"DSGE Forecasts of the Lost Recovery"

A DSGE Model Descriptions

This section of the appendix contains the model specifications for SW, SWπ, SWFF, SW^{+}, and SW^{++}, along with a description of how we construct our data, and a table with the priors on the parameters of the various models.

A.1 SW

We include a brief description of the log-linearized equilibrium conditions of the Smets & Wouters (2007) model to establish the foundation for explaining the later models. We deviate from the original Smets-Wouters specification by detrending the non-stationary model variables by a stochastic rather than a deterministic trend. This is done in order to express the equilibrium conditions in a flexible manner that accommodates both trend-stationary and unit-root technology processes. The model presented below is the model referred to in the paper as the SW model.

Let $\tilde{z}_t$ be the linearly detrended log productivity process, defined here as:

$$\tilde{z}_t = \rho_z \tilde{z}_{t-1} + \sigma_z \epsilon_{z,t},\ \epsilon_{z,t} \sim N(0,1) \tag{A-1}$$

All non-stationary variables are detrended by $Z_t = e^{\gamma t + \frac{1}{1-\alpha}\tilde{z}_t}$, where γ is the steady-state growth rate of the economy. The growth rate of Z_t in deviations from γ, which is denoted by z_t, follows the process:

$$z_t = \ln(Z_t/Z_{t-1}) - \gamma = \frac{1}{1-\alpha}(\rho_z - 1)\tilde{z}_{t-1} + \frac{1}{1-\alpha}\sigma_z \epsilon_{z,t} \tag{A-2}$$

All of the variables defined below will be given in log deviations from their non-stochastic steady state, where the steady state values will be denoted by *-subscripts.

A.1.1 Equilibrium Conditions

The *optimal allocation of consumption* satisfies the following Euler equation:

$$\begin{aligned} c_t = &-\frac{(1-he^{-\gamma})}{\sigma_c(1+he^{-\gamma})}\left(R_t - I\!E_t[\pi_{t+1}] + b_t\right) + \frac{he^{-\gamma}}{(1+he^{-\gamma})}\left(c_{t-1} - z_t\right) \\ &+ \frac{1}{(1+he^{-\gamma})} I\!E_t\left[c_{t+1} + z_{t+1}\right] + \frac{(\sigma_c - 1)}{\sigma_c(1+he^{-\gamma})}\frac{w_* L_*}{c_*}\left(L_t - I\!E_t[L_{t+1}]\right). \end{aligned} \tag{A-3}$$

where c_t is consumption, L_t denotes hours worked, R_t is the nominal interest rate, and π_t is inflation. The exogenous process b_t drives a wedge between the intertemporal ratio of the marginal utility of consumption and the riskless real return, $R_t - I\!E_t[\pi_{t+1}]$, and follows an AR(1) process with parameters ρ_b and σ_b. The parameters σ_c and h capture the relative degree of risk aversion and the degree of habit persistence in the utility function, respectively.

The *optimal investment decision* comes from the optimality condition for capital producers and satisfies the following relationship between the level of investment i_t and the value of capital, q_t^k, both measured in terms of consumption:

$$q_t^k = S''e^{2\gamma}(1+\beta e^{(1-\sigma_c)\gamma}) \left(i_t - \frac{1}{1+\beta e^{(1-\sigma_c)\gamma}}(i_{t-1} - z_t) - \frac{\beta e^{(1-\sigma_c)\gamma}}{1+\beta e^{(1-\sigma_c)\gamma}} \mathbb{E}_t[i_{t+1} + z_{t+1}] - \mu_t \right) \tag{A-4}$$

This relationship is affected by investment adjustment costs (S'' is the second derivative of the adjustment cost function) and by the marginal efficiency of investment μ_t, an exogenous process which follows an AR(1) with parameters ρ_μ and σ_μ, and that affects the rate of transformation between consumption and installed capital (see Greenwood et al. (1998)).

The *installed capital*, which we also refer to as the capital stock, evolves as:

$$\bar{k}_t = \left(1 - \frac{i_*}{\bar{k}_*}\right)\left(\bar{k}_{t-1} - z_t\right) + \frac{i_*}{\bar{k}_*} i_t + \frac{i_*}{\bar{k}_*} S''e^{2\gamma}(1+\beta e^{(1-\sigma_c)\gamma})\mu_t \tag{A-5}$$

where $\frac{i_*}{\bar{k}_*}$ is the steady-state ratio of investment to capital. The parameter β captures the intertemporal discount rate in the utility function of the households.

