Forward Guidance: Communication, Commitment, or Both?*

Marco Bassetto†

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Abstract

Faced with the constraint of the zero lower bound on interest rates, central banks around the world have engaged in forward guidance as one instrument to stimulate the economy. To properly ascertain the potential benefits of forward guidance as an independent tool of monetary policy, it is important to understand how it can work. I analyze the strategic interaction between households and the central bank as a game in which the central bank has access to cheap talk. In the absence of private information, the set of equilibrium payoffs is independent of the announcements of the central bank: forward guidance as a pure commitment mechanism ("Odyssean forward guidance") is a redundant policy instrument. When private information is present, central bank communication can have social value, and a central bank's communication strategy interacts with its credibility. Forward guidance emerges as a natural communication strategy when the private information in the hands of the central bank concerns its own preferences or beliefs.

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†UCL, Federal Reserve Bank of Chicago, and IFS

1 Introduction

With interest rates effectively at the zero lower bound in the United States, the Euro Area, Great Britain, and Japan, monetary authorities across the world have looked for alternative tools to stimulate the economy. The resulting unconventional monetary policy has revolved around two main pillars: forward guidance and quantitative easing. In this paper, we will consider the role of forward guidance in helping the conduct of government policy.[1] We define forward guidance as a situation in which central banks provide direct statements about the future path of their policy tools. To some extent, central banks have provided some forward guidance in their policy statements for years, as part of their broader discussion of their view on the underlying conditions of the economy. In fact, Campbell et al. [10] find evidence that forward rates often reflect ahead of time what would appear as a monetary policy shock in VARs that are purely based on spot-market interest rates and macroeconomic variables. What has been different recently is that announcements have become more explicit, and that they have been tied to a desire to precommit future policy.[2] Campbell et al. [10] emphasized this distinction by defining "Odyssean" forward guidance a situation in which monetary authorities make statements with the primary objective of committing their future policy, and "Delphic" forward guidance a situation in which statements about future policy are primarily meant to share with the public any superior information that the central bank may have about the future course of policy. In practice, forward guidance is of course never purely Odyssean nor ever purely Delphic. An important message of this paper is that the two elements are intrinsically linked: purely Odyssean forward guidance, when a central bank has no superior information compared to the public, will be shown to be a redundant policy instrument, while pure Delphic forward guidance could be valuable on its own, but will in general lead to better outcomes if it is in the hands of a central bank that is credibly pursuing strategies

[1] For some discussion about the benefits and risks of quantitative easing, see Bassetto and Messer [9], Hall and Reis [16], Carpenter et al. [11], and Del Negro and Sims [14].

[2] Commitment is very often desirable when a policymaker faces forward-looking agents, as emphasized first by Kydland and Prescott [18]. Within the new Keynesian framework, commitment to keep interest rates at zero for longer than would be optimal ex post is particularly valuable; see e.g. Eggertsson and Woodford [15] and Werning [23].

that eschew short-term temptations in favor of long-term welfare.

The approach that we pursue in this paper is based on the theoretical literature on cheap talk.[3] Cheap talk refers to a situation in which a player in a game has the possibility of sending messages that have no direct consequences on the set of future actions available to the players nor on their payoffs. Because of the lack of direct consequences, equilibria in which these messages are ignored are always present, but cheap talk opens the possibility for Pareto superior equilibria to emerge, in which messages reveal some information. When the messenger and the receiver of the message have conflicting objectives, full disclosure of private information will often not be possible.

The current policies of forward guidance map well into the theoretical framework of cheap talk. While central banks around the world have stated their intention not to raise interest rates for extended periods of time, these statements have not *directly* affected their ability to do so. As an example, the Federal Open Market Committee has continued to meet eight times a year, and a simple vote on each of these occasions could have led to a rate increase, independently of previous statements. Similarly, the statements per se do not have a direct effect on macroeconomic fundamentals nor on welfare; to the extent that they have been successful, it is because they influenced the private sector's expectations about the future course of policy. Furthermore, as in all interesting applications of cheap talk, the central bank's incentives are likely to be misaligned with those of the public, at least in the short run: as an example, in the throes of a major recession, the monetary authorities would most likely prefer sending optimistic messages and try to prevent expectations from adding to a downward spiral. The temptation to manipulate messages for short-term gains must be tempered with the potential loss of credibility.

