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ABSTRACT

Using a new database of weekly sovereign debt prices of paper currency and pound sterling (or gold) denominated debt, we identify the currency-risk component of sovereign yield spreads for nine of the largest emerging market borrowers for the period 1870-1913. Five years after a country joined the gold standard, paper currency bonds traded at significantly higher interest rates (more than 400 basis points on average) than a country's foreign currency debt denominated in pound sterling. Investors also expected exchange rates to fall by roughly 20 percent even after emerging market borrowers had joined the gold standard. The presence of persistent positive currency risk premiums long after gold standard adoption suggests that hard pegs for emerging market borrowers may never be fully credible.

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"How many more fiascoes will it take before responsible people are finally convinced that a system of fixed exchange rates is not a satisfactory financial arrangement for a group of large countries with independent political systems and independent national policies." (Milton Friedman, *Wall Street Journal*, September 22, 1992, p.A18)

I. Introduction

Can policymakers enhance credibility by adopting hard currency pegs? Countries may be able to borrow at lower rates if the adoption of fixed exchange rates confers credibility. Establishing regime credibility may be particularly important for emerging-market countries since their rates for borrowing tend to be higher than those for high-income countries; lower interest-rate spreads for emerging-market countries can in turn stimulate investment and economic growth (Berg and Borensztein, 2000; Schmukler and Serven, 2002).

The analysis of yield spreads is central to the debate about exchange-rate regime choice. Proponents of hard pegs argue that credible commitments to fixed exchange rates significantly reduce the premiums that emerging market countries pay to borrow in international capital markets. The premium has two components: (1) country risk and (2) currency risk.[1] The country risk premium represents the risk that a country will default on its debt obligations, while the currency risk premium represents the compensation that an investor receives for an adverse movement in the exchange rate of a paper-currency bond (Domowitz, Glen, and Madhavan, 1998). The latter component of the risk premium is particularly relevant for the debate over exchange-rate regime choice. Advocates of hard pegs argue that they can reduce the currency risk premium, and if perfectly credible, may even eliminate it altogether.[2] If financial markets do not consider the peg to be perfectly credible, however, then the currency risk premium will remain positive (Schmukler and Serven, 2002).

Since the pre-World War I gold standard was a global monetary system that is considered by many economists to be the most credible and widely used hard peg in modern financial

[1] There is a large empirical literature in international and development economics on the country-risk and/or currency-risk components of yield spreads for emerging market debt. For example, see Edwards (1984, 1986) and Sturzenegger and Powell (2003).
[2] Additionally, fixed exchange rates may reduce the probability of speculative attacks and contagion.

history, it provides a natural testing ground for understanding whether hard pegs are ever credible.[3] Using a large, new database of weekly sovereign debt prices from the period 1870-1913, we examine the movement in sovereign yields denominated in *both* paper currency and pounds sterling (or gold) in order to identify the country-risk and currency-risk components of sovereign yield spreads.[4] Our results suggest that joining the gold club did not entirely eliminate the interest-rate differential between a country's paper currency debt and gold bonds issued on international capital markets. Five years after a country joined the gold standard, the currency risk premium averaged more than 400 basis points. The existence of large currency premiums after countries adopted gold suggests that financial markets believed that these hard pegs were not fully credible. As our calculations suggest, investors still considered devaluation and departure from gold a high probability event in emerging markets.

The paper is organized as follows. The next section of the paper discusses the theoretical literature on the gold standard and whether it reduced the cost of borrowing in international capital markets. Section III describes the new weekly database on sovereign debt prices and analyzes the time series properties of the currency risk premium for emerging market borrowers after they adopted the gold standard. Section IV provides estimates of the expected devaluations that markets likely anticipated even after adoption of the gold standard. Finally, we discuss the implications of our findings as they relate to the credibility of fixed exchange-rate regimes in general.

II. The Gold Standard as a Rule for Policymakers

A. Theory

[3] Eichengreen (1996) suggests that one reason the classical gold standard may have been more credible peg than later fixed exchange rate systems was that central banks were able to attach priority to defending fixed exchange rates rather than pursuing countercyclical monetary policy. Obstfeld and Rogoff (1995) argue that modern hard pegs are unlikely to be credible because central banks will generally succumb to political pressure and not defend the peg when there is a sustained increase in interest rates (that lowers investment and output).

[4] Previous studies examining the gold standard have focused on country risk rather than currency risk. Bordo and Rockoff (1996) and Obstfeld and Taylor (2003) find that the gold standard lowered sovereign risk by approximately 30-40 basis points. Flandreau and Zumer (2004) find that the gold standard had no effect on sovereign yields once a broader set of economic and political variables controls are considered. Ferguson and Schularick (2006b) find that the gold standard effect disappears once the sample of sovereign borrowers is expanded to include the universe of debtors on the London market.

Bordo and Kydland (1995) provide an interpretation of the role of the gold standard as it relates to the literature on rules for policymakers. Accordingly, being on the gold standard tied the hands of the monetary authorities of a country. The monetary rule served as a credible commitment mechanism that solved the classic time-inconsistency problem (Kydland and Prescott, 1977). 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 a government sells debt to finance a war. From an *ex ante* perspective, it is optimal for the government to service its debt obligations. However, once the bonds have been sold, it is optimal for the government to default unless there is a commitment mechanism that ties the hands of monetary authorities. In the absence of a commitment mechanism, it is time inconsistent for the government to repay its debt obligations. Private agents will anticipate the government's incentive to default and they will not buy bonds, forcing the government to rely on taxes or money creation. Overall, the existence of an enforcement mechanism, such as a credible threat to deny the government access to borrowing in the future, means that a socially optimal, but time inconsistent policy of borrowing can be supported as an equilibrium outcome.

Bordo and Kydland (1995) also argue that the gold standard had an escape clause. Countries could suspend specie convertibility in the event of a war or a fiscal emergency; however, after the war or extraordinary event, it was well understood that a country would return to specie convertibility at the pre-war parity. Generally, resumption occurred after a "reasonable" delay period during which a country would impose deflationary policies to retire fiat currency printed for war finance. The United States and France, for example, fought wars in the 1860s and 1870s and issued large amounts of irredeemable paper currency and debt. Following the end of the war, both countries imposed deflationary policies to restore convertibility following the cessation of hostilities, and both had returned to a specie standard by 1880. Bordo and Kydland (1995) conclude that the gold standard was a contingent rule with an escape clause.

B. Testable Implications

Given our interest in understanding the effects of exchange-rate regime choice on borrowing costs, the most direct way of testing the credibility of the gold standard is to examine the currency risk premium. Previous research on the gold standard has focused almost

exclusively on country risk or political risk.[5] Our paper breaks new ground by examining the currency risk premium after gold standard adoption in order to assess the credibility of hard pegs for emerging market borrowers.

We examine the interest-rate differential between paper currency and gold bonds issued by a sovereign borrower during the classical gold standard period. To understand how the currency risk premium relates to anticipated changes in the exchange rate, we define $I_{t,k}$ as the annualized (gross) yield (i.e., one plus the interest rate) at time *t* on paper-currency debt issued by the sovereign borrower.[6] Let *k* denote the maturity of the currency bond issue. We define $I^*_{t,k}$ as the yield on gold debt with the same maturity as the paper-currency bond issued by the sovereign borrower. $I^{UK}_{t,k}$ is the risk-free interest rate, which is proxied in our analysis by the British consol, a perpetuity bond that is widely regarded as the world's bellwether security during our sample period (1870-1913). The total yield differential can then be written as:

$$(1) \qquad \frac{I_{t,k}}{I^{UK}_{t,k}} = \frac{I_{t,k}}{I^*_{t,k}} \frac{I^*_{t,k}}{I^{UK}_{t,k}}.$$

We can express the difference between the interest-rate on a paper-currency bond and the risk-free interest rate as the sum of two risk premiums. Setting $i_{t,k}$ equal to the natural log of $I_{t,k}$, we find that

$$(2) \qquad (i_{t,k} - i^{UK}_{t,k}) = (i_{t,k} - i^*_{t,k}) + (i^*_{t,k} - i^{UK}_{t,k}).$$

The first-term on the right hand side of equation (2) is called the currency risk premium while the second one is the country risk premium. The country risk premium (or political risk) represents the risk that a country will default on its debt obligations. We will now show that the currency risk premium, the first term on the right-hand side of equation (2), represents the compensation that an investor demands due to the possibility of a fall in the exchange rate. Under the assumption of risk-neutrality, arbitrage implies that uncovered interest parity should hold such that

[5] See Bordo and Rockoff (1996), Obstfeld and Taylor (2003), Ferguson and Schularick (2006a) and Flandreau and Zumer (2004).
[6] Our derivation follows Schmukler and Serven (2002).

$$(3) \quad I_{t,k} = I^*_{t,k}\left[\frac{E_t S_{t+k}}{S_t}\right]^{1/k},$$

where $E_t S_{t+k}$ is the expectation at time t of the exchange rate at time $t+k$. We define the exchange rate, $s_{t,k}$, as the amount of paper currency per unit of foreign currency. Taking natural logarithms of the interest parity condition, we can rewrite the first term in equation (2) as

$$(4) \qquad (i_{t,k} - i^*_{t,k}) = \Delta s^e_{t,k},$$

where $\Delta s^e_{t,k} = \frac{1}{k}\ln\left[\frac{E_t S_{t+k}}{S_t}\right]$. Equation (4) states that the currency risk premium equals the expected rate of change in the exchange rate. Hence, if a country made a completely credible, non-contingent, and permanent commitment to join the gold standard, then the probability of a devaluation of the exchange rate would be zero, and "paper bonds would have been as good as gold" (Obstfeld and Taylor, 2003). That is, for a country that credibly committed to the gold standard, the interest-rate differential between a country's paper currency and sterling bonds would also have been zero.[7] A large spread of paper currency over sterling denominated debt after the introduction of the gold standard, however, would suggest that the commitment to the fixed exchange rate was not seen as a credible monetary regime by financial markets.

