PART ONE

INTRODUCTION

ONE

Credibility in Fixed Exchange Rate Regimes

Theoretical and Historical Perspectives

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At present, the global monetary regime is based on floating exchange rates among the major advanced countries: the United States, Japan, the United Kingdom, Canada, Australia, and the Eurozone. The Eurozone is a monetary union. The rest of the world has a gamut of regimes, ranging from floating to hard pegs. A key underlying factor behind the current regime is credibility to maintain stable monetary policies.

The origins of credibility in monetary regimes go back to the classical gold standard, 1880–1914. In that regime, in the advanced countries, adherence by the monetary authorities to the rule of convertibility of national currencies in terms of gold provided a credible nominal anchor. Today gold is no longer the nominal anchor; instead this anchor is based on the credibility of independent central banks dedicated to keeping inflation low. Between 1914 and the present, the world exhibited several regimes that gradually did away with gold as the nominal anchor and that had varying success in maintaining credibility. In this book, we present nine studies of how credibility functioned in four monetary regimes, from the gold standard to the present regime of managed floating.

The issue of the appropriate exchange rate regime for a country has been a central theme in the international finance literature. Numerous currency crises in the last three decades of the twentieth century have given fixed but adjustable exchange rate regimes something of a bad name. The perceived wisdom is that such regimes are likely to be blown off track if the underlying macroeconomic fundamentals are at variance with the peg, or even if they are not, sunspot effects and pure contagion effects can produce the same unsatisfactory outcome. These apparent problems with fixed but adjustable rates led to the emergence of the so-called corners hypothesis as the perceived wisdom: To avoid the frenzy of speculative attacks and the consequent implications for the real economy and, more generally, the

international monetary system, countries should irrevocably lock their currencies to other currencies in some way (a monetary union or currency board), or they should allow their currencies to float freely, with little or no foreign exchange market intervention.

At the heart of the issue of how sustainable a fixed rate is likely to be is the credibility of the peg: A credible peg is much less likely to suffer the ignominy of a speculative attack than one that is not. Furthermore, the existence of a credible exchange rate can allow a central bank some flexibility in its ability to change monetary policy, despite the fact that the exchange rate is pegged. In this book, we focus on the issue of credibility. In particular, we bring together a group of papers that examine the credibility of a number of key regimes of the international monetary system, from the classical and interwar gold standards to the exchange rate mechanism (ERM) experience with fixed but adjustable exchange rates.

One key outcome of our work is that it would seem that credibility is a function of the particular international monetary regime in existence. For example, the classical and interwar gold standard systems seem to have a superior performance in terms of credibility compared to other regimes, such as the ERM experience with fixed exchange rates and sterling's experience under Bretton Woods. Therefore, in designing architecture for the International Monetary System (IMS), and indeed designing a reform of the IMS per se, a key question that arises from our work is: Do we need gold, or some other commodity, as the anchor, to impart credibility, or are there other mechanisms, institutions, and regulations that can replace a commodity-based system?

A further aspect of the work reported in this volume is that although the two main gold standard regimes did exhibit considerable credibility, there were key periods when they were non-credible. However, we show that there is usually an intuitive explanation for such non-credibility in terms of either economic or political fundamentals, and that such lack of credibility was short-lived. Another theme we seek to address in this book is what extent the existence of credibility in fixed-rate regimes lends to monetary authorities the ability to engage in independent monetary policies.

OVERVIEW

The book is divided into four sections after this introduction representing four exchange rate regimes: Part II, Classical Gold Standard; Part III, The Interwar Period; Part IV, Bretton Woods; and Part V, The European Monetary System Period.