In this paper, we show that forward guidance will be a particularly valuable policy tool when two conditions are met: first, the central bank must have some private information; second, this private information must concern the central bank's preferences or beliefs. The first point is straightforward: cheap talk is redundant if all the players in a game have symmetric information.

[3]See Crawford and Sobel [13]. Stein [22] applied cheap talk to monetary policy in an environment that shares many traits with section 5 in this paper. He focused purely on Delphic forward guidance, abstracting from credibility and the repeated game aspect of the interaction.

The second condition highlights situations in which central bank communication is naturally thought as forward guidance, rather than a more general notion of transparency. As an example, if the central bank has superior information about the current state of the economy, it would be most natural for the central bank to make statements about the state of the economy itself, rather than revealing it indirectly through its intended course of action, which may be a poor proxy for the information that the private sector needs. In such a context, we will show an extreme example in which messages about future policy are *useless*, whereas statements about the state of the economy help in coordinating the private sector.

When the central bank has private information about its own preferences and/or beliefs, the private agents do not care directly about them; rather, that information is valuable to the extent that it helps them predict how the central bank will behave. In this case, forward guidance is a natural message space, because it conveys precisely the information that the private sector needs.

Moving beyond the simple model developed here, the intuition developed in this paper is useful to think about the role of forward guidance for current monetary policy. Is forward guidance a way for the central bank to commit to keep interest rates effectively at the zero lower bound longer than it would otherwise be optimal ex post? If it were widely understood and accepted that optimal monetary policy calls for extended periods of zero interest rates, central banks could have simply staked their credibility on their actions, with no need to supplement them with promises. As an example, it is widely understood and accepted that keeping inflation low is desirable; many central banks around the world have not adopted an explicit inflation target, but they still have managed to build their credibility in sustaining low inflation. It is more plausible that forward guidance is needed because the models in which interest rates are optimally kept at zero for an extended period are not universally understood and accepted. In this case, forward guidance could play a role to signal that central banks believe in the prescriptions stemming from these models, and will set their policy based on these beliefs.

2 A simple model

We work within the context of the Barro-Gordon model [7].[4] Time is infinite and discrete. The economy is populated by a continuum of private agents ("households") and a government (or central bank). Uncertainty in the economy is described by a state space Ω, whose generic element is ω. The state ω will contain a realization of three sequences:

- A sequence of potential output $(y_t^*)_{t=0}^{\infty}$, which we assume to be uniformly contained in $[y^\ell, y^h]$;
- A sequence of target inflation $(\pi_t^*)_{t=0}^{\infty}$, uniformly contained in $[\pi^\ell, \pi^h]$;
- and a sequence for a sunspot variable $(s_t)t = 0^{\infty}$, which (without loss of generality) is independently and identically distributed according to a uniform distribution on [0,1].

In addition to a realization of these sequences, the state of nature may contain other variables, such as advance signals that the households or the government may receive about current and future realizations. In general, the state of nature will not be known by either the government or the agents as of time 0, but it will be gradually revealed over time. For now, we generically denote as $\{\mathcal{F}_t\}_{t=0}^{\infty}$ and $\{\mathcal{G}_t\}_{t=0}^{\infty}$ the filtration of what is known at the beginning of period t by the households and the government, respectively. Throughout the paper, we will retain the following two assumptions about $\mathcal{F}_t$ and $\mathcal{G}_t$:

Assumption 1 *The realization of s_t is in the information set of both households and the government at the beginning of period t, whereas no avdance information is available about it, so that the distribution of s_{t+1} conditional on $\mathcal{F}_t$ and $\mathcal{G}_t$ coincides with the unconditional distribution (uniform on $[0, 1]$).*

[4]The intuition developed here extends to the standard new Keynesian model, which I plan to consider in the future. The advantage of the Barro-Gordon model is that inflation is directly determined by the government, whereas in the new Keynesian model current inflation and output depend on expectations about future policy.

