

The Power of Forward Guidance Revisited[†]

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In recent years, central banks have increasingly turned to forward guidance as a central tool of monetary policy. Standard monetary models imply that far future forward guidance has huge effects on current outcomes, and these effects grow with the horizon of the forward guidance. We present a model in which the power of forward guidance is highly sensitive to the assumption of complete markets. When agents face uninsurable income risk and borrowing constraints, a precautionary savings effect tempers their responses to changes in future interest rates. As a consequence, forward guidance has substantially less power to stimulate the economy. (JEL E21, E40, E50)

Forward guidance has become an increasingly important tool of monetary policy in recent years. Gurkaynak, Sack, and Swanson (2005) show that much of the surprise news about monetary policy at the time of FOMC announcements arises from signals about the central bank's intentions about future monetary policy. In many cases, changes in the current federal funds rate are fully expected, and all of the *news* about monetary policy has to do with how the central bank is expected to set interest rates in the future.¹

Promises about future interest rates have been shown to have a powerful effect on the economy in standard monetary models. Eggertsson and Woodford (2003) show that a shock to the natural rate of interest that causes the economy to hit the zero lower bound on nominal interest rates induces a powerful deflationary spiral and a crippling recession. However, the recession can be entirely abated if the central bank commits from the outset to holding interest rates at the zero lower bound for a few additional quarters beyond what is justified by contemporaneous economic conditions.

Recent work argues that the magnitude of the effects of forward guidance in New Keynesian models stretches the limits of credibility. Carlstrom, Fuerst, and

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¹Campbell et al. (2012) reinforce these results using a longer sample period spanning the Great Recession.

Paustian (2012) show that a promise by the central bank to peg interest rates below the natural rate of interest for roughly two years generates explosive dynamics for inflation and output in a workhorse New Keynesian model (the Smets and Wouters 2007 model). Del Negro, Giannoni, and Patterson (2013) refer to this phenomenon as the *forward guidance puzzle*. Along the same lines, consider an experiment whereby the central bank promises a 1 percentage point lower real interest rate *for a single quarter* at some point in the future. We show that in the plain vanilla New Keynesian model, this promise has an 18 times greater impact on inflation when the promise pertains to interest rates five years in the future than when it pertains to the current interest rate.

It may seem unintuitive that an interest rate cut far in the future has a greater effect than a near-term one. To see why this arises in standard models, consider the response of consumption to a decrease in the real interest rate for a single quarter five years in the future. The consumption Euler equation dictates that consumption will rise immediately to a higher level and stay constant at that higher level for five years before returning to its normal level.² The cumulative response of consumption to the shock is therefore quite large and gets larger the further in the future the interest rate shocks occur. It is the cumulative response of consumption (with some discounting) that determines the response of current inflation in the basic New Keynesian model. So, the further in the future is the interest rate that the monetary authority announces it will change, the larger is the current response of inflation. At the zero lower bound, this large effect on inflation will lower real rates and thus create a powerful feedback loop on output.

But is it a realistic prediction of the standard model that agents increase their consumption by the same amount in response to an interest rate cut five years in the future as they do to a cut in the current interest rate? Many people face some risk of hitting a borrowing constraint over the next five years. This effectively shortens their planning horizon since interest rate changes in states of the world that occur after they hit a borrowing constraint are irrelevant for their current consumption plan. In addition to this, people's desire to maintain a buffer stock of saving for precautionary reasons will temper their response to future interest rate shocks. Taking full advantage of the opportunity for intertemporal substitution presented by the future interest rate change requires people to run down their assets. This is costly since it leaves them more exposed to future income shocks. As a consequence, people will trade off the gains from intertemporal substitution and the costs of running down their buffer stock of savings. As the low interest rate is further in the future, the change in assets needed to take full advantage of intertemporal substitution grows and the countervailing precautionary savings effect therefore grows stronger, tempering the effects of forward guidance.

To investigate the quantitative magnitude of these effects, we consider a general equilibrium model in which agents face uninsurable, idiosyncratic income risk and

²The response is a step function because consumption growth only deviates from normal when the real interest rate deviates from normal and this only occurs in the single quarter in our experiment. Another way to see this is that the forward guidance does not change the relative price of consumption for any two dates before the date of the interest rate change. All these dates must therefore have the same level of consumption. The end-point of consumption is pinned down at the old steady state by the fact that monetary shocks have no effect on real outcomes in the long run.

borrowing constraints. In this model, the effect of forward guidance about future interest rates on current output falls the further out in the future the interest rate change is. For forward guidance about the interest rate five years in the future, the effect on output and inflation is roughly 40 percent as large as in the standard model. For forward guidance about the interest rate ten years in the future, the effect on current output is essentially zero.³

Our results indicate that forward guidance is a much less effective policy tool at the zero lower bound in our incomplete markets model than it is in standard macro models. We consider a shock that lowers the natural rate of interest enough that the zero lower bound binds for five years and the initial fall in output is -4 percent in the absence of forward guidance. If we assume markets are complete (and precautionary savings thus absent), a policy of maintaining interest rates at zero for a little more than three quarters beyond what a strict inflation targeting central bank would do completely eliminates the fall in output. In contrast, in our incomplete markets model with idiosyncratic risk and borrowing constraints, the effect of this amount of forward guidance is substantially smaller and a significant recession remains.

Krusell and Smith (1998) compare the response of a complete markets and incomplete markets model to a productivity shock and find that the difference is small. In contrast, we find a large difference between the complete and incomplete markets model in response to forward guidance about real interest rates. The key difference in our experiments is the behavior of the real interest rate. Market incompleteness and household heterogeneity introduce forces that affect aggregate consumption. In the flexible price setting considered by Krusell and Smith (1998) these changes in demand are largely undone by adjustments in real interest rates.⁴ However, when prices are sticky and real interest rates respond sluggishly to shocks, the effects of market incompleteness and household heterogeneity on demand lead to substantial changes in output relative to the complete markets case.

Our work builds on recent papers that incorporate market incompleteness and idiosyncratic uncertainty into New Keynesian models starting with Oh and Reis (2012), Guerrieri and Lorenzoni (2015), McKay and Reis (2016), and Gornemann, Kuester, and Nakajima (2016). Related work by Auclert (2015) focuses on the redistributive effects of real interest rate changes in an incomplete markets model. We parameterize our model so as to make these redistributive effects small (since they are not the focus of our paper). Allowing for such redistributive effects can make the on-impact effects of a shock to the current interest rate quite a bit bigger than in our model. These redistributive effects are, for example, driving the large response of output to interest rates in Guerrieri and Lorenzoni (2015).

Werning (2015) shows how general equilibrium feedback effects of interest rate changes on household income can under certain conditions result in much larger effects on output than in our model, so that the effect of forward guidance may be unchanged relative to a representative agent benchmark. To get this, Werning

³ In a companion paper (McKay, Nakamura, and Steinsson 2016), we show that a simple model with incomplete markets and income risk yields a discounted Euler equation of the form $\hat{C}_t = \alpha E_t \hat{C}_{t+1} - \sigma(i_t - E_t \pi_{t+1} - r_t^n)$, where the factor α leads to discounting of the effects of future interest rate changes on current output as in the model we present in this paper.

⁴ We discuss this in detail in the longer working paper version of this paper (McKay, Nakamura, and Steinsson 2015).

assumes that everyone's income, borrowing constraints, and assets scale proportionately with aggregate income. In contrast, in our model, the extra income is received disproportionately by high income people and the shock leads incomes to rise relative to the households' assets. Both of these features mute the strength of the general equilibrium forces that Werning emphasizes.

Several other recent papers suggest "solutions" to the forward guidance puzzle. Del Negro, Giannoni, and Patterson (2013) argue that the experiment that gives rise to the puzzle is, itself, unreasonable. They argue that it is unreasonable to assume that the central bank really can engender substantial changes in long-term interest rates, which are at the core of why the forward guidance puzzle arises. Carlstrom, Fuerst, and Paustian (2012) and Kiley (2014) show that the magnitude of the forward guidance puzzle is substantially reduced in a sticky information (as opposed to a sticky price) model. This is because the sticky information Phillips curve is less forward looking. Our solution instead yields a Euler equation that is less forward looking than in the standard model. Caballero and Farhi (2014) argue that forward guidance is less effective if the reason why the zero lower bound binds is a shortage of safe assets in the economy, a safety trap, as opposed to a deleveraging or patience shock.

The paper proceeds as follows. Section I explains why forward guidance is so powerful in standard New Keynesian models. Section II presents our incomplete markets model featuring uninsurable idiosyncratic income risk and borrowing constraints. Section III describes our results about the reduced power of forward guidance in our incomplete markets model relative to the standard complete markets models. Section IV concludes.

I. Why Is Forward Guidance So Powerful?

It is useful to start with an explanation for why forward guidance is so powerful in standard monetary models. Consider the basic New Keynesian model as developed, e.g., in Woodford (2003) and Galí (2008). The implications of private sector behavior for output and inflation in this model can be described up to a linear approximation by an intertemporal "IS" equation of the form

$$(1) \quad x_t = E_t x_{t+1} - \sigma(i_t - E_t \pi_{t+1} - r_t^n),$$

and a Phillips curve of the form

$$(2) \quad \pi_t = \beta E_t \pi_{t+1} + \kappa x_t.$$

Here, x_t denotes the output gap, i.e., the percentage difference between actual output and the natural rate of output that would prevail if prices were fully flexible; π_t denotes inflation; i_t denotes the nominal, short-term, risk-free interest rate; r_t^n denotes the natural real rate of interest, i.e., the real interest rate that would prevail if prices were fully flexible; σ denotes the intertemporal elasticity of substitution; β denotes the subjective discount factor of households; and κ is the slope of the Phillips curve, which is determined by the degree of nominal and real rigidities in the economy. All variables are denoted as percentage deviations from their steady state values.

Suppose for simplicity that the monetary policy of the central bank is given by an exogenous rule for the real interest rate where the real interest rate tracks the natural real rate with some error: $r_t = i_t - E_t \pi_{t+1} = r_t^n + \epsilon_{t,t-j}$. Here $\epsilon_{t,t-j}$ denotes the shock to the short term real rate in period t that becomes known in period $t - j$.⁵ Absent any monetary shocks, the real interest rate will perfectly track the natural real rate and both the output gap and inflation will be zero. Suppose we start in such a state, but then the monetary authority announces that the real interest rate will be lower by 1 percent for a single quarter five years in the future, but maintained at the natural real rate of interest in all other quarters (i.e., $\epsilon_{t+20,t} = -0.01$).⁶

Figure 1 plots the response of output to this shock (assuming for simplicity that $\sigma = 1$). Even though the real interest rate does not change until 20 quarters later, output jumps up by a full 1 percent immediately. Output then stays at this higher level for 20 quarters before falling back to steady state in quarter 21. To understand why output responds in this way, it is important to consider that the shock changes the relative price of consumption between quarters 20 and 21 (since it is the real interest rate in quarter 20 that changes), but leaves the relative price of consumption for any two dates before quarter 20 and any two dates after quarter 20 unchanged. This implies that consumption growth can only deviate from normal in quarter 20. In other words, the response of consumption must be a step function. In addition to this, the level of consumption (and output) is pinned down in the long run by the fact that monetary shocks have no effect on real outcomes in the long run. This implies that consumption (and output) must rise by 1 percent immediately, so that they can fall back to steady state in quarter 21.⁷

The step-function shape of the output response in Figure 1 is determined solely by the Euler equation. The level of consumption, and therefore output, is however determined by the intertemporal budget constraint. In general equilibrium, income rises in response to this type of shock because the level of production increases in response to the increase in demand. This increase in income allows households to consume more initially without reducing consumption after period 20. We can compare this general equilibrium case to the response of a single household holding its own income fixed and also holding the actions of all other agents in the economy fixed (call this the partial equilibrium response). Figure A1 in the Appendix plots the partial equilibrium response. The partial equilibrium response is also a step function, since the same Euler equation applies. The difference is that the increase in consumption over the first 20 quarters will cause the household to run down

⁵ Given this specification of monetary policy, the model has a unique solution for which $\lim_{j \rightarrow \infty} E_t x_{t+j} = 0$ and inflation is bounded. We could alternatively assume that the monetary authority sets the nominal rate according to the following rule $i_t = r_t^n + \phi \pi_t + \tilde{\epsilon}_{t,t-j}$ and $\phi > 1$. In this case, the model has a unique bounded solution (without the additional restriction that $\lim_{j \rightarrow \infty} E_t x_{t+j} = 0$) and there exists a path for $\tilde{\epsilon}_{t,t-j}$ that gives the same solution as the model with monetary policy given by the exogenous path for the real rate we assume. We prefer to describe the monetary policy as an exogenous rule for the real interest rate because this simplifies our exposition substantially.

⁶ Conventional specifications of monetary shocks affect real rates in more than a single quarter. But in a linear model the effects of such monetary shocks can be “decomposed” into a simple sum of the effects of changes in real rates at each horizon. In this sense one can think of our 20-quarter experiment as one component of a more complex monetary shock that affects real rates in many quarters.

⁷ An alternative way to see this is to solve the intertemporal IS equation—equation (1)—forward to get $x_t = -\sigma \sum_{j=0}^{\infty} E_t (i_{t+j} - E_{t+j} \pi_{t+j+1} - r_{t+j}^n)$. Notice, that there is no discounting in the sum on the right-hand side of this equation. This implies that the output gap will rise immediately by 1 percent and will stay at that higher level for the next five years and then fall back to zero all at once when the low interest rate period passes.

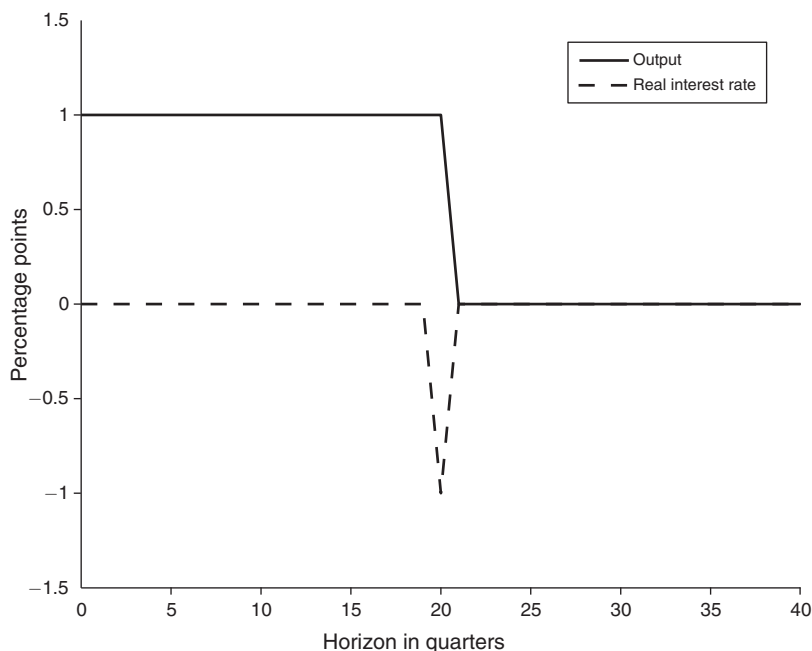


FIGURE 1. RESPONSE OF OUTPUT TO A 1-QUARTER DROP IN THE REAL INTEREST RATE 20 QUARTERS IN THE FUTURE

its wealth and imply that consumption going forward after period 20 will be permanently lower (this effect does not occur in general equilibrium due to the off-setting income rise). However, this difference is relatively small, even for a shock 20 quarters out. For this case, the partial equilibrium response of output is 91 basis points rather than the full 100 basis points in general equilibrium.

The logic described above, for forward guidance 20 quarters in the future, applies for forward guidance at any horizon. As a consequence, the further out in the future the forward guidance is, the larger is the *cumulative* response of output. In the New Keynesian model, it is the entire cumulative response of the output gap (albeit with some discounting) that determines the current response of inflation to forward guidance. To see this, it is useful to solve the Phillips curve forward to get

$$(3) \quad \pi_t = \kappa \sum_{j=0}^{\infty} \beta^j E_t x_{t+j}.$$

This equation makes clear that the further in the future is the interest rate that the monetary authority announces it will change, the larger is the current response of inflation. While the response of inflation to a 1 percent change in the current real rate is $\kappa\sigma$, the response of inflation to a 1 percent change in the real rate for one quarter in the infinite future is $\kappa\sigma/(1 - \beta)$. If $\beta = 0.99$, the current response of inflation to forward guidance about a single quarter in the infinite future is 100 times larger than the response of inflation to an equally large change in the current real interest rate. Figure 2 plots the response of inflation to forward guidance about interest rates at different horizons relative to the response of inflation to an equally large change in the current real interest rate. We see that the response of inflation to forward

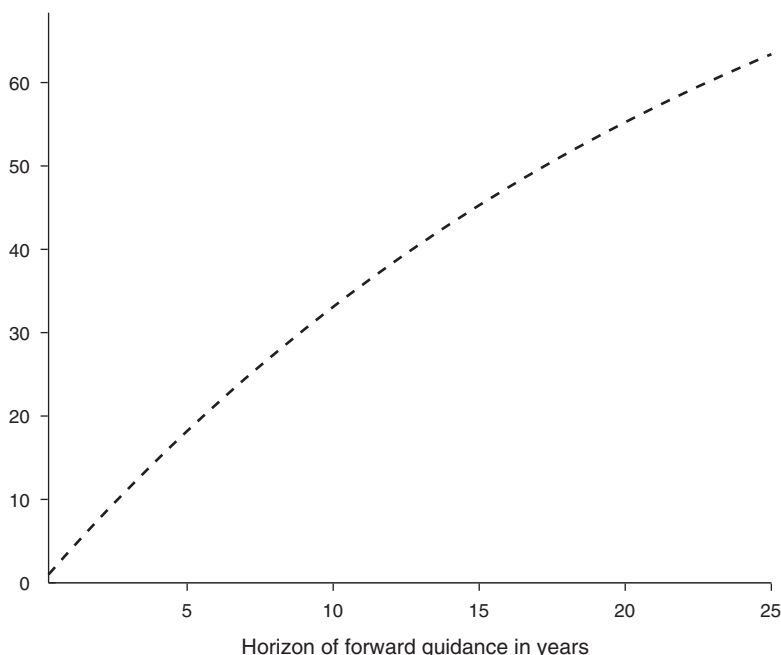


FIGURE 2. RESPONSE OF CURRENT INFLATION TO FORWARD GUIDANCE ABOUT INTEREST RATES AT DIFFERENT HORIZONS RELATIVE TO RESPONSE TO EQUALLY LARGE CHANGE IN CURRENT REAL INTEREST RATE

guidance about interest rates five years in the future is roughly 18 times larger than the response of inflation to an equally sized change in the current real interest rate.