Classical Gold Standard

In Chapter 2, C. Paul Hallwood, Ronald MacDonald, and Ian W. Marsh focus specifically on the issue of credibility in the classical and interwar gold standard periods. They adopt a target zone interpretation of the gold standard period and implement two categories of tests: tests of the mean-reverting properties of certain key exchange rates and the calculation of credibility confidence intervals for these currencies. Although the credibility test of Svensson is often seen as the simplest test of credibility, a test of the mean-reverting properties of exchange rate behavior in a target zone is in fact even simpler because it relies only on the time series properties of the exchange rate. To test mean reversion, the authors use variance ratio statistics and Dickey-Fuller type tests; for the classical gold standard period, evidence of very fast and significant mean reversion is reported: Within four months, half of a deviation is extinguished. For the interwar period, the authors also report evidence of mean reversion for key currencies, although this is not as clear-cut (as fast or as significant) as in the classical period.

In Chapter 3, Michael D. Bordo and Ronald MacDonald offer a framework to test the degree of monetary independence conferred on a central bank in a credible target zone arrangement. In the context of the classical gold standard regime, they show how to test the "stylized fact" of a failure of central banks to play by the rules of the game – sterilize gold flows and follow domestic policies independent of concern for convertibility – combined with an apparently credible IMS. Using an uncovered interest rate parity condition and a term structure relationship, the authors derive three testing systems. System one involves estimating Uncovered Interest Parity (UIP) as a long-run co-integrating relationship and then calculating the mean reversion speed to this equilibrium. The speed of mean reversion provides information on the degree of monetary independence.

The second system combines the UIP relationship with a term structure relationship. The latter is included to gauge how much long-term and short-term interest rates diverge as a result of a monetary impulse. If the target zone/central bank independence story is correct, long rates should be relatively insensitive to shocks (because any monetary independence can only be short-lived in this model), and this is demonstrated to hold in the data – long rates change by very little in response to impulses, and adjustment of long rates is relatively rapid.

The third system consists of the second system plus a vector of "short-run" fundamentals: the change in gold reserves, the change in industrial production, the change in prices, and the volatility of short-term interest rates. This

system is designed to capture the interest rate responses to temporary shocks in "fundamentals." The authors demonstrate, as expected, that the amount of policy independence is transitory, lasting about a year. Furthermore, the results show that interest rate adjustments do not need to be very large to accommodate 1 percent shocks in the fundamentals, and the magnitude of short rate adjustment proves to be much larger than that for long rates.

In Chapter 4, C. Paul Hallwood, Ronald MacDonald, and Ian W. Marsh examine in some detail a key feature of the results reported in Chapter 2, namely that the expected rate of re-alignment for the U.S. dollar was persistently non-zero for the period between 1879 and 1896. What explains this apparent lack of credibility? Because Friedman and Schwartz (1963) have argued that political factors rather than economic factors explain this behavior, the authors of the chapter use a modeling framework that seeks to disentangle the effect of economic fundamentals, expectational failures, time-varying risk premia, and political factors. The model used to assess this relies on splitting the interest differential into four components: a risk premium; the probability of re-alignment, which is a function of both economic and political factors; a peso effect, the expected rate of devaluation scaled by the probability of re-alignment; and the expected change in the exchange rate.

In sum, Hallwood, MacDonald, and Marsh find that the non-zero expected rate of re-alignment is predominately driven by a peso effect, and their explanation of this phenomenon is that financial markets were predicting a regime change – specifically the monetization of silver alongside gold – that would have increased both the U.S. money supply and the rate of inflation relative to the gold standard's "core" country, Britain. The specific events that gave rise to the belief in a regime change were the Bland-Allison Act of 1878, the prolonged agitation for the free coinage of silver – which lasted at least from 1879 until its weakening in late 1896 – the Sherman Silver Purchase Act of 1890, the draining of U.S. gold reserves during the 1890s, and the support given to the free-silver movement by influential elements in the Democratic Party. The authors argue that their finding of a significant dollar-peso problem quantifies the keen insights of Friedman and Schwartz (1963) and adds to the quantitative findings of some other investigators.

