Central Banks and Economic Policy after the Crisis: What Have We Learned?*

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ABSTRACT. The recent financial crisis has led to an unprecedented degree of policy activism by central banks and governments, institutions which rely in particular on detailed announcements of current and future policies, the use of unconventional policy instruments, and a close coordination of monetary and fiscal policies to contain risk, to manage the recovery, and to manage the exit strategy. This article provides a review of the conditions needed for policies of this type to work, and conditions when unconventional policy instruments or fiscal-monetary package will be necessary. The key lesson for central bank policy in the future lies in the management of expectations and inter-instrument coordination, which justifies publishing interest rate forecasts, spending plans, and tax rate projections in advance. In those cases, policy announcements, if properly communicated, can be used to extend the impact of both conventional and, more importantly in this context, unconventional policy instruments. The article also illustrates how the conflict between the desire to achieve short-run results and the need to achieve a long-run sustainable recovery can be managed.

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1. INTRODUCTION

Stable anchored inflation expectations are even more critical when you’re engaged in unconventional policies, […] Having inflation expectations anchored in this situation has been really, really critical. Risking un-anchoring inflation expectations would be far too risky and far too costly.

Donald Kohn, Vice Chairman of the Board of Governors, Federal Reserve System, Frankfurt am Main, May 21, 2010.

The recent financial crisis has led not only to a recession deeper and more severe than any since the great depression of the 1930s, but also to policy responses that are remarkable for their scope and cost. Those responses are also remarkable for the risks implied (e.g., zero interest rates, doubtful assets on central bank or treasury balance sheets, public debt, potential for future inflation), and for their emphasis on unconventional policy measures, announcements on the future path of policy, contingency planning, and exit strategies. Further, this crisis has led to an unprecedented degree of coordination (over impact and timing) between monetary, fiscal, and unconventional policy measures to the point that the distinctions between them may appear to have vanished. Under what circumstances can policies of this type be expected to work? What lessons should be learned for the conduct of monetary and fiscal policies, and what roles should be ascribed to the central bank and to government in the future?

Since the work of Barro (1974), Sargent and Wallace (1975), and Lucas (1976), forward-looking expectations have been regarded as placing severe limits on what can be achieved in a world of policy conflicts, and for requiring strong policy commitments to get even that far. Time inconsistency (going back on previous policy statements) and the Lucas critique (shifts in behavior as a result of anticipated market events) are often said to imply that such commitments cannot be considered credible and will lead inevitably to failure. In the context of the current recession, this means a loss of the recovery path, creation of unsustainable debt or excessive debt financing costs, future inflation caused by delaying the exit strategy or allowing the debt to be monetized.

These arguments, however, do not allow for the possibility that policymakers will actively engage in managing expectations by making policy announcements, alongside direct policy interventions, for the express purpose of shifting the expectations path itself. The significance of the expression actively managing should be understood to mean that a distinction is being made between the outcomes and stability of rationally expected policies given the behavior of the system as it is (Blanchard and Khan,
1980), and the case where the policy authorities try to influence the behavior of the system itself. (Hughes Hallett, Acocella, and Di Bartolomeo, 2010).

This article focuses on the latter case. If policy makers can do that, private expectations, will be exactly consistent with what both the private sector and policymakers expect the outcomes to be. Consequently, no one will be required to move off their expected path (make expectational errors) for the policies to work. The literature has often used this idea in debates over the feasibility and desirability of trying to anchor inflation expectations for monetary policy changes, or in arguments over the desirability of publishing interest rate forecasts (Soderlind, 1999; Woodford, 2003, 2005; Blinder, Fratzscher, de Hann, and Jansen, 2008; and Rudebusch and Williams, 2008).

This idea is also in the minds of the policy makers. A recent example is the European Central Bank’s concern that long-term policies, introduced to combat the financial crisis (such as greater transparency, new financial market regulations, reduced pro-cyclicality, planned liquidity withdrawals) should be announced early so as to have their effects appear immediately (Trichet, 2008). In a similar manner, Chairman Bernanke of the U.S. Federal Reserve System (Fed) has made many speeches in an attempt to influence current economic conditions by outlining the future path of interest rates, announcing new fiscal stimulus and credit guarantee packages, new bank regulations, or detailing the future exit strategies and the instruments to be used.