Assumption 2 *$\mathcal{F}_{t+1}$ is a finer partition than $\mathcal{G}_t$, that is, any private information that the government may have at the beginning of period t becomes common knowledge at the beginning of period $t+1$.*

Assumption 1 is mostly a technical assumption: it ensures that the set of equilibrium payoffs is convex. Assumption 2 implies that households eventually learn the same information that the government had; this will make it easier for them to detect government deviations from equilibrium play and will in turn greatly simplify our analysis. In what follows, it is not essential that this information is known by the households with a delay of at most one period; we could assume longer delays, as long as they are finite. While I conjecture that results extend to the case of persistent private information, in which households may never learn what the government observed, the analysis of this case is considerably more involved.

After information has been revealed to households and the government, the sequence of events within each period t unfolds as follows:

1. The government can send a message m_t to the households, out of some set $\mathcal{M}$. "Forward guidance" is a situation in which the message is directly about the inflation level that will be chosen in stage 4 (or the inflation level that will be chosen in future periods in stage 4).

2. Households form expectations about inflation π_t and aggregate output y_t, based on the information currently available to them; y_t^e and π_t^e represents the household average expectation.[5]

3. The government sets inflation $\pi_t \in [\underline{\pi}, \bar{\pi}]$,[6] and output is realized according to an expectations-augmented Phillips curve:

$$y_t = \theta y_t^* + (1-\theta) y_t^e + \lambda(\pi_t - \pi_t^e). \tag{1}$$

[5] In equilibrium, all households will have the same expectation.

[6] We impose exogenous bounds $\underline{\pi}$ and $\bar{\pi}$ for convenience, so that it is not necessary to discuss the consequences of government strategies that lead to nonexistence or infinite losses.

Barro and Gordon's original specification sets $\theta = 1$.[7] In their setting of symmetric information, that we will study in section 3, this makes no difference. However, we allow for the possibility that the government has superior information about y_t^* and that a strategic complementarity among private households leads to higher output when private-sector output expectations are more favorable.[8]

We assume that the government's[9] loss function is

$$E\sum_{t=0}^{\infty}\beta^t[(y_t - y_t^* - k)^2 + \alpha(\pi_t - \pi_t^*)^2], \tag{2}$$

where E represents the unconditional expectation before any information is revealed and k is a bias in the government's output target. As in Barro and Gordon, the interesting case is when $k \neq 0$ (and usually we think $k > 0$), so that the government has a temptation ex post to resort to unexpected inflation to stimulate the economy.

A household's loss function is

$$E\sum_{t=0}^{\infty}\beta^t[(y_t - y_t^e)^2 + (\pi_t - \pi_t^e)^2],$$

which simply means that in an equilibrium households will set their expectations rationally:

$$y_t^e = E[y_t|\mathcal{F}_t, m_t], \quad \pi_t^e = E[\pi_t|\mathcal{F}_t, m_t]. \tag{3}$$

While ω describes the sequence of exogenous shocks, to define an equilibrium we also need to keep track of (public) histories of play. As is standard (see e.g. Chari and Kehoe [12]),

[7] Barro and Gordon's model is also expressed in terms of unemployment, rather than output, but this makes no difference for the results.

[8] There is a large literature that studies the role of dispersed information in coordinating individual actions, using the global games approach from Morris and Shin [20]. Particularly relevant are the macroeconomic applications appearing in Hellwig [17], Amador and Weill [2], Lorenzoni [19], and Angeletos and La'O [3]. In that literature, government disclosure of information need not be beneficial, in that it may lead the private sector to focus too much on public signals and not enough on private signals; these issues are discussed especially in Morris and Shin [21] and Angeletos and Pavan [4, 5]. Here, I abstract from this complication because information is symmetric within the private sector, so government disclosure will be unambiguously beneficial.

