Smets and Wouters' model

$$
\begin{aligned}
y_t &= c_y c_t + i_y i_t + z_y z_t + \varepsilon_t^g && (1)\\
c_t &= c_1 c_{t-1} + (1-c_1)E_t c_{t+1} + c_2(l_t - E_t l_{t+1}) - c_3(r_t - E_t \pi_{t+1} + \varepsilon_t^b) && (2)\\
i_t &= i_1 i_{t-1} + (1-i_1)E_t i_{t+1} + i_2 q_t + \varepsilon_t^i && (3)\\
q_t &= q_1 E_t q_{t+1} + (1-q_1)E_t r_{t+1}^k - (r_t - E_t \pi_{t+1} + \varepsilon_t^b) && (4)\\
y_t &= \phi_p(\alpha k_t^s + (1-\alpha) l_t + \varepsilon_t^a) && (5)\\
k_t^s &= k_{t-1} + z_t && (6)\\
z_t &= z_1 r_t^k && (7)\\
k_t &= k_1 k_{t-1} + (1-k_1) i_t + k_2 \varepsilon_t^i && (8)\\
\mu_t^p &= \alpha(k_t^s - l_t) + \varepsilon_t^a - w_t && (9)\\
\pi_t &= \pi_1 \pi_{t-1} + pi_2 E_t \pi_{t+1} - \pi_3 \mu_t^p + \varepsilon_t^p && (10)\\
r_t^k &= -(k_t - l_t) + w_t && (11)\\
\mu_t^w &= w_t - \left(\sigma_l l_t + \frac{1}{1-\lambda/\gamma}\left(c_t - \frac{\lambda}{\gamma} c_{t-1}\right)\right) && (12)\\
w_t &= w_1 w_{t-1} + (1-w_1)E_t(w_{t+1} + \pi_{t+1}) - w_2 \pi_t + w_3 \pi_{t-1} - w_4 \mu_t^w + \varepsilon_t^w && (13)\\
r_t &= \rho r_{t-1} + (1-\rho)\left[r_\pi \pi_t + r_{\Delta y}(y_t - y_{t-1})\right] + \varepsilon_t^r && (14)
\end{aligned}
$$

Credit Risk and the Macroeconomy: Evidence from an Estimated DSGE Model,

Gilchrist et al. (2009)

- Tables and graphs from paper

Table 7: Prior and Posterior Distributions of Structural Parameters

	Prior			*Posterior*			
Parameter	Distribution	Mean	SD	Mode	Mean	P5	P95
χ	Beta	0.05	0.02	0.01	0.01	0.01	0.01
φ	Normal	4.00	1.50	4.62	6.98	5.43	8.56
σ_c	Normal	1.50	0.37	0.98	0.95	0.88	1.02
h	Beta	0.70	0.10	0.90	0.92	0.89	0.95
ξ_w	Beta	0.50	0.10	0.94	0.77	0.68	0.87
σ_l	Normal	2.00	0.75	2.36	1.43	0.25	2.73
ξ_p	Beta	0.50	0.10	0.72	0.74	0.68	0.80
ι_w	Beta	0.50	0.15	0.38	0.46	0.25	0.67
ι_p	Beta	0.50	0.15	0.65	0.38	0.19	0.61
ψ	Beta	0.50	0.15	0.36	0.57	0.44	0.71
ϕ_p	Normal	1.25	0.12	1.70	1.49	1.36	1.64
r_π	Normal	1.50	0.25	1.10	1.72	1.45	1.97
ρ	Beta	0.75	0.10	0.74	0.79	0.75	0.84
r_y	Normal	0.12	0.05	0.001	0.08	0.04	0.12
$r_{\Delta y}$	Normal	0.12	0.05	0.14	0.17	0.12	0.23
$\overline{\pi}$	Gamma	0.62	0.10	0.88	0.77	0.61	0.94
$100(\beta^{-1} - 1)$	Gamma	0.25	0.10	0.34	0.27	0.14	0.43
$\overline{l}$	Normal	0.00	2.00	-5.61	-4.61	-5.56	-3.70
$\overline{\gamma}$	Normal	0.40	0.10	0.33	0.36	0.33	0.39
α	Normal	0.30	0.05	0.26	0.20	0.17	0.23
$\overline{z}$	Normal	52.0	10.0	45.7	45.3	40.6	50.3
$\overline{s}$	Normal	0.39	0.10	0.35	0.34	0.26	0.41