Using the currency risk premium to identify the devaluation risk of a hard peg is conceptually straightforward, but often empirically difficult to implement. For example, the presence of capital controls can drive a wedge between the price of a country's sovereign bonds trading in paper and foreign markets. Indeed, the presence of capital controls in many emerging markets in the latter part of the twentieth century is one reason why the historical data from 1870-1913 is better, in general, for testing the credibility of hard pegs. The classical gold

[7] Some studies have measured the credibility of the gold standard countries by estimating "target zones" that use short-term interest rates and parity conditions between two countries to estimate expected devaluation. The problem with this methodology is that many countries issued debt in both paper and gold. In most cases, short-term interest rates during the gold standard were denominated in hard currency, not paper, so that a currency risk premium cannot be calculated. Another problem is that short-term interest rates are not available for many emerging market borrowers during the classical gold standard era.

standard was a period of unfettered capital markets that were largely free of government intervention (Eichengreen, 1996, IMF, 1997).[8]

A measure of the currency risk premium might also capture differential default risk rather than devaluation risk if there is a greater probability of defaulting on a domestic currency bond than a sterling denominated issue. It is worth emphasizing, however, that the emerging market borrowers in our sample faithfully serviced their gold and paper bonds for the entire gold standard period. The two possible exceptions are Argentina and Brazil, which defaulted on their debt obligations in 1890 and 1898, respectively. In both instances, however, Argentina and Brazil defaulted on their sterling (gold) and paper bonds employed in our analysis, suggesting that differential default risk is not likely a significant problem for our sample. Moreover, for more than half the countries in our sample, it would have been very difficult to differentially default since both of the bonds of the country were widely traded on international markets and therefore held by foreign creditors.

III. Evidence on the Movement of Currency Risk Premiums

To analyze the effect of the gold standard on sovereign yield spreads, we assembled a new database of weekly observations on bond prices. The database includes the universe of sovereign listings reported in *The Economist* from November 5, 1870 until June 30, 1914.[9] We supplement *The Economist* database with weekly bond yields from *The Commercial and Financial Chronicle*. For domestic bond markets, we collected monthly and weekly interest-rate data from financial newspapers located in the country of interest. Information on the bonds used in our study is reported in Appendix 1.

Convertibility under the gold standard was established by law or executive decree, although in some cases, such as France, maintenance of convertibility was left at the discretion of central banks rather than the sovereign or legislature. Table 1 presents a timeline of gold standard adoption for every country that joined the gold standard in the period 1870-1914 and

[8] Occasionally, during the classical gold standard period, central banks of gold-club countries attempted to alter gold flows via "gold devices," but these differ from more conventional capital controls in that they worked through a market mechanism which attempted to influence international arbitrage by manipulating gold points. This stands in contrast to administrative mechanisms of a modern nature, which are aimed at preventing individuals from freely importing or exporting specie or currencies (Bloomfield, 1959; Gallarotti, 1995).

[9] The full database is roughly 250,000 observations.

had bonds that actively traded on the London Stock Exchange. Column 1 gives the date of gold standard adoption that we define as the day that the monetary authority for a given country initiated or resumed specie convertibility. Column 2 lists the period of gold standard adherence for the 17 sovereign borrowers that joined the gold standard during our sample period. We limit our analysis to adoption and adherence episodes where a country or colony remained on the gold standard for at least two years.[10] Gold standard adoption dates for our sample are given in the Appendix 2.

Tables 2 and 3 present descriptive statistics of the currency risk premium and country risk (or political risk premium) as defined in the previous section of the paper. Even though the currency risk is the relevant premium for determining whether the hard pegs of the classical gold standard era were credible, we include the results for country risk so that we can compare the comparability of our bond data to previous studies. We calculate current yields for the "representative" long-term interest rate for each country or colony in our sample by dividing a bond's coupon by its price in period t.

The summary tables report average interest-rate differentials (in basis points) for 10-year and four-year windows or the largest available window. The windows are centered on the day that a country joined the gold standard except in a few cases where data constraints prevented the construction of a symmetric window. The four-year and 10-year windows are designed to measure long-run adherence to the gold standard. Each table reports the average yield spread (in basis points) for the 10-year or 4-year window (or largest available sample period) for each sovereign borrower along with the average interest-rate differential in the window before and after a country joined the gold club.

Panel A of Table 2 shows that country risk dropped an average of approximately 21 basis points in the two-year period after a country adopted the gold standard. The country risk premium declined for 13 out of 17 emerging market borrowers; yield spreads increased for India, Nicaragua, and South Africa. Turkey is the only country where the yield spread declined by more than 100 basis points. The simple summary statistics from Panel A show that the decline in interest-rate differentials was less than half the size of the drop in the 10-year windows. Panel B of Table 2 shows that the country risk premium declined an average of 39 basis points in the five

[10] We do not consider adherence to the gold standard for a period of less than two years to be a credible attempt to join the monetary rule. Although our choice of two years is arbitrary, the decision rule was selected to eliminate short-lived attempts by Argentina, Brazil, and Greece to join the gold club during the late nineteenth century.

years after a country joined the gold standard. The average decline of 39 basis points is nearly identical to the estimated "good housekeeping seal of approval effect" of the gold standard found in Bordo and Rockoff (1996).

Table 3 shows the currency risk premium for nine large emerging market borrowers: Argentina, Austria, Brazil, Chile, India, Italy, Mexico, Russia, and the United States. In 1913, these nine borrowers constituted roughly 60% of the world's outstanding external debt.[11] As described in Section II, the prediction of a fully credible hard peg is that the currency risk premium should be approximately equal to zero. As shown in column 3, the average currency risk premium five years after adoption was 415 basis points, suggesting that the hard pegs of the classical gold standard period were not credible.[12]

Although the descriptive statistics are informative, they only present average yield spreads before and after a country joined the gold standard. It may be the case that yield spreads declined between the pre- and post-event period, but a movement in the underlying trend is masked by using average interest-rate differentials. To provide some perspective on this question, Figures 1-9 show time-series plots of the currency risk premiums for which sovereign debt data denominated in both home and foreign currencies exist. The vertical line in each figure denotes when a country joined the gold standard. Since we are focusing on the interest-rate differentials between two bonds of the same country, where the primary difference between the obligations is their currency denomination, our analysis is simpler than those interested in understanding country risk: we largely eliminate the need to control for observed and unobserved differences in sovereign-specific fundamentals.[13]

As noted above, if a hard peg is perfectly credible, then the yield spread between a country's paper currency bonds and its debt denominated in pound sterling should fall to zero.

[11] The five largest emerging market borrowers as of 1913 that were not included in our sample are Australia, Japan, Turkey, Canada, and Egypt. Australia and Canada joined the gold standard prior to the start of our sample period. We were unable to locate paper bonds for Japan, Egypt, and Turkey. Our sample of nine emerging market borrowers that joined gold between 1870 and 1913 is identical to what appeared in the seminal paper on country risk by Bordo and Rockoff (1996). Although it is clear these borrowers differ in their level of development, we consider all of them to be "emerging markets borrowers" in the sense that their governments borrowed substantial sums internationally during the sample period and their bonds traded at a premium relative to the British consol.

[12] The average currency risk premium for the nine sovereign borrowers declined roughly 73 basis points in the "on-gold" period of the 10-year window and more than 43 basis points in the four-year window after a country adopted the hard peg.

[13] Empirical studies of sovereign risk during the gold standard have found the ratio of debt-to-revenue, budget deficit, and exports per capita to be important determinants of yield spreads (Ferguson and Schularick, 2006a; Flandreau and Zumer, 2004).

Figures 1-9 show, this is clearly not the case for our sample of nine emerging market countries. The currency risk premium for Argentina (Figure 1), one of the largest sovereign borrowers of the late nineteenth century, declines in the years leading up to the country's adoption of the gold standard in October 1899, but it remains at approximately 1,000 basis points after the country adopts the gold standard. As shown in Figure 2, although exchange-rate risk declined Austria around the period of adoption, the currency risk premium averaged approximately 120 basis points in the five-year period after the country joined the gold standard in 1892.