[9] We will use "government" and "central bank" interchangeably. There is a single policymaker.

to describe the set of possible equilibrium payoffs it is sufficient to keep track of the history of play by the large agent in the economy (the government).[10] We will thus define a history at the message stage as $h^t := \{m_s, \pi_s\}_{s=0}^{t-1}$, and a history at the expectations-setting stage as $h^{et} := (\{m_s, \pi_s\}_{s=0}^{t-1}, m_t)$.[11]

A government strategy is a $\mathcal{G}_t$-measurable mapping σ^g from (Ω, H^t) into a distribution over $\mathcal{M}$, and from (ω, H^{et}) into a distribution over $[\underline{\pi}, \bar{\pi}]$.[12] A (symmetric) household strategy is a $\mathcal{F}_t$-measurable mapping σ^p from (Ω, H^{et}) to $[\underline{\pi}, \bar{\pi}] \times [y^\ell, y^h]$.[13]

When the government and the households play a strategy profile σ^g, σ^p, their play induces a probability distribution over outcomes (ω, H^∞).

A strategy profile (σ^g, σ^p) is an equilibrium if:

- Given any (ω, h^t) and given that future play will occur according to (σ^g, σ^p), any message in the support of $\sigma^g(\omega, h^t)$ is optimal for the government.

- Given any (ω, h^{et}) and given that future play will occur according to (σ^g, σ^p), any inflation rate in the support of $\sigma^g(\omega, h^{et})$ is optimal for government.

- Given any (ω, h^{et}) and σ^g,

$$y_t^e = E[y_t | \mathcal{F}_t, m_t; \sigma^g]$$

and

$$\pi_t^e = E[\pi_t | \mathcal{F}_t, m_t; \sigma^g].$$

[10] As discussed in Bassetto [8], this is no longer sufficient when we are interested in studying the set of allocations that can be uniquely implemented under commitment.

[11] H^t and H^{et} are the corresponding sets, and to define measurability conditions for strategies we endow them with the Borel σ-algebra.

[12] We assume here that the government does not directly observe y_t^e and π_t^e. When the government has all the information that households have, this makes no difference: within an equilibrium, y_t^e and π_t^e are deterministic functions of what the government knows. This assumption is more relevant when households have superior information, as in the example of section 6. This example is relevant when the government cannot infer the missing information directly from household expectations.

[13] We do not consider mixing for the households, because their best response is always single-valued.

3 Odyssean forward guidance

We consider first the case in which the government has no private information. Then we obtain the following well-known result:

Proposition 1 *Assume that $\mathcal{F}_t = \mathcal{G}_t$. Then the set of equilibrium outcomes for inflation and output is independent of the message space $\mathcal{M}$ available to the government. In particular, the set of equilibria is the same whether the government $\mathcal{M}$ is a proper set or the empty set, in which case the government does not send any messages.*

Proof. See appendix.

To better illustrate what this proposition does and does not imply, we consider a specific example. Suppose that $k = 0.01$, $\pi_t^* \equiv 0.02$, $\beta = 0.96$, $\alpha = 1$, and $\lambda = 40$. Furthermore, y_t^* is known (along with the entire past history of play) to both the government and the private sector. In this case, the government inflation target is deterministic at 2%. Potential output may be random, but the government always wants to overstimulate the economy by 1%. In a repeated game context, this economy admits many equilibria, independently of the message space $\mathcal{M}$. We focus on two of them:[14]

1. Suppose that $\mathcal{M} = [\underline{\pi}, \bar{\pi}]$.[15] The following is an equilibrium strategy profile. If $\pi_t \neq m_t$ never occurred in the past, the government announces $m_t = 0.02$; otherwise, the government can send an arbitrary message (it could be 0.02 again, or anything else, since the households will no longer condition their strategy on the government's reports). Households set $y_t^e = y_t^*$ independently of the past history. If $\pi_t \neq m_t$ never occurred in the past and $m_t \leq 0.43$, households "believe" the government and set $\pi_t^e = m_t$. Otherwise, households set $\pi_t^e = \pi_t^* + (\lambda/\alpha)k = 0.43$. Finally, if $\pi_t \neq m_t$ never occurred in the past and $m_t \leq 0.43$, the government follows through on its announcement and sets $\pi_t = m_t$; otherwise, it sets $\pi_t = 0.43$.