However, what the literature has not done is identify the following: (1) the conditions under which the expectations that these interventions or announcements inevitably create can be managed; (2) their effect on the scope for policy making (as opposed to the possibility and importance of managing expectations); (3) how and when unconventional policy instruments will be necessary; or (4) when mutually supporting combinations of fiscal and monetary policy measures would be needed.

For the purposes of this article, unconventional monetary policies will be taken to mean any of the following: quantitative easing (interventions to shore up the banks’ capital or other resources); credit easing (direct lending to financial institutions, providing liquidity to key credit markets, the purchase of long term government securities); or quantitative easing “lite” (using intervention profits to buy long-term debt or to ease the Fed’s balance sheet). Borio and Disyatat (2009), Cúrdia and Woodford (2009), Gertler and Karadi (2009), or Gertler and Kiyotaki (2009) provide greater detail on how these policy instruments work.

This paper therefore investigates the circumstances in which policy announcements, if properly communicated, can be used to supplement or extend the impact of conventional policy instruments. Specifically, the article considers the choice of policies within a general rational expectations framework and shows that policy invariance can only arise in specific cases (empirically where the unit root or rank conditions specified below fail). In all other cases, policy announcements can be used by policymakers to...
help steer economic behavior, and, as a result, certain targets become reachable in reduced time. Thus, expectations typically enhance the power to control an economy over time. The rationale for this result can be understood by using the concept of controllability from the classical theory of economic policy (Tinbergen, 1952), and its dynamic extensions. Put differently, if a policymaker can achieve any desired vector of targets given exogenous expectations, then that policymaker will also be able to do so with endogenous expectations. If nothing else, the policymaker can attempt to steer the endogenous expectations to achieve specific targets in a shorter time.

To make use of this property of rational expectations, however, another ingredient must be present. The policymakers must be able to communicate, in a clear and effective manner, the intent and purpose of their policies, and how exactly these policies will produce the desired result. This will be necessary to convince the private sector that the promised policy measures will in fact be undertaken when they become due and that the intended outcomes can reasonably be expected to be achieved. Otherwise, there are no grounds to suppose that the private sector would shift, or anchor, its expectations in a way that adds to the policymakers’ ability to reach their desired goals such as recovery, smooth exit, debt reduction, and low inflation.

The approach in this paper differs from recent trends in the literature on communication by macro level policymakers. In the proposed framework, the crucial element is to reaffirm the targets and why the policies chosen can be expected to reach them. This is emphasized by Eggertson and Pugsley (2006), Moessner and Nelson (2008), Ferrero and Secchi (2009), and Libich (2009), and by Woodford’s (2003) observation that policy trade-offs will be eased when expectations fall into line. By contrast, much of the communications literature focuses on the quality of forecasts, the divergence or agreement among policymakers, and transcripts or voting records from policy committees (Ehrmann and Fratzscher, 2005, 2007; Jansen and De Haan, 2006; Visser and Swank, 2007).

The rest of the paper is organized as follows. The next section puts the communications problem into a general framework, deriving the reduced and final form of a general model with a single policy maker and rational expectations. The exposition deals with the conditions for static and dynamic controllability and demonstrates that, contrary to conventional wisdom, policy effectiveness can be enhanced by rational expectations. The purpose is to identify the circumstances under which managing expectations is possible, and the conditions when it is not. The next section demonstrates how policy announcements may help achieve recovery, or a sustainable recovery path, with or without the need for an exit strategy to prevent future inflation. That section is followed by a specific illustration of the main point of this paper, i.e., the opportunity for policymakers to manage expectations to their advantage in the context of monetary policy. The final section provides a summary and a review of the lessons for policymakers.
2. WHEN CAN POLICYMAKERS USE ANNOUNCEMENTS OR STEER EXPECTATIONS?

To understand the role of policy announcements and the importance of communication as a way to enhance the effectiveness of policy instruments first requires discussing the conditions under which the policymaker can control a dynamic system.