To build intuition, we have assumed that there is no endogenous feedback from changes in output and inflation back onto real interest rates. Actual monetary policies are more complicated. In normal times, forward guidance about lower real interest rates in the future may be partly undone by higher real interest rates in the intervening period. On the other hand, when monetary policy is constrained by the zero lower bound on short-term nominal interest rates, the higher inflation associated with forward guidance about future interest rates will actually lower current real interest rates and this will in turn raise current output and inflation further. In this case, the outsized effects of forward guidance we describe above will be further reinforced by subsequent endogenous interest rate movements.

II. An Incomplete Markets Model with Nominal Rigidities

Section I shows that the huge power of far future forward guidance in standard monetary models depends crucially on the prediction of the model that the current response of output to an expected change in real interest rates in the far future (say five years in the future) is equally large as the response of output to a change in the current real interest rate. But is this realistic? With some probability, one will hit a borrowing constraint in the next five years. This effectively shortens one's planning horizon. Also, households that face uninsurable idiosyncratic income risk and borrowing constraints will be wary of running down their wealth to take advantage

of the benefits of intertemporal substitution since this will reduce their ability to smooth consumption in the face of future income shocks. To analyze these effects, we develop a model with uninsurable idiosyncratic shocks to household productivity, borrowing constraints, and nominal rigidities.

A. The Environment

The economy is populated by a unit continuum of ex ante identical households with preferences given by

$$E_0 \sum_{t=0}^{\infty} \beta^t \left[\frac{c_{h,t}^{1-\gamma}}{1-\gamma} - \frac{\ell_{h,t}^{1+\psi}}{1+\psi} \right],$$

where $c_{h,t}$ is consumption of household h at time t and $\ell_{h,t}$ is labor supply of household h at time t . Households are endowed with stochastic idiosyncratic productivity $z_{h,t}$ that generates pretax labor income $W_t z_{h,t} \ell_{h,t}$, where W_t is the aggregate real wage. Each household's productivity $z_{h,t}$ follows a Markov chain with transition probabilities $\Pr(z_{h,t+1} | z_{h,t})$. We assume that the initial cross-sectional distribution of idiosyncratic productivities is equal to the ergodic distribution of this Markov chain. As the Markov chain transition matrix is constant over time, it follows that the cross-sectional distribution of productivities is constant. We use $\Gamma^z(z)$ to denote this distribution.

In this economy, a final good is produced from intermediate inputs according to the production function

$$Y_t = \left(\int_0^1 y_{j,t}^{1/\mu} dj \right)^\mu,$$

where Y_t denotes the quantity of the final good produced at time t and $y_{j,t}$ denotes the quantity of the intermediate good produced by firm j in period t . The intermediate goods are produced using labor as an input according to the production function

$$y_{j,t} = n_{j,t}$$

where $n_{j,t}$ denotes the amount of labor hired by firm j in period t .

The market structure of this model economy combines elements that are familiar from the standard New Keynesian model with elements that are familiar from the standard incomplete markets model (Bewley undated; Huggett 1993; Aiyagari 1994). While the final good is produced by a representative competitive firm, the intermediate goods are produced by monopolistically competitive firms. The intermediate goods firms face frictions in adjusting their prices that imply that they can only update their prices with probability θ per period as in Calvo (1983). These firms are controlled by a risk-neutral manager who discounts future profits at rate β . Whatever profits are produced are paid out immediately to the households with each household receiving an equal share D_t . Households cannot trade their stakes in the firms.

Households trade a risk-free real bond with real interest rate r_t between periods t and $t + 1$. Borrowing constraints prevent these households from taking negative bond positions. There is a stock of government debt outstanding with real face value B . The government raises tax revenue to finance interest payments on this debt. These taxes are collected by taxing households according to their labor productivity $z_{h,t}$. Let $\tau_t \bar{\tau}(z_{h,t})$ be the tax paid by a household h in period t . By levying the taxes on labor productivity, which is exogenous, the tax does not distort household decisions in the same way that a lump-sum tax does not. At the same time, the dependence of the tax on $z_{h,t}$ allows us to manipulate the cross-sectional correlation of tax payments and earnings.

We assume that the government runs a balanced budget so as to maintain a stable level of debt in each period. The government budget constraint is

$$(4) \quad \frac{B}{1 + r_t} + \sum_z \Gamma^z(z) \tau_t \bar{\tau}(z) = B.$$

To illustrate our main results about the power of forward guidance, we will consider several monetary policy experiments involving somewhat different specifications of monetary policy. These are described in Section III. The relationship between the real interest rate, the nominal interest rate i_t , and inflation π_t is given by the Fisher relation in the usual way

$$(5) \quad 1 + r_t = \frac{1 + i_t}{1 + \pi_{t+1}},$$

where $\pi_{t+1} \equiv P_{t+1}/P_t - 1$ and P_t is the aggregate price level.

B. Decision Problems

The decision problem faced by the households in the economy is

$$V_t(b_{h,t}, z_{h,t}) = \max_{c_{h,t}, b_{h,t+1}, \ell_{h,t}} \left\{ \frac{c_{h,t}^{1-\gamma}}{1-\gamma} - \frac{\ell_{h,t}^{1+\psi}}{1+\psi} + \beta \sum_{z_{h,t+1}} \Pr(z_{h,t+1} | z_{h,t}) V_{t+1}(b_{h,t+1}, z_{h,t+1}) \right\}$$

subject to

$$c_{h,t} + \frac{b_{h,t+1}}{1 + r_t} = b_{h,t} + W_t z_{h,t} \ell_{h,t} - \tau_t \bar{\tau}(z_{h,t}) + D_t$$

$$b_{h,t+1} \geq 0.$$

Let $c_t(b, z)$ be the decision rule for $c_{h,t}$, $g_t(b, z)$ be the decision rule for household bond holdings $b_{h,t+1}$, and $\ell_t(b, z)$ be the decision rule for $\ell_{h,t}$. These policy rules vary over time in response to aggregate events that affect current or future prices, taxes, or dividends.

The final goods producer's cost minimization problem implies that

$$(6) \quad y_{j,t} = \left(\frac{p_{j,t}}{P_t} \right)^{\mu/(1-\mu)} Y_t,$$

where $p_{j,t}$ is the price charged by firm j in period t and the aggregate price index is given by

$$P_t = \left(\int_0^1 p_{j,t}^{1/(1-\mu)} dj \right)^{1-\mu}.$$

When an intermediate goods producer updates its price it solves

$$\max_{p_t^*, \{y_{j,s}, n_{j,s}\}_{s=t}^{\infty}} \sum_{s=t}^{\infty} \beta^{s-t} (1-\theta)^{s-t} \left(\frac{p_t^*}{P_s} y_{j,s} - W_s n_{j,s} \right)$$

subject to

$$y_{j,s} = \left(\frac{p_t^*}{P_s} \right)^{\mu/(1-\mu)} Y_s,$$

$$y_{j,s} = n_{j,s},$$

where p_t^* is the price set by firms who are able to update their price at date t .

The solution to this problem satisfies

$$(7) \quad \frac{p_t^*}{P_t} = \frac{\sum_{s=t}^{\infty} \beta^{s-t} (1-\theta)^{s-t} \left(\frac{P_t}{P_s} \right)^{\mu/(1-\mu)} Y_s \mu W_s}{\sum_{s=t}^{\infty} \beta^{s-t} (1-\theta)^{s-t} \left(\frac{P_t}{P_s} \right)^{1/(1-\mu)} Y_s}.$$

C. Equilibrium

Let $\Gamma_t(b, z)$ be the distribution of households over idiosyncratic states at date t . This distribution evolves according to

$$(8) \quad \Gamma_{t+1}(\mathcal{B}, z') = \int_{\{(b, z): g_s(b, z) \in \mathcal{B}\}} \Pr(z'|z) d\Gamma_t(b, z)$$

for all sets $\mathcal{B} \subset \mathbb{R}$.

As a result of nominal rigidities, price dispersion will result in some loss of efficiency. Integrating both sides of (6) across firms and using $y_{j,t} = n_{j,t}$ yields an aggregate production function

$$(9) \quad S_t Y_t = \int n_{j,t} dj \equiv N_t,$$

where N_t is aggregate labor demand and $S_t \equiv \int_0^1 \left(\frac{p_{j,t}}{P_t} \right)^{\mu/(1-\mu)} dj$ reflects the efficiency loss due to price dispersion. S_t evolves according to

$$(10) \quad S_{t+1} = (1-\theta) S_t (1 + \pi_{t+1})^{-\mu/(1-\mu)} + \theta \left(\frac{P_{t+1}^*}{P_{t+1}} \right)^{\mu/(1-\mu)}.$$

Inflation can be written as a function of the relative price selected by firms that update their prices

$$(11) \quad 1 + \pi_t = \left(\frac{1 - \theta}{1 - \theta \left(\frac{p_t^*}{P_t} \right)^{1/(1-\mu)}} \right)^{1-\mu}.$$

Aggregate labor supply is given by

$$(12) \quad L_t \equiv \int z \ell_t(b, z) d\Gamma(b, z),$$

and labor market clearing requires

$$(13) \quad L_t = N_t.$$

Bond market clearing requires

$$(14) \quad B = \int g_t(b, z) d\Gamma_t(b, z).$$

The aggregate dividend paid by the intermediate goods firms is

$$(15) \quad D_t = Y_t - W_t N_t.$$

Finally, integrating across the household budget constraints and using the government budget constraint and equation (15) gives

$$(16) \quad C_t = Y_t$$

as the aggregate resource constraint, where $C_t \equiv \int c_t(b, z) d\Gamma_t(b, z)$.

An equilibrium of this economy consists of decision rules and value functions $\{g_t(b, z), \ell_t(b, z), V_t(b, z)\}_{t=0}^{\infty}$ that solve the household's problem, distributions $\{\Gamma_t(b, z)\}_{t=0}^{\infty}$ that evolve according to (8). In addition, an equilibrium involves sequences $\{C_t, L_t, N_t, Y_t, D_t, i_t, W_t, \pi_t, r_t, p_t^*/P_t, S_t, \tau_t\}_{t=0}^{\infty}$, that satisfy the definitions of C_t and L_t and equations (4), (5), (7), (9), (10), (11), (13), (15), (16), and a monetary policy rule as described in Section III.

The main difference between this model and the model discussed in Section I is the fact that markets are incomplete. If we modified this model to have complete markets and then linearized the equilibrium conditions, we would get the model in Section I. The introduction of incomplete markets yields a role for precautionary savings and it implies that redistribution of wealth across agents can affect the evolution of aggregate output. The fact that the present model is not linearized also implies that price dispersion affects equilibrium outcomes.

D. Calibration

Our model period is one quarter and our calibration is summarized in Table 1. We fix the steady state real interest rate at 2 percent annually and adjust the discount

TABLE 1—BASELINE CALIBRATION

Parameter	Description	Value	Target
β	Discount factor	0.986	2 percent annual interest rate
γ	Risk aversion	2	
$1/\psi$	Frisch elasticity	1/2	Chetty (2012)
B	Supply of assets	$1.4 \times \text{annual GDP}$	Aggregate liquid assets (see text)
μ	Markup	1.2	Christiano, Eichenbaum, and Rebelo (2011)
θ	Price revision rate	0.15	Christiano, Eichenbaum, and Rebelo (2011)

factor to match this.⁸ We set the coefficient of risk aversion to 2. We set the Frisch elasticity of labor supply to one-half, which is in line with the findings of Chetty (2012). In our baseline calibration we set the supply of government bonds, B , to match the ratio of aggregate liquid assets to GDP. We calculate liquid assets from aggregate household balance sheets reported in the flow of funds accounts and take the average ratio over the period 1970 to 2013.⁹ Our choice to calibrate the aggregate supply of assets to match liquid assets is motivated by the view that much of household net worth is illiquid and therefore not easily used for consumption smoothing and intertemporal substitution.¹⁰ In a sensitivity analysis we also consider a calibration in which we match aggregate household net worth, which we also calculate from the flow of funds accounts (described below).

For our choices of the desired markup of intermediate firms, μ , and probability of maintaining a fixed price, θ , we follow Christiano, Eichenbaum, and Rebelo (2011) and set $\mu = 1.2$ and $\theta = 0.15$. The implied degree of price stickiness is on the high side of values used in the business cycle literature. This tends to reduce the size of the effects we find on inflation since it makes inflation less sensitive to changes in current marginal costs. In the exercises we do where the zero lower bound on nominal interest rates binds, this also tends to reduce the size of the effects on output since the smaller effects on inflation translate into smaller effects on real interest rates (Werning 2012).

We calibrate the idiosyncratic wage risk to the persistent component of the estimated wage process in Floden and Lindé (2001).¹¹ The estimates of Floden and Lindé are for an AR(1) with annual observations of log residual wages after the effects of age, education, and occupation have been removed. Floden and Lindé find an autoregressive coefficient of 0.9136 and an innovation variance of 0.0426. We convert these estimates to parameters of a quarterly AR(1) process for log wages by simulating the quarterly process and aggregating to annual observations. We find the parameters of the quarterly process such that estimating an AR(1) on the simulated

⁸ We use the term “steady state” to refer to the stationary equilibrium in which aggregate quantities and prices are constant and inflation is zero.

⁹ We use the same definition of liquid assets as Guerrieri and Lorenzoni (2015). Flow of Funds Table B.101 lines 10 (deposits), 17 (treasury securities), 18 (agency and GSE securities), 19 (municipal securities), 20 (corporate and foreign bonds), 25 (corporate equities), and 26 (mutual fund shares). See <http://www.federalreserve.gov/releases/Z1/>.

¹⁰ Kaplan and Violante (2014) present a life-cycle savings model with liquid and illiquid assets and show that the illiquidity of household net worth leads to stronger and more realistic consumption responses to transitory income fluctuations.

¹¹ While it is common to include a transitory income shock in empirical models of wage dynamics we do not include such transitory shocks in our analysis because their impact on the quantitative results will be small as these shocks are easily smoothed by virtue of being transitory.

annual data reproduces the Floden and Lindé estimates, which results in an autoregressive coefficient of 0.966 and an innovation variance of 0.017. We discretize the resulting AR(1) process for log wages to a three-point Markov chain using the Rouwenhorst (1995) method.¹²

Finally, to capture the fact that the bulk of tax payments are made by those with high earnings we set $\bar{\tau}(z)$ to be positive only for the highest z . Since households are heterogeneous in the incomplete markets model, their MPCs differ widely. Households with little wealth have high MPCs, while households with a great deal of wealth have much lower MPCs. As a consequence, wealth redistribution matters for aggregate consumption dynamics. For example, a reallocation of income from high to low net worth households leads to higher consumption demand, all else equal. One way in which this shows up in our model is that a reduction in real interest rates will lead to a redistribution from savers to borrowers.¹³ In our model, households are savers and the government is the borrower. Our (realistic) assumption that taxes are paid mostly by the rich leads these redistribution effects to be relatively small as those households with many savings tend to be those with the greatest tax liabilities, which absorb the change in the government's debt service costs.

E. Alternative Calibrations

Our baseline calibration potentially implies too little volatility in household earnings. Guvenen, Ozkan, and Song (2014) report the standard deviation of the distribution of five-year earnings growth rates to be 0.73.¹⁴ Our model calibrated as described above implies this standard deviation is only 0.53.

We therefore consider an alternative calibration in which we raise the variance of the productivity shocks in the model so that our model matches this moment of the five-year earnings growth rate distribution. Doing so requires raising the variance of the idiosyncratic productivity innovation from 0.017 to 0.033. With more risk, the larger precautionary savings motive raises the total demand for assets by households. In this calibration we, thus, reduce the discount factor so that the model is again consistent with the total supply of assets and a 2 percent annual interest rate. This requires a discount factor of 0.978. We refer to this as the high risk calibration.

We also explore the extent to which our results depend on the average level of assets in the economy. With more assets, households will generally have more self-insurance and therefore will be less concerned with running down their assets. To explore this possibility we consider an alternative calibration in which we raise the supply of government debt, B , so that the average wealth in the economy is equal to the aggregate net worth of the household sector from the flow of funds, including both liquid and illiquid wealth.¹⁵ This yields a ratio of assets to annual GDP of 3.79. With a larger supply of assets, bond market clearing requires that households are

¹² Kopecky and Suen (2010) prove that the Rouwenhorst method can match the conditional and unconditional mean and variance, and the first-order autocorrelation of any stationary AR(1) process.

¹³ Auclert (2015) studies this redistribution channel of monetary policy in detail and shows that the redistribution depends on the agents' unhedged interest rate exposures.