The *arbitrage condition between the return to capital and the riskless rate* is:

$$\frac{r_*^k}{r_*^k + (1-\delta)} \mathbb{E}_t[r_{t+1}^k] + \frac{1-\delta}{r_*^k + (1-\delta)} \mathbb{E}_t[q_{t+1}^k] - q_t^k = R_t + b_t - \mathbb{E}_t[\pi_{t+1}] \tag{A-6}$$

where r_t^k is the rental rate of capital, r_*^k its steady-state value, and δ the depreciation rate.

The relationship between $\bar{k}_t$ and the *effective capital* rented out to firms k_t is given by:

$$k_t \;=\; u_t - z_t + \bar{k}_{t-1}. \tag{A-7}$$

where capital is subject to variable capacity utilization, u_t.

The optimality condition determining the *rate of capital utilization* is given by:

$$\frac{1-\psi}{\psi} r_t^k = u_t. \tag{A-8}$$

where ψ captures the utilization costs in terms of foregone consumption.

From the optimality conditions of goods producers it follows that all firms have the same *capital-labor ratio*:

$$k_t \;=\; w_t - r_t^k + L_t. \tag{A-9}$$

Real marginal costs for firms are given by:

$$mc_t \;=\; (1-\alpha)\, w_t + \alpha\, r_t^k. \tag{A-10}$$

where α is the income share of capital (after paying markups and fixed costs) in the production function.

All of the equations mentioned above have the same form regardless of whether or not technology has a unit root or is trend-stationary. A few small differences arise for the following two equilibrium conditions.

The *production function* under trend stationarity is:

$$y_t = \Phi_p \left(\alpha k_t + (1-\alpha)L_t\right) + \mathcal{I}\{\rho_z < 1\}(\Phi_p - 1)\frac{1}{1-\alpha}\tilde{z}_t. \tag{A-11}$$

The last term $(\Phi_p - 1)\frac{1}{1-\alpha}\tilde{z}_t$ drops out if technology has a stochastic trend because then one must assume that the fixed costs are proportional to the trend.

The *resource constraint* is:

$$y_t = g_t + \frac{c_*}{y_*}c_t + \frac{i_*}{y_*}i_t + \frac{r_*^k k_*}{y_*}u_t - \mathcal{I}\{\rho_z < 1\}\frac{1}{1-\alpha}\tilde{z}_t, \tag{A-12}$$

The term $-\frac{1}{1-\alpha}\tilde{z}_t$ disappears if technology follows a unit root process.

Government spending, g_t, is assumed to follow the exogenous process:

$$g_t = \rho_g g_{t-1} + \sigma_g \epsilon_{g,t} + \eta_{gz}\sigma_z\epsilon_{z,t} \tag{A-13}$$

The *price and wage Phillips curves* respectively are:

$$\begin{aligned}\pi_t = & \frac{(1-\zeta_p\beta e^{(1-\sigma_c)\gamma})(1-\zeta_p)}{(1+\iota_p\beta e^{(1-\sigma_c)\gamma})\zeta_p((\Phi_p-1)\epsilon_p+1)}mc_t \\ & + \frac{\iota_p}{1+\iota_p\beta e^{(1-\sigma_c)\gamma}}\pi_{t-1} + \frac{\beta e^{(1-\sigma_c)\gamma}}{1+\iota_p\beta e^{(1-\sigma_c)\gamma}}\mathbb{E}_t[\pi_{t+1}] + \lambda_{f,t}\end{aligned} \tag{A-14}$$

$$\begin{aligned}w_t = & \frac{(1-\zeta_w\beta e^{(1-\sigma_c)\gamma})(1-\zeta_w)}{(1+\beta e^{(1-\sigma_c)\gamma})\zeta_w((\lambda_w-1)\epsilon_w+1)}\left(w_t^h - w_t\right) \\ & - \frac{1+\iota_w\beta e^{(1-\sigma_c)\gamma}}{1+\beta e^{(1-\sigma_c)\gamma}}\pi_t + \frac{1}{1+\beta e^{(1-\sigma_c)\gamma}}\left(w_{t-1} - z_t - \iota_w\pi_{t-1}\right) \\ & + \frac{\beta e^{(1-\sigma_c)\gamma}}{1+\beta e^{(1-\sigma_c)\gamma}}\mathbb{E}_t\left[w_{t+1} + z_{t+1} + \pi_{t+1}\right] + \lambda_{w,t}\end{aligned} \tag{A-15}$$

where ζ_p, ι_p, and ϵ_p are the Calvo parameter, the degree of indexation, and the curvature parameters in the Kimball aggregator for prices, with the equivalent parameters with subscript w corresponding to wages.