Any dynamic model can be expressed in a simple general matrix form:

\[ y_t = Ay_{t-1} + By_{t+1/t} + Cx_t + u_t \]

for \( t = 1, \ldots, T \) (5.1)

where \( T \) is a finite, but possibly large number representing the policy horizon; and where \( y_{t+1/t} = E(y_{t+1}/\Omega_t) \) denotes the mathematical expectation of \( y_{t+1} \) conditional on \( \Omega_t \) (the information set available at \( t \)). In this set up, \( y_t \) is a vector of \( n \) endogenous variables at time \( t \); \( x_t \) is a vector of \( m \) potential policy instruments; and \( u_t \) is a vector of exogenous shocks or other influences which have a known mean, but otherwise come from unspecified probability distributions.

Equation (5.1) therefore describes how the economy will actually evolve over time, as a function of past events and in view of expected future events, direct policy interventions, and external shocks or events. The matrices \( A \), \( B \) and \( C \) are constant and of order \( n \times n \), \( n \times m \) respectively, and have at least some non-zero elements. The analysis of this paper is restricted to additive uncertainty in order to be able to obtain exact expressions for expectations of the target variables. There is no clear agreement on the best way to proceed, or even on how to define controllability in expectation, if (5.1) is nonlinear in its parameters.

The model can now be solved from the vantage point of any particular period, say \( t = 1 \), by putting it into final form conditional on the information available in that period (Hughes Hallett and Fisher, 1988; Hughes Hallett, Ma, and Yin, 1996):

\[
\begin{pmatrix}
    y_{1/1} \\
    y_{T/1}
\end{pmatrix}
= \begin{pmatrix}
    I & -B & 0 & 0 \\
    -A & I & 0 & 0 \\
    0 & 0 & -B & I
\end{pmatrix}^{-1}
\begin{pmatrix}
    C & 0 & \cdots & 0 \\
    0 & \ddots & \ddots & \vdots \\
    \vdots & \ddots & \ddots & 0 \\
    0 & \cdots & 0 & C
\end{pmatrix}
\begin{pmatrix}
    x_{1/1} \\
    x_{T/1} \\
    u_{1/1} \\
    u_{T/1}
\end{pmatrix}
+ \begin{pmatrix}
    Ay_0 \\
    By_{T+1/1}
\end{pmatrix}
\]  

(5.2)

In the above representation, \( y_0 \) is a known initial condition for \( t = 1 \); and \( y_{T+1/1} \) is some assumed or projected terminal condition, most likely that which describes the economy’s expected long-run equilibrium state as part of \( \Omega \). Although Equation (5.2) has been solved from the point of view of \( \Omega_1 \), it could have been derived for each \( \Omega_t, t = 1, \ldots, T \), in turn (where \( y_{j/0} = E_t(y_j) \) if \( j \geq t \), but \( y_{j/0} = y_j \) if \( j < t \); and similarly for \( x \) and \( u \)). However, for simplicity, only the \( \Omega_1 \) case is considered in what follows. Generalizations to any value of \( t \) are then obvious.
The solution of Equation (5.2) clearly implies that neither the policymakers nor the private sector is required to move off their expected paths (make expectations errors) for the policies to work. In fact, Equation (5.2) shows precisely the opposite; that those expectations are exactly consistent with what the private sector/policymakers expect the outcomes to be. The real point is whether policies, or policy announcements, can be found that will shift the expectations path by the required amount. The task of the paper is to find the conditions under which that can be done.

Previous work by Hughes Hallett, Di Bartolomeo, and Acocella (2008) shows that the model solution, Equation (5.2), always exists so long as the matrix product $AB$ does not contain a unit root. A weaker condition guaranteeing that this condition will hold when $T \to \infty$ is the usual condition for a stable rational expectations equilibrium that the behavior of the (5.1) must remain bounded in all periods (Hughes Hallett and Fisher, 1988).