2. Suppose that $\mathcal{M} = \emptyset$: no messages can be sent by the government. The following is an

[14] The verification that the two strategy profiles are indeed equilibria is relegated to the appendix.

[15] Assume $\underline{\pi} < 0.02$ and $\bar{\pi} > 0.43$.

equilibrium strategy profile. Households set $y_t^e = y_t^*$ independently of the past history. If $\pi_t \neq 0.02$ never occurred in the past, households set $\pi_t^e = \pi_t^* = 0.02$. Otherwise, households set $\pi_t^e = 0.43$. Finally, if $\pi_t \neq 0.02$ never occurred in the past, the government sets $\pi_t = 0.02$; otherwise, it sets $\pi_t = \pi_t^* + (\lambda/\alpha)k = 0.43$.

In both equilibria described above household expectations are set according to a trigger strategy and the outcome coincides with what would arise under government commitment ($\pi_t = \pi_t^*$ and $y_t = y_t^*$); in both cases, the threat that disciplines the government's temptation to overstimulate the economy is future reversion to permanently repeating the equilibrium outcome of the static one-shot game.

The first equilibrium resembles what Campbell et al. [10] call "Odyssean forward guidance:" the government announces future policy, and puts its credibility at stake. If the government fails to deliver on its announcements, it loses its ability to coordinate expectations favorably, and high inflation ensues. This equilibrium shows that Proposition 1 *does not* say that government messages are necessarily irrelevant.

The second equilibrium achieves the same outcome, but without resorting to forward guidance, and is based on the idea that "actions speak louder than words." Notice that, in the first equilibrium, the private sector can perfectly forecast what message the government will send. It is thus possible to bypass the message and stake the government's credibility directly on its *actions*. Pure Odyssean forward guidance is unnecessary. When the private sector and the government share the same information, the temptation that the government faces to renege on its promises is the same whether those promises have been made explicit or left implicit.

Finally, in the example above, forward guidance is only about the policy that the government will undertake subsequently within the period, but the proposition extends to announcements about policy further into the future. As an example, the following is also an equilibrium. Suppose again that $\mathcal{M} = [\underline{\pi}, \bar{\pi}]$. Assume that there is some outstanding message $m_{-1} = 0.02$. If $\pi_t \neq m_{t-1}$ never occurred in the past, the government announces $m_t = 0.02$; otherwise, the government can send an arbitrary message (it could be 0.02 again, or anything else, since the households will no longer condition their strategy on the government's reports). Households set $y_t^e = y_t^*$

independently of the past history. If $\pi_t \neq m_{t-1}$ never occurred in the past and $m_{t-1} < 0.43$, households "believe" the government and set $\pi_t^e = m_{t-1}$. Otherwise, households set $\pi_t^e = 0.43$. Finally, if $\pi_t \neq m_{t-1}$ never occurred in the past and $m_{t-1} < 0.43$, the government follows through on its announcement and sets $\pi_t = m_{t-1}$; otherwise, it sets $\pi_t = 0.43$. In this equilibrium, the government announces its inflation plan one period ahead of time. Nonetheless, the equilibrium outcome remains the same, and it coincides with what happens in the trigger-strategy equilibrium with no messages that we described above.