Figure 3 shows the currency risk premium for Brazil, another large Latin American borrower. Currency risk rose from a little under 50 basis points to around 100 basis points at the time of adoption and remained at approximately 100 basis points after the country joined the gold standard. Figure 4 provides evidence for the British colony of India, and indicates that the interest-rate differential between paper rupee and gold rupee denominated debt trading on the London market averaged 240 basis points in the five years after the country joined the gold club.

Figure 5 presents the evidence for Italy, another European emerging market of the nineteenth century. The currency risk premium for Italy also declines over the sample period, as the Southern European country moved towards adopting the gold standard, but hovers between 40-60 basis points five years after adoption. The interest-rate differential between Mexico's paper and sterling denominated bonds declines substantially prior to adoption, but the currency risk premium for Mexico averaged almost 500 basis points in the five-year period after the country joined the gold standard (Figure 6). For Russia, the currency risk premium shown in Figure 7 is large and appears to change very little over the 10-year window, averaging more than 800 basis points before and after adoption of gold in 1897. Figure 8 also shows that the currency risk premium for the United States averaged approximately 100 basis points over the entire 10-year sample period.[14] Chile was on the gold standard for a shorter period compared to other countries in our sample (it joined the gold standard in 1895 and abandoned its hard peg in July 1898).[15] The currency risk premium averaged more than 583 basis points while it was on the

[14] For the United States, we used both the 4.5 percent gold bonds (due in 1891) and the 4 percent gold bonds (due in 1907) to calculate the currency risk premium. We spliced the two bond series together by subtracting 30 basis points off the 4.5 percent bonds in the period when data on the 4 percent gold bonds was not available. The 30-basis-point difference is the average yield spread differential between the 4.5 percent gold bonds and the 4 percent gold bonds.

[15] Bordo and Rockoff (1996) discuss the relationship between Chilean internal peso bonds and its sterling denominated external debt, but do not interpret the interest-rate differential as a measure of the currency risk premium and its implications for the credibility of the hard peg. Chile also briefly joined the gold club in the early to

gold standard (Figure 9). This large interest-rate differential suggests that investors likely never perceived its peg to be very credible.

Overall, the time-series evidence suggests that the gold standard was not very credible for many emerging market countries since the interest-rate differential between a country's paper currency debt and its sterling bonds often remained more than two or three hundred basis points years after a country joined the gold standard.

IV. Implied Devaluations for Emerging Market Borrowers

An alternative way of assessing the credibility of the hard pegs of the classical gold standard era is to consider whether investors believed that countries would devalue after gold standard adoption. If the size of an anticipated devaluation were close to zero, this would indicate that investors viewed the pegs as fully credible. However, if the expected devaluation deviated significantly from zero, this would indicate that markets did not expect the pegs to last.

In this section, we follow the methodology proposed in (Schmukler and Serven, 2002) and derive estimates of the size of the anticipated devaluation for our sample of nine emerging market borrowers that issued both gold-denominated and paper-denominated sovereign debt. Using our assumption of risk neutrality and the definitions in Section II of the paper, we can rewrite the currency risk premium as the likelihood of an exchange rate devaluation, p, multiplied by the size of the expected devaluation, d_t^e:

$$(5) \quad (i_{t,k} - i_{t,k}^*) = p d_t^e .$$

Dividing the currency risk premium by the probability of a fall in the exchange-rate yields the anticipated size of the devaluation:

$$(6) \quad d_t^e = (i_{t,k} - i_{t,k}^*) / p.$$

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mid 1870s. However, we were unable to locate any domestic paper bonds to test the credibility of this earlier episode of gold standard commitment.

Table 4 shows the expected size of the devaluation of each for each of our nine emerging market borrowers. Each cell in the table provides an estimate of the size of the expected decline in the exchange rate depending on the country and the likelihood of a devaluation occurring in that country. Each column of the table shows a hypothetical probability of devaluation occurring.[16]

It is possible to narrow down the range of the size of the anticipated decline in the exchange rate by employing Bordo and Murshid's (2006) estimates of the likelihood a global financial crisis. They find that the probability of a global crisis during our sample period ranged between 10 and 14 percent. If we assume that each country's probability of a fall in the exchange-rate is equal to the probability of a global crisis and we use the lower end estimate of a global crisis of 10 percent, then the data suggest that markets anticipated that exchange rates would fall by an average of 40 percent (Column 1, Table 4). The size of the decline in the exchange rate varies significantly across our sample of nine emerging market countries. Investors anticipated that exchange rates would fall by less than 13 percent for countries like Austria, Brazil, Italy, and the United States, but would decline by more than 30 percent for countries such as Argentina, Chile, India, Mexico, and Russia.[17]

One potential criticism of the baseline results is that the probability of a crisis in a given country is higher than the incidence of a global crisis. Another possibility is that other factors such as domestic political instability, which could lead to an exchange-rate devaluation, played an important role in the sustainability of hard pegs during the gold standard. We therefore consider an alternative scenario – that the probability of a financial crisis in a given country is twice the probability of a global crisis or 20 percent. Under this scenario, the average maximum implied devaluation is then roughly 20 percent. Here again, there is considerable variance across our sample. For countries like Austria, Brazil, Italy, and the United States, the maximum implied decline in the exchange rate was less than 10 percent; for other countries, it ranged from 12 to 55 percent.

[16] India is useful to include in our sample because it provides an example of a debt issuer with almost no likelihood of differential default or differential recovery since it was a colony and both gold and paper bonds were guaranteed by the metropole. Five years after joining gold, India's currency risk premium is still roughly 245 basis points.

[17] Our analysis also suggests that the currency risk premium is also capturing a factor that is largely distinct from the determinants of country risk given that the correlation between the change in the currency risk premium and the country risk premium is less than 0.20 for the seven emerging market countries with both paper and gold (sterling) bonds.

V. Conclusion

Was the gold standard a credible hard peg? In this paper, we suggest that previous literature on the gold standard has not focused on the relevant test. We show that it is the level of the currency risk premium (the interest-rate differential between a sovereign borrower's paper and gold bonds) after gold standard adoption that provides information about whether the classical gold standard was a credible peg. Using a new database of weekly and monthly bond prices, we analyze the currency risk premium for a sample of nine large emerging market borrowers during the gold standard period. The empirical analysis suggests that the currency risk premium averaged more than 400 basis points in the five-year period after a country joined the gold standard. The large and persistent currency risk premium implies that markets expected exchange rates to depreciate approximately 20 percent for our sample of gold standard countries. Given that the gold standard is considered by many economists to be the most credible fixed exchange rate system in modern history, our results suggest that hard pegs may never be credible.

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Table 1

Timeline of Gold Standard Adoption and Adherence

Country	Date of Adoption	Dates of Adherence
Argentina	October 31, 1899	10/31/1899-8/2/1914
Austria	August 2, 1892	8/2/1892-8/4/1914
Brazil	October 15, 1906	10/15/1906-12/12/1914
Ceylon	September 26, 1901	9/26/1901-9/4/1914
Chile	June 1, 1895	6/1/1895-7/11/1898
Costa Rica	October 26, 1896	10/26/1896-9/18/1914
Egypt	November 17, 1885	11/17/1885-8/2/1914
Greece	March 19, 1910	3/19/1910-12/1914
India	January 1, 1898	1/1/1898-9/5/1914
Italy	March 1, 1883	3/1/1883-1894
Mexico	May 1, 1905	5/1/1905-1914
Nicaragua	March 20, 1912	3/20/1912-1914
Russia	January 3, 1897	1/3/1897-7/1914
South Africa (Cape of Good Hope)	February 9, 1882	2/9/1882-9/6/1914
Sweden	May 30, 1873	3/30/1873-1914
Turkey	January 6, 1881	1/6/1881-8/4/1914
United States	January 1, 1879	1/1/1879-9/7/1917

Table 2. Measuring the Country Risk Premium

Panel A: 4-Year Windows

Country	Whole Period (1)	Pre-Gold (2)	On Gold (3)	Change (4)	Observations (5)
Argentina	376.49	405.42	347.57	-57.84	209
Austria	139.72	140.21	139.17	-2.40	209
Brazil	207.12	216.65	197.34	-24.31	49
Ceylon	71.53	74.65	68.39	-6.26	209
Chile	256.26	260.09	252.48	-7.61	209
Costa Rica	1410.54	1426.72	1400.14	-26.58	209
Egypt	294.84	328.07	261.94	-66.13	209
Greece	670.43	709.44	631.71	-77.73	209
India	52.83	50.05	55.65	5.59	209
Italy	147.06	131.34	162.59	31.25	49
Mexico	207.33	210.49	204.19	-6.31	209
Nicaragua	499.96	499.24	501.73	2.49	153
Russia	105.00	113.65	96.33	-17.32	209
South Africa (Cape of G. Hope)	144.37	138.99	149.75	10.76	209
Sweden	164.01	166.75	161.23	-5.51	209
Turkey	652.56	704.57	599.86	-104.71	209
United States	78.17	80.41	76.02	-4.39	209
Country Average	332.25	332.75	312.12	-21.00	

Table 2. Measuring the Country Risk Premium (continued)