¹⁴ This value is the average across years of the values reported in Table A8 of Guvenen, Ozkan, and Song (2014).

¹⁵ Here we use the ratio of household net worth to GDP averaged over 1970 to 2013. Household net worth is taken from Table B.101, line 41.

more patient so as to increase the demand for assets at a given interest rate. In this calibration, we set the discount factor to 0.992 to be able to match a 2 percent annual interest rate. We refer to this as the high asset calibration.

Finally, we consider a case where we increase both the supply of assets and the extent of risk that households face. In this case we match a ratio of assets to GDP of 3.79 and the standard deviation of five-year earnings growth rates of 0.73. The discount factor needed to match a 2 percent annual interest rate is 0.990. We refer to this as the high risk and asset calibration.

F. Computation

In Section III, we compute the perfect foresight transition paths of the economy in response to monetary policy and demand shocks. We assume that the economy begins in the steady state and returns to steady state after 250 quarters. We begin by guessing paths for all aggregate quantities and prices. We can then verify whether this guess is an equilibrium by checking that the definition of an equilibrium given above is satisfied. Part of this step involves solving and simulating the households problem at the guessed prices. We solve the household's problem by iterating on the Euler equation backward through time using the endogenous gridpoint method of Carroll (2006) to compute the policy rules for each period of the transition. We then simulate the population of households forward through time using a non-stochastic simulation algorithm to compute the distribution of wealth at each date. We can then compute aggregate consumption, labor supply, and bond holdings using the policy rules and distribution of wealth for each date. If our guess is not an equilibrium we update it to a new guess that is closer to an equilibrium. We generate the new guess of prices and aggregate quantities by making use of an auxiliary model that approximates the aggregate behavior of the incomplete markets households and then solving for an equilibrium under this approximating model. We perform this step using a version of Newton's method. We provide additional details of the computational methods in the Appendix.

III. Results

Our main result is that the power of forward guidance is substantially muted in the incomplete markets model we present in Section II relative to the standard complete-markets New Keynesian model. To illustrate this, we first consider a simple policy experiment: suppose the central bank promises a 50 basis point (i.e., 2 percent annualized) decrease in the real interest rate for a single quarter five years in the future.¹⁶

Figure 3 plots the response of output to this shock in our incomplete markets model and, for comparison, in the complete markets version of this model. As we discuss in Section I, the response of output under complete markets is a step function: Output immediately jumps up by 25 basis points and remains at that elevated level for 20 quarters before returning to steady state (recall that the IES is one-half).

¹⁶ As in Section I, we assume here that the monetary authority sets an exogenous path for the real interest rate.

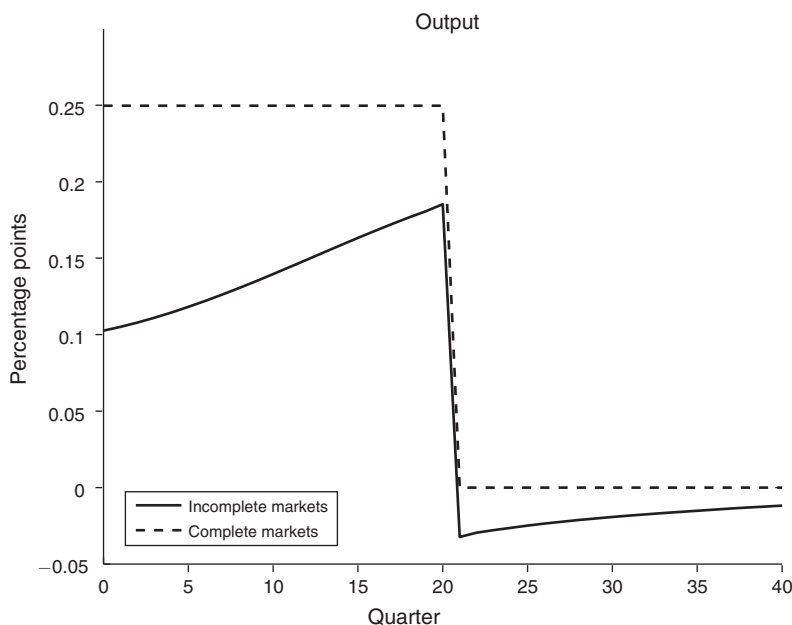


FIGURE 3. RESPONSE OF OUTPUT TO 50 BASIS POINT FORWARD GUIDANCE ABOUT THE REAL INTEREST RATE IN QUARTER 20 (With Real Interest Rates in All Other Quarters Unchanged)

In contrast, in the incomplete markets model the initial increase in output is only about 40 percent as large. Output then gradually rises as the interest rate decrease gets closer. But even in the period right before the interest rate decrease, the increase in output is substantially smaller than under complete markets.

To understand why the response of output is muted under incomplete markets, it is useful to start by considering how a single household would respond to this type of shock in partial equilibrium (i.e., if its income was unaffected by the shock). As we discuss in the introduction, this household will increase its consumption, but by less than it would under complete markets. This is because it is loath to run down its buffer stock of savings since a smaller buffer stock will leave the household more exposed to future idiosyncratic shocks to income. The household will therefore trade-off the cost of a lower buffer stock with the gains from intertemporal substitution. This contrasts with the complete markets case where it poses no concern for households to run down their wealth, since they are fully insured against all shocks, and as a consequence households take full advantage of opportunities to intertemporally substitute.

In general equilibrium, the increased consumption demand results in higher income (since $C_t = Y_t$ in equilibrium). The extra income yields a further boost to the household's consumption demand implying that the general equilibrium response is larger than the partial equilibrium response. In our model, this general equilibrium boost is relatively small implying that the general equilibrium response is similar in magnitude to the partial equilibrium response (see Figure A2 in the Appendix).

Another difference between the complete markets response and the incomplete markets response in Figure 3 is that, after the interest rate change passes, output falls

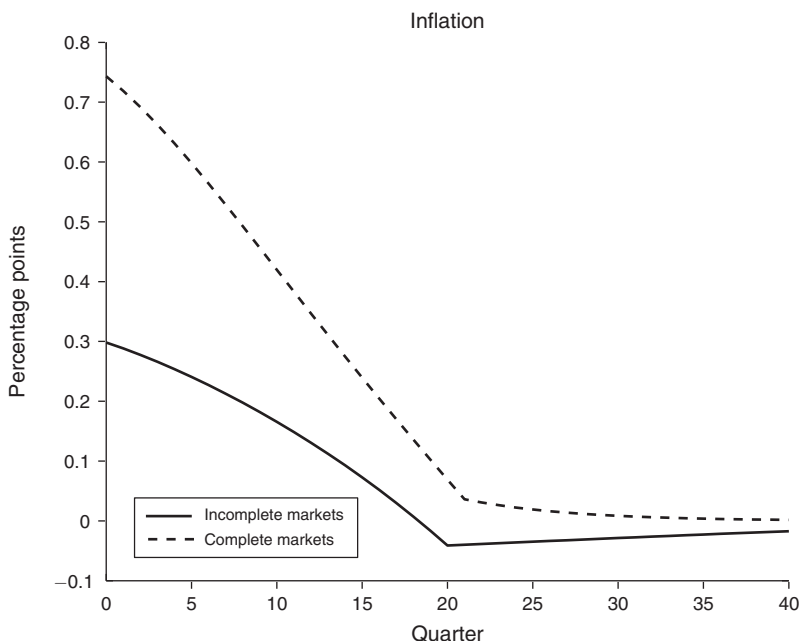


FIGURE 4. RESPONSE OF INFLATION TO 50 BASIS POINT FORWARD GUIDANCE ABOUT THE REAL INTEREST RATE IN QUARTER 20 (With Real Interest Rates in all Other Quarters Unchanged)

below steady state for some time in the incomplete markets case. The reason for this is that the interest rate shock leads to a redistribution of wealth away from households with high marginal propensities to consume and toward households with low marginal propensities to consume (MPC). This wealth redistribution lowers aggregate demand (and therefore output) for some time until the distribution of wealth has had time to converge back to steady state.¹⁷

Figure 4 plots the response of inflation to this same shock. The five year output boom induced by the forward guidance about real interest rates leads to a large inflation response in the complete markets case. Since the output boom is much smaller in the incomplete markets model, the rise in inflation is also much smaller. The initial response of inflation in the incomplete markets model is again only about 40 percent as large as in the complete markets model.

Are these responses symmetric for interest rate increases versus decreases? Above, we consider the response of the economy to a decrease in interest rates five years in the future. We get very similar results if we instead consider an equally large increase in interest rates five years in the future. The immediate effect on output is a drop of 12 basis points, while output rises by about 10 basis points in the case of

¹⁷There are two reasons why the interest rate shock leads to a redistribution toward households with low MPCs (which tend to be the high productivity households). First, the fall in interest rates implies that the government needs less tax revenue in period 20 to pay the interest on the debt. Since the high productivity households pay the tax, they benefit from this fall in taxes. If these same households owned all the assets, their asset income would fall by an equal amount. The high productivity households own most of the assets but not all. So, on net, they benefit from the fall in interest rates. Second, the boom in output that the fall in interest rates causes leads wages to rise more than firm dividends. Since a larger fraction of the income of high productivity households is wage income, this also disproportionately benefits the high productivity households.

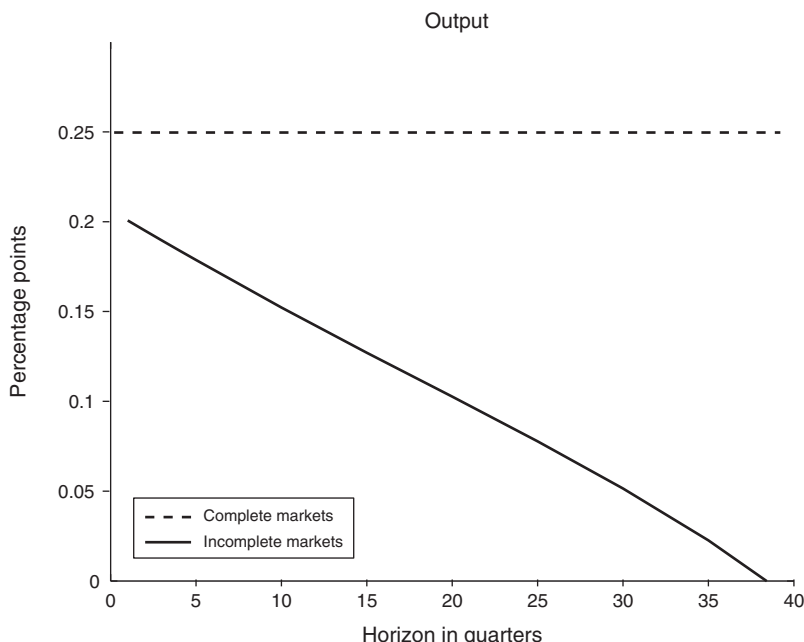


FIGURE 5. INITIAL RESPONSE OF OUTPUT TO 50 BASIS POINT FORWARD GUIDANCE ABOUT THE REAL INTEREST RATE FOR A SINGLE QUARTER AT DIFFERENT HORIZONS

a decrease (Figure 3). The immediate effect on inflation is a drop of 28 basis points, while inflation rises by about 30 basis points in the case of a decrease (Figure 4).¹⁸

A. Dependence on Horizon of Forward Guidance

The difference between the complete and incomplete markets models grows with the horizon of the interest rate shock. Figure 5 plots the initial response of output to 50 basis point forward guidance about the real interest rate in a single quarter as the horizon of that single quarter changes from 1 to 40 quarters.¹⁹

In the complete markets model, output always rises by 25 basis points, regardless of the horizon of the forward guidance. In contrast, in the incomplete markets model, the effect is only about 20 basis points for an announcement about the real interest rate next quarter and falls monotonically thereafter. It is roughly ten basis points for an announcement about the real interest rate five years ahead, and essentially zero for an announcement about the real interest rate ten years ahead.

Intuitively, the probability of hitting a borrowing constraint before the interest rate change rises with the length of time until the interest rate change occurs. For

¹⁸It may seem puzzling that the absolute size of the output response is larger for the interest rate increase, but the ranking is reversed for the inflation response. Both interest rate increases and decreases yield an increase in price dispersion (because they both yield nonzero inflation). This implies that more labor is needed to produce the amount of output demanded, which raises wages in both cases and pushes inflation up, reversing the relative rankings.

¹⁹For example, the points at horizon 20 in Figure 5 are the first points on each line in Figure 3. And the points at horizon 10 in Figure 5 are the initial response of output in the two models if the central bank announces that it will lower the real interest rate by 50 basis points for a single quarter 10 quarters in the future.

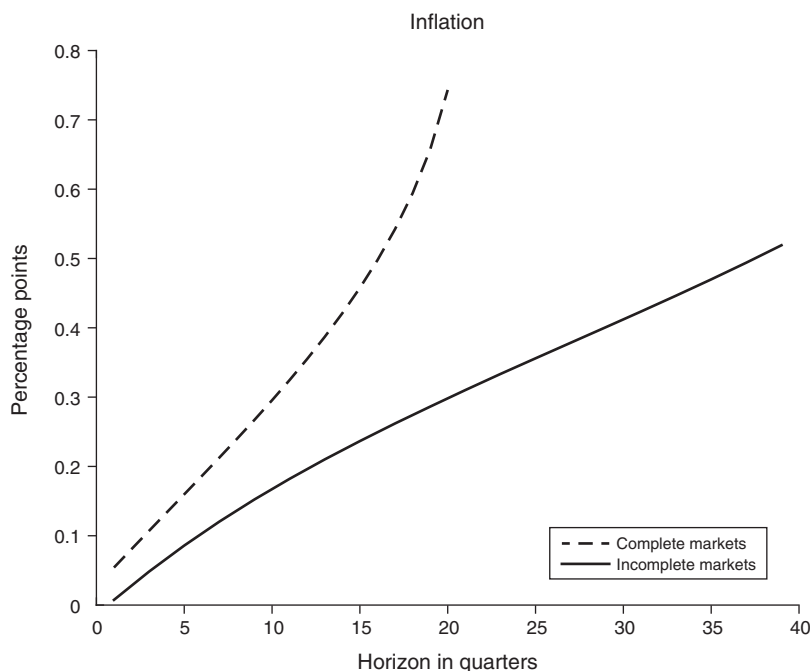


FIGURE 6. INITIAL RESPONSE OF INFLATION TO 50 BASIS POINT FORWARD GUIDANCE ABOUT THE REAL INTEREST RATE FOR A SINGLE QUARTER AT DIFFERENT HORIZONS

this reason, the benefit of responding falls. In addition, the cost of responding rises since the amount the household would need to run down its assets to take full advantage of the opportunity to intertemporally substitute gets larger and larger. Together, these forces imply that eventually the benefits from intertemporal substitution are simply too small to make it worth it for households to incur the costs associated with running down their buffer-stock savings.

In Section I, we show how the immediate full response of consumption under complete markets to an interest rate change at any future horizon arises because the response of current consumption is a function of an undiscounted sum of log changes in future real interest rates. In contrast, in our incomplete markets model, consumption behaves as though there is a “discount factor” on future consumption in the Euler equation which discounts the effects of real interest rate changes more and more the further in the future they are.²⁰ The extent of this type of discounting depends on the nature of the incomplete markets model, and the policy experiment. We explore below how this discounting is dependent on the amount of risk households face and the amount of assets they have to self-insure.

The results for inflation are even starker. Figure 6 plots the initial response of inflation to forward guidance about the real interest rate at different horizons. In

²⁰In a companion paper (McKay, Nakamura, and Steinsson 2016), we present a simple model with incomplete markets and unemployment risk which yields a log-linearized Euler equation of the form $\hat{C}_t = \alpha E_t \hat{C}_{t+1} - \gamma^{-1}(i_t - E_t \pi_{t+1} - r_t^n)$, where hats on variables denote percent deviations from steady state. This Euler equation differs from the standard Euler equation due to the “discount factor” α in front of the $E_t \hat{C}_{t+1}$ term. We show that this simple model can generate very similar responses to forward guidance to the incomplete markets model we consider in this section.

the complete markets model, the response of inflation rises explosively with the horizon of the forward guidance.²¹ In the incomplete markets model, in contrast, the inflation response is smaller to start out with, grows more slowly, and therefore generates very different results at long horizons.

B. Results for Alternative Calibrations

Table 2 presents the results of the forward guidance experiment described above for our baseline incomplete markets model as well as for several alternative calibrations of our incomplete markets model. We also present the results for the complete markets version of our model, for comparison. In each case, we present the initial response of output and inflation to 50 basis point forward guidance about the real interest rate for a single quarter five years in the future.

The high risk calibration features greater uninsurable risk than our baseline calibration. We roughly double the volatility of idiosyncratic productivity shocks relative to our baseline calibration, allowing us to match recent evidence on the volatility of earnings growth from Guvenen, Ozkan, and Song (2014). This boosts the precautionary savings motive and further reduces the power of forward guidance relative to the complete markets benchmark. The response of output in this case is only about 20 percent of the complete markets benchmark and the response of inflation only about 32 percent of the complete markets benchmark.

