Testing Credibility

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Analysis of credibility became an active research topic once Kydland and Prescott (1977) put a new foundation under earlier work on policy rules. Since that time, and particularly following Barro and Gordon's (1983) JPE paper, there has been an explosion of literature on this topic. Much less has been done empirically. Rogoff's paper is a welcome addition to a small literature on the empirical testing of credibility hypotheses in game theoretical models. Do central banks behave as in Barro-Gordon type models? Are they bold and decisive as McCallum wants them to be? Or do they behave in some other way?

Informally, credibility is easily defined. It is a measure of the confidence that the public has that the central bank (or other policymaker) will follow the policy path to which it is committed. A more precise generic definition brings in the problem of time consistency. A policy is credible if, given his objectives, the policymaker maximizes by choosing the expected policy action
when the time comes to act.

Some of the empirical problems are immediately apparent. Suppose the policy rule is inferred not announced? How does the analyst or the public learn the policy rule other than by observation? With many possible contingent states, there will be uncertainty about how well a state contingent rule is known. The credible policy depends on the objectives of the policymaker, on the expectations of the public, on the public’s knowledge of the rule. All of these are non-observables. Later work, for example influential work on reputation of the policymaker, does not narrow the number of non-observables. Further, these models assume away a major part of a central bank’s problem – the control of the money-supply. As Drs. Issing and Rich note in their papers, economists seeking to test the credibility of a rule-based policy cannot assume a close short-run relation between money and the price level.

It takes a brave economist to undertake empirical work where there are so many unobservables. Fortunately, we have some brave economists – two of them – Axel Weber and Ken Rogoff – at this conference.

Despite the difficulties, some empirical statements can be made. A large part of the literature uses models that are readily rejected. The reason is
that, in the Barro-Gordon model, the inflation rate is non-zero and constant except for shocks. We do not observe constant rates of inflation anywhere. How would we explain changes in inflation, for example between the 1920’s and 1930’s? These models cannot explain why some countries had hyper-inflation in the 1920s while others had stable prices. Nor can they explain as they stand why the inflation rate increased in most countries in the seventies but was lowered in many countries during the eighties and nineties, or why inflation in Japan is negative on average for the past 20 years. I was surprised that Ken chose this framework as the basis for his analysis.

The literature has two or three attempts to give quasi-operational definitions. For the case in which the policymaker announces targets, Cukierman and I defined \textit{average} credibility as the extent to which the public expects the policymaker to deviate from the action consistent with the prior announcement. \textit{Marginal} credibility was defined as the response of the public’s expectations to the announcement of a target. Notice that both of these definitions make credibility a continuous variable, so that the expected rate of inflation can change. Notice also that we get rid of one problem by assuming a policy announcement but do not get rid of all non-observables – e.g., expectations of the public and intentions of the policymaker.
Some additional, significant problems arise in testing credibility models. Most credibility modelling focuses on the policy rule for issuing money, the money supply, but does not model the supply. Moreover, money is used as a medium of exchange because it saves on information costs and transaction costs. These costs are not constant. Changes in intermediation and the growth of intermediaries are important for the rate of growth of the demand for money. Bordo and Jonung's empirical studies suggest that these changes in costs have brought large, permanent changes to the demand for money. Such changes are relevant for the choice of a policy rule. The policymakers response to these changes must be part of any model that tests for credibility.

Further problems arise in empirical testing of credibility because there is uncertainty about the true model of the economy, and policymakers do not announce rules. A policymaker finds it is in his interest to be ambiguous about the rule he follows. Simply put, the combination of neglect of information costs and intermediation, non-observables, ambiguity, and economists' inability to develop an accepted, empirically tested, dynamic model of the economy makes empirical testing of credibility models an exceptionally challenging venture.

Federal Reserve chairmen and other central bankers are adept at making
ambiguous statements about their decisions and future actions. Ambiguity obscures the rule, the timing of policy actions, and the size of prospective changes. Ambiguity increases opportunities for discretionary action. Earlier joint work with Cukierman, further developed in his book, argues that policymakers have an optimal level of ambiguity. They do not maximize credibility—whatever that would mean. Many build credibility to use when they choose to surprise the public. For present purposes, ambiguity makes it difficult to find the precise rule that is followed, to learn what the public anticipates about policy, and to test for credibility. This is also true of price rules in the U.K. and some other countries.