The variable w_t^h corresponds to the *household's marginal rate of substitution between consumption and labor* and is given by:

$$\frac{1}{1-he^{-z_*^*}}\left(c_t - he^{-z_*^*}c_{t-1} + he^{-z_*^*}z_t\right) + \nu_l L_t = w_t^h. \tag{A-16}$$

where η_l is the curvature of the disutility of labor (equal to the inverse of the Frisch elasticity in the basence of wage rigidities).

The mark-ups $\lambda_{f,t}$ and $\lambda_{w,t}$ follow exogenous ARMA(1, 1) processes:

$$\lambda_{f,t} = \rho_{\lambda_f}\lambda_{f,t-1} + \sigma_{\lambda_f}\epsilon_{\lambda f,t} + \eta_{\lambda_f}\sigma_{\lambda_f}\epsilon_{\lambda_f,t-1} \tag{A-17}$$

$$\lambda_{w,t} = \rho_{\lambda_w}\lambda_{w,t-1} + \sigma_{\lambda_w}\epsilon_{\lambda w,t} + \eta_{\lambda_w}\sigma_{\lambda_w}\epsilon_{\lambda_w,t-1} \tag{A-18}$$

Lastly, the monetary authority follows a *policy feedback rule*:

$$R_t \;=\; \rho_R R_{t-1} + (1-\rho_R)\left(\psi_1\pi_t + \psi_2(y_t - y_t^f)\right) + \psi_3\left((y_t - y_t^f) - (y_{t-1} - y_{t-1}^f)\right) + r_t^m \tag{A-19}$$

where the flexible price/wage output y_t^f is obtained from solving the version of the model absent nominal ridigities (without equations (3)-(12) and (15)), and the residual r_t^m follows an AR(1) process with parameters ρ_{r^m} and σ_{r^m}.
The exogenous component of the policy rule r_t^m evolves according to the following process:

$$r_t^m = \rho_{r^m} r_{t-1}^m + \epsilon_t^R + \sum_{k=1}^{K} \epsilon_{k,t-k}^R \tag{A-20}$$

where ϵ_t^R is the usual contemporaneous policy shock and $\epsilon_{k,t-k}^R$ is a policy shock that is known to agents at time $t-k$, but affects the policy rule k periods later — that is, at time t. As outlined in Laseen & Svensson (2011), these *anticipated policy shocks* allow us to capture the effects of the zero lower bound on nominal interest rates, as well as the effects of forward guidance in monetary policy.

A.1.2 Measurement Equations

The SW model is estimated using seven quarterly macroeconomic time series, whose measurement equations are given below:

$$\begin{array}{lcl}
\textit{Output growth} & = & \gamma + 100(y_t - y_{t-1} + z_t) \\
\textit{Consumption growth} & = & \gamma + 100(c_t - c_{t-1} + z_t) \\
\textit{Investment growth} & = & \gamma + 100(i_t - i_{t-1} + z_t) \\
\textit{Real Wage growth} & = & \gamma + 100(w_t - w_{t-1} + z_t) \\
\textit{Hours} & = & \bar{l} + 100 l_t \\
\textit{Inflation} & = & \pi_* + 100\pi_t \\
\textit{FFR} & = & R_* + 100 R_t \\
\textit{FFR}^e_{t,t+j} & = & R_* + I\!E_t[R_{t+j}], j = 1, ..., 6
\end{array} \tag{A-21}$$

where all variables are measured in percent, π_* and R_* measure the steady-state levels of net inflation and short term nominal interest rates, respectively, and $\bar{l}$ represents the mean of the hours (this variable is measured as an index).

The priors for the DSGE model parameters are the same as in Smets & Wouters (2007) and are summarized in Panel I of the priors table listed in the SW^{++} section.

A.2 SWπ

The SWπ model builds on SW by allowing the inflation target to be time-varying. The time-varying inflation target, π^*_t, allows us to capture the dynamics of inflation and interest rates in the estimation sample.

The time-varying *inflation target* evolves according to

$$\pi^*_t = \rho_{\pi^*}\pi^*_{t-1} + \sigma_{\pi^*}\epsilon_{\pi^*,t} \tag{A-22}$$

where $0 < \rho_{\pi^*} < 1$ and $\epsilon_{\pi^*,t}$ is an i.i.d. shock. π^*_t is a stationary process, although the prior on ρ_{π^*} forces this process to be highly persistent.

A.2.1 Measurement Equations

As in Aruoba & Schorfheide (2008) and Del Negro & Eusepi (2011), we use data on long-run inflation expectations in the estimation of SWπ. This allows us to pin down the target inflation rate to the extent that long-run inflation expectations contain information about the central bank's objective.