Panel B: 10-Year Windows

Country	Whole Period (1)	Pre-Gold (2)	On Gold (3)	Change (4)	Observations (5)
Argentina	431.56	556.71	306.20	-250.51	521
Austria	143.79	147.79	139.74	-8.043	521
Brazil	219.325	236.436	196.103	-40.33	99
Ceylon	78.01	79.00	76.98	-2.01	521
Chile	253.02	281.78	237.45	-44.33	521
Costa Rica	1005.25	925.49	1088.90	163.41	521
Egypt	269.61	300.17	231.37	-68.80	422
Greece	640.59	699.32	572.42	-126.90	484
India	45.89	46.93	44.90	-2.03	521
Italy	145.40	125.75	161.78	36.03	111
Mexico	203.93	210.88	198.85	-12.03	452
Nicaragua	542.20	549.68	501.73	-47.95	309
South Africa (Cape of G. Hope)	118.66	134.22	103.04	-31.18	463
Russia	147.70	142.76	154.05	11.29	
Sweden	166.43	169.14	164.99	-4.15	396
Turkey	696.40	826.55	613.18	-213.37	426
United States	68.79	83.12	54.53	-28.59	521
Country Average	304.50	324.45	285.07	-39.38	

Table 3. Measuring the Currency Risk Premium

Panel A: 4-Year Windows

Country	Whole Period (1)	Pre-Gold (2)	On Gold (3)	Observations (5)
Argentina	1217.85	1271.52	1164.74	209
Austria	217.65	213.23	221.98	209
Brazil*	97.16	93.65	100.69	49
India	268.65	281.47	256.07	209
Italy*	95.72	119.40	72.93	49
Mexico	575.23	665.32	489.38	209
Russia	795.69	789.17	802.37	209
United States	101.60	103.39	99.79	209
Chile*	572.49	640.67	583.19	49
Country Average	438.00	464.20	421.24	

Table 3. Measuring the Currency Risk Premium (continued)

Panel B: 10-Year Windows

Country	Whole Period (1)	Pre-Gold (2)	On Gold (3)	Observations (5)
Argentina	1286.63	1465.26	1107.95	521
Austria	240.31	260.856	219.649	521
Brazil*	89.50	79.45	99.67	71
India	256.47	282.47	245.46	371
Italy*	89.27	124.19	60.54	111
Mexico	582.70	709.13	489.38	452
Russia	820.43	820.02	820.77	510
United States	102.02	95.46	108.57	521
Chile*	581.13	580.11	583.19	79
Country Average	449.83	490.77	415.02	

Note: * indicates monthly data.

Table 4. Implied Devaluations for Gold Standard Adopters

(Percent)

	Assumed Probability of Devaluation				
Country	10%	25%	50%	75%	90%
Argentina	110.8	55.4	22.2	14.8	12.3
Austria	12.6	6.3	2.5	1.7	1.4
Brazil	10.0	5.0	2.0	1.3	1.1
India	24.5	12.3	4.9	3.3	2.7
Italy	6.1	3.0	1.2	0.8	0.7
Mexico	48.9	24.5	9.8	6.5	5.4
Russia	81.3	40.6	16.3	10.8	9.0
United States	6.1	3.0	1.2	0.8	0.7
Chile	58.3	29.2	11.7	7.8	6.5
Average Size of Devaluation	**39.8**	**19.9**	**8.0**	**5.3**	**4.4**

Notes: Under the assumption of risk neutrality, the maximum implied devaluation is computed by dividing the average value of the currency risk premium in the five-year period after joining the gold standard by the assumed probability of a devaluation.

Figure 1
Currency Risk for Argentina, Nov. 1894-Oct. 1904
(Basis Points)

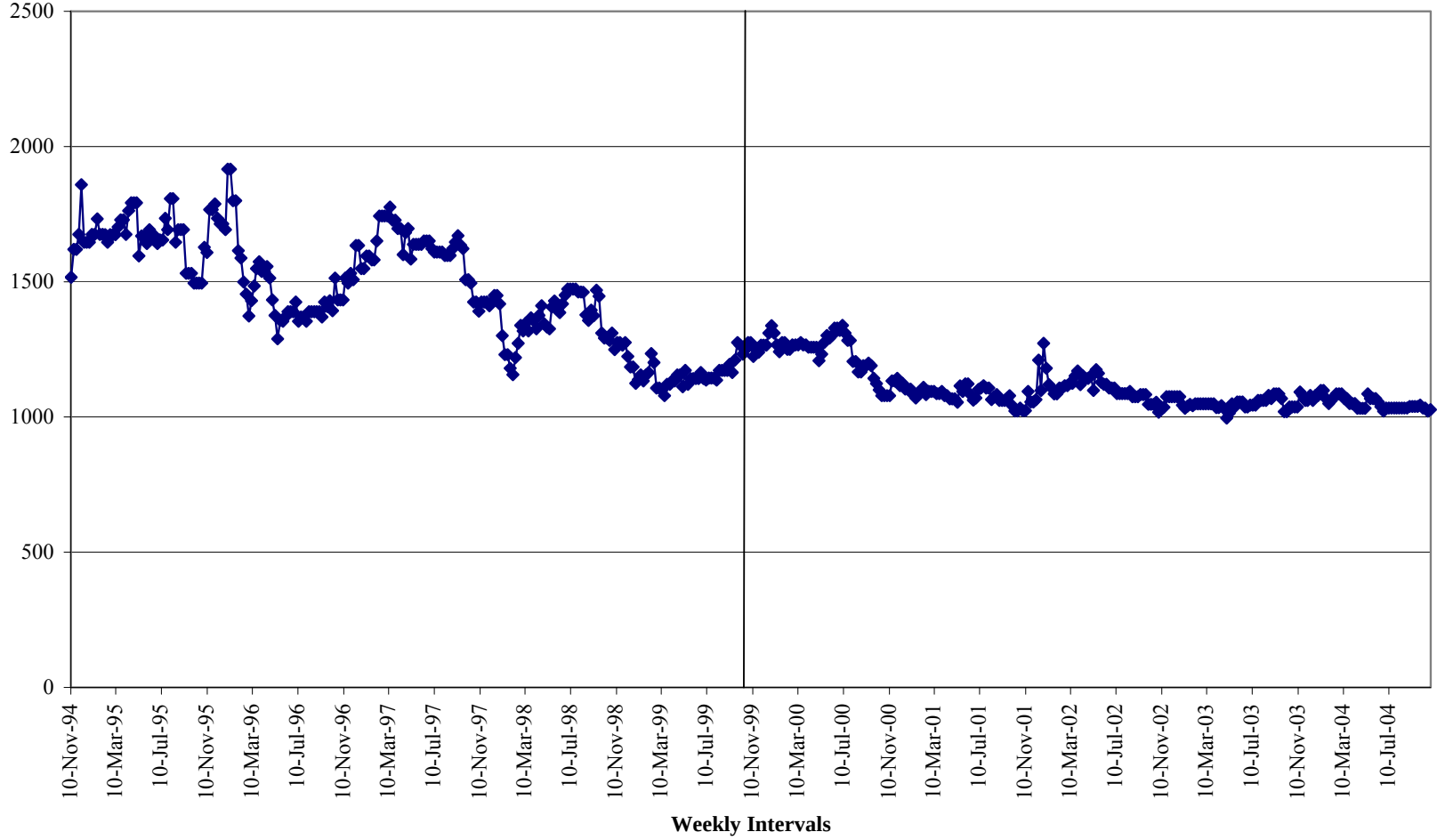


Figure 2
Currency Risk for Austria, 1887-1892
(Basis Points)