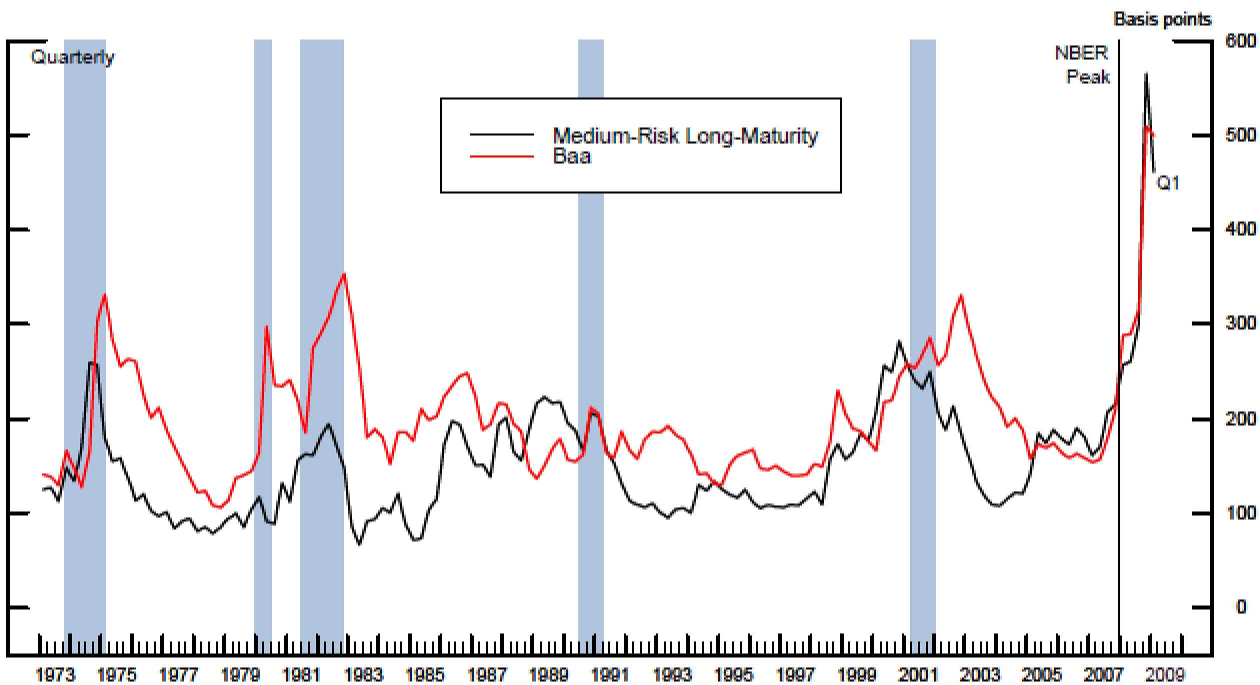
NOTE: Entries under the heading *Priors* specify the mean and the standard deviation of the prior distribution for the model's estimated structural parameters (see text for details). Entries under the heading *Posterior* denote the Bayesian ML estimates of the mean and the mode, along with the 5th (P5) and 95th percentiles (P95), of the posterior distribution.