4 Private information about the state of the economy

In this section, we consider a case in which the government has superior information about the underlying state of the economy. We retain the assumption that the inflation target π_t^* is known by both the private sector and the government at the beginning of period t. In contrast, potential output y_t^* is not known at the beginning of period t; we denote by $F_{y_t^*}(.|\mathcal{F}_t)$ its distribution, conditional on the private-sector information. At the beginning of the period, the government has access to the same information as the private sector, but it also receives a potentially noisy signal $\tilde{y}_t$. Conditional on the government's superior information,[16] the distribution of potential output is thus $F_{y_t^*}(.|\mathcal{G}_t)$. For simplicity, we further assume that the government signal becomes common knowledge at the beginning of period $t+1$. While results would extent to settings of persistent private information, the proofs would be significantly more complicated.

As a benchmark, suppose that the government could commit to a strategy for its future reports and inflation choices at the beginning of time, before any information is revealed. It is straightforward to prove that the best equilibrium outcome arises when the government commits to report truthfully its information to the private sector and to set $\pi_t \equiv \pi_t^*$. Formally:

Proposition 2 *Let $\mathcal{M} = [\underline{y}, \bar{y}]$ be the message space. Suppose that the government commits to a strategy σ^g that reports $m_t = E[y_t^*|\mathcal{G}_t]$ and sets $\pi_t = \pi_t^*$ with probability 1. Let $\omega, (y_t, \pi_t, y_t^e, \pi_t^e)_{t=0}^{\infty}$*

[16] Observing $\tilde{y}_t$ implies that the σ-algebra $\mathcal{G}_t$ that represents the government information at time t is finer than the one of the households, $\mathcal{F}_t$.

be the resulting equilibrium outcome. Then there is no other message space and/or government strategy that generates an equilibrium outcome that strictly dominates $\omega, (y_t, \pi_t, y_t^e, \pi_t^e)_{t=0}^{\infty}$.

Proof. See appendix.

Under commitment, the government realizes that it cannot fool the private sector; any deterministic misreporting of its signals would be undone by the private agents, and any garbling of the signals would simply increase the variance of output around potential, which is undesirable.

When the government cannot commit, the typical cheap talk conflict emerges: since incentives are not aligned, the government has a temptation to misreport its signal to induce the households to increase their output. Nonetheless, the ability to send messages will in general be valuable, and superior equilibria in which some information is revealed will emerge.[17] This will happen in either of two situations. First, it will happen when households face sufficiently high uncertainty about potential output compared to the government, so that the benefits from coordination trump the incentive to misreport. Alternatively, it will happen when the government is sufficiently patient, so that information revelation may be supported by trigger strategies in which the future credibility of the government is at stake.

We formalize these points in the following proposition.

Proposition 3 *Fix* $\alpha, \lambda, k, \underline{\pi}, \bar{\pi}$, *and the stochastic process for* $(y_t, \tilde{y}_t, \pi_t^*)_{t=0}^{\infty}$. *Then, given any* $\beta \in [0, 1)$, *there exists a value* $\hat{y}$ *and a message space* $\mathcal{M} \neq \emptyset$ *such that, if* $E[y_t^*|\mathcal{F}_t] > E[y_t^*|\mathcal{G}_t] + \hat{y}$ *with positive probability, the set of equilibrium payoffs attainable in the game in which the government can send messages from* $\mathcal{M}$ *is strictly larger than the corresponding set if no messages are allowed. Furthermore, as long as there exists a period* t *such that* $Prob(E[y_t^*|\mathcal{F}_t] \neq E[y_t^*|\mathcal{G}_t]) > 0$, *there exists a value* $\bar{\beta} \in [0, 1)$ *and a message space* $\mathcal{M} \neq \emptyset$, *such that for all* $\beta > \bar{\beta}$ *the set of equilibrium payoffs attainable in the game in which the government can send messages from* $\mathcal{M}$ *is strictly larger than the corresponding set if no messages are allowed. In both cases, the expansion of the set includes higher equilibrium payoffs than what can be supported without messages. If* $\bar{\pi}$ *is sufficiently high,* $\bar{\beta}$ *can be chosen so that the worst equilibrium payoff with messages coincides with the worst equilibrium without messages.*

[17] We evaluate welfare from the perspective of the government.

Proof. See appendix.