Given the above condition, Equation (5.2) can now be rewritten as:

$$
\begin{pmatrix}
  y_{1/1} \\
  \vdots \\
  y_{T/1}
\end{pmatrix} =
\begin{bmatrix}
  R_{11} & \cdots & R_{1T} \\
  \vdots & \ddots & \vdots \\
  R_{T1} & \cdots & R_{TT}
\end{bmatrix}
\begin{pmatrix}
  x_{1/1} \\
  \vdots \\
  x_{T/1}
\end{pmatrix}
+ 
\begin{pmatrix}
  b_{1/1} \\
  \vdots \\
  b_{T/1}
\end{pmatrix}
$$

or

$$
y = Rx + b \quad (5.3)
$$

where each $R_{i,j} = \frac{\partial y_{i/1}}{\partial x_{j/1}}$ is an $n \times m$ matrix of policy multipliers for $t, j = 1…T$. The $R_{i,j}$ sub-matrices are the standard causal multipliers between $y_{t/1}$ and $x_{j/1}$, incorporating a delay of $t – j$ periods between implementation and realization, when $t \geq j$. But sub-matrices $R_{i,j}$, where $t < j$, denote the anticipatory effects, on $y_{t/1}$, of an announced or anticipated policy change $x_{j/1}$ at some point in the future.

The policymaker may now be interested in two types of controllability. The first type is static or Tinbergen controllability. Static controllability is normally defined as the set of conditions that must hold if an arbitrary set of target values for the endogenous variables $y_j$ is to be reached in each period – at least in expectation, given that the original model is stochastic. Define those target values to be $y_{i/1}^d$, where superscript $d$ denotes a desired value from the perspective of period 1. Given that, $y^d$ can be defined to be the stacked vector of those desired values across all time periods.

Static controllability, in each period in turn, therefore requires the matrix $R$ in Equation (5.3) to possess an inverse. The necessary condition for this is that $n = m$; i.e., there are at least as many instruments as targets. Linear independence in the impacts of the instruments on the targets is then a
sufficient condition. There is, therefore, no generalization or change to the static controllability conditions when there are rational forward looking expectations.

The second type of controllability is dynamic controllability. An economy is said to be controllable dynamically if a sequence of instrument values $x_1, \ldots, x_t$ can be found to reach an arbitrary value, $y^d_t$, for the target variables in period $t$, at least in expectation, given an arbitrary starting point $y_0$ (Holly and Hughes Hallett, 1989). In this case, the policymaker would no longer be concerned with the period-by-period controllability of the target variables between periods 1 and $t$. Viewed from period 1, dynamic controllability requires instead a sequence of actual or intended instrument values $x_{1/1}, \ldots, x_{T/1}$ that guarantee the desired targets can be reached in period $t$. Given Equation (5.3), this will be possible only if the sequence of policy multipliers and anticipatory effects, $R_{1,1}, \ldots, R_{t,T}$, is of full rank: $r(R_{1,1}, \ldots, R_{t,T}) = n$, given an arbitrary initial state $y_0$ and a terminal condition $y_{T+1/1}$. These controllability conditions contain a generalization over the traditional case with backward looking models. If $n > t$, which is entirely possible for small values of $t$, then dynamic controllability will be available through the reactions of $y_{1/1}$ to the implemented policy choices $x_{1/1}, \ldots, x_{t/1}$; and through the anticipatory effects of announced or expected policy interventions that lie in the future: $x_{t+1/1}, \ldots, x_{n/1}$. That implies the policymaker can use policy announcements, in addition to policy interventions, to guide the course of the economy. In a conventional model that would not be possible since $R_{t,j} = 0$ for all $j > t$. In effect, policymakers have a greater number of policy “instruments” at their disposal.

This result implies first that $y_{1/1}$ itself is controllable from the first period, even if there are insufficient instruments ($m < n$), provided that $T \geq n$ and $r(R_{1,1}, \ldots, R_{t,n}) = n$. Astute policymakers will therefore realize that good communication lies at the heart of the policy problem if they want to reach their policy targets in the early periods or at lower cost. This is a fact that has not been lost on central bank policymakers in their attempts to control or anchor private sector expectations of future inflation in such a way as to make interest rate policies more effective (Woodford, 2005; Blinder et al., 2008; Rudebusch and Williams, 2008).

Second, dynamic controllability is possible with a much reduced instrument set compared to static controllability. There are two parts to this reduction: (1) the ability to use one or more instruments sequentially rather than a group of several instruments used once and in parallel; and (2) the ability to augment or replace parts of an existing policy strategy with announcements of future policy changes.
Third, while $x_{t/1}$ will represent implemented decisions when the policy maker comes to control $y_{t/1}$, the $x_{2/1},...,x_{n/1}$ values, being policy announcements, might never be carried out. However, because they are decisions that lie in the future, the possibility of time inconsistency plays no role in the controllability of $y_{t/1}$ so long as they are genuinely held expectations at this point. Thus these expectations of future actions will be genuine because they are the values that deliver the first best outcomes. Policymakers have no incentive, strategic advantage or interest in choosing to make themselves worse off than they need to be.