Thus there is an additional measurement equation for 10 year inflation expectations that augments (A-21), given by

$$\textit{10y Infl. Expectations} = \pi_* + \mathbb{E}_t\left[\frac{1}{40}\sum_{j=0}^{39}\pi_{t+j}\right] \tag{A-23}$$

A.3 SWFF

Financial frictions are incorporated into the SW model following the work of Bernanke et al. (1999) and Christiano et al. (2009).

A.3.1 Equilibrium Conditions

SWFF replaces (A-6) with the following equation for the *excess return on capital* — that is, the spread between the expected return on capital and the riskless rate — and the definition of the *return on capital*, $\tilde{R}^k_t$, respectively:

$$\mathbb{E}_t\left[\tilde{R}^k_{t+1} - R_t\right] = -b_t + \zeta_{sp,b}(q^k_t - \bar{k}_t - n_t) + \tilde{\sigma}_{\omega,t} \tag{A-24}$$

and

$$\tilde{R}^k_t - \pi_t = \frac{r^k_*}{r^k_* + (1-\delta)}r^k_t + \frac{(1-\delta)}{r^k_* + (1-\delta)}q^k_t - q^k_{t-1} \tag{A-25}$$

where $\tilde{R}^k_t$ is the gross nominal return on capital for entrepreneurs, n_t is entrepreneurial equity, and $\tilde{\sigma}_{\omega,t}$ captures mean-preserving changes in the cross-sectional dispersion of ability across entrepreneurs (see Christiano et al. (2009)) and follows an AR(1) process with parameters ρ_{σ_ω} and σ_{σ_ω}.

The following equation outlines the *evolution of entrepreneurial net worth*:

$$\hat{n}_t = \zeta_{n,\tilde{R}^k_t}\left(\tilde{R}^k_t - \pi_t\right) - \zeta_{n,\tilde{R}^k_t}(R_{t-1} - \pi_t) + \zeta_{n,qK}(q^k_{t-1} + \bar{k}_{t-1}) + \zeta_{n,n}n_{t-1} - \frac{\zeta_{n,\sigma_\omega}}{\zeta_{sp,\sigma_\omega}}\tilde{\sigma}_{\omega,t-1} \quad \text{(A-26)}$$

A.3.2 Measurement Equations

SWFF's additional measurement equation for the spread (given below) augments the standard set of SW measurement equations (A-21) along with (A-23).

$$Spread = SP_* + 100\mathbb{E}_t\left[\tilde{R}^k_{t+1} - R_t\right] \quad \text{(A-27)}$$

where SP_* measures the steady-state spread. Priors are specified for the parameters SP_*, $\zeta_{sp,b}$, ρ_{σ_ω}, σ_{σ_ω}, and the parameters $\bar{F}_*$ and γ_* (the steady-state default probability and the survival rate of entrepreneurs, respectively), are fixed.

A.4 SWFF$^+$

The SW$^+$ model augments the technology process, Z^*_t, with a long-run component, Z^p_t, such that $Z^*_t = e^{\frac{1}{1-\alpha}\tilde{z}_t} Z^p_t e^{\gamma t}$. Recall the previous specification of the growth rate of the technology process (A-2). Now with an additional term, $z^p_t = ln(Z^p_t/Z^p_{t-1})$, the growth rate of the technology process follows:

$$z_t = \ln(Z^*_t/Z^*_{t-1}) - \gamma = \frac{1}{1-\alpha}(\rho_z - 1)\tilde{z}_{t-1} + \frac{1}{1-\alpha}\sigma_z\epsilon_{z,t} + z^p_t \quad \text{(A-28)}$$

where

$$z^p_t = \rho_{z^p} z^p_{t-1} + \sigma_{z^p}\epsilon_{z^p,t},\ \epsilon_{z^p,t} \sim N(0,1) \quad \text{(A-29)}$$

A.4.1 Measurement Equations

SW$^+$ adds an additional set of measurement equations for core PCE, the 10 year nominal bond yield, and TFP.

$$\begin{aligned} \textit{Core PCE Inflation} &= \pi_* + \pi_t + e^{pce}_t \\ \textit{10y Nominal Bond Yield} &= R_* + \mathbb{E}_t\left[\frac{1}{40}\sum_{k=1}^{40} R_{t+k}\right] + e^{10y}_t \\ \textit{TFP growth, demeaned} &= z_t + \frac{\alpha}{1-\alpha}(u_t - u_{t-1}) + e^{tfp}_t \end{aligned} \quad \text{(A-30)}$$

All the e^*_t processes follow exogenous AR(1) specifications, and can be thought of either as measurement errors or some other unmodelered source of discrepancy between the model and the data (e.g., risk premia for the long term nominal rate).