After Alan Greenspan became Federal Reserve chairman, he did more to commit the Federal Reserve to a particular target and rule – an $M_2$ growth path and a price stability ($p^*$) rule – than had been done since the 1920s. Short-term results were discouraging. The $M_2$ growth rate was difficult to control or interpret. Greenspan publicly abandoned $M_2$ growth (and other monetary aggregates) and returned to the tradition of ambiguity and discretionary choice of timing, but he delivered relatively low inflation. Yet Axel Weber’s empirical work assigns a low value to the Federal Reserve’s reputation. The U.S. is near France in his calculations.
What can we learn empirically from observations? If we consider the procedures or rules in countries with lowest inflation, we find many differences. The five countries with lowest rates of inflation from 1974 to 1993 in the Federal Reserve of St. Louis data base do not follow similar rules. I expect they are among the most credible countries because of their results, not their procedures.

Each of the five countries had an inflation of 4% or less for the period. The Bank of Japan is nominally responsible to the Ministry of Finance, although practice varies. Cukierman (1992, p. 451) assigns it the same independence as the Federal Reserve. Yet it has the lowest inflation rate of any country — -1.7% for the 1974–93 period using the GDP deflator. Singapore, the second lowest, doesn’t have a central bank. The Singapore Monetary Authority intervenes in the exchange market when it thinks that is a good thing to do. In both of these countries, it is difficult to make explicit the central bank’s objectives or the public’s expectations.

Germany and Switzerland pursue independent monetary policies and use preannounced monetary targets but sometimes miss the target. The definitions of credibility are more useful here, but sophisticated analysis doesn’t add much to what one learns from the mean and variance of quarterly or
annual inflation rates. People believe that Switzerland and Germany have relatively credible monetary policies because they deliver lower rates of inflation than most other countries. Would we find Switzerland or Germany less credible if they delivered the same inflation rates but did a poorer job of hitting their announced targets? Conversely, would we find them more credible if they hit their targets precisely but had a higher average rate of inflation. Our theories of inflation are not good enough to predict short-term changes in the rate of inflation or to use our models to assign credibility rankings.

What seems important is that Germany and Switzerland promptly correct large errors. In his paper for the conference, George Rich showed us that there were three big misses in money growth after 1970. Reading from his chart, 60% in 1971 is followed by – 20% in 1972. 35% in 1978 is followed by – 25% in 1979. 20% in 1987 is followed by - 10% in 1979. I submit that these instances of decisive correction have more influence on the SNB’s credibility than either small annual departures or exact hits on a target.

Targeting money growth means the price level will be a random walk whatever the expected rate of inflation. Suppose money growth is set to keep expected inflation at zero. A one-time price level change, distributed over time, can give rise to serially correlated, transitory non-zero rates of
price change. Data will show prices rising or falling while the maintained rate of inflation is zero.

Suppose the central bank follows, but does not announce, a rule that keeps money growth equal to real output growth so that the unknown but true value of expected inflation is zero. There is no permanent inflation. There are transitory and permanent changes in the price level that make the rate of price change deviate from zero. For example, there are frequent real shocks or changes in intermediation.

This is, of course, artificial. The public would eventually learn the rule. Nevertheless, it brings out a problem in measuring credibility that should not be ignored, particularly where the rule is opaque and changing. Discussion of inflation for the past 25 years has been plagued by the failure to distinguish temporary and permanent changes in the price level from permanent changes in the rate of inflation.

The fifth country with low inflation is the Netherlands. The Netherlands is an informative case. Here simple observation is clearly consistent with the definitions of credibility but not with the Barro-Gordon model of inflation. The Netherlands follows an easily observed rule. It pegs the guilder to the D-Mark and takes whatever inflation rate results. I believe they joined in
every revaluation of the mark except one. One can treat the exchange rate as an announcement and observe what it is. We know the objective and we can use observation of the exchange rate to judge the credibility of the Netherlands central bank in carrying out its policy.

Or can we? Suppose the Netherlands doesn’t follow Germany in the next revaluation of the mark. That experiment has been run. A one-time failure to revalue enlarged the interest rate differential. It took many years to remove the differential by following a policy of always revaluing with Germany. Nevertheless on Weber’s measures of credibility, the Netherlands has credibility close to Germany’s. Would it not be better to use a market measure such as the interest rate spread on comparable debt as one measure of credibility?

However it is measured, credibility is a stock that rises or falls with policy outcomes. Is the optimal degree of credibility the same as maximum credibility? Should a country build a stock and never use it to satisfy time consistency properties? Or, would it be more useful to analyze a political economy world where the policymaker is less interested in the public interest than in his own interest and the two are not always the same. Even relatively independent central banks have been known to expand money growth
in election years, as much research shows.

We don't need to go to political economy. After Sweden, France, U.K., and Mexico spent $30 billion or more to defend a fixed exchange rate, should they have borrowed more to maintain their credibility (assuming someone would lend?) Was Ricardo right when he told the Bank of England to deflate by 50% to reestablish the pound at the former gold parity? (He later changed his mind.) Economists generally agree with Keynes's ex post judgement that it was a mistake to restore the pound at its prewar parity in 1925.