In the high asset calibration, we set the ratio of assets to GDP in the model to be almost three times higher than in our baseline calibration (3.79 versus 1.4). We do this to match the ratio of total net worth in the economy to GDP (as opposed to total liquid assets as in our baseline calibration). Increasing the quantity of available assets in the economy increases the size of the precautionary savings buffers available to households and thus reduces their reluctance to engage in intertemporal substitution. This change therefore moves the incomplete markets model closer to the complete markets benchmark. The output response rises to 58 percent of the complete markets benchmark, while the inflation effect rises to 49 percent.²²

We also consider a high risk and asset calibration with both of the above-mentioned alternative parameter values. These two modifications largely offset each other. As a consequence, the results lie between the two calibrations described above and close to the baseline calibration. The response of output in this calibration is

²¹ There is a powerful feedback loop in our nonlinear model. High inflation leads to an increase in price dispersion, which results in loss of efficiency. Workers must then work harder to produce the output that households demand. To induce workers to work more, wages must rise leading to more inflation. For small amounts of inflation these forces are not important, but if inflation remains elevated for long enough these dynamics lead to a sharp enough increase in wages and relative prices that the model solution can no longer be computed accurately. Interestingly, inflation itself asymptotes to a finite value because, in the nonlinear New Keynesian model, no matter how high the current desired price of adjusting firms is, inflation can only asymptote to a certain level, because demand (and the products weight in the price index) falls with the relative price of adjusting firms. See Ascari (2004) for a very related discussion.

²² One might ask how adding unsecured debt would affect our results. We have considered a case in which the amount of assets in the model is calibrated as in our baseline case but we relax the borrowing constraint by allowing households to borrow up to five times average monthly labor income. Figure 2 of Kaplan, Violante, and Weidner (2014) indicates that very few households have unsecured debt that is larger than five times monthly income. This calibration yields results that are very similar to our baseline case (an initial output response of 10.9bp versus 10.3bp in our baseline case).

TABLE 2—POWER OF 20 QUARTER AHEAD FORWARD GUIDANCE

	Initial responses of	
	Output	Inflation
Baseline	10.3	29.8
High risk	4.8	23.8
High asset	14.5	36.2
High risk and asset	11.6	33.8
Complete markets	25.0	74.3

Note: Initial response of output and inflation (in basis points) to forward guidance that reduces the expected real interest rate 20 quarters ahead by 50 basis points for four different calibrations of our incomplete markets model.

46 percent of the complete markets benchmark, while the response of inflation is 45 percent of the complete markets benchmark.

These alternative calibrations demonstrate that, with more risk and less self-insurance, the effects of precautionary savings and credit constraints become more pronounced. There are several reasons to believe that our baseline calibration understates the importance of these forces. In our baseline calibration, the fraction of agents that are constrained in steady state is 13 percent implying that 87 percent of households have positive liquid assets. Kaplan, Violante, and Weidner (2014) present estimates from the US Survey of Consumer Finances that 75 percent of US households have positive liquid assets. On this metric, therefore, our baseline calibration understates the fraction of households with low liquid assets relative to the US data. A related statistic is the average marginal propensity to consume (MPC). In our baseline calibration the average MPC is only 12 percent, and even in our high risk calibration it rises only to 14 percent. In contrast, a substantial amount of empirical evidence suggests larger values for the average MPC, with many studies estimating values close to 20 percent.²³ On the basis of these statistics, one might argue for calibrations in which households are more credit constrained than in the calibrations we have considered. Such a calibration would likely further amplify the effects we emphasize regarding the differences between the complete and incomplete markets models.

C. Zero Lower Bound Analysis

In recent years, risk-free nominal interest rates around the world have hit zero. At the zero lower bound (ZLB), forward guidance has become an indispensable policy tool, since it is no longer possible to implement monetary policy via the current policy rate. Eggertsson and Woodford (2003) show how a persistent shock to the natural interest rate that causes the economy to hit the ZLB can provoke a massive recession if the central bank does not engage in unconventional monetary policy.

²³Parker (1999) estimates that household spend 20 percent of increases in disposable income when they hit the Social Security tax cap. Johnson, Parker, and Souleles (2006) estimate that households spent 20–40 percent of tax rebate checks they received in 2001, and Parker et al. (2013) estimate that households spent 12–30 percent of tax rebate checks they received in 2008. These studies as well as most others on this topic consider anticipated changes in income. They therefore provide a lower bound for responses to unanticipated changes in income. See Jappelli and Pistaferri (2010) for an excellent recent survey of the literature on the response of consumption to changes in income.

They show, however, that the recession can be fully abated by a relatively modest amount of forward guidance about future interest rates.

Our conclusions above suggest that forward guidance may not be as powerful at the ZLB in our incomplete markets model. To investigate this question, we follow Eggertsson and Woodford (2003) in assuming that the ZLB is brought on by a temporary shock to the subjective discount factor of households in the economy that depresses the natural rate of interest below zero. In other words, we now consider a case where the discount factor can vary over time. The specific shock we consider is an increase in the discount factor that lasts for a known number of quarters and then reverts to normal.²⁴ We choose the size and persistence of the shock so that the initial output decline is 4 percent and the ZLB binds for 20 quarters under a naive monetary policy (described below).²⁵

We consider two alternative monetary policies. First, we consider a policy where the central bank sets the nominal interest rate equal to a simplified Taylor rule whenever this yields an interest rate greater than zero, and, otherwise, sets the nominal rate to zero: $i_t = \max[0, \bar{r} + \phi\pi_t]$, where $\phi = 1.5$ and \bar{r} is the steady state real interest rate. We refer to this policy as the “naive” policy. We also consider an “extended” policy whereby the central bank sets the nominal rate to zero for several additional quarters beyond what is implied by the naive policy and then reverts back to the policy rule. We choose the length of the additional monetary stimulus to fully eliminate the initial fall in output in the complete markets model.

Figure 7 shows that forward guidance is substantially less powerful at the ZLB in the incomplete markets model than in the standard New Keynesian model. The bottom two lines show the path of output under the naive monetary policy for the complete and incomplete markets cases; while the top two lines show the effects of the extended monetary policy in these two cases. While the extended monetary policy fully eliminates the recession in the complete markets case, a substantial recession remains in the incomplete markets model. Figure 8 shows the implications for inflation: the extended policy is much more successful in preventing deflation in the complete markets model versus the incomplete markets model. While the initial deflation is only about 30 basis points in the complete markets case, it is more than 100 basis points in the incomplete markets case. The fact that inflation is lower in the incomplete markets case implies that real interest rates are higher (since nominal rates are stuck at zero). This contributes to the larger fall in output.

Figure 9 plots the implications of the naive and extended monetary policies for the nominal interest rate. Under the naive policy, the ZLB binds for 20 quarters and then rises gradually to its steady state value of 50 basis points. Under the extended policy, the nominal interest rate remains at zero for 23 quarters (an additional 3 quarters),

²⁴Our shock differs from the shock considered in Eggertsson and Woodford (2003) in that its persistence is known, implying that agents have perfect foresight about the evolution of the aggregate economy. Eggertsson and Woodford (2003) consider a shock that reverts back to normal with constant probability each period. Clearly, both formulations are approximations. Eggertsson and Woodford’s formulation abstracts from time-variation in the probability of the ZLB period ending, while our framework abstracts from uncertainty about when it will end. However, the incomplete markets model is more difficult to solve computationally without the assumption of perfect foresight for aggregate shocks.

²⁵Hitting these targets requires slightly different calibrations of the discount factor shock in the complete versus the incomplete markets model: it corresponds to a decline in the natural rate of 16.4 basis points in the incomplete markets model, but only 14.8 basis points in the complete markets model. In each case, the duration of the shock is 33 quarters.

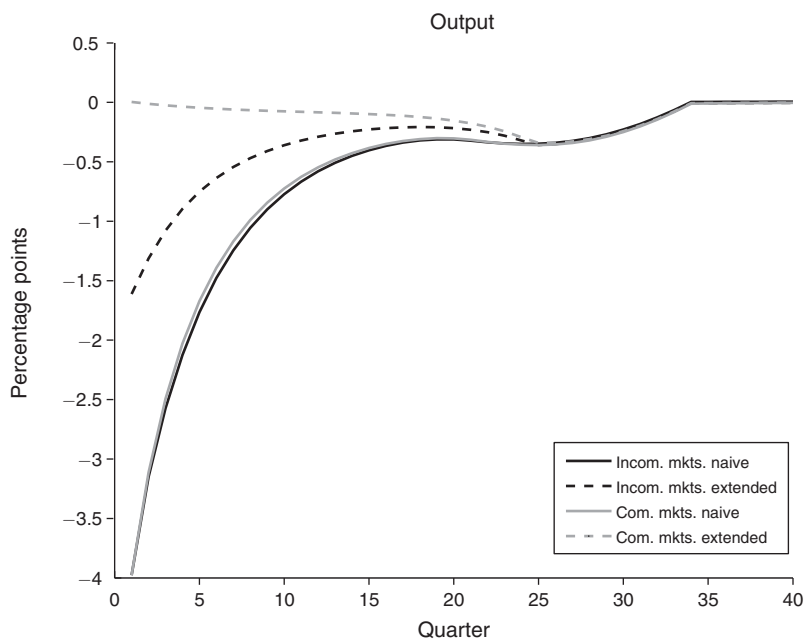


FIGURE 7. RESPONSE OF OUTPUT TO THE ZLB SHOCK

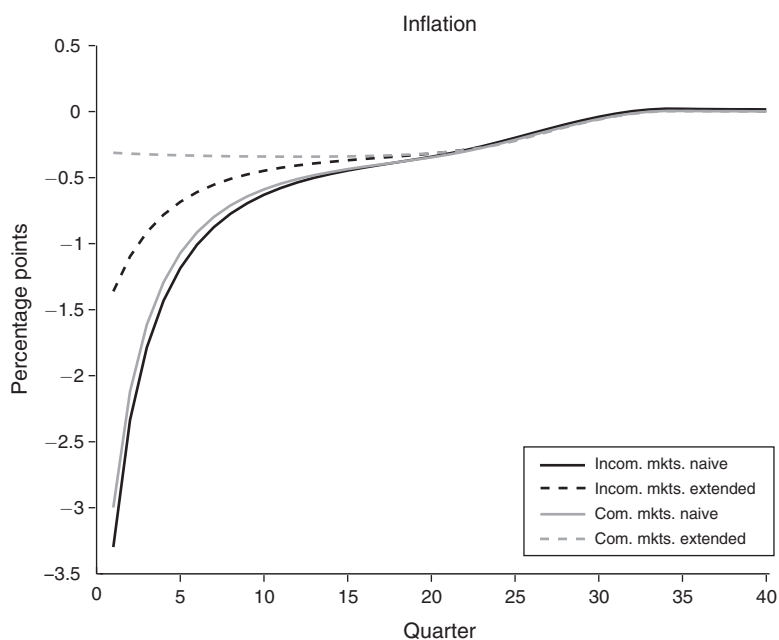


FIGURE 8. RESPONSE OF INFLATION TO THE ZLB SHOCK

and interest rates are somewhat lower in quarter 24 than the naive policy implies (this partial stimulus in the 24th quarter is what is needed to exactly eliminate the initial fall in output due to the shock). The difference between the dashed and solid lines, thus, indicates the amount of additional stimulus provided by the extended policy.

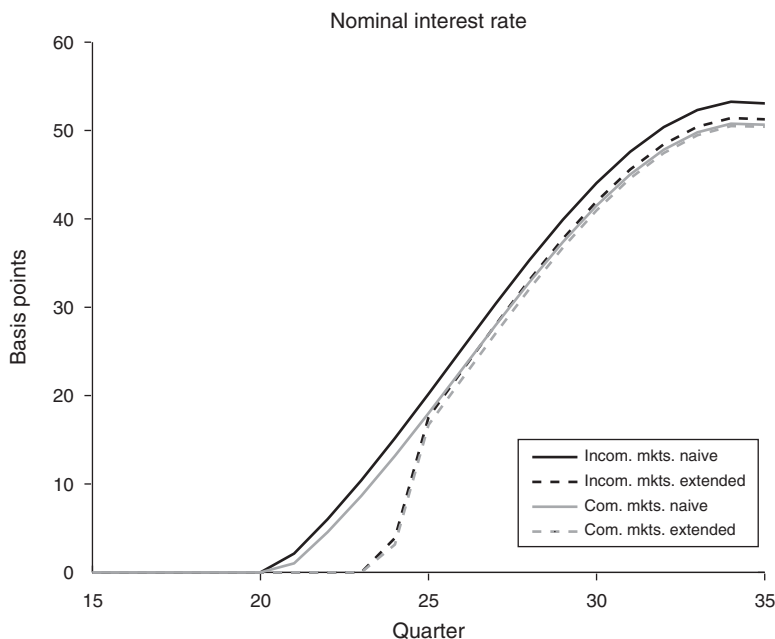


FIGURE 9. RESPONSE OF NOMINAL INTEREST RATE TO THE ZLB SHOCK

IV. Conclusion

We study the effects of forward guidance about monetary policy. We do this in a standard New Keynesian model augmented with uninsurable income risk and borrowing constraints and find that allowing for uninsurable income risk and borrowing constraints substantially decreases the power of forward guidance relative to a New Keynesian model with complete markets.

In the standard New Keynesian model with complete markets, an announcement about interest rates has the same effect on current consumption whether it pertains to the current short rate or the short rate five years in the future. In contrast, when markets are incomplete the effect of such an announcement on current consumption declines with the horizon of the announcement. Forward guidance about interest rates five years in the future has only about 40 percent as large an effect on current consumption as in the complete markets case, while forward guidance about interest rates ten years in the future has essentially no effect on current consumption. Intuitively, in the incomplete markets model, a precautionary savings effect counteracts the standard intertemporal substitution motive.

We have focused in the paper on analyzing the response of the incomplete markets model to monetary policy shocks. However, movements in real interest rates play an important role in the response of the economy to a wide variety of shocks. The arguments we have made will therefore affect the response of the economy to a wide variety of shocks.

APPENDIX: PARTIAL EQUILIBRIUM VERSUS GENERAL EQUILIBRIUM

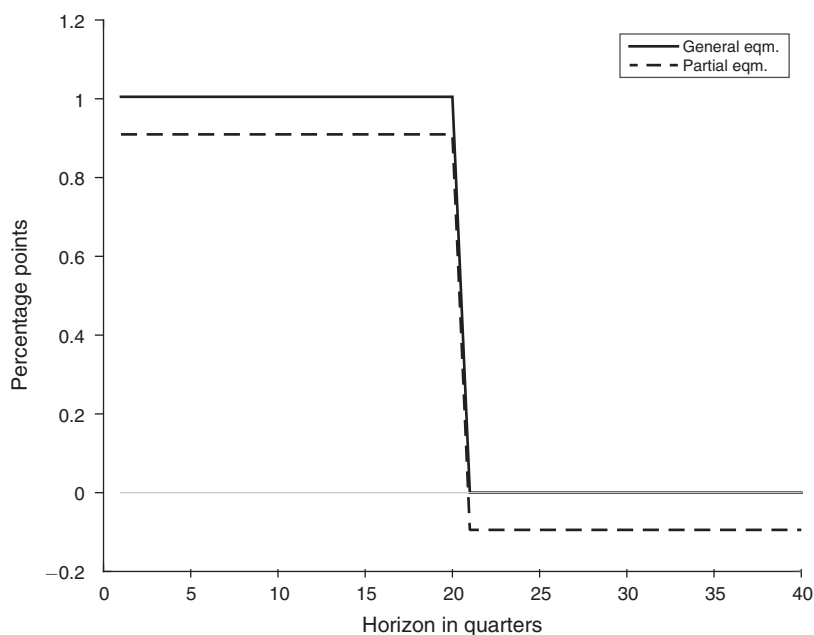


FIGURE A1. COMPARISON OF THE GENERAL AND PARTIAL EQUILIBRIUM RESPONSES TO A 1 PERCENTAGE POINT REDUCTION IN REAL INTEREST RATES IN PERIOD 20 WITH A UNIT INTERTEMPORAL ELASTICITY OF SUBSTITUTION UNDER COMPLETE MARKETS

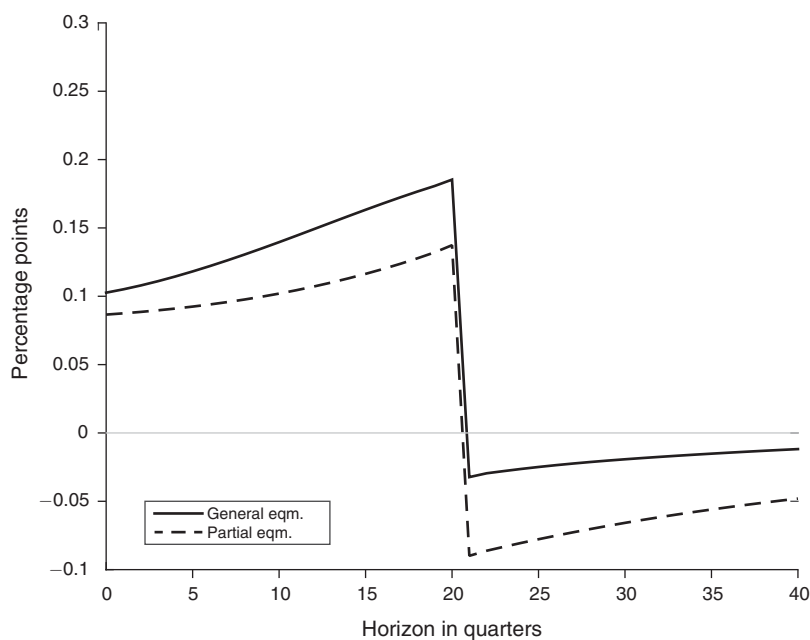


FIGURE A2. COMPARISON OF THE GENERAL AND PARTIAL EQUILIBRIUM RESPONSE TO A 50 BASIS POINT REDUCTION IN REAL INTEREST RATES IN PERIOD 20

Notes: The figure shows the output response for the incomplete markets model with an intertemporal elasticity of substitution of one-half. The partial equilibrium response holds wages, profits, and taxes fixed but allows households to reoptimize their labor supply.