A.5 SWFF^{++}

A.5.1 Measurement Equations

SW^{++} adds the additional measurement equation for GDI and modifies the equation for GDP given in Section A-21:

$$\begin{aligned} GDP\ growth &= 100\gamma + (y_t - y_{t-1} + z_t) + e_t^{gdp} - \mathcal{C}_{me} e_{t-1}^{gdp} \\ GDI\ growth &= 100\gamma + (y_t - y_{t-1} + z_t) + e_t^{gdi} - \mathcal{C}_{me} e_{t-1}^{gdi} \end{aligned} \tag{A-31}$$

The e_t^* terms follow exogenous AR(1) specifications as similarly described in Section A.4. Furthermore, we introduce correlation in the measurement errors for GDP and GDI, which evolve as follows:

$$e_t^{gdp} = \rho_{gdp} e_{t-1}^{gdp} + \sigma_{gdp}\epsilon_t^{gdp},\ \epsilon_t^{gdp} \sim i.i.d.N(0,1)$$

$$e_t^{gdi} = \rho_{gdi} e_{t-1}^{gdi} + +\varrho_{gdp}\sigma_{gdp}\epsilon_t^{gdp} + \sigma_{gdi}\epsilon_t^{gdi},\ \epsilon_t^{gdi} \sim i.i.d.N(0,1)$$

We assume that $\mathcal{C}_{me} = 1$. The measurement errors for GDP and GDI are thus stationary in levels, and enter the observation equation in first differences (e.g. $\epsilon_t^{gdp} - \epsilon_{t-1}^{gdp}$ and $\epsilon_t^{gdi} - \epsilon_{t-1}^{gdi}$). GDP and GDI are also cointegrated as they are driven by a common stochastic trend.

A.6 Data Transformation

The data are transformed following Smets & Wouters (2007), with the exception of the civilian population data, which are filtered using the Hodrick-Prescott filter to remove jumps around census dates. For each financial variable, we take quarterly averages of the annualized daily data and divide by four. Let Δ denote the temporal difference operator. Then:

$$\begin{aligned}
&\text{GDP growth} &&= 100 * \Delta LN((GDP/GDPDEF)/CNP16OV) \\
&\text{GDI growth} &&= 100 * \Delta LN((GDI/GDPDEF)/CNP16OV) \\
&\text{Consumption growth} &&= 100 * \Delta LN((PCEC/GDPDEF)/CNP16OV) \\
&\text{Investment growth} &&= 100 * \Delta LN((FPI/GDPDEF)/CNP16OV) \\
&\text{Real wage growth} &&= 100 * \Delta LN(COMPNFB/GDPDEF) \\
&\text{Hours worked} &&= 100 * LN((AWHNONAG * CE16OV/100)/CNP16OV) \\
&\text{GDP deflator inflation} &&= 100 * \Delta LN(GDPDEF) \\
&\text{Core PCE inflation} &&= 100 * \Delta LN(JCXFE) \\
&\text{FFR} &&= (1/4) * \text{FEDERAL FUNDS RATE} \\
&\text{FFR}^e_{t+k|t} &&= (1/4) * \text{BLUE CHIP } k\text{-QUARTERS AHEAD FFR FORECAST} \\
&\text{10y inflation exp} &&= (\text{10-year average CPI inflation forecast} - 0.50)/4 \\
&\text{Spread} &&= (1/4) * (\text{Baa Corporate} - \text{10 year Treasury}) \\
&\text{10y bond yield} &&= (1/4) * (\text{10 year Treasury}) \\
&\text{TFP growth, demeaned} &&= (1/4) * (\text{Fernald's TFP growth, unadjusted, demeaned})/(1-\alpha)
\end{aligned}$$

In the long-term inflation expectation transformation, 0.50 is the average difference between CPI and GDP annualized inflation from the beginning of the sample to 1992.

A.7 Inference, Prior and Posterior Parameter Estimates

We estimate the model using Bayesian techniques. This requires the specification of a prior distribution for the model parameters. For most parameters common with Smets & Wouters

(2007), we use the same marginal prior distributions. As an exception, we favor a looser prior than Smets & Wouters (2007) for the quarterly steady-state inflation rate π_*; it is centered at 0.75% and has a standard deviation of 0.4%. Regarding the financial frictions, we specify priors for the parameters SP_*, $\zeta_{sp,b}$, ρ_{σ_ω}, and σ_{σ_ω}, while we fix the parameters corresponding to the steady-state default probability and the survival rate of entrepreneurs, respectively. In turn, these parameters imply values for the parameters of (A-26). Information on the priors and posterior mean is provided in Table A-1.