The following proposition can now be stated.

**Proposition (announcement based controllability):** Forward looking rational expectations enhance the power to control an economy over time in that policy announcements may be used to supplement and extend the impact of conventional policy instruments. Controllability is now available with a reduced instrument set from $t = 1$, if $r(R_1,...R_n) = n$.

The corollary to this proposition is that all $y_{t/1}$ values, including the first period’s targets $y_{1/1}$, are now dynamically controllable if the rank condition in our proposition holds. This is an important extension over conventional dynamic controllability where period $t = n$ is the earliest date at which the policymaker can obtain controllability if he has a single policy instrument; or $t = n/2$ if there are two instruments, and so on. Thus, $y_{t/1}$ is controllable from the first period, even if there are insufficient instruments ($m < n$), provided that both $T \geq n$ and the proposition holds.

The reason time inconsistent behavior will not appear here must be clarified. Controllability at period $t$ means that, barring unforeseen shocks, policymakers will be able to reach their first best values for $y_t$ in expectation. Hence, $y_{t/1} = y_{t/1} = y_t^{d}$ are fixed and known quantities. But $y_{t/1} = y_{t/1}$ is fixed by history; and $x_{t/1} = x_{t/1}$ likewise. Hence, if nothing else changes, $x_{t/1} = x_{t/1}$. Although policymakers are free to set $x_{t/1} \neq x_{t/1}$, they would never do so because $y_t^{d}$ is a first best value, which can be reached given no further information changes or unforeseen shocks. So to assert time inconsistency in this case is to claim that rational policymakers would deliberately choose to make themselves worse off, given the chance, and that the private sector should expect them to try to do so. Such a claim is hardly rational.

Thus, although examining the conditions that permit effective signaling and commitment is important in many situations, recognizing that a class of problems exists for which they are neither necessary nor relevant is equally important. Moreover, this class of problems will typically be a large one, given that it includes all possible cases down to just one instrument and many targets if $T \geq n$ is large enough. Hence, time inconsistency is an exception rather than the rule: it will only appear if policymakers are impatient, but have too few instruments.

8
The importance of providing credible, convincing explanations of future policies and target values, and the ability to reach them, is now obvious. If the policymakers and the private sector share information sets or, if policymakers are thought to possess superior information which they share with the private sector, then the economy will reach its first best outcomes. In this case, credibility requires private agents to check if the policymakers’ announcement/explanations match their own projections, in so far as they have firm projections. But if they do not share information, or if the private sector has access to better information, then the policymakers’ announced outcomes will not be reached. Instead the outcomes will be what private agents expect to happen given the announced policies. Policymakers then have an incentive to adjust to regain their preferred target values. But that is the normal process of correcting an implementation error, not time inconsistency.

3. WHY SHOULD POLICYMAKERS TRY TO MANAGE EXPECTATIONS?

To illustrate the relevance of our analysis, consider a simple macroeconomic model formed by two equations that describe the supply side (a forward looking Phillips curve) and the demand side (a dynamic IS curve) of the economy:

\[ \pi_t = (1-\lambda)\beta E_t\pi_{t+1} + \lambda\pi_{t-1} + \kappa y_t + \phi f_t + \varepsilon_t \]  
\[ y_t = E_t y_{t} - \sigma (i_t - E_t\pi_{t+1}) + \chi f_t + \nu_t \]

where \( \pi_t \) is the inflation rate, and \( y_t \) is the output gap relative to a non-market clearing trend – or relative to the natural rate of output arising from monopolistic competition in the goods market (Blanchard and Kiyotaki, 1987), or a gap created by tax distortions elsewhere in the economy (Alesina and Tabellini, 1987). In this model, \( f_t \) and \( i_t \) are the fiscal and monetary (nominal interest rate) instruments; \( \varepsilon_t \) and \( \nu_t \) are (white noise) supply and demand shocks. All remaining symbols are positive parameters.