Proposition 3 is not unambiguously optimistic. First, as is always the case in games with cheap talk, there will be equilibria in which the government "babbles," sending the same message independently of its information, and households in turn disregard the government message, defeating any attempt to convey extra information. Perhaps even more disappointingly, there are instances in which allowing for a nontrivial message space will create the possibility of equilibria whose welfare is *worse* than the worst possible equilibrium under no messages. We know from the work of Abreu, Pierce, and Stacchetti [1] that there often is a link between the payoff of the best and the worst equilibrium: the worst equilibrium represents a threat that can be used to support the best equilibrium, and the best equilibrium can be used as a reward for the government to be willing to endure the worst punishment. The ability to send messages offers a way for the government to better coordinate the private sector, reducing the volatility of output; paradoxically, by increasing the payoff in the best equilibrium, this ability opens the door for the worst equilibrium to become worse. The last part of the theorem proves that this will not happen if the maximal level of attainable inflation is sufficiently high and the government is sufficiently patient. In this case, the "punishment stage" of the worst equilibrium will not last a single period and the continuation of the worst equilibrium will not be the best equilibrium. Then, the government cannot do worse than what happens when households expect it to babble and ignore its messages. This case is reassuring: government communication may lead to better equilibrium payoffs, but not to worse ones.[18]

From here on, we will take the optimistic view that the economy coordinates on superior outcomes, in which case the government messages are unambiguously helpful. However, the next question is whether these messages take the form of "forward guidance" versus a generic need for "transparency." A transparent government discloses (truthfully) a variety of information that is not publicly available. This information takes the form of forward guidance if it concerns the future path of policy. The example at hand is designed to be particularly stark. For β sufficiently

[18] Of course, we are silent on the process by which households and the government coordinate to one among many equilibria. If the introduction of government communication leads to coordination toward equilibria with a worse payoff, the ability to send messages might still be harmful.

high, the Folk theorem implies that the best equilibrium outcome will coincide with the outcome under commitment described in proposition 2. In this equilibrium, inflation is always at its target value π_t^* and it does not depend on the private information available to the central bank. As a consequence, a message reporting future policy would not allow the households to infer the information that they need to form the appropriate expectations: while communication is potentially valuable, it is not about future policy.

The example above is clearly extreme. In richer environments, optimal government policy will depend on the realization of the shocks about which the government has superior knowledge. However, even in this case, reporting future policy, as opposed to the underlying information that rationalizes the policy choice, is at best an indirect way to convey the information that the households need to form their expectations. For the sake of concreteness, consider an example in which, for some reason, the government objective function is[19]

$$E\sum_{t=0}^{\infty}\beta^t\left\{(y_t-y_t^*-k)^2+\alpha[\pi_t-\pi_t^*-f(y_t^*)]^2\right\}, \tag{4}$$

so that optimal inflation under commitment will be $\pi_t=\pi_t^*+E[f(y_t^*)|\mathcal{G}_t]$. In this case, sending a message about future policy π_t will reveal some information to the private sector about what the government observed through $\tilde{y}_t$. However, even in this case, unless f is affine, knowing $E[f(y_t^*)|\mathcal{G}_t]$ need not be the same as knowing $E[y_t^*|\mathcal{G}_t]$, which is what the households really need. Announcing future policy is an imperfect and roundabout way of announcing the underlying information that the private sector requires to properly coordinate.

In the next two sections, we consider two cases in which the government's private information is not about the underlying state of the economy, but rather about its objective or its beliefs. We will show that in this case sending messages about future policy is a natural way to convey the information that households need to make their decisions.

[19] We do not consider microfoundations for this example. It is simply meant as an illustration of a situation in which optimal government policy depends on the underlying information about the exogenous state of the economy.