Table A-1: Parameter Estimates

Parameter	SWFF Prior			SWFF Posterior			SW Posterior		
	Type	Mean	SD	Mean	90.0% LB	90.0% UB	Mean	90.0% LB	90.0% UB
				Steady State					
100γ	N	0.400	0.100	0.406	0.382	0.431	0.367	0.320	0.414
α	N	0.300	0.050	0.142	0.112	0.172	0.143	0.115	0.171
$100(\beta^{-1}-1)$	G	0.250	0.100	0.127	0.062	0.193	0.168	0.071	0.265
σ_c	N	1.500	0.370	0.776	0.614	0.937	1.063	0.854	1.270
h	B	0.700	0.100	0.521	0.428	0.615	0.611	0.531	0.690
ν_l	N	2.000	0.750	2.574	1.741	3.410	2.161	1.278	3.005
δ	-	0.025	0.000	0.025	0.025	0.025	0.025	0.025	0.025
Φ	N	1.250	0.120	1.582	1.444	1.713	1.559	1.435	1.690
S''	N	4.000	1.500	3.325	1.813	4.717	6.590	4.927	8.197
ψ	B	0.500	0.150	0.684	0.562	0.821	0.759	0.626	0.896
$\bar{L}$	N	-45.000	5.000	-46.042	-48.189	-43.815	-45.106	-47.011	-43.251
λ_w	-	1.500	0.000	1.500	1.500	1.500	1.500	1.500	1.500
π_*	G	0.750	0.400	1.151	0.808	1.490	0.681	0.526	0.839
g_*	-	0.180	0.000	0.180	0.180	0.180	0.180	0.180	0.180
				Nominal Rigidities					
ζ_p	B	0.500	0.100	0.926	0.903	0.950	0.844	0.799	0.888
ζ_w	B	0.500	0.100	0.923	0.905	0.942	0.856	0.811	0.904
ι_p	B	0.500	0.150	0.294	0.139	0.443	0.223	0.092	0.345
ι_w	B	0.500	0.150	0.445	0.256	0.633	0.484	0.279	0.687
ε_p	-	10.000	0.000	10.000	10.000	10.000	10.000	10.000	10.000
ε_w	-	10.000	0.000	10.000	10.000	10.000	10.000	10.000	10.000
				Policy					
ψ_1	N	1.500	0.250	1.148	1.039	1.250	1.847	1.584	2.100
ψ_2	N	0.120	0.050	0.004	-0.005	0.013	0.110	0.064	0.156
ψ_3	N	0.120	0.050	0.193	0.160	0.225	0.207	0.171	0.241
ρ	B	0.750	0.100	0.724	0.693	0.754	0.868	0.840	0.897
ρ_{rm}	B	0.500	0.200	0.182	0.106	0.257	0.257	0.170	0.342
				Financial Frictions					
$F(\omega)$	-	0.030	0.000	0.030	0.030	0.030	-	-	-
spr_*	G	2.000	0.100	1.914	1.775	2.054	-	-	-
ζ_{spb}	B	0.050	0.005	0.052	0.045	0.059	-	-	-
γ_*	-	0.990	0.000	0.990	0.990	0.990	-	-	-
				Exogenous Processes					
ρ_g	B	0.500	0.200	0.983	0.974	0.992	0.978	0.965	0.992
ρ_μ	B	0.500	0.200	0.874	0.827	0.924	0.713	0.623	0.801
ρ_z	B	0.500	0.200	0.940	0.918	0.964	0.978	0.960	0.995
ρ_{λ_f}	B	0.500	0.200	0.725	0.594	0.862	0.858	0.794	0.924

Note: N, B, G, and IG stand, respectively, for the normal, beta, gamma, and root inverse gamma distributions. Under the inverse gamma prior mean and SD, the mode τ and degrees of freedom ν are reported.