REFERENCES

- Aiyagari, S. Rao. 1994. "Uninsured Idiosyncratic Risk and Aggregate Saving." *Quarterly Journal of Economics* 109 (3): 659–84.
- Ascari, Guido. 2004. "Staggered Prices and Trend Inflation: Some Nuisances." *Review of Economic Dynamics* 7 (3): 642–67.
- Auclert, Adrien. 2015. "Monetary Policy and the Redistribution Channel." http://web.stanford.edu/~aaucclert/mp_redistribution.pdf (accessed August 24, 2016).
- Bewley, Truman. Undated. "Interest Bearing Money and the Equilibrium Stock of Capital." Unpublished.
- Caballero, Ricardo J., and Emmanuel Farhi. 2014. "The Safety Trap." National Bureau of Economic Research Working Paper 19927.
- Calvo, Guillermo A. 1983. "Staggered Prices in a Utility-Maximizing Framework." *Journal of Monetary Economics* 12 (3): 383–98.
- Campbell, Jeffrey R., Charles L. Evans, Jonas D. M. Fisher, and Alejandro Justiniano. 2012. "Macroeconomic Effects of Federal Reserve Forward Guidance." *Brookings Papers on Economic Activity* 2012 (Spring): 1–54.
- Carlstrom, Charles T., Timothy S. Fuerst, and Matthias Paustian. 2012. "Inflation and Output in New Keynesian Models with a Transient Interest Rate Peg." Federal Reserve Bank of Cleveland Working Paper 1234.
- Carroll, Christopher D. 2006. "The Method of Endogenous Gridpoints for Solving Dynamic Stochastic Optimization Problems." *Economics Letters* 91 (3): 312–20.
- Chetty, Raj. 2012. "Bounds on Elasticities with Optimization Frictions: A Synthesis of Micro and Macro Evidence on Labor Supply." *Econometrica* 80 (3): 969–1018.
- Christiano, Lawrence, Martin Eichenbaum, and Sergio Rebelo. 2011. "When Is the Government Spending Multiplier Large?" *Journal of Political Economy* 119 (1): 78–121.
- Del Negro, Marco, Marc Giannoni, and Christina Patterson. 2013. "The Forward Guidance Puzzle." Federal Reserve Bank of New York Staff Report 574.
- Eggertsson, Gauti B., and Michael Woodford. 2003. "The Zero Bound on Interest Rates and Optimal Monetary Policy." *Brookings Papers on Economic Activity* 2003 (1): 139–211.
- Floden, Martin, and Jesper Lindé. 2001. "Idiosyncratic Risk in the United States and Sweden: Is There a Role for Government Insurance?" *Review of Economic Dynamics* 4 (2): 406–37.
- Gali, Jordi. 2008. *Monetary Policy, Inflation, and the Business Cycle*. Princeton: Princeton University Press.
- Gornemann, Nils, Keith Kuester, and Makoto Nakajima. 2016. "Doves for the Rich, Hawks for the Poor? Distributional Consequences of Monetary Policy." Board of Governors of the Federal Reserve System. International Finance Discussion Paper 1167.
- Guerrieri, Veronica, and Guido Lorenzoni. 2015. "Credit Crises, Precautionary Savings, and the Liquidity Trap." NBER Working Paper 17583.
- Gurkaynak, Refet S., Brian Sack, and Eric T. Swanson. 2005. "Do Actions Speak Louder Than Words? The Response of Asset Prices to Monetary Policy Actions and Statements." *International Journal of Central Banking* 1 (1): 55–93.
- Güvenen, Fatih, Serdar Ozkan, and Jae Song. 2014. "The Nature of Countercyclical Income Risk." *Journal of Political Economy* 122 (3): 621–60.
- Huggett, Mark. 1993. "The Risk-Free Rate in Heterogeneous-Agent Incomplete-Insurance Economies." *Journal of Economic Dynamics and Control* 17 (5-6): 953–69.
- Jappelli, Tullio, and Luigi Pistaferri. 2010. "The Consumption Response to Income Changes." *Annual Review of Economics* 2 (1): 479–506.
- Johnson, David S., Jonathan A. Parker, and Nicholas S. Souleles. 2006. "Household Expenditure and the Income Tax Rebates of 2001." *American Economic Review* 96 (5): 1589–1610.
- Kaplan, Greg, and Giovanni L. Violante. 2014. "A Model of the Consumption Response to Fiscal Stimulus Payments." *Econometrica* 82 (4): 1199–1239.
- Kaplan, Greg, Giovanni L. Violante, and Justin Weidner. 2014. "The Wealthy Hand-to-Mouth." *Brookings Papers on Economic Activity* 2014 (Spring): 77–138.
- Kiley, Michael T. 2014. "Policy Paradoxes in the New Keynesian Model." Board of Governors of the Federal Reserve System, Finance and Economics Discussion Series 2014-29.
- Kopecky, Karen A., and Richard M. H. Suen. 2010. "Finite State Markov-Chain Approximations to Highly Persistent Processes." *Review of Economic Dynamics* 13 (3): 701–14.
- Krusell, Per, and Anthony A. Smith Jr. 1998. "Income and Wealth Heterogeneity in the Macroeconomy." *Journal of Political Economy* 106 (5): 867–96.

- McKay, Alisdair, Emi Nakamura, and Jón Steinsson.** 2015. "The Power of Forward Guidance Revisited." National Bureau of Economic Research Working Paper 20882.
- McKay, Alisdair, Emi Nakamura, and Jón Steinsson.** 2016. "The Discounted Euler Equation: A Note." NBER Working Paper 22129.
- McKay, Alisdair, Emi Nakamura, and Jón Steinsson.** 2016. "The Power of Forward Guidance Revisited: Dataset." *American Economic Review*. <http://dx.doi.org/10.1257/aer.20150063>.
- McKay, Alisdair, and Ricardo Reis.** 2016. "The Role of Automatic Stabilizers in the U.S. Business Cycle." *Econometrica* 84 (1): 141–94.
- Oh, Hyunseung, and Ricardo Reis.** 2012. "Targeted Transfers and the Fiscal Response to the Great Recession." *Journal of Monetary Economics* 59 (S): S50–S64.
- Parker, Jonathan A.** 1999. "The Reaction of Household Consumption to Predictable Changes in Social Security Taxes." *American Economic Review* 89 (4): 959–73.
- Parker, Jonathan A., Nicholas S. Souleles, David S. Johnson, and Robert McClelland.** 2013. "Consumer Spending and the Economic Stimulus Payments of 2008." *American Economic Review* 103 (6): 2530–53.
- Rouwenhorst, K. Geert.** 1995. "Asset Pricing Implications of Equilibrium Business Cycle Models." In *Frontiers of Business Cycle Research*, edited by Thomas F. Cooley, 294–330. Princeton, NJ: Princeton University Press.
- Smets, Frank, and Rafael Wouters.** 2007. "Shocks and Frictions in US Business Cycles: A Bayesian DSGE Approach." *American Economic Review* 97 (3): 586–606.
- Werning, Iván.** 2012. "Managing a Liquidity Trap: Monetary and Fiscal Policy." NBER Working Paper 17344.
- Werning, Iván.** 2015. "Incomplete Markets and Aggregate Demand." National Bureau of Economic Research Working Paper 21448.
- Woodford, Michael.** 2003. *Interest and Prices*. Princeton, NJ: Princeton University Press.

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1. Lilia Maliar, John B. Taylor. 2024. Odyssean forward guidance in normal times. *Journal of Economic Dynamics and Control* **165**, 104877. [[Crossref](#)]
2. Masataka Eguchi, Hidekazu Niwa, Takayuki Tsuruga. 2024. Should the Fiscal Authority Avoid Implementation Lag?. *Oxford Bulletin of Economics and Statistics* **86**:4, 856-870. [[Crossref](#)]
3. Stephen J. Cole, Sungjun Huh. 2024. Measuring the effects of unconventional monetary policy tools under adaptive learning. *Journal of Economic Dynamics and Control* **164**, 104876. [[Crossref](#)]
4. Andreas Gulyas, Matthias Meier, Mykola Ryzhenkov. 2024. Labor market effects of monetary policy across workers and firms. *European Economic Review* **166**, 104756. [[Crossref](#)]
5. Yongseung Jung. 2024. Limited Financial Market Participations and Shocks in Business Cycles in Korea. *East Asian Economic Review* **28**:2, 245-273. [[Crossref](#)]
6. Davide Melcangi, Vincent Sterk. 2024. Stock Market Participation, Inequality, and Monetary Policy. *Review of Economic Studies* **200**. . [[Crossref](#)]
7. Tersoo David Iorngurum. 2024. The exchange rate pass-through to domestic prices: A meta-analysis. *Journal of Economic Surveys* **23**. . [[Crossref](#)]
8. Christian Bayer, Benjamin Born, Ralph Luetticke. 2024. Shocks, Frictions, and Inequality in US Business Cycles. *American Economic Review* **114**:5, 1211-1247. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
9. Hie Joo Ahn, Shihan Xie, Choongryul Yang. 2024. Effects of monetary policy on household expectations: The role of homeownership. *Journal of Monetary Economics* **114**, 103599. [[Crossref](#)]
10. Stéphane Dupraz, Hervé Le Bihan, Julien Mathéron. 2024. Make-up strategies with finite planning horizons but infinitely forward-looking asset prices. *Journal of Monetary Economics* **143**, 103542. [[Crossref](#)]
11. FUMITAKA NAKAMURA. 2024. Household Income, Portfolio Choice, and Heterogeneous Consumption Responses to Monetary Policy Shocks. *Journal of Money, Credit and Banking* **105**. . [[Crossref](#)]
12. Julián Parra-Polanía, Andrés Sánchez-Jabba, Miguel Sarmiento. 2024. Are FX communications effective? Evidence from emerging markets. *Emerging Markets Review* **59**, 101091. [[Crossref](#)]
13. ELIZABETH BERSSON, PATRICK HÜRTGEN, MATTHIAS PAUSTIAN. 2024. Expectations Formation, Sticky Prices, and the ZLB. *Journal of Money, Credit and Banking* **56**:2-3, 365-393. [[Crossref](#)]
14. Daisuke Ida. 2024. Household heterogeneity and the price puzzle in a new Keynesian model. *Journal of Macroeconomics* **79**, 103587. [[Crossref](#)]
15. TIM HAGENHOFF, JOEP LUSTENHOUWER, MIKE TSIONAS. 2024. The Rationality Bias. *Journal of Money, Credit and Banking* **88**. . [[Crossref](#)]
16. Sushant Acharya, Paolo A. Pesenti. 2024. Spillovers and Spillbacks. *SSRN Electronic Journal* **88**. . [[Crossref](#)]
17. Rubén Domínguez-Díaz, Donghai Zhang. 2024. The Macroeconomic Effects of Unemployment Insurance Extensions: A Policy Rule-Based Identification Approach. *SSRN Electronic Journal* **109**. . [[Crossref](#)]
18. Oliver Pfäuti, Fabian Seyrich, Jonathan Zinman. 2024. Bad Luck or Bad Decisions? Macroeconomic Implications of Persistent Heterogeneity in Cognitive Skills and Overconfidence. *SSRN Electronic Journal* **113**. . [[Crossref](#)]

19. Oliver Pfäuti, Fabian Seyrich, Jonathan Zinman. 2024. Bad Luck or Bad Decisions? Macroeconomic Implications of Persistent Heterogeneity in Cognitive Skills and Overconfidence. *SSRN Electronic Journal* **113**. . [[Crossref](#)]
20. Sushant Acharya, Jess Benhabib. 2024. Global Indeterminacy in Hank Economies. *SSRN Electronic Journal* **88**. . [[Crossref](#)]
21. Marc Dordal i Carreras, Seung Joo Lee. 2024. Higher-Order Forward Guidance. *SSRN Electronic Journal* . [[Crossref](#)]
22. Davide Debortoli, Jordi Gali. 2024. Heterogeneity and Aggregate Fluctuations: Insights from Tank Models. *SSRN Electronic Journal* **88**. . [[Crossref](#)]
23. Luigi Bocola, Alessandro Dovis, Kasper Jørgensen, Rishabh Kirpalani. 2024. Bond Market Views of the Fed. *SSRN Electronic Journal* **84**. . [[Crossref](#)]
24. Xavier Gabaix. 2023. Marshall Lecture 2023: Behavioral Macroeconomics via Sparse Dynamic Programming. *Journal of the European Economic Association* **21**:6, 2327-2376. [[Crossref](#)]
25. Meihua Jiang, Yuzhe Huang. 2023. Is forward guidance an effective policy: A time-varying analysis. *Finance Research Letters* **58**, 104486. [[Crossref](#)]
26. Guido Ascari, Sophocles Mavroeidis, Nigel McClung. 2023. Coherence without rationality at the zero lower bound. *Journal of Economic Theory* **214**, 105745. [[Crossref](#)]
27. Christopher G. Gibbs, Nigel McClung. 2023. Does my model predict a forward guidance puzzle?. *Review of Economic Dynamics* **51**, 393-423. [[Crossref](#)]
28. Andres Alonso-Robisco, José Manuel Carbó. 2023. Analysis of CBDC narrative by central banks using large language models. *Finance Research Letters* **58**, 104643. [[Crossref](#)]
29. YONGSEUNG JUNG. 2023. A LOOK AT THE U.S. BUSINESS CYCLES THROUGH THE LENS OF A TANK MODEL. *The Singapore Economic Review* **68**:06, 1991-2009. [[Crossref](#)]
30. Daisuke Ida. 2023. The effect of real money balances on international monetary policy transmission. *Journal of International Money and Finance* **139**, 102964. [[Crossref](#)]
31. António Afonso, Francisco Gomes Pereira. 2023. Unconventional monetary policy in the Euro area: Impacts on loans, employment, and investment. *International Journal of Finance & Economics* **31**. . [[Crossref](#)]
32. Olivier Coibion, Dimitris Georgarakos, Yuriy Gorodnichenko, Michael Weber. 2023. Forward Guidance and Household Expectations. *Journal of the European Economic Association* **21**:5, 2131-2171. [[Crossref](#)]
33. Timo Boppart, Per Krusell, Jonna Olsson. 2023. Labor supply when productivity keeps growing. *Review of Economic Dynamics* **50**, 61-87. [[Crossref](#)]
34. Greta Meggiorini. 2023. Behavioral New Keynesian Models: An empirical assessment. *Journal of Macroeconomics* **77**, 103538. [[Crossref](#)]
35. Haoyang Liu, Dean Parker, Rodney Ramcharan. 2023. Monetary Policy, Business Liquidity and Survival: Evidence from the Refinancing Channel. *The Review of Financial Studies* **36**:9, 3738-3780. [[Crossref](#)]
36. Christian K. Wolf. 2023. The Missing Intercept: A Demand Equivalence Approach. *American Economic Review* **113**:8, 2232-2269. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
37. Mary A. Burke, Ali Ozdagli. 2023. Household Inflation Expectations and Consumer Spending: Evidence from Panel Data. *Review of Economics and Statistics* **105**:4, 948-961. [[Crossref](#)]
38. He Nie. 2023. Government spending multipliers with the Real Cost channel. *Macroeconomic Dynamics* **11**, 1-22. [[Crossref](#)]

39. Saroj Bhattarai, Gauti B Eggertsson, Bulat Gafarov. 2023. Time Consistency and Duration of Government Debt: A Model of Quantitative Easing. *The Review of Economic Studies* **90**:4, 1759-1799. [[Crossref](#)]
40. Sushant Acharya, Edouard Challe, Keshav Dogra. 2023. Optimal Monetary Policy According to HANK. *American Economic Review* **113**:7, 1741-1782. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
41. Olivier Coibion, Dimitris Georgarakos, Yuriy Gorodnichenko, Maarten van Rooij. 2023. How Does Consumption Respond to News about Inflation? Field Evidence from a Randomized Control Trial. *American Economic Journal: Macroeconomics* **15**:3, 109-152. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
42. David Tercero-Lucas. 2023. Nonstandard monetary policies and bank profitability: The case of Spain. *International Journal of Finance & Economics* **28**:3, 2248-2277. [[Crossref](#)]
43. David Berger, Luigi Bocola, Alessandro Dovis. 2023. Imperfect Risk Sharing and the Business Cycle. *The Quarterly Journal of Economics* **138**:3, 1765-1815. [[Crossref](#)]
44. Junzhu Zhao. 2023. Wealth in utility, the Taylor principle and determinacy. *Journal of Macroeconomics* **76**, 103525. [[Crossref](#)]
45. Seungjun Baek. 2023. The redistributive effects of monetary policy in an overlapping generations model. *European Economic Review* **155**, 104433. [[Crossref](#)]
46. Dario Bonciani, Joonseok Oh. 2023. Monetary policy inertia and the paradox of flexibility. *Journal of Economic Dynamics and Control* **151**, 104668. [[Crossref](#)]
47. Adrien Auclert, Bence Bardóczy, Matthew Rognlie. 2023. MPCs, MPEs, and Multipliers: A Trilemma for New Keynesian Models. *Review of Economics and Statistics* **105**:3, 700-712. [[Crossref](#)]
48. Rishabh Aggarwal, Adrien Auclert, Matthew Rognlie, Ludwig Straub. 2023. Excess Savings and Twin Deficits: The Transmission of Fiscal Stimulus in Open Economies. *NBER Macroeconomics Annual* **37**, 325-412. [[Crossref](#)]
49. Philippe Andrade, Erwan Gautier, Eric Mengus. 2023. What matters in households' inflation expectations?. *Journal of Monetary Economics* **83**. . [[Crossref](#)]
50. Jinhee Woo. 2023. The power of forward guidance: The role of social transfer. *Economic Modelling* **88**, 106387. [[Crossref](#)]
51. Jianhao Lin, Ziwei Mei, Liangyuan Chen, Chuanqi Zhu. 2023. Is the People's Bank of China consistent in words and deeds?. *China Economic Review* **78**, 101919. [[Crossref](#)]
52. Francesco Busato, Bruno Chiarini, Gianluigi Cisco, Maria Ferrara. 2023. Green preferences. *Environment, Development and Sustainability* **25**:4, 3211-3253. [[Crossref](#)]
53. Christina Patterson. 2023. The Matching Multiplier and the Amplification of Recessions. *American Economic Review* **113**:4, 982-1012. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
54. Martin B. Holm. 2023. Monetary transmission with income risk*. *The Scandinavian Journal of Economics* **125**:2, 441-460. [[Crossref](#)]
55. Martin Mandler, Michael Scharnagl. 2023. The effects of shocks to interest rate expectations in the euro area: Estimates at the country level. *Journal of Forecasting* **42**:3, 643-656. [[Crossref](#)]
56. Christian Bayer, Benjamin Born, Ralph Luetticke. 2023. The liquidity channel of fiscal policy. *Journal of Monetary Economics* **134**, 86-117. [[Crossref](#)]
57. Kiana Basiri, Babak Mahmoudi, Chenggang Zhou. 2023. Who benefits the most? Risk pooling in mortgage loan insurance: Evidence from the Canadian mortgage market. *Real Estate Economics* **51**:2, 311-337. [[Crossref](#)]
58. Donato Masciandaro, Oana Peia, Davide Romelli. 2023. Central bank communication and social media: From silence to Twitter. *Journal of Economic Surveys* **11**. . [[Crossref](#)]