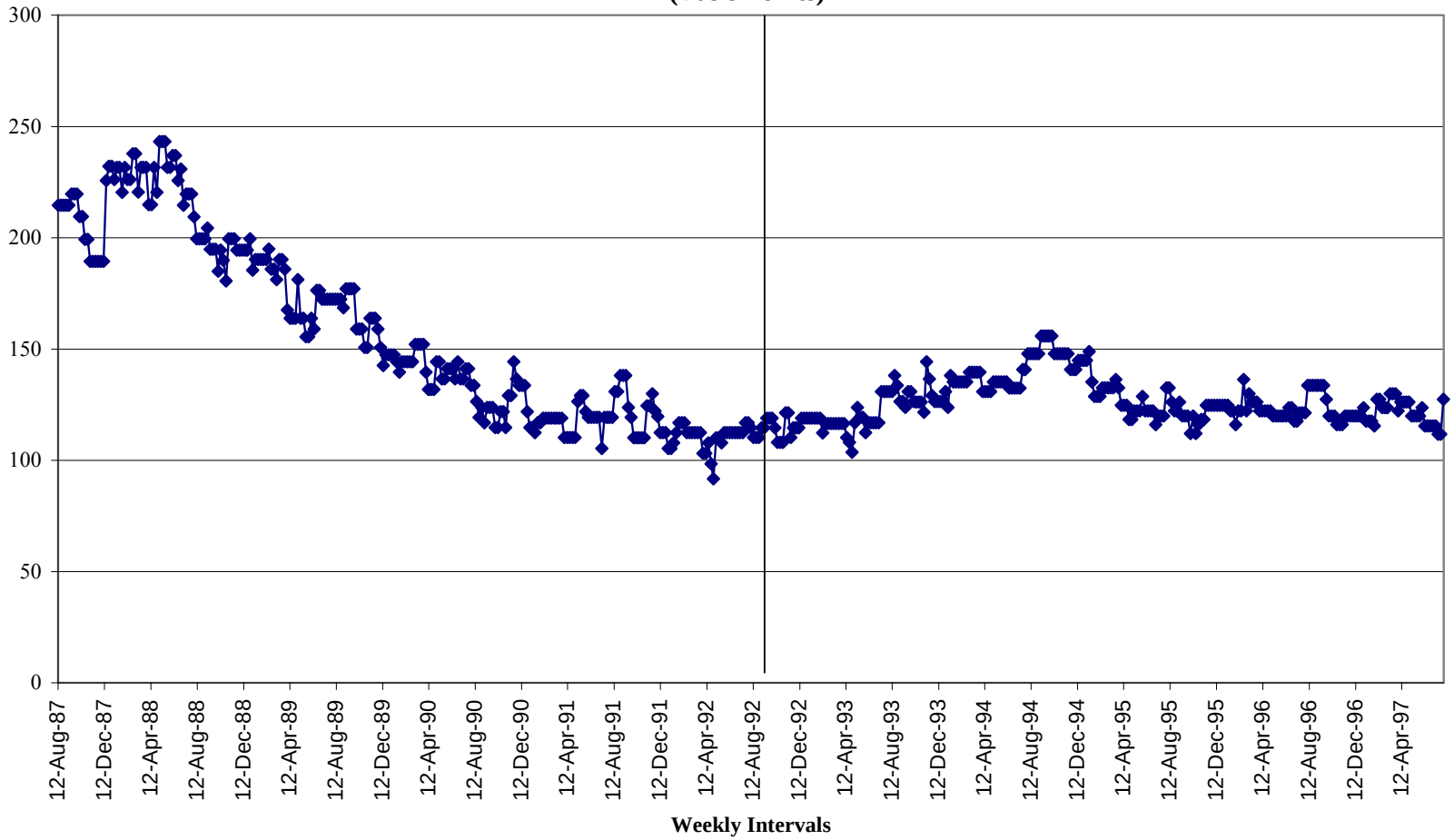


Figure 3
Currency Risk for Brazil, 1902-March 1910
(Basis Points)

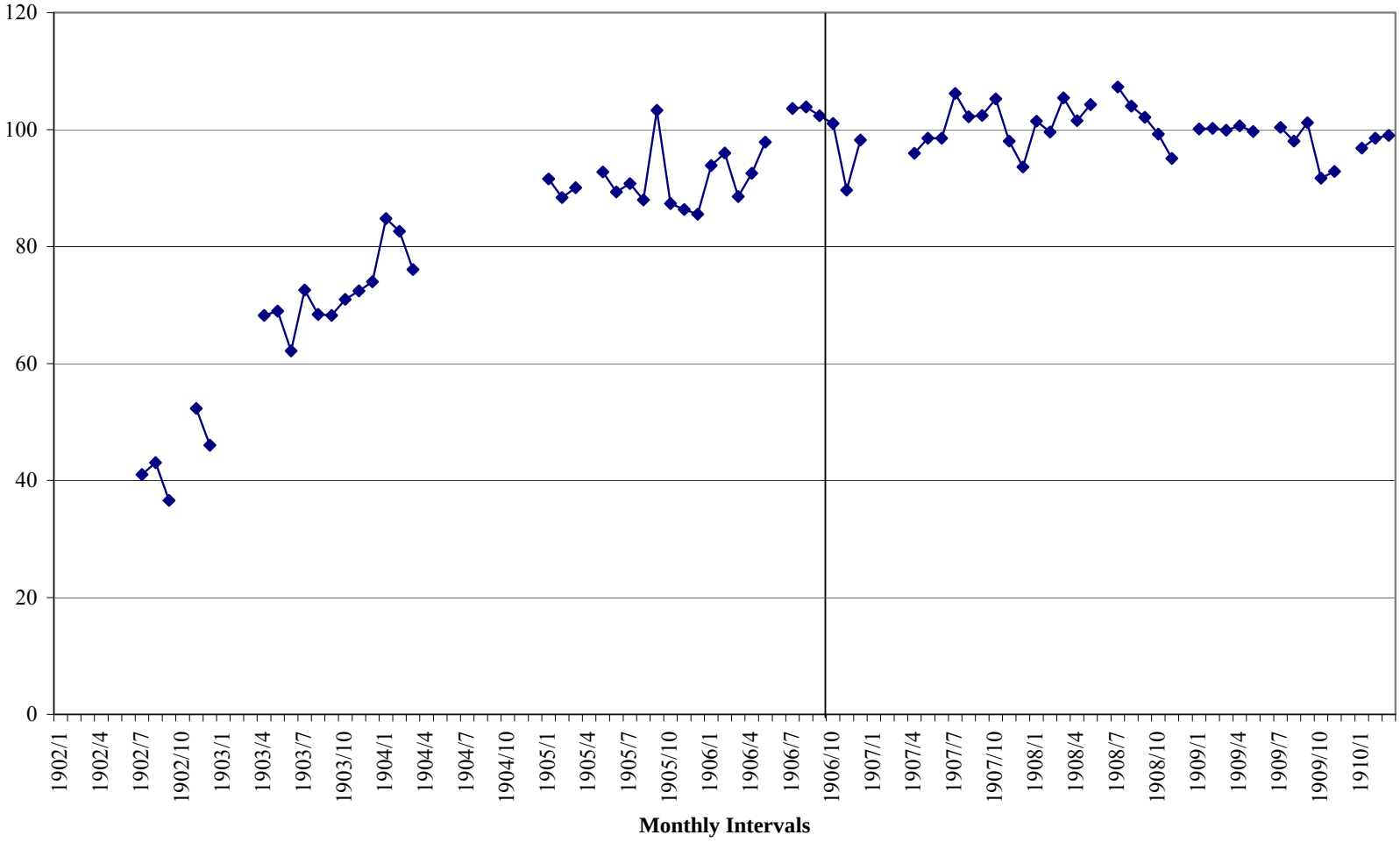
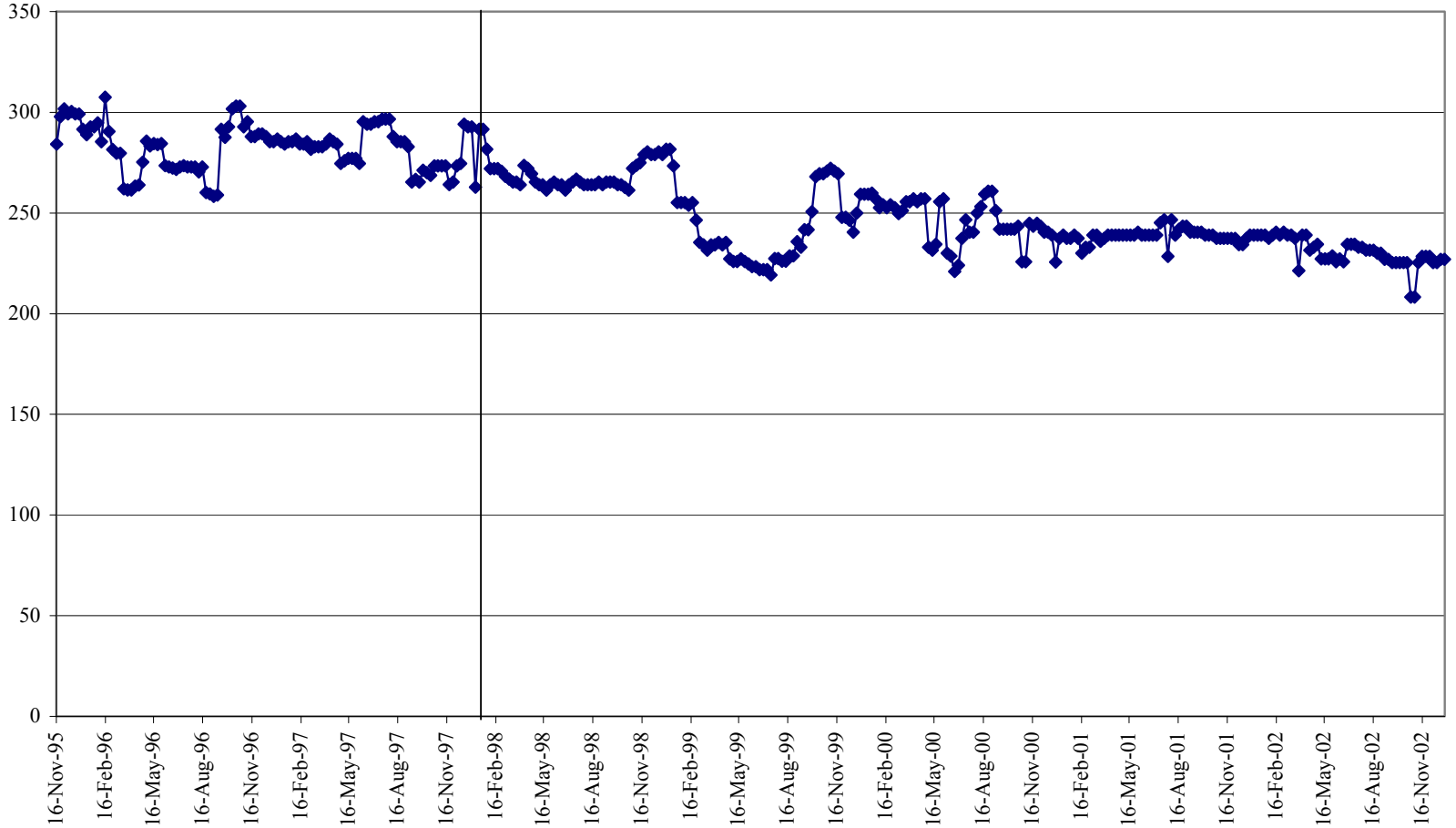