Table 8: Prior and Posterior Distributions of Structural Shock Processes

	Prior			*Posterior*			
Parameter	Distribution	Mean	SD	Mode	Mean	P5	P95
σ_n	Inv. Gamma	0.10	2.00	7.88	8.15	7.38	8.91
σ_{fd}	Inv. Gamma	0.10	2.00	0.08	0.08	0.07	0.09
σ_{gs}	Inv. Gamma	0.10	2.00	0.56	0.47	0.33	0.59
σ_a	Inv. Gamma	0.10	2.00	0.41	0.41	0.37	0.46
σ_b	Inv. Gamma	0.10	2.00	0.14	0.12	0.09	0.15
σ_g	Inv. Gamma	0.10	2.00	0.50	0.50	0.45	0.55
σ_r	Inv. Gamma	0.10	2.00	0.25	0.25	0.22	0.28
σ_p	Inv. Gamma	0.10	2.00	0.20	0.18	0.12	0.23
σ_w	Inv. Gamma	0.10	2.00	0.21	0.23	0.18	0.27
ρ_{fd}	Beta	0.50	0.20	0.84	0.84	0.79	0.89
ρ_{gs}	Beta	0.50	0.20	0.61	0.74	0.61	0.87
ρ_a	Beta	0.50	0.20	0.92	0.84	0.75	0.93
ρ_b	Beta	0.50	0.20	0.29	0.52	0.37	0.68
ρ_g	Beta	0.50	0.20	0.89	0.89	0.82	0.96
ρ_r	Beta	0.50	0.20	0.22	0.19	0.07	0.30
ρ_p	Beta	0.50	0.20	0.64	0.82	0.71	0.94
ρ_w	Beta	0.50	0.20	0.80	0.88	0.80	0.96
μ_p	Beta	0.50	0.20	0.89	0.82	0.64	0.99
μ_w	Beta	0.50	0.20	0.72	0.75	0.61	0.89
ρ_{gn}	Beta	0.50	0.20	0.62	0.47	0.30	0.65

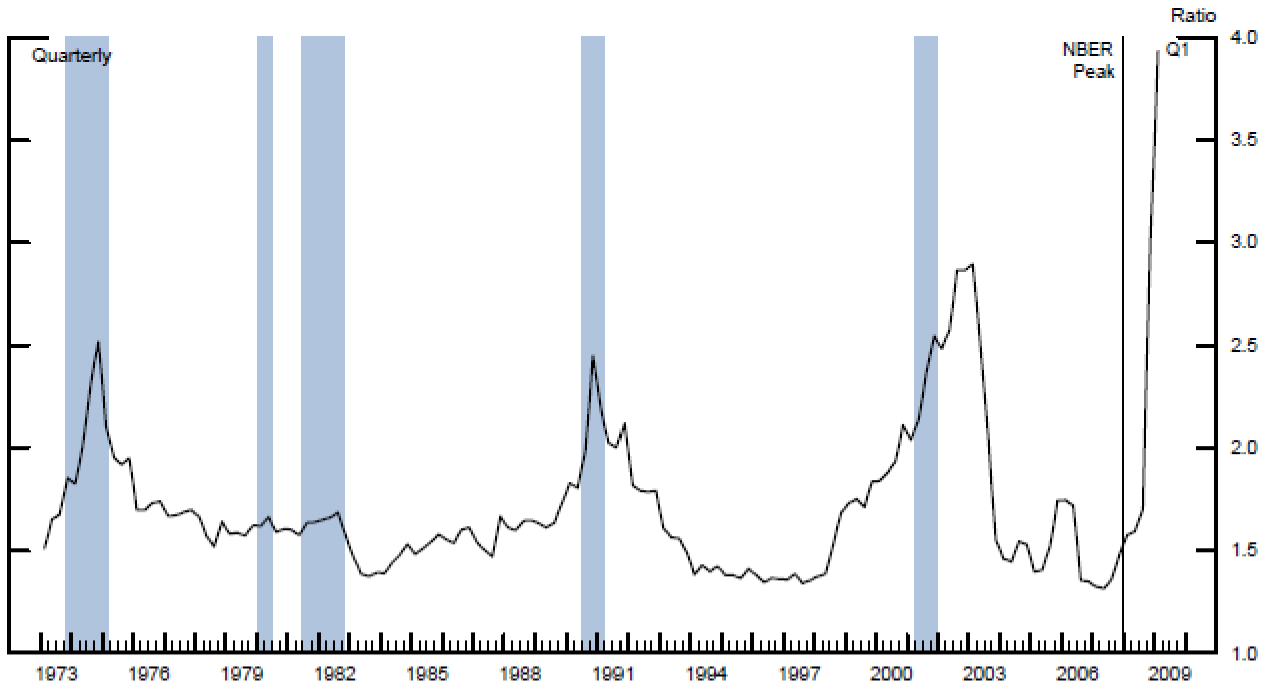
NOTE: Entries under the heading *Priors* specify the mean and the standard deviation of the prior distribution for the parameters governing the time-series properties of the model's structural shocks (see text for details). Entries under the heading *Posterior* denote the Bayesian ML estimates of the mean and the mode, along with the 5th (P5) and 95th percentiles (P95), of the posterior distribution.