The economy described by Equations (5.4) and (5.5), with \( \beta \) either zero or different from zero, is statically controllable if both fiscal and monetary policy are available and linearly independent (i.e., if \( \phi, \chi \neq 0 \)). The matrix of policy multipliers, \( R \) in Equation (5.3), is then non-singular and static controllability is guaranteed. By contrast, if only one policy instrument (e.g., monetary policy) is available, the matrix \( R \) is not square and static controllability is lost. The provisional lesson to be drawn is that the policymaker must use both policies together (i.e., monetary policy with a full stimulus package) if he wants to achieve timely results in a crisis: for example, to arrest a further or deeper crash. Otherwise, he must be satisfied with and accept a slower recovery using dynamic controllability over two periods to reach certain targets along the way, and especially if the intention is to avoid relapses in the recovery path.
(the second dip in a double dip recession for example; or inflationary pressures created through debt or irresponsible fiscal or monetary expansions).

However, if only one instrument, e.g. monetary policy, is available and the conditions for dynamic controllability are satisfied, the policymaker can have static controllability by using that instrument at time \( t \) and announcing a proper monetary policy for the next period, as is done in the next section.

Additional examples can easily be generated that imply instant controllability by choosing mixed policies: for example, monetary policy plus announcements about future fiscal policy; or fiscal policy and announcements of future monetary policies. The Fed and Treasury adopted the former strategy at the onset of the current recession when Congress was debating and enacting the Troubled Asset Relief Program (TARP) and fiscal stimulus packages. Once they were put in place, the strategy switched to the second option with a clearly defined program of stimulus expenditures from the Treasury and announcements from the Fed of how to manage the exit strategy.

4. COMMUNICATION EVEN WITHOUT KEYNESIAN FISCAL POLICY EFFECTS

One of the great debates of monetary policy is whether central banks should allow forecasts of future interest rates to be published. Rudebusch and Williams (2008) and Eusepi and Preston (2010) argue this can be used to strengthen economic policy. Archer (2005), Moessner and Nelson (2008), and Ferrero and Secchi (2009) provide evidence to support this view. But others argue that to do so may imply a stronger consensus or more certainty about future policies than actually exists; or that it may propagate errors and make adjusting policies again later in the face of unexpected shocks difficult. Also, private agents could overreact to noisy public signals, but under-react to more accurate private information (Faust and Svensson, 2002; Amato, Morris, and Shin, 2003; Walsh, 2007).

To address this dispute, consider an economy represented by the following model:

\[
y_t = \rho y_{t-1} + \alpha (\pi_t - E_t \pi_{t+1}) - \beta (i_t - E_t \pi_{t+1}) + \varepsilon_t
\]  
\[
i_t = c_0 + c_1 (\pi_t - \pi^*) + c_2 y_t + \nu_t
\]  

(5.6)  
(5.7)

As before, \( y_t \) is the deviation of output from its natural rate; \( \pi_t \) is the rate of inflation; \( E_t \pi_{t+1} \) is the private sector’s current expectation for the rate of inflation; and \( \pi^* \) is the government or central bank’s target inflation rate; where \( i_t \) is the nominal rate of interest, \( \varepsilon_t \) is a supply shock with mean zero and constant variance, and \( \nu_t \) is a monetary policy shock likewise with mean zero and constant variance. All remaining symbols are positive parameters.
Equation (5.6) is an elaboration of the standard model that has been part of the theory of monetary policy since the introduction of the Barro-Gordon model in 1983. It consists of a short run Phillips curve with persistence, set within a standard forward looking Lucas supply function and then elaborated to include the effects of real interest rate changes on output. The only policy instrument in this example will be monetary policy: the current interest rate, \(i_t\). Equation (5.7) is a Taylor rule controlling monetary policy: \(c_0\) is a constant term reflecting the equilibrium rate of interest; \(\nu_t\) the possible control errors; and determinacy (the Taylor principle) suggests that \(c_1 > 1\).