5 Delphic forward guidance: private information about the government's objective

We now assume that the government and the private sector have symmetric information about y_t^*, but the government has private information about π_t^*. Without loss of generality, we assume that the government knows π_t^* perfectly (since the only role of π_t^* is to act as the government's preferred inflation rate). At the beginning of period t, conditional on the information available to the private sector, π_t^* has a distribution $F_{\pi_t^*}(.|\mathcal{F}_t)$. As in the previous section, we rule out persistent private information by assuming that π_t^* becomes common knowledge at the beginning of period $t+1$.[20] We can repeat the same steps as Propositions 2 and 3 and establish the following:[21]

- If the government can commit to its strategy ahead of time, the best outcome arises when the government commits to report π_t^* truthfully, and sets $\pi_t = \pi_t^*$.
- Whenever household uncertainty about π_t^* is sufficiently dispersed or the government is sufficiently patient (β sufficiently close to 1), the ability to send messages expands the set of possible equilibrium payoffs. This expansion will always include payoffs that are strictly higher than the best payoff attainable with no messages.

In this case, households have all the information about the underlying state of the economy that they need to make decisions, given government policy. While the government could report its underlying information that leads it to prefer π_t^*, this is more information than necessary: all they need is to know the policy choice π_t that the government will take.[22] In other words, what the private sector needs is precisely forward guidance about monetary policy.

[20] That π_t^* becomes common knowledge is once again not essential, although it greatly simplifies the arguments. However, for reaping the benefits of repeated interaction, it is important that at least *some* additional information about π_t^* will become available to the private sector after the government policy choice. When this is not the case, Athey, Atkeson, and Kehoe [6] show that the optimal mechanism would involve a static provision of government incentives. Even in that environment, cheap talk, which is ruled out in their paper, could still be valuable.

[21] Precise statements of the propositions and the proof are in the appendix.

[22] Under commitment, $\pi_t = \pi_t^*$, but this need not be the case when the government acts under discretion.

6 Delphic forward guidance: private information about the government's beliefs

In section 4, we assumed that the government had superior information about the underlying state of the economy. Here, we assume instead that the households receive a perfect signal of y_t^* at the beginning of period t, while the government only observes a noisy signal $\tilde{y}_t$, so that it faces nontrivial uncertainty described by the the conditional distribution $F_{y_t^*}(.|\mathcal{G}_t)$. Even though households know y_t^* perfectly, the government still has private information, about its own imperfect beliefs.[23]

When government preferences are given by (2), optimal government policy under commitment requires the government to set $\pi_t = \pi_t^*$ unconditionally, and households do not need any report from the government to achieve perfect foresight, setting $y_t^e = y_t^*$ and $\pi_t^e = \pi_t^*$.

However, suppose instead that the loss function is once again distorted as in (4). In this case, the best equilibrium outcome when the government can commit to its strategy involves setting $\pi_t = \pi_t^* + E(f(y_t^*)|\mathcal{G}_t)$ and a truthful report by the government. The government's report could be about the signal $\tilde{y}_t$, but it can also be directly about $\pi_t = \pi_t^* + E(f(y_t^*)|\mathcal{G}_t)$: the only reason households need to know the imperfect signal observed by the government is to form expectations about government policy. Once again, in this setting forward guidance is a natural message space for the government to communicate the information that can coordinate households towards desirable equilibria.

7 Conclusion

In this paper, we have shown that forward guidance is unnecessary if its purpose is purely as a commitment tool. When the government and the private sector have symmetric information,

[23]Formally, it would be incorrect to say that households have superior information compared to the government. If households unambiguously had superior information, $\mathcal{F}_t$ would be a finer σ-algebra than $\mathcal{G}_t$; but in this case, households would know what the government knows. In our example, instead, households do not know what the government observed.

actions speak louder than words, and the same outcomes can be achieved when the government stakes its credibility on its actions directly, with no need to have interim messages. When the government has private information, optimal disclosure may call for transparency, but not necessarily forward guidance: in many instances, households learn more if the government discloses the actual information, rather than its future policy plans. We identified two circumstances in which a policy of forward guidance is potentially beneficial: these arise when the primary source of asymmetric information concerns directly the preferences or the beliefs of the policymaker.

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A Appendix

To be completed.