The Interwar Period

In Chapter 5, Michael D. Bordo and Ronald MacDonald apply the methods used in Chapter 3 to test for monetary independence in the interwar gold exchange standard period, a period that Hallwood, MacDonald, and Marsh

in Chapter 2 found to be credible. Interestingly, and in terms of its credibility, Bordo and MacDonald find that the system behaves much as in the classical gold standard period.

In Chapter 6, C. Paul Hallwood, Ronald MacDonald, and Ian W. Marsh push the analyses of Chapter 2 one step further and attempt to assess the importance of economic fundamentals in forcing both the United Kingdom and the United States off the gold standard in 1931 and 1933, respectively. For the United Kingdom they assume that the expected rate of re-alignment is a function of standard macroeconomic fundamentals, such as relative money supplies, current accounts, and relative income, whereas for the U.S. dollar they test Brown's (1940) hypothesis that the expected rate of re-alignment is driven by gold reserves and banking crises. Such simple models are shown to work for the interwar period, in the sense that they have good in-sample explanatory power and coefficients are in general correctly signed and statistically significant. The authors show that for the United Kingdom, simply graphing the fitted expected devaluation along with the actual value shows the former leads the turning point and also the direction of the final change correctly. For the United States, a Vector Autoregression (VAR) analysis shows that both bank failures and gold flows are significant determinants of expected devaluation, and gold (out)flows cause bank failures. The authors interpret this result as reflecting that the Fed's commitment to the gold standard constrained its internal monetary policy.

In Chapter 7, C. Paul Hallwood, Ronald MacDonald, and Ian W. Marsh consider whether the impending war in Europe helped destroy the Gold Bloc in 1936. Specifically, they investigate how the Gold Bloc operated between France, the Netherlands, Switzerland, and Belgium, especially from the time the United States left the gold standard in March 1933 to its end in September 1936. They distinguish two different causes of the abandonment of gold by the Gold Bloc members (France, Netherlands, and Switzerland) in September 1936 – the external and internal inconsistency hypotheses. The external inconsistency hypothesis, extant in the literature, takes the form of an argument that economic causes – high price levels in the Gold Bloc relative to non–Gold Bloc countries (such as the United States and the United Kingdom) – exerted deflationary pressures in the Gold Bloc, which eventually became intolerable. The internal inconsistency hypothesis is that the Gold Bloc became unworkable because of asymmetric military-political shocks emanating from Germany and Italy, which adversely affected confidence in the French franc to a greater extent than either the Swiss franc or the Dutch gilder. The tests employed are based on the kind of credibility tests considered elsewhere in the book, specifically those relying on interest

yield differentials. Although Hallwood, MacDonald, and Marsh find some support for the internal inconsistency hypothesis, the available data does not allow a researcher to claim that either the internal or external inconsistency hypothesis dominates.

Bretton Woods

In Chapter 8, Michael D. Bordo, Ronald MacDonald, and Michael J. Oliver examine the experience of UK sterling in the crisis period between 1964 and 1967. Evidence from credibility tests as conducted in earlier chapters shows that the sterling peg was often not credible and that the speculative attacks that occurred were justified. New archival daily data on sterling reserves shows that UK reserves were lower than official estimates at the time and were in worse shape than policy makers admitted to the public and their own creditors. The authors find that reserve movements driven by monetary and fiscal indiscipline were a key driver of the expected rate of re-alignment. They also show that the Bank of England was sensitive to movements of the exchange rate with respect to the exchange rate band.

The European Monetary System Period

The mean-reverting properties of the ERM experience with fixed exchange rates is tested by Myrvin Anthony and Ronald MacDonald in Chapter 9 for the narrow-band period of the ERM (1979–1992). For this period, the authors show, in contrast to the gold standard periods, a considerable lack of credibility, although they do note that when the other member central banks followed policies consistent with that of the Bundesbank, they were able to buy into its credibility, the Netherlands being a case in point. Proponents of wide-band target zones argue that they can be more stabilizing than narrow bands because, by reducing the likelihood of a relatively safe one-way bet on a re-alignment, they limit speculation against a currency. The likelihood of a safe one-way bet is regarded as more likely in a narrow-band target zone (see Kenen, 1995). In other words, by making it more costly (less safe) for speculators who may attempt to gain from a one-way bet on a re-alignment of the currency, a wide-band target zone tends to be more stabilizing than a narrow zone.