59. Jeffrey Sheen, Ben Zhe Wang. 2023. Do monetary condition news at the zero lower bound influence households' expectations and readiness to spend?. *European Economic Review* **152**, 104345. [[Crossref](#)]
60. Seungki Hong. 2023. MPCs in an emerging economy: Evidence from Peru. *Journal of International Economics* **140**, 103712. [[Crossref](#)]
61. Evi Pappa, Morten O. Ravn, Vincent Sterk. Expectations and incomplete markets 569–611. [[Crossref](#)]
62. George-Marios Angeletos, Chen Lian. Dampening general equilibrium: incomplete information and bounded rationality 613–645. [[Crossref](#)]
63. Saki Bigio, Yuliy Sannikov. 2023. A Model of Credit, Money, Interest and Prices. *SSRN Electronic Journal* **83**. . [[Crossref](#)]
64. Daeha Cho. 2023. Unemployment risk, MPC heterogeneity, and business cycles. *Quantitative Economics* **14**:2, 717–751. [[Crossref](#)]
65. Jesús Fernández-Villaverde, Joël Marbet, Galo Nuno, Omar Rachedi. 2023. Inequality and the Zero Lower Bound. *SSRN Electronic Journal* **54**. . [[Crossref](#)]
66. Jesús Fernández-Villaverde, Joël Marbet, Galo Nuno, Omar Rachedi. 2023. Inequality and the Zero Lower Bound. *SSRN Electronic Journal* **54**. . [[Crossref](#)]
67. Mark Aguiar, Manuel Amador, Cristina Arellano. 2023. Pareto Improving Fiscal and Monetary Policies: Samuelson in the New Keynesian Model. *SSRN Electronic Journal* **109**. . [[Crossref](#)]
68. René Glawion. 2023. Sequence-Space Jacobians in Continuous Time. *SSRN Electronic Journal* **89**. . [[Crossref](#)]
69. Noah Kwicklis. 2023. Transfer Payments, Sacrifice Ratios, and Inflation in a Fiscal Theory HANK. *SSRN Electronic Journal* **88**. . [[Crossref](#)]
70. Xiang SHI. 2023. Overbuilding and Recession: A New Drawback of Housing Market Boom-and-Bust Cycle. *SSRN Electronic Journal* **123**. . [[Crossref](#)]
71. Antzelos Kyriazis. 2023. Quantitative Easing and Fiscal Policy Effectiveness. *SSRN Electronic Journal* **89**. . [[Crossref](#)]
72. Antzelos Kyriazis. 2023. Quantitative Easing Spillovers. *SSRN Electronic Journal* **71**. . [[Crossref](#)]
73. Maurice Obstfeld. 2023. Natural and Neutral Real Interest Rates: Past and Future. *SSRN Electronic Journal* **71**. . [[Crossref](#)]
74. Gregor Boehl. 2023. Robust Nonlinear Transition Dynamics in HANK. *SSRN Electronic Journal* **32**. . [[Crossref](#)]
75. Matteo Bondesan. 2023. Conquering FIRE via Boundedly Rational HANK. *SSRN Electronic Journal* **372**. . [[Crossref](#)]
76. Christian Admin De la Huerta Avila. 2023. The Predictive Power of Central Bank Communication: Evidence from Mexico. *SSRN Electronic Journal* **108**. . [[Crossref](#)]
77. Xiaoliang Wang, Mengbo Zhang. 2023. Exchange Rates, US Monetary Policy and the Global Portfolio Flows. *SSRN Electronic Journal* **37**. . [[Crossref](#)]
78. Frantisek Masek, Jan Žemlička. 2023. Average Inflation Targeting in a Behavioral Heterogeneous Agent New Keynesian Model. *SSRN Electronic Journal* **38**. . [[Crossref](#)]
79. Rohan Kekre. 2022. Unemployment Insurance in Macroeconomic Stabilization. *Review of Economic Studies* **88**. . [[Crossref](#)]
80. Narayana R Kocherlakota. 2022. The Unavoidability of Low Inflation–Low Output Traps. *The Review of Economic Studies* **89**:6, 3410–3435. [[Crossref](#)]
81. Taeyoung Doh, A. Lee Smith. 2022. A new approach to integrating expectations into VAR models. *Journal of Monetary Economics* **132**, 24–43. [[Crossref](#)]

82. Christopher Gust, Edward Herbst, David López-Salido. 2022. Short-Term Planning, Monetary Policy, and Macroeconomic Persistence. *American Economic Journal: Macroeconomics* 14:4, 174-209. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
83. Florin O. Bilbiie. 2022. Neo-Fisherian Policies and Liquidity Traps. *American Economic Journal: Macroeconomics* 14:4, 378-403. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
84. David Evans, George W. Evans, Bruce McGough. 2022. The RPEs of RBCs and other DSGEs. *Journal of Economic Dynamics and Control* 143, 104492. [[Crossref](#)]
85. Narayana R. Kocherlakota. 2022. Stabilization with fiscal policy. *Journal of Monetary Economics* 131, 1-14. [[Crossref](#)]
86. Jianguo Liu, Liya Liu, Min Min, Shuying Tan, Fanqing Zhao. 2022. Can central bank communication effectively guide the monetary policy expectation of the public?. *China Economic Review* 75, 101833. [[Crossref](#)]
87. Ippei Fujiwara, Yuichiro Waki. 2022. The Delphic forward guidance puzzle in New Keynesian models. *Review of Economic Dynamics* 46, 280-301. [[Crossref](#)]
88. ANTOINE LEPETIT. 2022. The Optimal Inflation Rate with Discount Factor Heterogeneity. *Journal of Money, Credit and Banking* 54:7, 1971-1996. [[Crossref](#)]
89. Carolin Pflueger, Gianluca Rinaldi. 2022. Why does the Fed move markets so much? A model of monetary policy and time-varying risk aversion. *Journal of Financial Economics* 146:1, 71-89. [[Crossref](#)]
90. Niklas Amberg, Thomas Jansson, Mathias Klein, Anna Rogantini Picco. 2022. Five Facts about the Distributional Income Effects of Monetary Policy Shocks. *American Economic Review: Insights* 4:3, 289-304. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
91. Leonardo N. Ferreira. 2022. Forward guidance matters: Disentangling monetary policy shocks. *Journal of Macroeconomics* 73, 103423. [[Crossref](#)]
92. HIROKUNI IIBOSHI, MOTOTSUGU SHINTANI, KOZO UEDA. 2022. Estimating a Nonlinear New Keynesian Model with the Zero Lower Bound for Japan. *Journal of Money, Credit and Banking* 54:6, 1637-1671. [[Crossref](#)]
93. Antoine Lepetit, Cristina Fuentes-Albero. 2022. The limited power of monetary policy in a pandemic. *European Economic Review* 147, 104168. [[Crossref](#)]
94. Sebastian Gechert, Jan Siebert. 2022. Preferences over wealth: Experimental evidence. *Journal of Economic Behavior & Organization* 200, 1297-1317. [[Crossref](#)]
95. Gavin Goy, Cars Hommes, Kostas Mavromatis. 2022. Forward guidance and the role of central bank credibility under heterogeneous beliefs. *Journal of Economic Behavior & Organization* 200, 1240-1274. [[Crossref](#)]
96. Manthos D Delis, Sizhe Hong, Nikos Paltalidis, Dennis Philip. 2022. Forward Guidance and Corporate Lending. *Review of Finance* 26:4, 899-935. [[Crossref](#)]
97. Alexandre N. Kohlhas. 2022. Learning by Sharing: Monetary Policy and Common Knowledge. *American Economic Journal: Macroeconomics* 14:3, 324-364. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
98. Jane M. Ryngaert. 2022. Inflation disasters and consumption. *Journal of Monetary Economics* 129, S67-S81. [[Crossref](#)]
99. Constantinos Challoumis. 2022. Index of the cycle of money - The case of Poland. *Research Papers in Economics and Finance* 6:1, 72-86. [[Crossref](#)]
100. Wolfgang Maennig, Viktoria C. E. Schumann. 2022. Prevention Effect of News Shocks in Anti-Doping Policies. *Journal of Sports Economics* 23:4, 431-459. [[Crossref](#)]

101. Sumit Agarwal, Yeow Hwee Chua, Changcheng Song. 2022. Inflation expectations of households and the upgrading channel. *Journal of Monetary Economics* **128**, 124-138. [[Crossref](#)]
102. Tobias Müller, Kai Christoffel, Falk Mazelis, Carlos Montes-Galdón. 2022. Disciplining expectations and the forward guidance puzzle. *Journal of Economic Dynamics and Control* **137**, 104336. [[Crossref](#)]
103. Martin Eichenbaum, Sergio Rebelo, Arlene Wong. 2022. State-Dependent Effects of Monetary Policy: The Refinancing Channel. *American Economic Review* **112**:3, 721-761. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
104. Alisdair McKay, Johannes F. Wieland. 2022. Forward Guidance and Durable Goods Demand. *American Economic Review: Insights* **4**:1, 106-122. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
105. Florin O. Bilbiie, Diego R. Känzig, Paolo Surico. 2022. Capital and income inequality: An aggregate-demand complementarity. *Journal of Monetary Economics* **126**, 154-169. [[Crossref](#)]
106. XIN DENG, LIN GE, XUAN WU. 2022. SPILLOVER EFFECT OF THE FEDERAL RESERVE'S FORWARD GUIDANCE ON CHINA'S FINANCIAL MARKETS: FROM MECHANISM ANALYSIS TO EMPIRICAL TEST. *The Singapore Economic Review* **67**:02, 603-634. [[Crossref](#)]
107. Leif Brubakk, Saskia ter Ellen, Ørjan Robstad, Hong Xu. 2022. The macroeconomic effects of forward communication. *Journal of International Money and Finance* **120**, 102536. [[Crossref](#)]
108. Karsten O. Chipeniuk, Nets Hawk Katz, Todd B. Walker. 2022. Households, auctioneers, and aggregation. *European Economic Review* **141**, 103997. [[Crossref](#)]
109. Jennifer La'O, Alireza Tahbaz-Salehi. 2022. Optimal Monetary Policy in Production Networks. *Econometrica* **90**:3, 1295-1336. [[Crossref](#)]
110. Luigi Iovino, Jennifer La'O, Rui Mascarenhas. 2022. Optimal monetary policy and disclosure with an informationally-constrained central banker. *Journal of Monetary Economics* **125**, 151-172. [[Crossref](#)]
111. Oliver de Groot, Alexander Haas. 2022. The Signalling Channel of Negative Interest Rates. *SSRN Electronic Journal* **32**. . [[Crossref](#)]
112. Stéphane Dupraz, Herve Le Bihan, Julien Matheron. 2022. Make-up Strategies with Finite Planning Horizons but Forward-Looking Asset Prices. *SSRN Electronic Journal* **109**. . [[Crossref](#)]
113. Davide Debortoli, Jordi Gali. 2022. Idiosyncratic Income Risk and Aggregate Fluctuations. *SSRN Electronic Journal* **88**. . [[Crossref](#)]
114. Taskforce on Rate. 2022. Rate Forward Guidance in an Environment of Large Central Bank Balance Sheets: A Eurosystem Stock-Taking Assessment. *SSRN Electronic Journal* **32**. . [[Crossref](#)]
115. António Afonso, Francisco Gomes Pereira. 2022. Unconventional Monetary Policy in the Euro Area. Impacts on Loans, Employment, and Investment. *SSRN Electronic Journal* **32**. . [[Crossref](#)]
116. Guillaume Arnould, Benjamin Guin, Steven R. G. Ongena, Paolo Siciliani. 2022. (When) Do Banks React to Anticipated Capital Reliefs?. *SSRN Electronic Journal* **11**. . [[Crossref](#)]
117. Stefano Eusepi, Christopher Gibbs, Bruce Preston. 2022. Monetary policy trade-offs at the zero lower bound. *SSRN Electronic Journal* **117**. . [[Crossref](#)]
118. Gianluca Benigno, Pierpaolo Benigno. 2022. Managing Monetary Policy Normalization. *SSRN Electronic Journal* **114**. . [[Crossref](#)]
119. William Daniel Dupor, Marios Karabarbounis, Marianna Kudlyak, M. Saif Mehkari. 2022. Regional Consumption Responses and the Aggregate Fiscal Multiplier. *SSRN Electronic Journal* **105**. . [[Crossref](#)]
120. Stephane Dupraz, Herve Le Bihan, Julien Matheron, Banco de España Research Paper Submitter. 2022. Make-up Strategies with Finite Planning Horizons but Forward-Looking Asset Prices. *SSRN Electronic Journal* **88**. . [[Crossref](#)]

121. Shan Ying, Ben Zhe Wang. 2022. The Role of Monetary Policy Uncertainty in Transmitting Monetary Policy Shocks. *SSRN Electronic Journal* **31**. . [[Crossref](#)]
122. Yongseung Jung. 2022. Consumption Heterogeneity and Driving Forces of Business Cycles in Korea. *SSRN Electronic Journal* **52**. . [[Crossref](#)]
123. Hanno Kase, Leonardo Melosi, Matthias Rottner. 2022. Estimating Nonlinear Heterogeneous Agents Models with Neural Networks. *SSRN Electronic Journal* **88**. . [[Crossref](#)]
124. Cristiano Cantore, Filippo Ferroni, Haroon Mumtaz, Angeliki Theophilopoulou. 2022. A Tail of Labor Supply and a Tale of Monetary Policy. *SSRN Electronic Journal* **110**. . [[Crossref](#)]
125. Britta Gehrke, Thomas Dengler. 2022. Short-Time Work and Precautionary Savings. *SSRN Electronic Journal* **42**. . [[Crossref](#)]
126. Lukas Nord. 2022. Who Cares about Inflation? Endogenous Expectation Formation of Heterogeneous Households. *SSRN Electronic Journal* **108**. . [[Crossref](#)]
127. Yongseung Jung. 2022. Consumption Heterogeneity and Driving Forces of Business Cycles in Korea. *SSRN Electronic Journal* **52**. . [[Crossref](#)]
128. Callum Jones, Mariano Kulish, Daniel M. Rees. 2022. International spillovers of forward guidance shocks. *Journal of Applied Econometrics* **37**:1, 131-160. [[Crossref](#)]
129. Oliver Pfäuti, Fabian Seyrich. 2022. A Behavioral Heterogeneous Agent New Keynesian Model. *SSRN Electronic Journal* **88**. . [[Crossref](#)]
130. Stephen J. Cole, Enrique Martínez-García. 2021. The effect of central bank credibility on forward guidance in an estimated New Keynesian model. *Macroeconomic Dynamics* **80**, 1-39. [[Crossref](#)]
131. Sebastián Fanelli, Ludwig Straub. 2021. A Theory of Foreign Exchange Interventions. *The Review of Economic Studies* **88**:6, 2857-2885. [[Crossref](#)]
132. Christopher J. Erceg, Zoltan Jakab, Jesper Lindé. 2021. Monetary policy strategies for the European Central Bank. *Journal of Economic Dynamics and Control* **132**, 104211. [[Crossref](#)]
133. Oguzhan Cepni, Rangan Gupta. 2021. Time-varying impact of monetary policy shocks on US stock returns: The role of investor sentiment. *The North American Journal of Economics and Finance* **58**, 101550. [[Crossref](#)]
134. George-Marios Angeletos, Karthik A Sastry. 2021. Managing Expectations: Instruments Versus Targets. *The Quarterly Journal of Economics* **136**:4, 2467-2532. [[Crossref](#)]
135. Atif Mian, Ludwig Straub, Amir Sufi. 2021. Indebted Demand. *The Quarterly Journal of Economics* **136**:4, 2243-2307. [[Crossref](#)]
136. Stefano Di Bucchianico. 2021. Negative Interest Rate Policy to Fight Secular Stagnation: Unfeasible, Ineffective, Irrelevant, or Inadequate?. *Review of Political Economy* **33**:4, 687-710. [[Crossref](#)]
137. Jonathan Chiu, Miguel Molico. 2021. Short-run dynamics in a search-theoretic model of monetary exchange. *Review of Economic Dynamics* **42**, 133-155. [[Crossref](#)]
138. Jason Choi, Andrew Foerster. 2021. Optimal monetary policy regime switches. *Review of Economic Dynamics* **42**, 333-346. [[Crossref](#)]
139. Martin Blomhoff Holm, Pascal Paul, Andreas Tischbirek. 2021. The Transmission of Monetary Policy under the Microscope. *Journal of Political Economy* **129**:10, 2861-2904. [[Crossref](#)]
140. Wei Cui, Vincent Sterk. 2021. Quantitative easing with heterogeneous agents. *Journal of Monetary Economics* **123**, 68-90. [[Crossref](#)]
141. Asad Dossani. 2021. Central bank tone and currency risk premia. *Journal of International Money and Finance* **117**, 102424. [[Crossref](#)]
142. Alisdair McKay, Ricardo Reis. 2021. Optimal Automatic Stabilizers. *The Review of Economic Studies* **88**:5, 2375-2406. [[Crossref](#)]