Figure 4
Currency Risk for India, Nov. 1895- Dec. 1902
(Basis Points)



Weekly Intervals

Figure 5
Currency Risk for Italy, Jan. 1879-March 1888
(Basis Points)

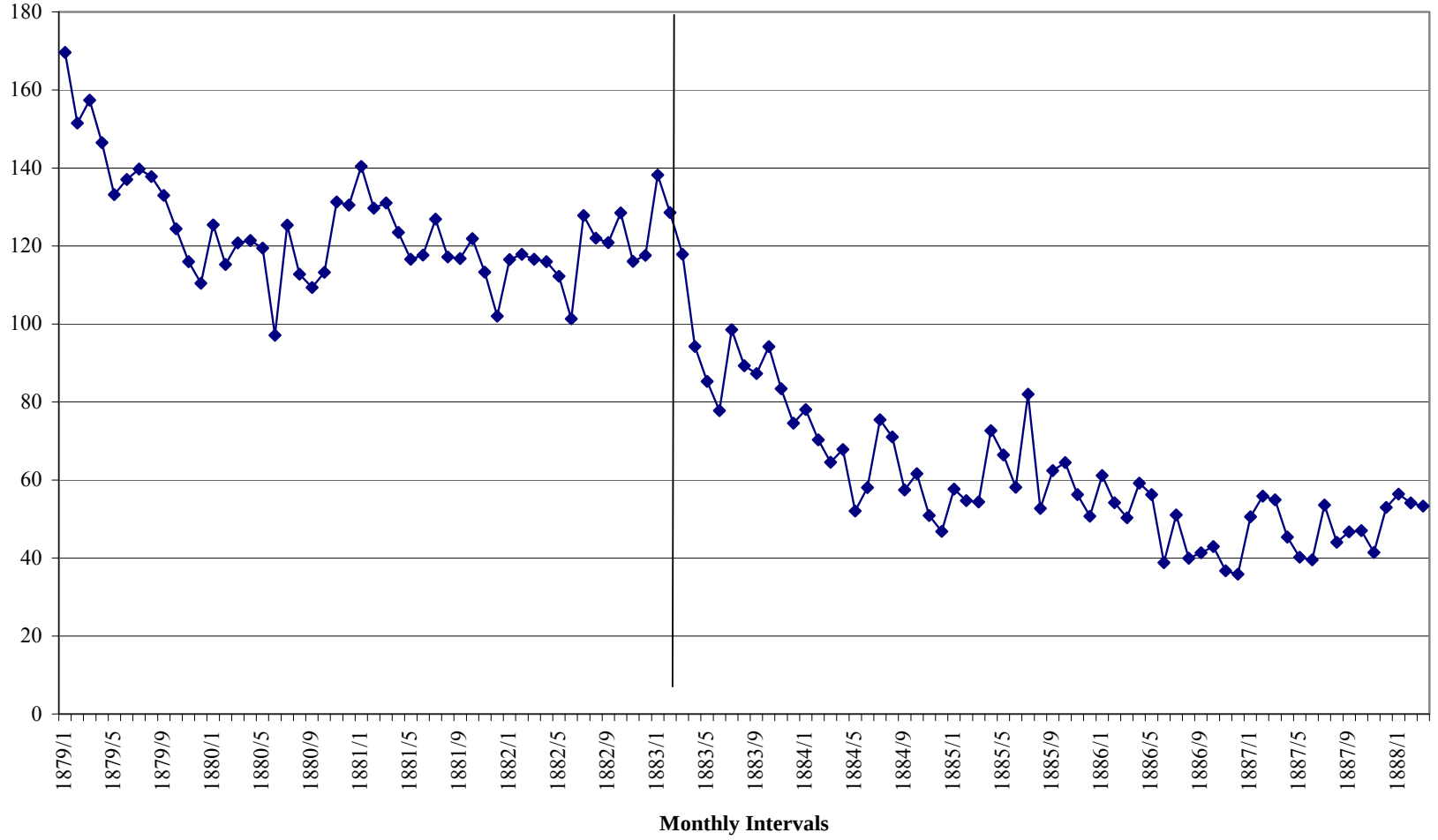


Figure 6
Currency Risk for Mexico, Sept. 1901-1910
(Basis Points)

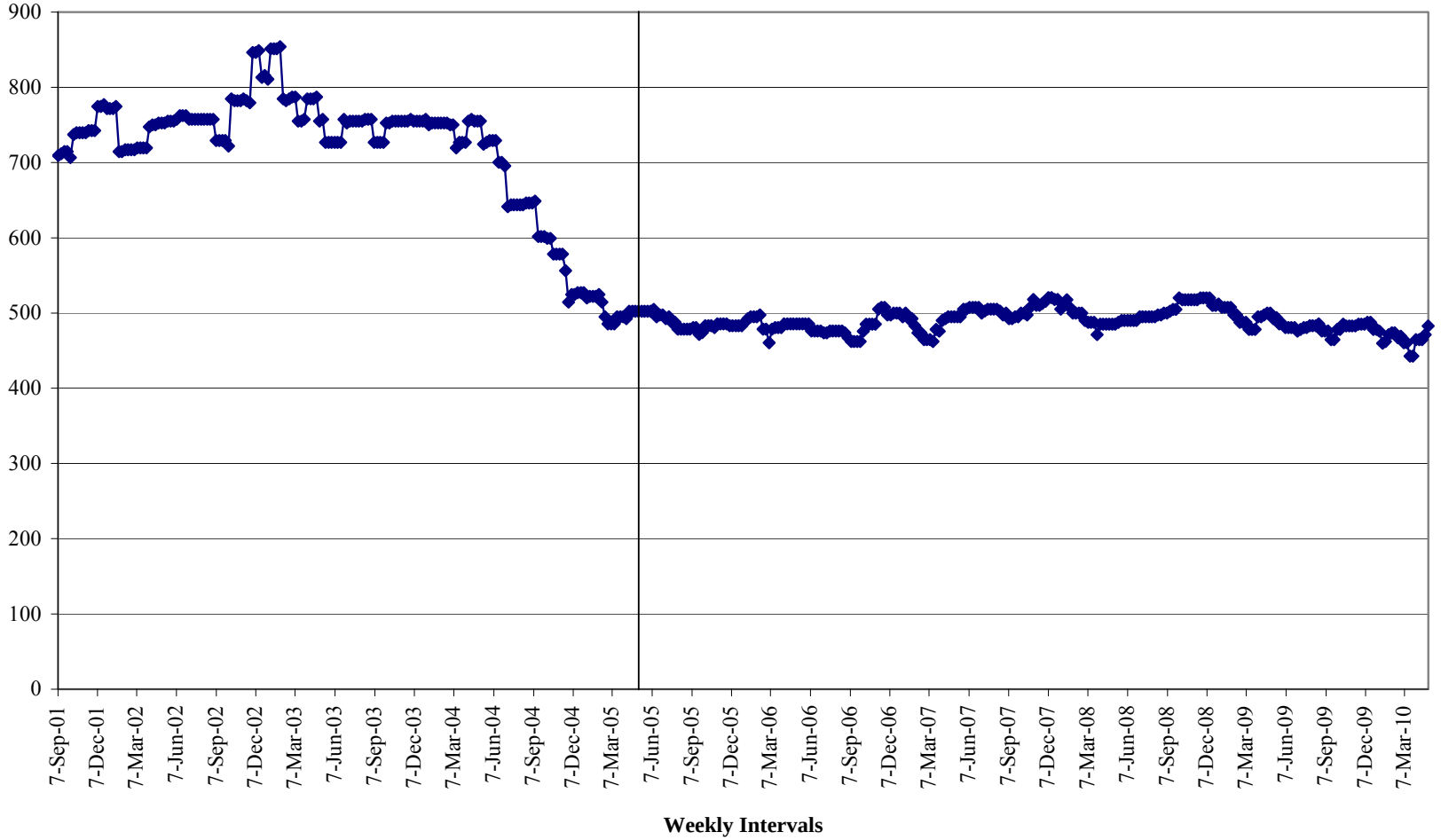


Figure 7
Currency Risk for Russia, May 1892-January 1902
(Basis Points)