Table A-1: Parameter Estimates

	SWFF Prior			SWFF Posterior			SW Posterior		
Parameter	Type	Mean	SD	Mean	90.0% LB	90.0% UB	Mean	90.0% LB	90.0% UB
ρ_{λ_w}	B	0.500	0.200	0.403	0.135	0.668	0.980	0.966	0.994
η_{λ_f}	B	0.500	0.200	0.637	0.461	0.816	0.731	0.596	0.866
η_{λ_w}	B	0.500	0.200	0.421	0.176	0.656	0.972	0.957	0.988
η_{gz}	B	0.500	0.200	0.796	0.622	0.974	0.796	0.635	0.974
σ_g	IG	0.100	2.000	2.919	2.677	3.147	2.891	2.660	3.118
σ_μ	IG	0.100	2.000	0.401	0.320	0.474	0.365	0.301	0.431
σ_z	IG	0.100	2.000	0.509	0.465	0.554	0.517	0.473	0.563
σ_{λ_f}	IG	0.100	2.000	0.145	0.126	0.164	0.128	0.106	0.150
σ_{λ_w}	IG	0.100	2.000	0.381	0.336	0.425	0.356	0.326	0.386
ρ_b	B	0.500	0.200	0.950	0.944	0.957	0.888	0.857	0.920
σ_b	IG	0.100	2.000	0.035	0.029	0.040	0.094	0.078	0.108
ρ_{σ_ω}	B	0.750	0.150	0.982	0.971	0.990	-	-	-
ρ_{π^*}	-	0.990	0.000	0.990	0.990	0.990	-	-	-
σ_{σ_ω}	IG	0.050	4.000	0.067	0.060	0.074	-	-	-
σ_{π^*}	IG	0.030	6.000	0.018	0.014	0.022	-	-	-
σ_{rm}	IG	0.100	2.000	0.185	0.172	0.199	-	-	-

Note: N, B, G, and IG stand, respectively, for the normal, beta, gamma, and root inverse gamma distributions. Under the inverse gamma prior mean and SD, the mode τ and degrees of freedom ν are reported.

B Vintages for Real Real-Time Forecast Comparison

Table A-2: Vintages for Real Real-Time Forecast Comparison

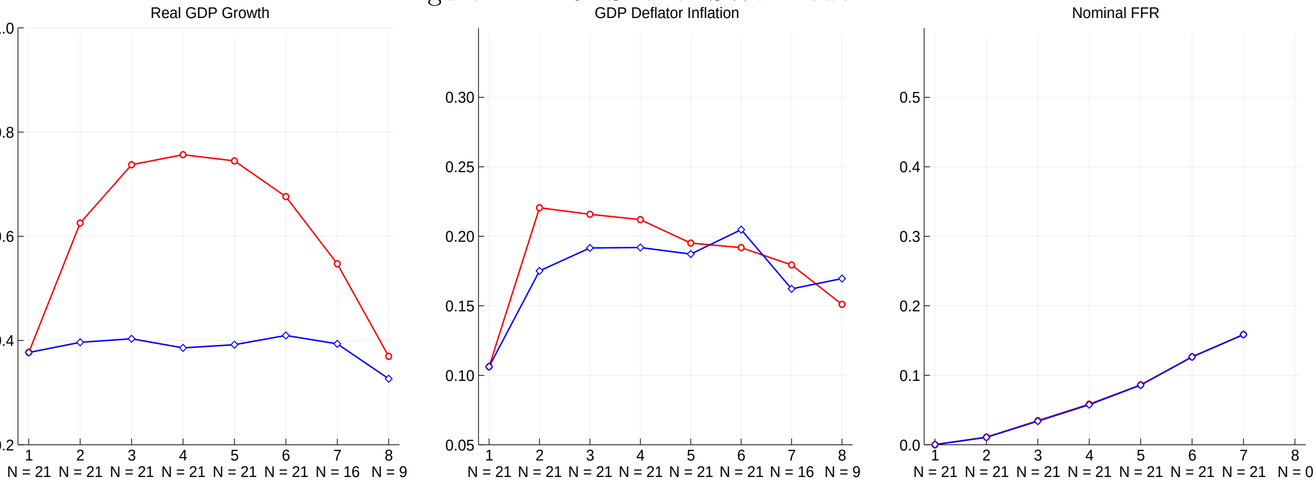
	Bluechip		SPF		SEP	
Quarter	Vintage	NYFed Vintage	Vintage	NYFed Vintage	Vintage	NYFed Vintage
2011-Q1	110410	110315			110426	110420
2011-Q2	110710	110615	110513	110311	110621	110615
2011-Q3					111101	111019
2011-Q4			111114	111019	120124	120111
2012-Q1	120410	120409	120210	120111	120424	120409
2012-Q2	120710	120605	120511	120409	120619	120605
2012-Q3	121010	120829			120912	120829
2012-Q4	130110	121113			121211	121113
2013-Q1	130410	130308	130215	130124	130319	130308
2013-Q2	130710	130613			130618	130613
2013-Q3	131010	130912	130816	130723	130917	130912
2013-Q4	140110	131212	131125	131023	131217	131212
2014-Q1	140410	140313			140318	140313
2014-Q2	140710	140610	140516	140423	140617	140610
2014-Q3	141010	140908	140815	140722	140916	140908
2014-Q4	150110	141209	141117	141021	141216	141209
2015-Q1	150410	150309	150213	150121	150317	150309
2015-Q2	150710	150610	150515	150421	150616	150610
2015-Q3	151010	150828	150814	150721	150916	150828
2015-Q4	160110	151204	151113	151014	151215	151204
2016-Q1	160410	160226	160212	160117	160315	160226