Figure 1: Selected Corporate Bond Spreads



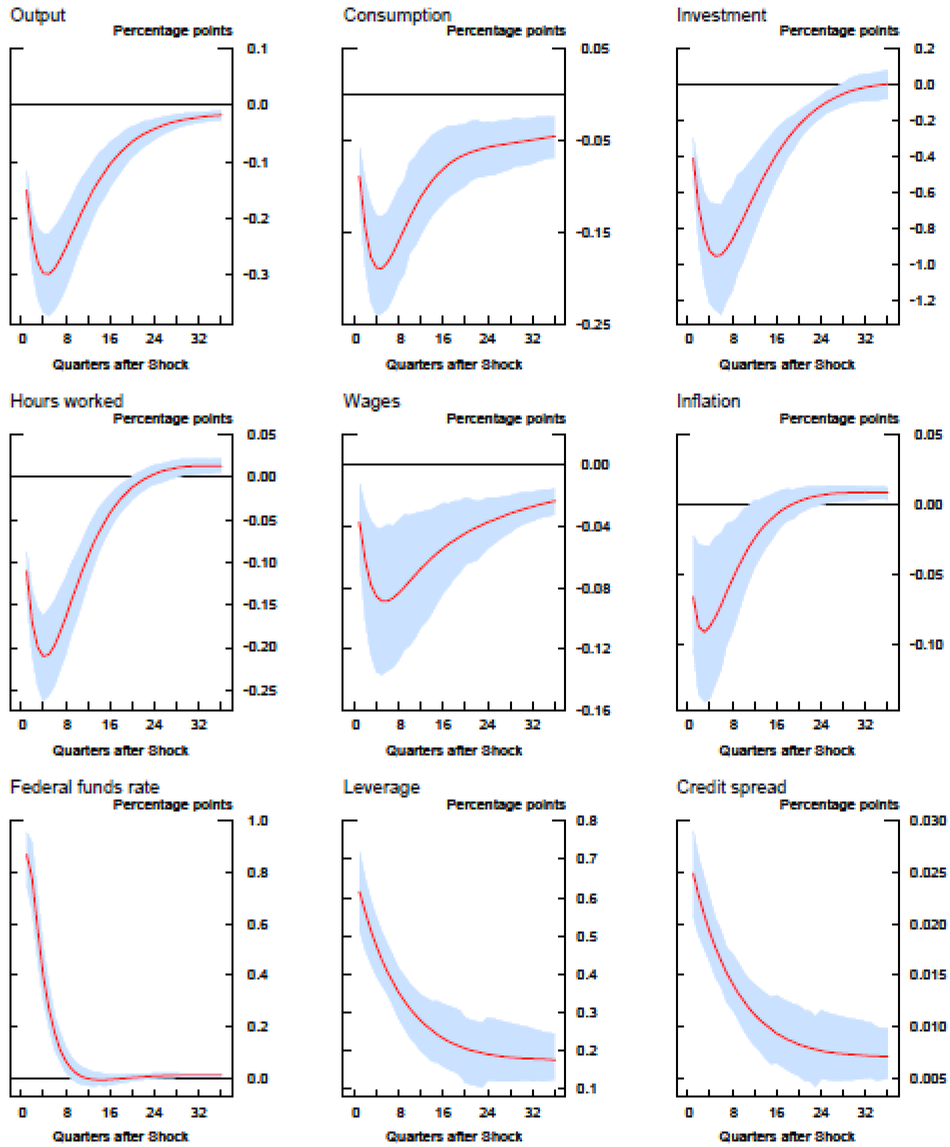
NOTE: The black line depicts the average credit spread associated with very long maturity corporate bonds issued by firms with low to medium probability of default (see text for details); the red line depicts the standard Baa credit spread, measured relative to the 10-year Treasury yield. The shaded vertical bars denote NBER-dated recessions.