143. Joshua K. Hausman, Paul W. Rhode, Johannes F. Wieland. 2021. Farm Product Prices, Redistribution, and the Early U.S. Great Depression. *The Journal of Economic History* **81**:3, 649-687. [[Crossref](#)]
144. Masakazu Emoto, Takeki Sunakawa. 2021. Applying the explicit aggregation algorithm to heterogeneous agent models in continuous time. *Economics Letters* **206**, 109940. [[Crossref](#)]
145. KIMBERLY A. BERG, CHADWICK C. CURTIS, STEVEN LUGAUER, NELSON C. MARK. 2021. Demographics and Monetary Policy Shocks. *Journal of Money, Credit and Banking* **53**:6, 1229-1266. [[Crossref](#)]
146. Olga Antipina, Nina Miklashevskaya. 2021. On the tradition of teaching basic economic theory at Moscow University: past, present, future. *Moscow University Economics Bulletin* :4, 237-254. [[Crossref](#)]
147. Karl Harmenberg. 2021. Aggregating heterogeneous-agent models with permanent income shocks. *Journal of Economic Dynamics and Control* **129**, 104185. [[Crossref](#)]
148. Martin Baumgärtner, Jens Klose. 2021. Why central banks announcing liquidity injections is more effective than forward guidance. *International Finance* **24**:2, 236-256. [[Crossref](#)]
149. Florin O. Bilbiie, Xavier Ragot. 2021. Optimal monetary policy and liquidity with heterogeneous households. *Review of Economic Dynamics* **41**, 71-95. [[Crossref](#)]
150. Leonor Modesto, Carine Nourry, Thomas Seegmuller, Alain Venditti. 2021. Growth and instability in a small open economy with debt. *Mathematical Social Sciences* **112**, 26-37. [[Crossref](#)]
151. Cristiano Cantore, Filippo Ferroni, Miguel León-Ledesma. 2021. The Missing Link: Monetary Policy and The Labor Share. *Journal of the European Economic Association* **19**:3, 1592-1620. [[Crossref](#)]
152. Alistair Macaulay. 2021. The attention trap: Rational inattention, inequality, and fiscal policy. *European Economic Review* **135**, 103716. [[Crossref](#)]
153. Rui Wang. 2021. Evaluating the Unconventional Monetary Policy of the Bank of Japan: A DSGE Approach. *Journal of Risk and Financial Management* **14**:6, 253. [[Crossref](#)]
154. Pascal Michailat, Emmanuel Saez. 2021. Resolving New Keynesian Anomalies with Wealth in the Utility Function. *The Review of Economics and Statistics* **103**:2, 197-215. [[Crossref](#)]
155. Edward Nelson. 2021. The Emergence of Forward Guidance As a Monetary Policy Tool. *Finance and Economics Discussion Series* **2021**:032, 1-59. [[Crossref](#)]
156. Constantinos Challoumis. 2021. Analysis of the Theory of Cycle of Money. *Acta Universitatis Bohemiae Meridionalis* **23**:2, 13-29. [[Crossref](#)]
157. Joachim Hubmer, Per Krusell, Anthony A. Smith.. 2021. Sources of US Wealth Inequality: Past, Present, and Future. *NBER Macroeconomics Annual* **35**, 391-455. [[Crossref](#)]
158. Morten O Ravn, Vincent Sterk. 2021. Macroeconomic Fluctuations with HANK & SAM: an Analytical Approach. *Journal of the European Economic Association* **19**:2, 1162-1202. [[Crossref](#)]
159. Jordi Galí. 2021. Monetary Policy and Bubbles in a New Keynesian Model with Overlapping Generations. *American Economic Journal: Macroeconomics* **13**:2, 121-167. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
160. Ralph Luetticke. 2021. Transmission of Monetary Policy with Heterogeneity in Household Portfolios. *American Economic Journal: Macroeconomics* **13**:2, 1-25. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
161. Eric Sims, Jing Cynthia Wu. 2021. Evaluating Central Banks' tool kit: Past, present, and future. *Journal of Monetary Economics* **118**, 135-160. [[Crossref](#)]
162. Behzad Diba, Olivier Loisel. 2021. Pegging the interest rate on bank reserves: A resolution of New Keynesian puzzles and paradoxes. *Journal of Monetary Economics* **118**, 230-244. [[Crossref](#)]
163. . The Political Economy of the Abe Government and Abenomics Reforms **57**, . [[Crossref](#)]

164. Joshua K. Hausman, Takashi Unayama, Johannes F. Wieland. Abenomics, Monetary Policy, and Consumption 139-169. [[Crossref](#)]
165. Tilman Bletzinger, Leopold von Thadden. 2021. Designing QE in a fiscally sound monetary union. *European Economic Review* **132**, 103611. [[Crossref](#)]
166. Guido Ascari, Leandro M. Magnusson, Sophocles Mavroeidis. 2021. Empirical evidence on the Euler equation for consumption in the US. *Journal of Monetary Economics* **117**, 129-152. [[Crossref](#)]
167. Juan Antolín-Díaz, Ivan Petrella, Juan F. Rubio-Ramírez. 2021. Structural scenario analysis with SVARs. *Journal of Monetary Economics* **117**, 798-815. [[Crossref](#)]
168. Philippe Andrade, Filippo Ferroni. 2021. Delphic and odyssean monetary policy shocks: Evidence from the euro area. *Journal of Monetary Economics* **117**, 816-832. [[Crossref](#)]
169. Edward Nelson. 2021. The Emergence of Forward Guidance As a Monetary Policy Tool. *SSRN Electronic Journal* . [[Crossref](#)]
170. Justin Bloesch, Jacob Weber. 2021. Structural Changes in Investment and the Waning Power of Monetary Policy. *SSRN Electronic Journal* **52**. . [[Crossref](#)]
171. Adrien Auclert, Bence Bardóczy, Matthew Rognlie, Ludwig Straub. 2021. Using the Sequence-Space Jacobian to Solve and Estimate Heterogeneous-Agent Models. *Econometrica* **89**:5, 2375-2408. [[Crossref](#)]
172. Alisdair McKay, Johannes F. Wieland. 2021. Lumpy Durable Consumption Demand and the Limited Ammunition of Monetary Policy. *Econometrica* **89**:6, 2717-2749. [[Crossref](#)]
173. Narayana R. Kocherlakota. 2021. Bounds on price-setting. *Theoretical Economics* **16**:3, 979-1015. [[Crossref](#)]
174. Rohan Kekre. 2021. Unemployment Insurance in Macroeconomic Stabilization. *SSRN Electronic Journal* **88**. . [[Crossref](#)]
175. M. Saif Mehkari, William Daniel Dupor, Marios Karabarbounis, Marianna Kudlyak. 2021. Regional Consumption Responses and the Aggregate Fiscal Multiplier. *SSRN Electronic Journal* **105**. . [[Crossref](#)]
176. Hannah Seidl, Fabian Seyrich. 2021. Unconventional Fiscal Policy in HANK. *SSRN Electronic Journal* **88**. . [[Crossref](#)]
177. Stefano Eusepi, Christopher Gibbs, Bruce Preston. 2021. Forward Guidance with Unanchored Expectations. *SSRN Electronic Journal* **117**. . [[Crossref](#)]
178. Narayana Kocherlakota. 2021. Stabilization with Fiscal Policy. *SSRN Electronic Journal* **88**. . [[Crossref](#)]
179. Matthieu Darracq Paries, Alessandro Notarpietro, Juha Kilponen, Niki Papadopoulou, Srecko Zimic, Pierre Aldama, Geert Langenus, Matthieu Lemoine, Elena Angelini, Matija Lozej, Robert-Paul Berben, Fulvia Marotta, Alice Carroy, Julien Matheron, Kai Philipp Christoffel, Carlos Montes-Galdón, Matteo Ciccarelli, Joan Paredes, Agostino Consolo, Massimiliano Pisani, Pietro Cova, Michaela Schmöller, Milan Damjanović, Andra Smadu, Gregory Walque, Béla Szörfi, Stéphane Dupraz, Harri Turunen, José Emilio Gumiel, Fabio Verona, Thomas Haertel, Igor Vetlov, Samuel Hurtado, Anders Warne, Paulo Júlio, Anastasia Zhutova. 2021. Review of Macroeconomic Modelling in the Eurosystem: Current Practices and Scope for Improvement. *SSRN Electronic Journal* **122**. . [[Crossref](#)]
180. Maria Eskelinen. 2021. Monetary Policy, Agent Heterogeneity and Inequality: Insights from a Three-Agent New Keynesian Model. *SSRN Electronic Journal* **32**. . [[Crossref](#)]
181. Haoyang Liu, Rodney Ramcharan, Dean Parker. 2021. Monetary Policy, Business Liquidity and Survival: Evidence from the Refinancing Channel. *SSRN Electronic Journal* **134**. . [[Crossref](#)]
182. BOKERI RPS Submitter. 2021. Monetary Non-Neutrality in a Multi sector Economy: The Role of Risk-Sharing. *SSRN Electronic Journal* **80**. . [[Crossref](#)]

183. Matteo Leombroni, Ciaran Rogers. 2021. Household Portfolios, Monetary Policy and Asset Prices. *SSRN Electronic Journal* **89**. . [[Crossref](#)]
184. Mirko Wiederholt, Christopher Roth, Johannes Wohlfart. 2021. The Effects of Forward Guidance: Theory with Measured Expectations. *SSRN Electronic Journal* **1**. . [[Crossref](#)]
185. yuanyang Guo. 2021. Discussions About Selected Applied Time-Series Topics Using the Vector Autoregressions. *SSRN Electronic Journal* **86**. . [[Crossref](#)]
186. Greta Meggiorini. 2021. Behavioral New Keynesian Models: An Empirical Assessment. *SSRN Electronic Journal* **186**. . [[Crossref](#)]
187. Deniz Aydin. 2021. Forbearance, Interest Rates, and Present-Value Effects in a Randomized Debt Relief Experiment. *SSRN Electronic Journal* **125**. . [[Crossref](#)]
188. Andrea Orame, Rodney Ramcharan, Roberto Robatto. 2021. Quantitative Easing, Bank Lending, and Competition. *SSRN Electronic Journal* **12**. . [[Crossref](#)]
189. Thomas Matthys, Elien Meuleman, Rudi Vander Venet. 2020. Unconventional monetary policy and bank risk taking. *Journal of International Money and Finance* **109**, 102233. [[Crossref](#)]
190. Brent Bundick, A. Lee Smith. 2020. The Dynamic Effects of Forward Guidance Shocks. *The Review of Economics and Statistics* **102**:5, 946-965. [[Crossref](#)]
191. Constantinos Chailoumis. 2020. Index of the Cycle of Money - The Case of Latvia. *Economics and Culture* **17**:2, 5-12. [[Crossref](#)]
192. GAUTI B. EGGERTSSON, MARC P. GIANNONI. 2020. Medium-Term Money Neutrality and the Effective Lower Bound. *Journal of Money, Credit and Banking* **52**:S2, 561-600. [[Crossref](#)]
193. FELIPE ALVES, GREG KAPLAN, BENJAMIN MOLL, GIOVANNI L. VIOLANTE. 2020. A Further Look at the Propagation of Monetary Policy Shocks in HANK. *Journal of Money, Credit and Banking* **52**:S2, 521-559. [[Crossref](#)]
194. JORDI GALÍ. 2020. Uncovered Interest Parity, Forward Guidance and the Exchange Rate. *Journal of Money, Credit and Banking* **52**:S2, 465-496. [[Crossref](#)]
195. Michael Koetter. 2020. Lending effects of the ECB's asset purchases. *Journal of Monetary Economics* **116**, 39-52. [[Crossref](#)]
196. Chao Gu, Han Han, Randall Wright. 2020. THE EFFECTS OF NEWS WHEN LIQUIDITY MATTERS. *International Economic Review* **61**:4, 1411-1435. [[Crossref](#)]
197. Michael T. Kiley. 2020. Pandemic Recession Dynamics: The Role of Monetary Policy in Shifting a U-Shaped Recession to a V-Shaped Rebound. *Finance and Economics Discussion Series* **2020**:083, 1-32. [[Crossref](#)]
198. Matthieu Picault, Louis Raffestin. 2020. The other side of forward guidance: Are central banks constrained by financial markets?. *Finance Research Letters* **36**, 101324. [[Crossref](#)]
199. Michael Beenstock. 2020. Aggregate supply in spatial general equilibrium theory. *Spatial Economic Analysis* **15**:4, 374-391. [[Crossref](#)]
200. NADAV BEN ZEEV, CHRISTOPHER GUNN, HASHMAT KHAN. 2020. Monetary News Shocks. *Journal of Money, Credit and Banking* **52**:7, 1793-1820. [[Crossref](#)]
201. Kurt G. Lunsford. 2020. Policy Language and Information Effects in the Early Days of Federal Reserve Forward Guidance. *American Economic Review* **110**:9, 2899-2934. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
202. Yumei Guo, Shan He. 2020. Does confidence matter for economic growth? An analysis from the perspective of policy effectiveness. *International Review of Economics & Finance* **69**, 1-19. [[Crossref](#)]

203. Laura Feiveson, Nils Goernemann, Julie Hotchkiss, Karel Mertens, Jae Sim. 2020. Distributional Considerations for Monetary Policy Strategy. *Finance and Economics Discussion Series* **2020:070**, 1-27. [[Crossref](#)]
204. Xavier Gabaix. 2020. A Behavioral New Keynesian Model. *American Economic Review* **110:8**, 2271-2327. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
205. Salem Abo-Zaid, Ahmed H. Kamara. 2020. Credit Constraints and the Government Spending Multiplier. *Journal of Economic Dynamics and Control* **116**, 103901. [[Crossref](#)]
206. Jiri Slacalek, Oreste Tristani, Giovanni L. Violante. 2020. Household balance sheet channels of monetary policy: A back of the envelope calculation for the euro area. *Journal of Economic Dynamics and Control* **115**, 103879. [[Crossref](#)]
207. Christian Pfister, Jean-Guillaume Sahuc. 2020. Unconventional monetary policies: A stock-taking exercise. *Revue d'économie politique* **Vol. 130:2**, 137-169. [[Crossref](#)]
208. Sergio de Ferra, Kurt Mitman, Federica Romei. 2020. Household heterogeneity and the transmission of foreign shocks. *Journal of International Economics* **124**, 103303. [[Crossref](#)]
209. Ben S. Bernanke. 2020. The New Tools of Monetary Policy. *American Economic Review* **110:4**, 943-983. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
210. Christian R. Proaño, Benjamin Lojak. 2020. Animal spirits, risk premia and monetary policy at the zero lower bound. *Journal of Economic Behavior & Organization* **171**, 221-233. [[Crossref](#)]
211. Marco Airaudo. 2020. Temptation and forward-guidance. *Journal of Economic Theory* **186**, 104989. [[Crossref](#)]
212. Rafael Gerke, Sebastian Giesen, Alexander Scheer. 2020. The power of forward guidance in a quantitative TANK model. *Economics Letters* **186**, 108828. [[Crossref](#)]
213. Tobias Broer, Niels-Jakob Harbo Hansen, Per Krusell, Erik Öberg. 2020. The New Keynesian Transmission Mechanism: A Heterogeneous-Agent Perspective. *The Review of Economic Studies* **87:1**, 77-101. [[Crossref](#)]
214. James Cloyne, Clodomiro Ferreira, Paolo Surico. 2020. Monetary Policy when Households have Debt: New Evidence on the Transmission Mechanism. *The Review of Economic Studies* **87:1**, 102-129. [[Crossref](#)]
215. Cristiano Cantore, Filippo Ferroni, Miguel Leon-Ledesma. 2020. The Missing Link: Monetary Policy and the Labor Share. *SSRN Electronic Journal* **14**. . [[Crossref](#)]
216. Nigel McClung. 2020. The Power of Forward Guidance and the Fiscal Theory of the Price Level. *SSRN Electronic Journal* . [[Crossref](#)]
217. Derin Aksit. 2020. How to Model Forward Guidance and Address a Larger Puzzle. *SSRN Electronic Journal* . [[Crossref](#)]
218. Margherita Bottero, Camelia Minoiu, Jose-Luis Peydro, Andrea Polo, Andrea Presbitero, Enrico Sette. 2020. Expansionary Yet Different: Credit Supply and Real Effects of Negative Interest Rate Policy. *SSRN Electronic Journal* **32**. . [[Crossref](#)]
219. Antoine Lepetit, Cristina Fuentes-Albero. 2020. The Limited Power of Monetary Policy in a Pandemic. *SSRN Electronic Journal* **1**. . [[Crossref](#)]
220. Shengyin Ouyang, Ziqing Du, Meiling Cai. 2020. Statistical measurement of the impact of monetary policy on price levels. *National Accounting Review* **2:2**, 188-203. [[Crossref](#)]
221. Pablo Ottonello, Thomas Winberry. 2020. Financial Heterogeneity and the Investment Channel of Monetary Policy. *Econometrica* **88:6**, 2473-2502. [[Crossref](#)]
222. Sushant Acharya, Keshav Dogra. 2020. Understanding HANK: Insights From a PRANK. *Econometrica* **88:3**, 1113-1158. [[Crossref](#)]