Note: The "Quarter" column corresponds to the first forecast quarter for the Bluechip and SEP forecast comparisons, and the second forecast quarter for the SPF forecast comparison. The "Vintage" and "NYFed Vintage" columns correspond to the release dates of the Bluechip, SPF, and SEP, and the NY Fed DSGE real real-time forecast vintage that they were matched with. The vintages are reported in YYMMDD format (year-month-day).

C Additional Results

C.1 Financial Frictions vs. Time-Varying $\pi*$

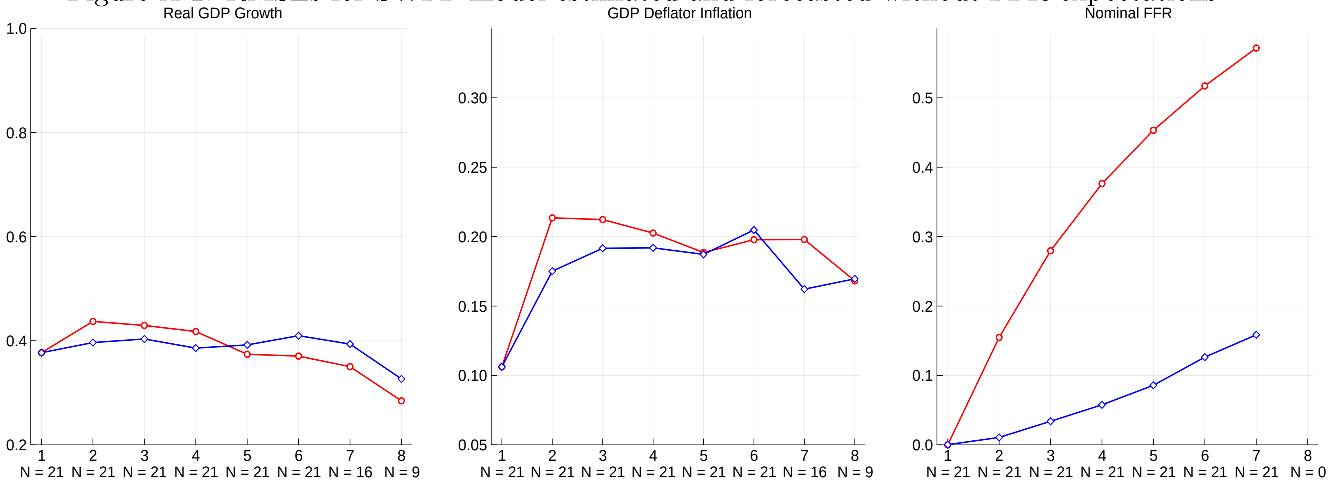
Figure A-1: RMSEs for SWπ model



Note: The panels compare the RMSEs for the SWπ DSGE model (red circles) with the Blue Chip (blue diamonds) for one through eight quarters ahead for real output growth, GDP deflator inflation, and interest rates. Output growth and inflation are expressed in Q/Q percent terms, whereas interest rates are in quarterly percentage points. The $N = n$ labels under each x-axis tick indicate the number of observations available for both the BCEI and DSGE forecasts at that horizon. Forecast origins from January 2011 to January 2016 only are included in these calculations.

C.2 Estimating and Forecasting without FFR Expectations

Figure A-2: RMSEs for SWFF model estimated and forecasted without FFR expectations



Note: The panels compare the RMSEs for the SWFF DSGE model (red circles) with the Blue Chip (blue diamonds) for one through eight quarters ahead for real output growth, GDP deflator inflation, and interest rates. Output growth and inflation are expressed in Q/Q percent terms, whereas interest rates are in quarterly percentage points. The $N = n$ labels under each x-axis tick indicate the number of observations available for both the BCEI and DSGE forecasts at that horizon. Forecast origins from January 2011 to January 2016 only are included in these calculations. In this exercise, we re-estimated and forecasted the SWFF model without FFR expectations data. Compare to the RMSEs in Figure 8, which were computed from the baseline parameter draws (estimated using FFR expectations data).