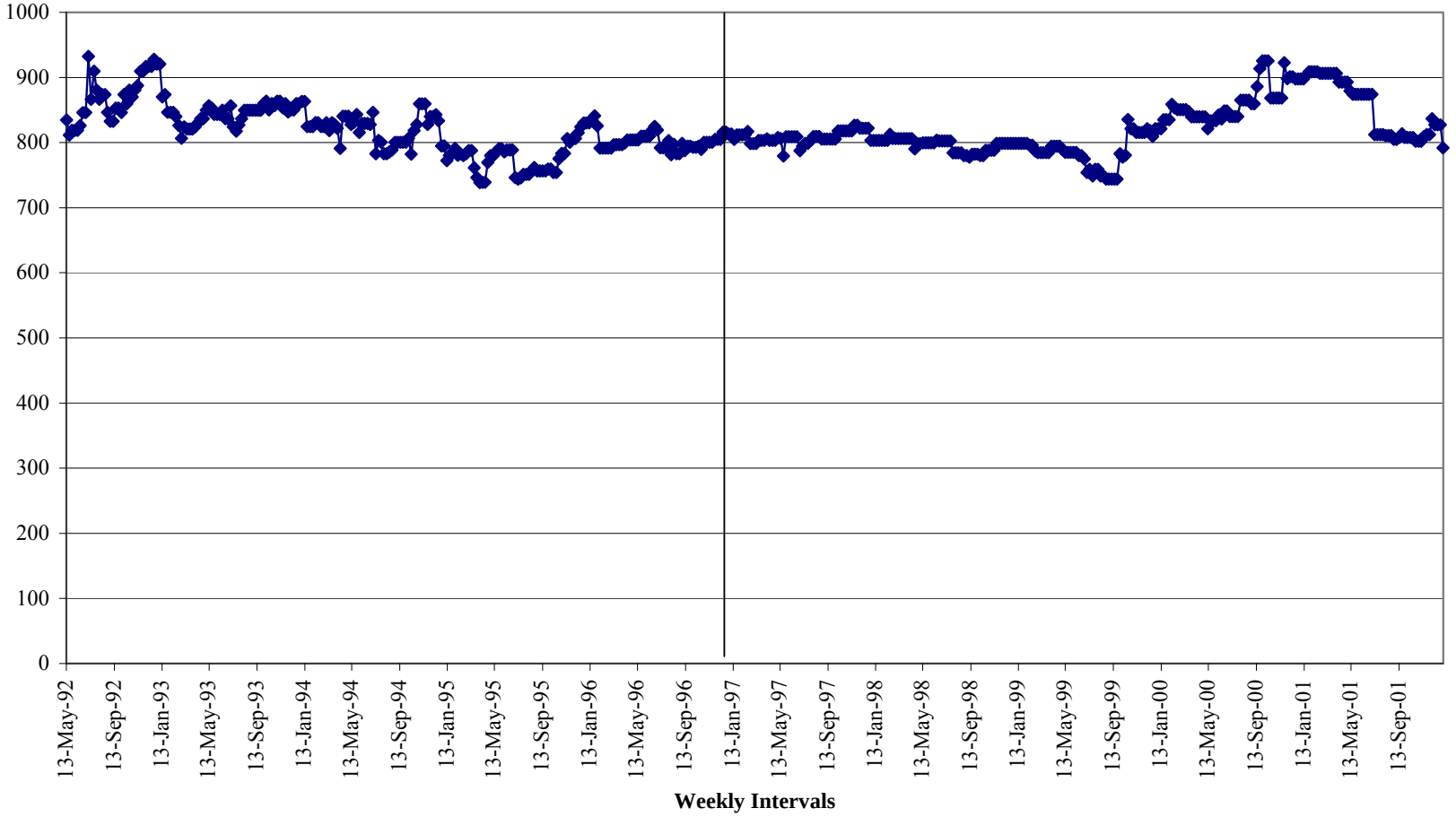


Figure 8
Currency Risk for the USA, 1874-1883
(Basis Points)

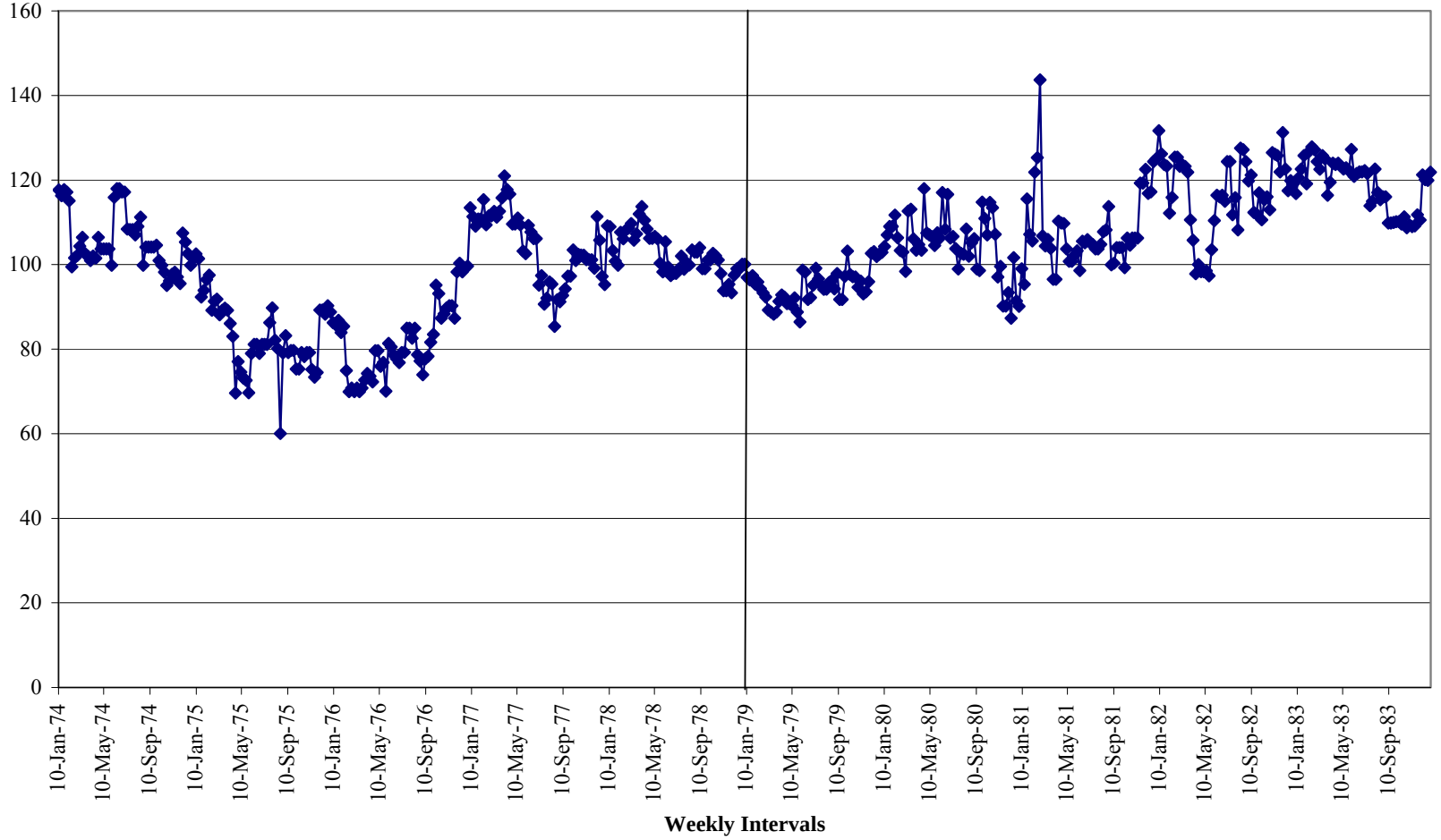
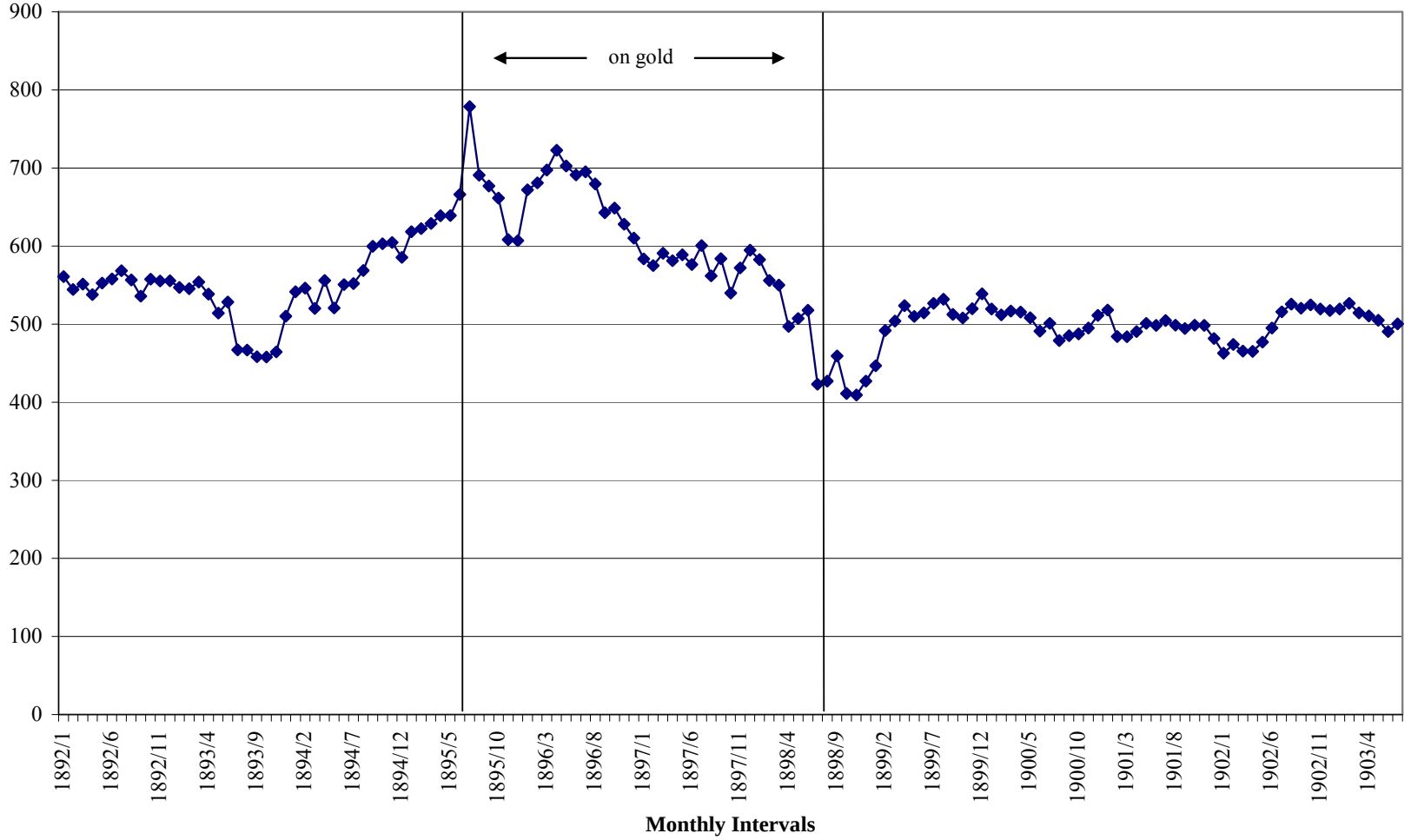