Figure 2: Leverage Ratio



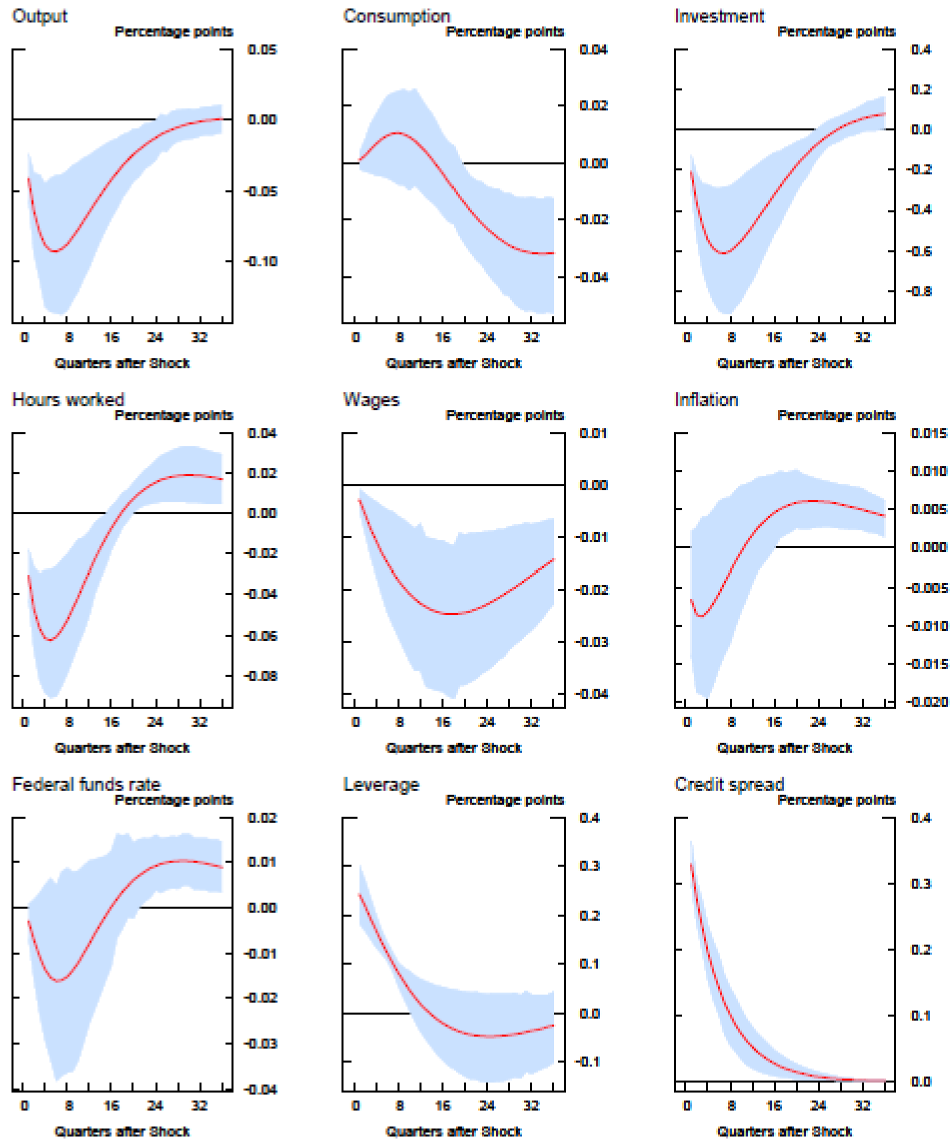
NOTE: The black line depicts the time-series of the cross-sectional averages of the leverage ratio for U.S. nonfinancial corporations. Leverage is defined as the ratio of the market-value of the firm's total assets (V) to the market-value of the firm's common equity (E), where the market-value of the firm's total assets is calculated using the Merton-DD model (see text for details). The shaded vertical bars denote NBER-dated recessions.