Finally, in Chapter 10, Hali Edison and Ronald MacDonald apply the first system's methods of Chapter 2 to the ERM period and find that this system behaves very much like the classical gold standard in the sense that countries whose currencies exhibit credibility, such as the Netherlands

and Belgium, had some monetary independence, but that this was transitory and only lasted for about a year (a metric similar to what Bordo and MacDonald found in Chapter 3 for the classical period).

MEASURING CREDIBILITY AND MEAN REVERSION IN TARGET ZONE REGIMES

One key issue in a number of chapters in this volume relates to the measurement of credibility in a target zone regime. In this section, we sketch a few methods for testing credibility, which have been widely used in the literature and are used in a number of the chapters in this book. We also briefly summarize the so-called variance *ratio* tests, which are also used in a number of chapters in this book.

Perhaps the simplest test of credibility involves plotting the forward exchange rate against the upper and lower bands of the target zone (Svensson, 1993). The idea here is that in a credible target zone, the forward exchange rate will be the market's expected exchange rate and should be bounded by the upper and lower bands of the target zone:

$$s^l \leq f_t \leq s^u, \tag{1.1}$$

where s^l is the lower band of the target zone and s^u is the upper band. If the forward rate were to lie outside the band, this would be prima facie evidence that the target zone was non-credible.

More precise measures of credibility rely on measuring re-alignment expectations, and in this we follow the methodology of Svensson (1991, 1993) and Bertola and Svensson (1993). In natural logarithms, define the current exchange rate, s_t, as:

$$s_t \equiv x_t + c_t, \tag{1.2}$$

where c_t represents the central parity and x_t represents the deviation of the exchange rate from central parity ($x_t \equiv s_t - c_t$). Using this expression and taking time derivatives, the expected change in the exchange rate may, in turn, be defined as:

$$E[ds_t]/dt \equiv E_t[dx_t]/dt + E_t[dc_t]/dt, \tag{1.3}$$

where $E_t[dx_t]/dt$ is the expected rate of currency depreciation within the band and $E_t[dc_t]/dt$ is the expected rate of re-alignment. So the rationally expected rate of change of the exchange rate is divided into the expected movement "within the band," ($E_t[dx_t]/dt$), plus the expected rate of depreciation of the central parity, ($E_t[dc_t]/dt$).

Let x_t^u and x_t^l denote the upper and lower limits of an exchange rate's deviation from the central parity. The maximum possible changes in the exchange rate within the band are then given by the following weak inequality:

$$\left(x_t^l - x_t\right)/d_t \le E_t[dx_t]/dt \le \left(x_t^u - x_t\right)/d_t\,. \tag{1.4}$$

Assuming that the interest differential measures the total expected change in the exchange rate, the following weak inequality expresses Svensson's "100 percent" confidence interval:

$$\left(i_t - i_i^*\right) - \left(x_t^u - x_t\right)/d_t \le E_t[dc_t]/dt \le \left(i_t - i_t^*\right) - \left(x_t^l - x_t\right)/d_t\,. \tag{1.5}$$

This re-alignment expectation can be calculated if we know the expected change in the exchange rate, $E_t[ds]/dt$, which is easily calculated from the interest differential on the basis that uncovered interest parity is assumed to hold (i.e., in discrete time: $E\Delta s_{t+k} = i_t - i_t^*$). To calculate the expected movement of the exchange rate within the band, $E_t[dx]/dt$, the maximum possible changes in the exchange rate within the band for a particular fixed exchange rate regime must be determined, which requires using the values of the upper and lower limits of the band. For the gold standard periods, these are defined by the gold points; for other regimes considered in this book, these are defined by the allowed movement of the exchange rate above and below the central parity (which for Bretton Woods, for example, was plus or minus 1 percent).[1] It is only when both the left and right sides of the inequality signs are of the same sign that we reject the null hypothesis of no re-alignment expectation.[2]