The reduced form for Equations (5.6) and (5.7), corresponding to Equation (5.2) above, does not allow static controllability since the matrix \(R\) in Equation (5.3) is not square if only contemporaneous instruments are to be used; there being one instrument, \(i_t\), and two targets, \(\pi_t\) and \(y_t\), in each time period. Because deriving the relevant policy multiplier matrices in this case is difficult, the necessary expressions have been set out in the technical appendix to allow the interested reader to verify the results of this section. However, the two-period policy problem can be written as above using the complete two-period version of Equation (5.2) to obtain Equation (5.8) in the appendix. Controllability now emerges because both the upper and lower partitions of the multiplier matrix in Equation (5.9) of the appendix are non-singular. This will be true unless the underlying parameters satisfy \(\alpha = \beta\) exactly in the upper sub-matrix (for current outcomes); or \(\alpha = \beta c_1\) in the lower one (for future expected outcomes). These are sufficient conditions; and they cannot both hold simultaneously since the Taylor principle requires \(c_1 > 1\). So, in this set up, policymakers are guaranteed to control either future expectations or current outcomes through policy announcements/forecasts, or both. Beyond that, there is one particular value of the parameter that controls the economy’s dynamics, \(\rho\), which can lead to singularity for the whole system, which corresponds to the unit root condition previously identified in discussing the general case.

Hence, since \((y_t, \pi_t)\) and \((y_{t+1}, \pi_{t+1})\) are current and expected future target values from the perspective of period \(t\), policymakers can control not only current inflation and output (in expectation at least), but also inflation expectations and growth forecasts for the next period. That adds to their power to control inflation (and output or employment) by anchoring the private sector’s expectations.

This example is a further illustration of dynamic controllability under forward-looking expectations, and makes the case for publishing conditional forecasts of future interest rates as a normal part of the monetary policy framework. Indeed, achieving successful outcomes would become even more difficult if inflation expectations could not be tied down at the same time as inflation itself. There might be other ways of controlling the outcomes for \((y_{t+1}, \pi_{t+1})\) in period \(t+1\) of course; for example using current and past interest rates as implied by Equation (5.9). But that is a conventional backwards looking
attempt to use dynamic controllability, and it will still fail to tie down or anchor expectations in future periods.

5. CONCLUSIONS
The recent financial crisis has led to a recession deeper and more severe than any since the great depression of the 1930s. As a result, it has led to policy responses that are remarkable for their activism and for their costs. They are also unusual for their risks (zero interest rates, doubtful assets on central bank or treasury balance sheets, public debt, and future inflation), for their use of unconventional policy measures, and for their extensive use of announcements on the future path of policy, contingency planning and exit strategies. Under what circumstances can policies of this type be expected to work, and what lessons can be learned for the conduct of monetary and fiscal policies in the future?

This paper shows that policy failures only emerge when there is a conflict between public and private information sets; or if there is insufficient time or scope to use the policy instruments to reach all the targets required. But, in the absence of such restrictions, policy makers should be able to harness private expectations to help them achieve their targets. In that sense, resolving a financial crisis should be easier than is generally supposed. That is not to suggest the resolution will be easy; it will depend on the depth of the recession, how well the recovery strategies are communicated, the quality and consistency of public and private information, and how well the private sector understands the behavior of the economy.

The paper also shows that forward-looking expectations are a powerful mechanism, in combination with the chosen policy values, for influencing the natural dynamics of the economy. Knowing the conditions under which such expectations can be managed to achieve the desired outcomes (recovery path) is important, as is testing if they are satisfied before embarking on a policy program that depends on expectations to reach its objectives.

The proposition on announcement-based controllability in this paper has been derived to supply a rank condition that defines the circumstances under which rational expectations can be used to increase a policymaker’s power to control an economy over time. That proposition shows how communication and policy announcements can then be exploited to supplement and extend the impact of conventional policy instruments. This gives a formal justification for using policies designed to manage expectations, such as publishing interest rate forecasts, or a future exit strategy, or the details of a program of quantitative easing, as well as defining the circumstances in which expectations cannot be anchored or steered (known as cases of policy impotence, instances in which it would be wiser for the Federal Reserve System in a particular country not to act).

One implication of this condition is that, in the absence of changes in information, once a policy sequence has been announced there can be no question of revising an announcement for strategic reasons,
or of expecting it to be revised, because policymakers can and are known to be able to reach their first best outcomes. So they have no incentive or any interest in not following through on their announcements because not doing so would only make them worse off.