Figure 3: Model Responses to a Contractionary Monetary Policy Shock



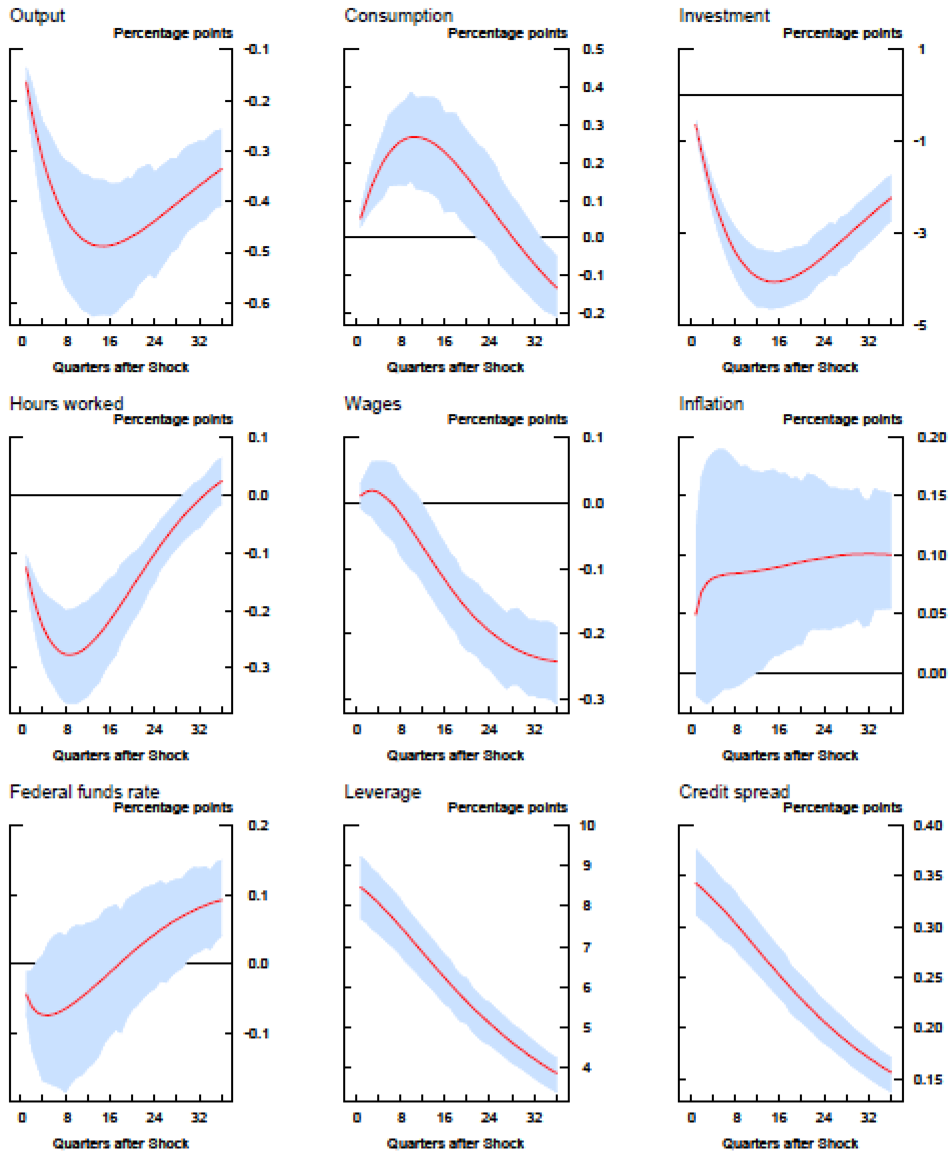
NOTE: The red lines in each panel depicts the estimated impulse responses of the model's variables to a one-standard-deviation monetary policy shock. The shaded bands denote the 80 percent confidence intervals.