[1] A numerical illustration may be helpful. Suppose that the expected change in the exchange rate as measured by the interest differential is 5% and that the exchange rate is currently at the center of the zone (i.e., $x_t = 0$ and, therefore, $x^u{}_t - x_t = 0.5\%$, or approximately half the width of the historical gold points). It follows that $4.5\% \le E_t[dc]/dt \le 5.5\%$, and we are confident that depreciation of the central parity is expected. The idea that we are "100%" confident derives from the fact that we are assuming the edges of the target zone, x^l and x^u, are known for certain. But supposing that the exchange rate is again at the center of its zone but that the expected depreciation is only 0.25%, we now calculate $-0.25\% \le E_t[dc]/dt \le 0.75\%$. In this case, the range of expectations spans both a possible appreciation of the central parity and a depreciation. As this range spans zero, we do not reject the null hypothesis that no re-alignment is expected.

[2] The expected rate of re-alignment can be interpreted as the expected devaluation size multiplied by the frequency of re-alignment. Suppose that, conditional on there being a devaluation, the devaluation will be 5%. An expected rate of re-alignment of 2.5% (roughly the average for the sterling-dollar rate through the less credible early part of the classical gold standard for the United States between 1879 and 1896 [see Hallwood,

Svensson (1993) has argued that a more precise measure of re-alignment expectations can be obtained from the so-called 95 percent confidence interval. This relies on a basic theoretical proposition by Krugman (1991) and to Miller and Weller (1991), and is discussed in more detail in succeeding chapters, that within a target zone the exchange rate should be a mean-reverting – or stationary – time series. Based on this, Svensson (1993) calculates the expected movement of the exchange rate within the band as a linear function of the current deviation, x_t, of the exchange rate from the central parity. Imposing rational expectations, the expected movement of the exchange rate within the band over the subsequent m months is the fitted value from the regression:

$$x_{t+m} - x_t = \alpha_0 + \alpha_1 x_t + u_t. \tag{1.6}$$

The availability of the fitted value then facilitates calculation of the discrete time 95 percent confidence interval as:

$$\left(i_t - i_t^*\right) - \left(x_t^{+5} - x_t\right) \leq E_t \Delta c_t \leq \left(i_t - i_t^*\right) - \left(x_t^{-5} - x_t\right), \tag{1.7}$$

where x_t^{+5} and x_t^{-5} represent the plus and minus 5 percent values of x_t.

As we have noted, and as we shall see in more detail later, a relatively straightforward way of testing for mean reversion would be to use a standard unit root test, such as the Dickey-Fuller type test. However, it is now widely accepted that such tests are not very powerful in detecting whether a series is stationary or not, particularly when the series contains a root that lies close to the unit circle. An alternative way of testing for unit roots is provided by the variance ratio test, recently popularized in the economics literature by Cochrane (1988). The variance ratio test is, we believe, especially useful for the kind of exchange rate behavior analyzed in this volume because it can indicate three types of potential behavior in a time series: whether a series contains a unit root and is therefore non-stationary; whether the series is non-stationary and, additionally, exhibits what we refer to as super-persistence (that is, it has a root greater than unity); or whether the series is mean-reverting and therefore stationary. For the last two outcomes, the variance ratio test can be regarded as particularly useful

MacDonald, and Marsh, 1995]) implies that the expected frequency of re-alignment is 0.5 per annum. That is, the market expects a 5% devaluation within the year to happen with a 50% probability. Equivalently, the expected time to a 5% devaluation of the dollar is two years. Thus, although the average expected rate of re-alignment may appear to be small, it can be consistent with quite substantial devaluation expectations. Of course, when the confidence interval spans zero, we cannot reject the hypothesis that the expected probability of a devaluation of any magnitude is zero.