A second implication is that the quality and credibility of communication by policy makers is a key issue. Examining the conditions that permit effective signaling and commitment is important. But equally important is to recognize that there is a large class of problems for which effective signaling and commitment are neither necessary nor relevant. However, clear communication is still required so that agents can check the consistency of the announced policies and target values with their own information. In practice, this will cover a large class of policy problems because it implies that any number of policy targets can be controlled (in expectation) if the policy horizon is long enough.

This last point then leads to four specific conclusions. First, successful communication will contain two elements: consistency with the announced targets, and the setting out of clear priorities and target values to signal credibility (when there are too few instruments or too few time periods to allow instant success). Second, policymakers who are patient can achieve the goals that they want (their first best targets) if they have the time, \( t \geq n \), or enough policy instruments at their disposal. Third, time inconsistent behavior is therefore likely to be the exception, but will become a problem if policymakers persuade themselves that they need to reach too many targets in too short a time. Finally, coordinated fiscal and monetary policy packages, and unconventional policy instruments are typically indispensable if time horizons are short.

REFERENCES


APPENDIX

Given the model represented by Equations (5.6) and (5.7), the two-period policy problem can be rewritten using the complete two-period version of Equation (5.2) to obtain:

\[
\begin{bmatrix}
y_t
\pi_t
y_{t+1}
\pi_{t+1}
\end{bmatrix} = \begin{bmatrix}
I & -B
-A & I
\end{bmatrix}^{-1} \begin{bmatrix}
C & 0 & i_t
0 & C & E_{t+2}
\end{bmatrix} \begin{bmatrix}
y_0
\pi_0
E_{t+2}
\end{bmatrix} + \frac{1}{\Delta} \begin{bmatrix}
\varepsilon_t + \alpha u_t
u_{t+1} - c_2 c_1^{-1} \varepsilon_{t+1}
E_{t+2}
\end{bmatrix}
\]

\[ (5.8) \]

where 
\[ A = \begin{bmatrix}
1 & 0 & 0 & 0
-c_2 c_1^{-1} & 1 & 0 & 0
\end{bmatrix},
B = \begin{bmatrix}
0 & 1 & 0 & 0
0 & -c_2 c_1^{-1} & 0 & 0
\end{bmatrix},
C = \begin{bmatrix}
\alpha - \beta c_1
\beta c_2 + 1
\end{bmatrix}
\text{ and } \Delta = (1 + \alpha c_1^{-1} c_2) \neq 0.

The policy multiplier matrix for this model is then:

\[
\frac{1}{\Phi} \begin{bmatrix}
(\alpha - \beta c_1) \Delta & (\beta - \alpha)(1 + \beta c_2)
\rho (\beta - \alpha)(\alpha - \beta c_1) c_1^{-1} c_2 + (1 + \beta c_2) \Phi & -c_2 c_1^{-1} (\beta - \alpha)(1 + \beta c_1)
\rho (\alpha - \beta c_1) c_2 \Delta & (\beta - \alpha) \Delta
-c_2 c_1^{-1} \rho (\alpha - \beta c_1)
\end{bmatrix}
\begin{bmatrix}
i_t
E_{t+1}
\end{bmatrix}
\]

\[ (5.9) \]

where \( \Phi = \Delta^2 c_1 + \rho (\beta - \alpha) c_2. \) Putting Equation (5.9) back into Equation (5.8) indicates that \((y_t, \pi_t)\) and \((y_{t+1}, \pi_{t+1})\) are both statically controllable in this economy using current policies and announcements or projections of future actions so long as \(\alpha \neq \beta\) for the immediate targets \((y_t, \pi_t)\), and as long as \(\alpha \neq \beta c_1\) for next period’s targets \((y_{t+1}, \pi_{t+1})\). Note also that if contemporaneous policy instruments only are allowed to be used, then the announcements of future policy, \(E_t(i_{t+1})\), cannot appear in Equation (5.9), reducing the associated multiplier matrix to a single column. Static controllability is therefore lost, and the matrix \(R\) from Equation (5.3) is not square (having dimensions \(2T \times T\) for a \(T\)-period problem).