt procedure is employed to correct for the autoregressive structure in the error process.

As discussed earlier in the paper, many countries' record of adherence to the gold standard changed over time. Bordo and Rockoff (1996) used equations (1) and (2) to measure average systematic risk for each country during the years in which long-term

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<sup>1</sup> The countries included in this sample are: Argentina, Australia, Brazil, Canada, Chile, Denmark, Italy, Norway, Portugal, Spain, Sweden, United Kingdom, and United States.



interest rates are available. I reconsider their model by recursively estimating the beta coefficient for each country. This methodology has several advantages over their least squares approach corrected for serial correlation. First, Bordo and Rockoff employ a dummy variable to capture the effect of being on the gold standard. A dummy variable is an on-off variable that cannot capture the impact of policy changes for countries that shadowed the gold standard. At the other extreme, a dummy variable is not useful for countries that always adhered to the gold standard because the variable will always take a value of one.

Therefore, I believe that a recursive analysis can provide further insight into the relationship between adherence and risk premia in long-term government securities. Specifically, I can use the recursive analysis to address questions such as the relationship between shadowing and risk premia, the behavior of risk during periods of crises, and whether forward looking expectations appear to have influenced systematic risk in long-term interest rates. The only disadvantage of this approach is that it estimates univariate regressions. To the extent that innovations in interest rates are correlated across countries then there is a loss of efficiency in this approach. In summary, I believe that this methodology is one approach that can yield additional insights into the behavior of interest rates during the gold standard period.

I employ the Kalman filter methodology to examine time-varying systematic risk in long-term interest rates during the gold standard period. The Kalman filter is a simple algorithm that sequentially processes observations allowing the beta coefficients to evolve over time. Estimation of the Kalman filter requires the specification of an observation and state equation. The observation equation for country  $i$  is

$$R_{it} - R_{UKt} = X_{it} \beta_{it} + e_{it} \quad (3)$$

where  $\eta_{it}$  is the variance of  $e_{it}$ . The only difference between equation (1) and equation (3) is that  $\beta_{it}$  in equation (3) is a vector that contains the constant and the beta coefficient that evolves over time. The estimates in the last period of the Kalman filter,

referred to as the final state vector, are equivalent to the least squares estimates. As noted above, a second equation is needed to estimate the Kalman filter. The second equation, commonly referred to as the state equation, describes the evolution of the beta coefficients over time. I assume that the state equation for country  $i$  evolves as a random walk that can be written as follows

$$\beta_{it} = \beta_{it-1} + v_{it} \quad (4)$$

where  $M_{it}$  is the variance of  $v_{it}$ . The Kalman filter is then initialized with starting values taken from the first two periods for each equation. Maximum Likelihood techniques are then employed to provide annual estimates of systematic risk. The beta coefficients for gold bonds are reported in Table 2. The beta coefficients for paper bonds appear in Table 3. There is only one set of estimates for risk reported since the results from both the least squares model corrected for serial correlation and the estimates from the final state vector of the Kalman filter are identical.<sup>1</sup> Figures 4-10 plot the beta coefficient for each country as it evolves over time.

**Table 2**  
**Least Squares Estimates for Gold Bonds**

Constant	Coefficient	Rho	DW	R <sup>2</sup> -adjuste	N
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<sup>1</sup> I estimated the Kalman filter using the time series corrected for serial correlation.

<b>Denmark</b>	0.079 (0.145)	0.315*** (0.106)	0.368 (0.266)	1.589	0.507	18
<b>Norway</b>	0.259 (0.275)	0.315* (0.174)	0.478*** (0.157)	2.117	0.318	31
<b>Sweden</b>	0.916*** (0.212)	0.155 (0.131)	0.732*** (0.131)	1.951	0.552	33
<b>Italy</b>	-0.256 (0.529)	0.609*** (0.172)	0.949*** (0.064)	1.966	0.939	34

Note: \* means significant at the 10 percent level.

\*\* means significant at the 5 percent level.

\*\*\* means significant at the 1 percent level.

**Table 3**  
**Least Squares Estimates for Paper Bonds**

	<b>Constant</b>	<b>Coefficient</b>	<b>Rho</b>	<b>DW</b>	<b>R<sup>2</sup>- adjusted</b>	<b>N</b>
<b>Italy</b>	0.109 (0.539)	0.529** (0.228)	0.927*** (0.085)	2.111	0.886	34
<b>Portugal</b>	-0.024 (0.289)	1.782*** (0.183)		1.307	0.802	24
<b>Spain</b>	-1.984** (0.794)	2.671*** (0.485)	0.796*** (0.106)	1.875	0.901	31

Note: \* means significant at the 10 percent level.