Figure 9
Currency Risk for Chile, 1892-1903
(Basis Points)



Appendix 1. Bond Data

We collected the data on weekly bonds yields from *The Economist*, and *The Commercial and Financial Chronicle*. In the following table, we list the interest rate stated in the terms of the bond.

Argentina – 4.5 percent, bonds are to be redeemed within 39 years after they were issued in 1889.
Argentina – 7 percent Cedula 'B' paper bonds.
Austria – 4 percent gold perpetuity bonds; 5 percent paper perpetuity bonds
Brazil – 4.5 percent sterling bonds, bonds redeemable with a sinking-fund of 1 percent per annum. Redeemable in 1911.
Brazil – 5 percent apolocies (gold and paper perpetuity bonds) taken from *Jornol do Commercio*.
Ceylon – 4 percent debentures, redeemable by 1934.
Costa Rica – 5 percent A Series, interest rate reduced to 3 percent on April 22, 1899. The bonds were retired via half-annual drawings.
Chile – 4.5 percent sterling bonds, bonds redeemed when the bonds fall below par or by a sinking-fund provision. Eight bonds Bonos (paper bonds) with a 10-year maturity. Data on paper-currency bonds for Chile were taken from *El Mercurio*.
India – 3.5 percent sterling bonds redeemable on or after 1931.
India – 3.5 1854-1855 rupee bonds, repayable 3-months after notice by the government after August 1, 1904.
Italy – five percent rentes, perpetuity bonds traded in London; 5 percent irredeemable paper and gold rendita bonds.
Mexico – 5 percent external bonds redeemable by 1945.
Mexico – 5 percent Internal Silver Bonds, redeemable by means of a cumulative sinking-fund of .25 percent.
Nicaragua – 1886/1909 six percent bonds. Redeemable in 35 years.
France – 3 percent rentes, perpetuity bonds.

Appendix 1. Bond Data (continued)

Russia – 1822 five percent perpetuity, coupons payable in London, traded on major European markets.
Russia – 6 percent (1817) paper bonds, 94.5 million paper rouble issue, coupons payable in Amsterdam
South Africa (Cape of Good Hope) – Cape of Good Hope 4.5 percent, due in 1900
Sweden – 5 percent, issued in 1868
Turkey – 4.25 percent external tribute of 1871, redeemable by 1900.
UK – consols 3 percent until, then 2.75 which were redeemable in 1923.
United States - 6 percent currency bonds, due 1895-1899; 4.5 percent gold bonds due 1891; 4 percent gold bonds due 1907.

Appendix 2. Gold Standard Adoption Dates and Source Information

Argentina – The Law of Conversion was passed on Oct. 31, 1899 restoring convertibility (della Paolera and Taylor, 2001, p. 120).

Austria – Joined the gold standard by laws passed August 2, 1892. (Mitchell, 1898).

Brazil – "Under an act which went into effect December 22, 1906, a conversion fund was established by means of import duties collected in gold." (Monetary Systems of the Principle Countries of the World, p.8).

Ceylon – Adopted with the Gold Ordinance Act of September 26, 1901 and maintained until 1914 (Gunasekera, p. 137).

Chile – A new conversion law of Feb. 11, 1895 set June 1, 1895 as the day for the redemption of notes. This continued until July of 1898. (Bordo and Kydland, 1995, p. 437-438).

Costa Rica – On July 16, 1900, the bank began redeeming certificates in gold (Young, 1925, p. 196).

France – Adopted the gold standard on Nov 5, 1878 (Pick and Sedillot, 1971, p. 587).

Greece – Adopted the gold standard on March 19, 1910 (Bordo and Kydland, 1995, p.439).

India – Adopted the gold standard the week of May 7, 1898. The scheme of Indian Government for establishing a gold standard published and severely criticized (*Investor's Monthly Manual*, December, 1898)

Appendix 2 (continued). Gold Standard Adoption Dates and Source Information

Italy- On April 12, 1884, the country adopted the gold standard. By 1894, it was back on a paper standard (Fratianni and Spinelli, 1997, p. 439).

Mexico- The Enabling Act was passed on Dec. 9, 1904 authorizing the establishment of a gold standard. On March 25, 1905, a decree promulgated the new system. The law went into effect on May 1, 1905 (Kemmerer, 1944, p. 524).

Nicaragua - Law of March 1912 embodied recommendations for gold-exchange system. (Young, 1925, Pgs. 147-150). A new currency system began on March 23, 1913 (Young, 1925, p. 159).

Russia – The country adopted the gold standard January 3-15, 1897 (Pick and Sedillot, 1971, p. 488).

South Africa(Cape of Good Hope) - On Feb. 10, 1882, silver coins were made clearly tokens, placing the currency firmly on a gold standard (www.dollarization.org).

Sweden – The country signed a convention in December 1872 instituting the gold standard (Morys, 2007, p. 41).

Turkey - Starting on March 13, 1880, there was in practice a "limping" gold standard, even though the country was officially on a hard peg. This system was maintained until Aug. 3, 1914 (dollarization.org, 2005).

United States – Resumed specie convertibility following the Civil War on January 1, 1879 (Kemmerer, 1916, p. 85).

Appendix 3. Paper Bonds during the Classical Gold Standard, 1870-1913

Issue	Size of Issue(year)	Foreign Markets for Paper Bonds (primary domestic market)	Market for Gold Bond
Argentine 7% Cedulas 'B' Currency	$9.58 million(1900)	London and other Continental Bourses	London and other Continental Bourses
Austrian 5% Perpetuity	£177 million(1890)	London and other Continental Bourses	London and other Continental Bourses
Brazil 5% Apolicies	Mx63.6 million (1905)	No (Rio de Janiero and Sao Paolo)	Rio de Janiero and Sao Paolo
Chilean 8% Bonos	151 million gold pesos(1900)	Valparaiso	London and other Continental Bourses
Indian 3.5% Rupee	Rx13.75 million(1900)	London	London
Italian 5% Perpetuity	Half of all government debt is in paper bonds	No (Milan)	Paris
Mexican 5% Internal	$59 million	London	London
Russian 6% Internal paper loan	38.5 million paper roubles outstanding (1895)	Amsterdam	Amsterdam
United States 6%	$64 million(1879)	No (New York)	New York

Sources: *Investor's Monthly Manual*, *Official Stock Exchange Intelligence, and* Llona (1990). Rx stands for Rupee. Mx stands for milreis.