After World War I, Montagu Norman and Benjamin Strong agreed that both the U.S. and the U.K. should deflate to restore prewar gold parities and price levels. Wouldn't it have been socially better to use up some credibility and avoid the social costs of deflations in at least one country – perhaps even in both?

Consider recent experience in Latin America. After experience with inflation, devaluation and exchange rate problems in three previous election years, Mexico was able to establish sufficient credibility to return to world capital markets after 1989 by adopting institutional reform, and promoting privatization, budget balance, and other reforms. After decades of high inflation, default, devaluation, and workouts, Argentina reformed in 1990. In
1994 Brazil promised to reform for the sixth or seventh time in the past twenty years. Each of these countries received large loans and equity investments from presumptively rational investors abroad. Credibility appears to have increased despite long histories of trouble. This suggests a model in which large discrete changes in credibility can occur following reforms.

Argentina is a particularly interesting example of the use of institutionalization to increase credibility. In the past, I have been skeptical of the practical relevance of the literature on trigger strategies used to punish the policymaker. These models eliminate a most difficult problem by assuming a representative individual who metes out the punishment. This abstracts from the problem of coordinating individual actions to get a social response.

Argentina adopted a currency board but it added an important feature. The public can hold its deposits in dollars or pesos. Any risk of inflationary action can be followed by a shift into dollar deposits. This is an uncoordinated, but so far effective, punishment technique.

Axel Weber made an heroic attempt to see how far sophisticated econometrics can overcome the problems of measuring or approximating such subjective elements as the policymakers’ tradeoffs or the public’s beliefs about those anticipations and the other problems I have discussed. These efforts
are welcome. We learn from them, but I believe we will continue to assess credibility by outcomes rather than econometric models. And, as I have suggested, more weight should be given to market measures.

Next, a word on the value of credibility. Until the EMS ran into difficulties in 1992–93, many papers discussed the role of the EMS in extending credibility from Germany to its neighbors. It is true that inflation rates fell in Europe but the accompanying cost in unemployment was often higher in the EMS than in countries with flexible exchange rates. A few years ago, I computed the maximum level of unemployment experienced during the disinflation of the 1980s and the annualized rate of decline in unemployment from its peak to the end of 1988. Maximum unemployment rates were higher in the EMS than in eight large countries outside. And unemployment rates fell more slowly in the EMS than outside – about 50% slower in my comparison. Germany had one of the slowest rates of decline, although its maximum unemployment rate was lower than in most of the EMS and non-EMS countries.

Of course, factors other than credibility affect these observed differences. But, Germany’s credibility did not reduce costs for the EMS countries below those in the United States, the U.K., Japan or Sweden. Each of the lat-


ter (non-EMS) countries experienced more rapid decline in unemployment rates than Belgium, Denmark, Germany, Ireland or Italy - members of the EMS. (France was omitted because the unemployment rate had only declined slightly and only in 1988, the last year of the sample.)

My conclusion is not that credibility is unimportant. We don't know that one way or the other. Our models either give implications that lead to their easy rejection or to implications that are not easily tested. To get beyond Axel Weber's suggestive measurements of EMS credibility will not be easy. At the subjective level, commitment by Britain to the EMS as a means of lowering the cost of inflation didn't work as expected by its proponents. Nor has the EMS worked to lower social costs of disinflation in Spain, France, and Italy. Reported rates of inflation have fallen, but unemployment rates range from 12% to 24%, hardly a testament to the social benefits of commitment to the European Monetary System or the gain in credibility that such commitment achieves.

Finally, a word about Ken Rogoff's model. Ken sensibly tries to bypass many of the problems I mentioned by drawing testable implications from a more fully specified model than is found in most of the credibility or reputation literature. The main implication is that the import share is negatively
related to the inflation rate if country size is held constant. This is an interesting fact that makes sense for fixed exchange rate countries. Why should it work for countries on fluctuating exchange rates? Ken’s conjecture that unanticipated inflation harms the terms of trade in large countries stretches data averaged over two decades.

I close with a question. Suppose there is a monetary union in Europe. Import share is lower for the aggregate than for the individual countries. Would inflation increase as Ken’s model implies?

My own conjecture is that game theoretic literature teaches us some wrong lessons. Yes, ambiguity is important and so are credibility and the design of institutions. But as a positive theory of inflation, it fails. The great depression and the great inflation were not pre-planned. There were mistakes. It was not a central banker or an obscure economist working in the bowels of the central bank that convinced much of the profession and many policymakers that the Phillips curve tradeoff was permanent or long lasting. It was Samuelson and Solow, leaders of our profession.

Much evidence suggests that the error has been recognized. Central banks are now trying to avoid their past mistakes. Inflation has fallen in the industrial countries. Did the positive theories of inflation predict this?