223. Lilia Maliar, Serguei Maliar, John B. Taylor, Inna Tsener. 2020. A tractable framework for analyzing a class of nonstationary Markov models. *Quantitative Economics* **11**:4, 1289-1323. [[Crossref](#)]
224. Manthos D. Delis, Sizhe Hong, Nikos Paltalidis, Dennis Philip. 2020. Forward Guidance and Corporate Lending. *SSRN Electronic Journal* **108**. . [[Crossref](#)]
225. Olivier Coibion, Dimitris Georgarakos, Yuriy Gorodnichenko, Michael Weber. 2020. Forward Guidance and Household Expectations. *SSRN Electronic Journal* **110**. . [[Crossref](#)]
226. Lydia Cox, Gernot J. Müller, Ernesto Pasten, Raphael Schoenle, Michael Weber. 2020. Big G. *SSRN Electronic Journal* **104**. . [[Crossref](#)]
227. Christopher Gibbs, Nigel McClung. 2020. Does My Model Predict a Forward Guidance Puzzle?. *SSRN Electronic Journal* **108**. . [[Crossref](#)]
228. Guillaume Arnould, Benjamin Guin, Steven R. G. Ongena, Paolo Siciliani. 2020. (When) Do Banks React to Anticipated Capital Reliefs?. *SSRN Electronic Journal* **11**. . [[Crossref](#)]
229. Zohair Alam. 2020. The Diminishing Impact of Monetary Policy on Asset Prices Around Non-FOMC Macroeconomic Announcements. *SSRN Electronic Journal* **110**. . [[Crossref](#)]
230. Christopher Gust, Edward Herbst, J. David López-Salido. 2020. Short-term Planning, Monetary Policy, and Macroeconomic Persistence. *Finance and Economics Discussion Series* **2020**:003. . [[Crossref](#)]
231. Andreas Schaab. 2020. Micro and Macro Uncertainty. *SSRN Electronic Journal* **3**. . [[Crossref](#)]
232. Yongseung Jung. 2019. What drives business cycles in Korea?. *Japan and the World Economy* **52**, 100978. [[Crossref](#)]
233. Marcin Bielecki, Michał Brzoza-Brzezina, Marcin Kolasa. 2019. Comment on “The limits of forward guidance” by Jeffrey R. Campbell, Filippo Ferroni, Jonas D. M. Fisher and Leonardo Melosi. *Journal of Monetary Economics* **108**, 135-139. [[Crossref](#)]
234. Zeno Enders, Franziska Hünnekes, Gernot J. Müller. 2019. Monetary policy announcements and expectations: Evidence from german firms. *Journal of Monetary Economics* **108**, 45-63. [[Crossref](#)]
235. Michael Ehrmann, Gaetano Gaballo, Peter Hoffmann, Georg Strasser. 2019. Can more public information raise uncertainty? The international evidence on forward guidance. *Journal of Monetary Economics* **108**, 93-112. [[Crossref](#)]
236. Marco Bassetto. 2019. Forward guidance: Communication, commitment, or both?. *Journal of Monetary Economics* **108**, 69-86. [[Crossref](#)]
237. Emmanuel Farhi, Iván Werning. 2019. Monetary Policy, Bounded Rationality, and Incomplete Markets. *American Economic Review* **109**:11, 3887-3928. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
238. Charles Dennery. 2019. Dampened expectations in the Phillips Curve: A note. *Economics Letters* **184**, 108642. [[Crossref](#)]
239. Paola Boel, Christopher J. Waller. 2019. STABILIZATION POLICY AT THE ZERO LOWER BOUND. *International Economic Review* **60**:4, 1539-1563. [[Crossref](#)]
240. Florin O. Bilbiie. 2019. Optimal Forward Guidance. *American Economic Journal: Macroeconomics* **11**:4, 310-345. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
241. Seungjun Baek. 2019. The redistributive effects of forward guidance. *Economics Letters* **182**, 118-121. [[Crossref](#)]
242. Taisuke Nakata, Ryota Ogaki, Sebastian Schmidt, Paul Yoo. 2019. Attenuating the forward guidance puzzle: Implications for optimal monetary policy. *Journal of Economic Dynamics and Control* **105**, 90-106. [[Crossref](#)]

243. Philippe Andrade, Gaetano Gaballo, Eric Mengus, Benoît Mojon. 2019. Forward Guidance and Heterogeneous Beliefs. *American Economic Journal: Macroeconomics* 11:3, 1-29. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
244. Adrien Auclert. 2019. Monetary Policy and the Redistribution Channel. *American Economic Review* 109:6, 2333-2367. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
245. Junko Koeda. 2019. Macroeconomic effects of quantitative and qualitative monetary easing measures. *Journal of the Japanese and International Economies* 52, 121-141. [[Crossref](#)]
246. Elton Beqiraj, Giovanni Di Bartolomeo, Marco Di Pietro. 2019. Beliefs formation and the puzzle of forward guidance power. *Journal of Macroeconomics* 60, 20-32. [[Crossref](#)]
247. SARAH MOUABBI, JEAN-GUILLAUME SAHUC. 2019. Evaluating the Macroeconomic Effects of the ECB's Unconventional Monetary Policies. *Journal of Money, Credit and Banking* 51:4, 831-858. [[Crossref](#)]
248. Gabriel Chodorow-Reich. 2019. Geographic Cross-Sectional Fiscal Spending Multipliers: What Have We Learned?. *American Economic Journal: Economic Policy* 11:2, 1-34. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
249. Dietmar Fehr, Frank Heinemann, Aniol Llorente-Saguer. 2019. The power of sunspots: An experimental analysis. *Journal of Monetary Economics* 103, 123-136. [[Crossref](#)]
250. Marcus Hagedorn, Jinfeng Luo, Iouri Manovskii, Kurt Mitman. 2019. Forward guidance. *Journal of Monetary Economics* 102, 1-23. [[Crossref](#)]
251. Jeffrey M. Lacker. 2019. Forward guidance a Comment. *Journal of Monetary Economics* 102, 24-28. [[Crossref](#)]
252. Andrew Hughes Hallett, Nicola Acocella. 2019. Forward guidance reassessed: Stabilizability under endogenous policy rules. *Journal of Macroeconomics* 59, 325-335. [[Crossref](#)]
253. Julio Garín, Robert Lester, Eric Sims. 2019. Are Supply Shocks Contractionary at the ZLB? Evidence from Utilization-Adjusted TFP Data. *The Review of Economics and Statistics* 101:1, 160-175. [[Crossref](#)]
254. Joshua K. Hausman, Paul W. Rhode, Johannes F. Wieland. 2019. Recovery from the Great Depression: The Farm Channel in Spring 1933. *American Economic Review* 109:2, 427-472. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
255. Julien Matheron. 2019. Peut-on encore modéliser la politique monétaire dans un cadre DSGE ?. *Revue française d'économie* Vol. XXXIII:3, 165-200. [[Crossref](#)]
256. Mariana García-Schmidt, Michael Woodford. 2019. Are Low Interest Rates Deflationary? A Paradox of Perfect-Foresight Analysis. *American Economic Review* 109:1, 86-120. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
257. Gauti B. Eggertsson, Neil R. Mehrotra, Jacob A. Robbins. 2019. A Model of Secular Stagnation: Theory and Quantitative Evaluation. *American Economic Journal: Macroeconomics* 11:1, 1-48. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
258. Alex Haberis, Richard Harrison, Matt Waldron. 2019. Uncertain policy promises. *European Economic Review* 111, 459-474. [[Crossref](#)]
259. Gauti B. Eggertsson, Vaishali Garga. 2019. Sticky prices versus sticky information: Does it matter for policy paradoxes?. *Review of Economic Dynamics* 31, 363-392. [[Crossref](#)]
260. Wilko Bolt, Kostas Mavromatis, Sweder van Wijnbergen. 2019. The Global Macroeconomics of a Trade War. The Eagle Model on the US-China Trade Conflict. *SSRN Electronic Journal* . [[Crossref](#)]
261. Sarah Mouabbi, Jean-Guillaume Sahuc. 2019. Evaluating the Macroeconomic Effects of the ECB's Unconventional Monetary Policies. *SSRN Electronic Journal* 26. . [[Crossref](#)]

262. Marco Giacomelli, Rodney Ramcharan, Edison Yu. 2019. The FOMC and the Mortgage Market. *SSRN Electronic Journal* . [[Crossref](#)]
263. Wei Cui, Vincent Sterk. 2019. Quantitative Easing. *SSRN Electronic Journal* . [[Crossref](#)]
264. Daniel Lewis. 2019. Announcement-Specific Decompositions of Unconventional Monetary Policy Shocks and Their Macroeconomic Effects. *SSRN Electronic Journal* . [[Crossref](#)]
265. Francesco D'Acunto, Daniel Hoang, Maritta Paloviita, Michael Weber. 2019. Human Frictions in the Transmission of Economic Policy. *SSRN Electronic Journal* . [[Crossref](#)]
266. Jennifer La'O, Alireza Tahbaz-Salehi. 2019. Optimal Monetary Policy in Production Networks. *SSRN Electronic Journal* **30**. . [[Crossref](#)]
267. Thomas Hintermaier, Winfried Koeniger. 2019. Differences in Euro-Area Household Finances and Their Relevance for Monetary-Policy Transmission. *SSRN Electronic Journal* **89**. . [[Crossref](#)]
268. Antoine Lepetit. 2018. The Optimal Inflation Rate with Discount Factor Heterogeneity. *Finance and Economics Discussion Series* **2018:086**. . [[Crossref](#)]
269. Gregor Bäurle, Daniel Kaufmann. 2018. Measuring Exchange Rate, Price, and Output Dynamics at the Effective Lower Bound. *Oxford Bulletin of Economics and Statistics* **80:6**, 1243-1266. [[Crossref](#)]
270. Martin Feldkircher, Florian Huber. 2018. Unconventional U.S. Monetary Policy: New Tools, Same Channels?. *Journal of Risk and Financial Management* **11:4**, 71. [[Crossref](#)]
271. Christopher Gust, Edward Herbst, J. David López-Salido. 2018. Forward Guidance with Bayesian Learning and Estimation. *Finance and Economics Discussion Series* **2018:072**. . [[Crossref](#)]
272. Wouter J Den Haan, Pontus Rendahl, Markus Riegler. 2018. Unemployment (Fears) and Deflationary Spirals. *Journal of the European Economic Association* **16:5**, 1281-1349. [[Crossref](#)]
273. Hess Chung, Taisuke Nakata, Matthias Paustian. 2018. Optimal Monetary Policy in a DSGE Model with Attenuated Forward Guidance Effects. *FEDS Notes* **2018:2264**. . [[Crossref](#)]
274. George-Marios Angeletos, Chen Lian. 2018. Forward Guidance without Common Knowledge. *American Economic Review* **108:9**, 2477-2512. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
275. Lawrence J. Christiano, Martin S. Eichenbaum, Mathias Trabandt. 2018. On DSGE Models. *Journal of Economic Perspectives* **32:3**, 113-140. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
276. Greg Kaplan, Giovanni L. Violante. 2018. Microeconomic Heterogeneity and Macroeconomic Shocks. *Journal of Economic Perspectives* **32:3**, 167-194. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
277. Jordi Galí. 2018. The State of New Keynesian Economics: A Partial Assessment. *Journal of Economic Perspectives* **32:3**, 87-112. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
278. Emi Nakamura, Jón Steinsson. 2018. High-Frequency Identification of Monetary Non-Neutrality: The Information Effect*. *The Quarterly Journal of Economics* **133:3**, 1283-1330. [[Crossref](#)]
279. George-Marios Angeletos. 2018. Frictional Coordination. *Journal of the European Economic Association* **16:3**, 563-603. [[Crossref](#)]
280. Matthew Canzoneri, Dan Cao, Robert Cumby, Behzad Diba, Wenlan Luo. 2018. The forward fiscal guidance puzzle and a resolution. *Journal of Economic Dynamics and Control* **89**, 26-46. [[Crossref](#)]
281. SeHyoung Ahn, Greg Kaplan, Benjamin Moll, Thomas Winberry, Christian Wolf. 2018. When Inequality Matters for Macro and Macro Matters for Inequality. *NBER Macroeconomics Annual* **32**, 1-75. [[Crossref](#)]
282. John H. Cochrane. 2018. Michelson-Morley, Fisher, and Occam: The Radical Implications of Stable Quiet Inflation at the Zero Bound. *NBER Macroeconomics Annual* **32**, 113-226. [[Crossref](#)]
283. Olivier Blanchard. 2018. Distortions in Macroeconomics. *NBER Macroeconomics Annual* **32**, 547-554. [[Crossref](#)]

284. Greg Kaplan, Benjamin Moll, Giovanni L. Violante. 2018. Monetary Policy According to HANK. *American Economic Review* **108**:3, 697-743. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
285. Philippe Bacchetta, Elena Perazzi, Eric van Wincoop. 2018. Self-fulfilling debt crises: What can monetary policy do?. *Journal of International Economics* **110**, 119-134. [[Crossref](#)]
286. Baptiste Massenet. 2018. A Business Cycle Model with Neuroeconomic Foundations. *SSRN Electronic Journal* . [[Crossref](#)]
287. Bill Dupor, Marios Karabarbounis, Marianna Kudlyak, M. Mehkari. 2018. Regional Consumption Responses and the Aggregate Fiscal Multiplier. *SSRN Electronic Journal* **109**. . [[Crossref](#)]
288. Tomohide Mineyama. 2018. Downward Nominal Wage Rigidity and Inflation Dynamics During and After the Great Recession. *SSRN Electronic Journal* . [[Crossref](#)]
289. Hirokuni Iiboshi, Mototsugu Shintani, Kozo Ueda. 2018. Estimating a Nonlinear New Keynesian Model with the Zero Lower Bound for Japan. *SSRN Electronic Journal* **72**. . [[Crossref](#)]
290. Zhesheng Qiu. 2018. Level-k DSGE and Monetary Policy. *SSRN Electronic Journal* **81**. . [[Crossref](#)]
291. Ethan Min Fang. 2018. Monetary Policy Transmission Through Financial Heterogeneity: Firm-Level Evidence. *SSRN Electronic Journal* **127**. . [[Crossref](#)]
292. Kurt G. Lunsford. 2018. Understanding the Aspects of Federal Reserve Forward Guidance. *SSRN Electronic Journal* . [[Crossref](#)]
293. Gavin Goy, Cars H. Hommes, Kostas Mavromatis. 2018. Forward Guidance and the Role of Central Bank Credibility under Heterogeneous Beliefs. *SSRN Electronic Journal* . [[Crossref](#)]
294. Salomon Fiedler,, Isabel Hanisch,, Nils Jannsen,, Maik Wolters. 2017. Effectiveness of Unconventional Monetary Policy in the Euro Area: An Assessment Based on a Literature Survey. *Credit and Capital Markets – Kredit und Kapital* **50**:4, 455-488. [[Crossref](#)]
295. Alisdair McKay, Emi Nakamura, Jón Steinsson. 2017. The Discounted Euler Equation: A Note. *Economica* **84**:336, 820-831. [[Crossref](#)]
296. Benjamin D. Keen, Alexander W. Richter, Nathaniel A. Throckmorton. 2017. FORWARD GUIDANCE AND THE STATE OF THE ECONOMY. *Economic Inquiry* **55**:4, 1593-1624. [[Crossref](#)]
297. Veronica Guerrieri, Guido Lorenzoni. 2017. Credit Crises, Precautionary Savings, and the Liquidity Trap*. *The Quarterly Journal of Economics* **132**:3, 1427-1467. [[Crossref](#)]
298. Michael T. Kiley, John M. Roberts. 2017. Monetary Policy in a Low Interest Rate World. *Finance and Economics Discussion Series* **2017**:080. . [[Crossref](#)]
299. ###. 2017. How to Estimate the Policy Effect of Forward Guidance in the Korean Economy. *Journal of Insurance and Finance* **28**:2, 3-36. [[Crossref](#)]
300. Behzad Diba, Olivier Loisel. 2017. Pegging the Interest Rate on Bank Reserves. *SSRN Electronic Journal* . [[Crossref](#)]
301. Behzad Diba, Olivier Loisel. 2017. Pegging the Interest Rate on Bank Reserves: A Resolution of New Keynesian Puzzles and Paradoxes. *SSRN Electronic Journal* . [[Crossref](#)]
302. Brent Bundick, Andrew Smith. 2016. The Dynamic Effects of Forward Guidance Shocks. *SSRN Electronic Journal* **60**. . [[Crossref](#)]
303. Carlos Carvalho, Eric Hsu, Fernanda Nechio. 2016. Measuring the Effect of the Zero Lower Bound on Monetary Policy. *SSRN Electronic Journal* . [[Crossref](#)]
304. Galo Nuno, Carlos Thomas. 2016. Optimal Monetary Policy with Heterogeneous Agents. *SSRN Electronic Journal* **14**. . [[Crossref](#)]
305. Sarah Mouabbi, Jean-Guillaume Sahuc. 2016. Evaluating the Macroeconomic Effects of the ECB's Unconventional Monetary Policies. *SSRN Electronic Journal* **26**. . [[Crossref](#)]

306. William T. Gavin, Benjamin D. Keen, Alexander W. Richter, Nathaniel A. Throckmorton. 2013.
The Stimulative Effect of Forward Guidance. *SSRN Electronic Journal* **38**. . [[Crossref](#)]