\*\* means significant at the 5 percent level.

\*\*\* means significant at the 1 percent level.

## **VI. Variability of Systematic Risk during the Gold Standard Period**

The results from the econometric analysis support the hypothesis that the gold standard was a signal of financial rectitude, "a good housekeeping seal of approval." I find that for Italian gold bonds, the beta coefficient that measures risk is significant at the one percent level. However, they are significant at different levels for the Scandinavian countries, being Denmark significant at the one percent while Norway is at the ten percent level. Moreover, the results indicate that countries that closely adhered to the gold standard have lower beta coefficients. The empirical evidence for the paper bonds confirms the findings for the gold bonds. The beta coefficients for the Southern European countries are significant at the one per cent level, and all are greater than one except for Italy. The large beta coefficients for the paper bonds reflect then currency risk. I now examine the time-varying risk component for the gold and paper bonds to provide a more in depth look into the relationship between adherence to the monetary rule and systematic risk. I examine risk during crisis periods and check the results for any unusual pattern in risk or perceived risk.

The empirical evidence for Denmark, Norway, and Sweden shows that risk fluctuated within a narrow range. In addition, there is a convergence of systematic risk in the Scandinavian monetary union. The Scandinavian countries are characterized as countries that adhered to the gold standard. As a result, I would expect the beta coefficients to be small and to exhibit not much variability. An inspection of the beta coefficients plotted in Figures 4, 5, and 6 shows that they fluctuated between  $-0.4$  and  $0.4$  in the three countries. The low values of the recursive estimates for Denmark, Norway, and Sweden are a signal of the closed adherence to the gold standard of these three countries.

Data constraints prohibit an analysis of risk for Denmark prior to 1896 (Figure 4). Systematic risk showed a decline in 1898 that is followed by a sharp rise a year later. This movement in systematic risk is difficult to explain, but risk fluctuated within a narrow range ( $-0.4$  and  $0.3$ ). This might reflect the onset of the banking agreement between the Scandinavian central banks that formally took place in 1901. After this point, the beta

coefficient for the interest rates time series is remarkably stable for Denmark until the beginning of World War I. The absence of fluctuations in risk during this last period also indicates that the country was on the gold standard.

Systematic risk in long-term Norwegian debt was quite volatile during the 1880s (Figure 5). The international crisis of 1873 and the decrease in railway investments, due to variations in customs, affected Norway in 1879. The government's finances then suffered a crisis that could be reflected in the fluctuations of the beta coefficient in the years just after the panic occurred. Risk reached almost its previous value but the liquidity panic, and therefore the perceived financial risk of the last years of the 1890s made it fall. It did not stabilize until the agreement between the Bank of Denmark and the Bank of Norway was signed in 1901. Thereafter, systematic risk for Norway remained very stable until 1914, reflecting the fact that the country was on the gold standard.

Sweden is the last remaining country examined in the group of the Scandinavian countries (Figure 6). The beta coefficient for Sweden has the smallest value of the countries in the sample. Risk in Swedish securities follows a path similar to that of Norway just at the beginning of the sample. Risk in long-term government securities fluctuated a lot at the beginning of the 1880s. This probably reflects, in part, the deflation suffered by the country at that time. The rapid expansion of industrialization and growth reflect the upward trend in systematic risk that stabilized after 1901. The absence of a rise in risk during the whole period, except for the movements of the 1880s, also indicates that Sweden was a member country of the gold standard.

In contrast, the beta coefficients for the countries that shadowed the gold standard, Italy, Portugal, and Spain, are all higher than one (one is the beta coefficient for the market portfolio), except for Italian bonds. This means that countries that shadowed the gold standard were charged higher interest rates in international capital markets because of their higher risk. The estimates for Italy, Portugal, and Spain also have a greater range that is to be expected given that the three European countries exhibited a wide range of positions towards the gold standard during the period 1880 to 1914.

The recursive estimates for Italy indicate that systematic risk fell in the 1880s (Figures 7 and 8). The country enacted conservative fiscal and monetary reforms and moved towards the gold standard during the 1870s. These facts are reflected in the downward trend followed by systematic risk in the 1880s. However, after this point, the beta coefficients for both interest rate series start taking an upward trend and they did not really stabilize until the beginning of the twentieth century. The gold issue does take on a noticeable upward trend beginning in 1889. Nevertheless, Italian government securities seem to be largely immune to the international crisis of 1891. The empirical result might suggest that Italy pursued a time invariant policy of shadowing the gold standard. Unfortunately, this interpretation does not fit well with Italy's historical record of adherence to the gold standard. Italy left the gold standard in 1894 and did not exhibit monetary and fiscal restraint until after 1901. Perhaps other forces such as factor price equalization or changes in government policy can explain the unusual behavior of the beta coefficient for the Southern European country. In any case, I leave this as an item for future research.

On the other hand, the time path of systematic risk for Portugal follows a pattern consistent with the predictions of the "good housekeeping seal of approval" (Figure 9). Data constraints prohibit an analysis of risk prior to Portugal's departure from the gold standard in 1891. Nevertheless, the beta coefficient for Portugal has its highest values between 2.8 and 3 times the market beta, at the beginning of the sample. This suggests that systematic risk was quite high during the international crisis of 1891. The beta coefficient then follows a cyclical pattern during the 1890s as Portugal recovered from the Baring crisis. Beginning in 1904, the beta coefficient is constant for the remainder of the sample that could reflect fiscal restraint and a movement by Portugal towards the gold standard.

Systematic risk in long-term Spanish debt trading on the London Exchange also fits nicely with the hypothesis that the gold standard was a signal of financial rectitude (Figure 10). In 1881, the Treasury minister Camacho restructured government securities through a debt conversion. The fundamental characteristic of the reform was that investors received interest payments in London or Paris in pound sterling or French francs, respectively. The beta coefficient for Spain decreased from approximately 4 to 1.5 in the years surrounding

the implementation of the Camacho Reform in 1881. The time path of systematic risk during this period suggests that government policy was a credible move towards the gold standard (although not a formal commitment). The results also suggest that Spain probably shadowed the gold standard at an earlier date than previous studies have suggested (see García-Iglesias, 1998). The beta coefficient decreased for a few years after the fiscal reform of 1881 and then rose during the 1890s following the international crisis of 1891 and the Cuban War of 1898. The large expense of the war and the loss of the overseas colonies ultimately led to the passage of the Villaverde reform that restored budget equilibrium in Spain. This is reflected in the remarkably constant beta coefficient in long-term Spanish debt at the beginning of the twentieth century. Although there is little volatility in the beta coefficient in the years leading to World War I, systematic risk in Spain was higher during the first decade of the 1900s than during the years that followed the Camacho reform.

## **VII. Conclusion**

Several conclusions emerge from this study of time-varying systematic risk for the sample of six countries that adhered to the gold standard with varying degrees. Although there are some exceptions, like Italy, the results confirm the findings of Bordo and Rockoff. The gold standard was a signal of financial rectitude, "a good housekeeping seal of approval" where countries that followed the rule were charged lower interest rates and given greater access to international capital markets. However, the results from this paper tell a much richer story about systematic risk and adherence to the gold standard. I find that risk fell markedly following the adoption of time-consistent monetary and fiscal policies (i.e., Spain). I also find that risk increases considerably more during crisis periods for countries that did not closely adhere to the gold standard. This result suggests that there was a 'flight to quality' during the international crisis of 1890 where world investors traded in their emerging market debt for US corporate debt and British consols. Moreover, risk remained high for many years in several peripheral countries following international crisis, or perceived financial crisis. This suggests that it is beneficial for a small country to

adhere to a monetary rule. A country can benefit from participating in a monetary union as opposed to a country that pursues independent monetary policies. Strict adherence then allows a country to borrow at lower interest rates in international capital markets.

These findings also indicate systematic risk stabilized for almost all the countries in the sample during the 1900s. This could be the result of a fall in the overall market price risk, a 'market wide' effect of the gold standard. At the same time, the convergence of systematic risk for the Scandinavian countries might suggest that also a considerable amount of time is needed for monetary variables to converge when in a monetary union. This evidence from the study of the gold standard might be helpful to the monetary authorities of the European Union.

Therefore, the Scandinavian countries by joining the Scandinavian Currency Union and the classical gold standard enjoyed the benefits of a predetermined monetary regime. On the other hand, the Southern European countries, even though they shadowed the gold standard, followed an independent monetary policy that did not allow them to accrue similar benefits. These results can contribute to the development of the Europe of tomorrow. Monetary authorities can learn from history by anticipating the venues of the changing face of Europe.



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