Figure 4: Model Responses to an Adverse Credit Supply Shock



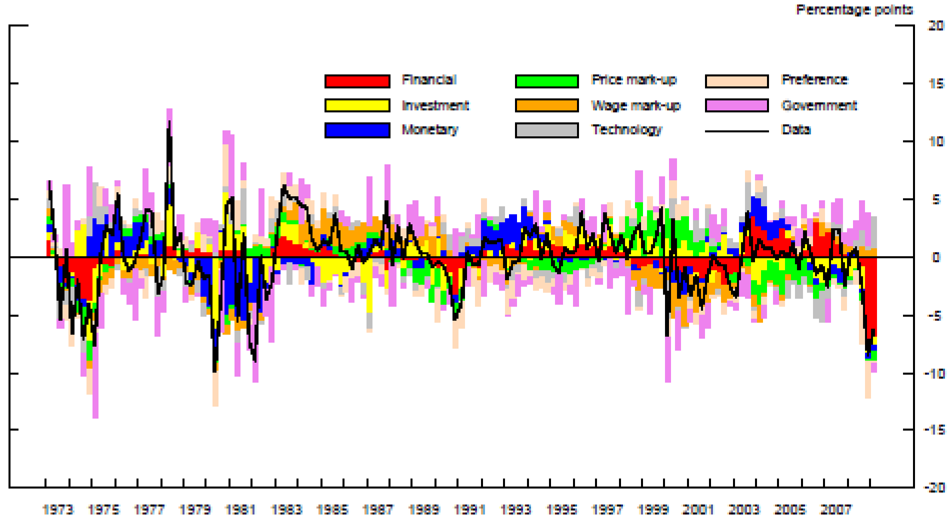
NOTE: The red lines in each panel depicts the estimated impulse responses of the model's variables to a one-standard-deviation credit supply shock. The shaded bands denote the 80 percent confidence intervals.

Figure 5: Model Responses to an Adverse Net Worth Shock



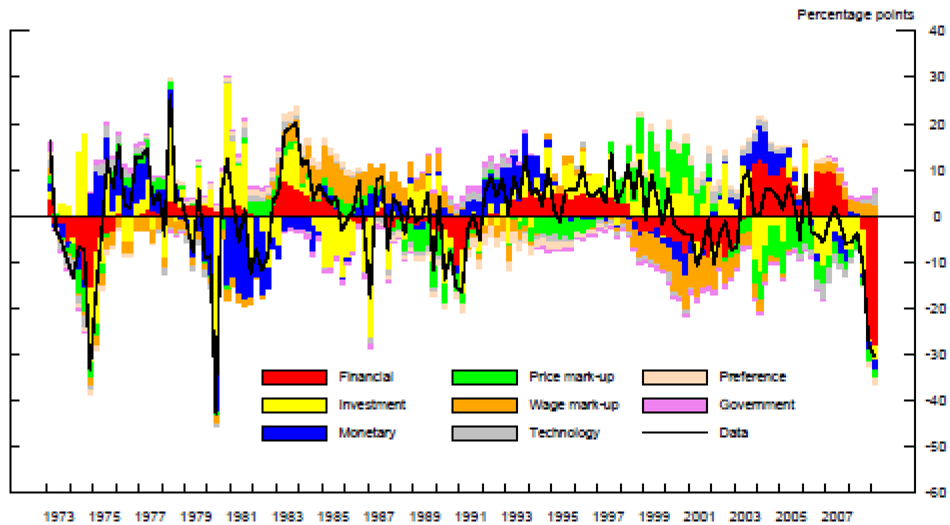
NOTE: The red lines in each panel depicts the estimated impulse responses of the model's variables to a one-standard-deviation net worth shock. The shaded bands denote the 80 percent confidence intervals.

Figure 6: Historical Decomposition of Output Growth



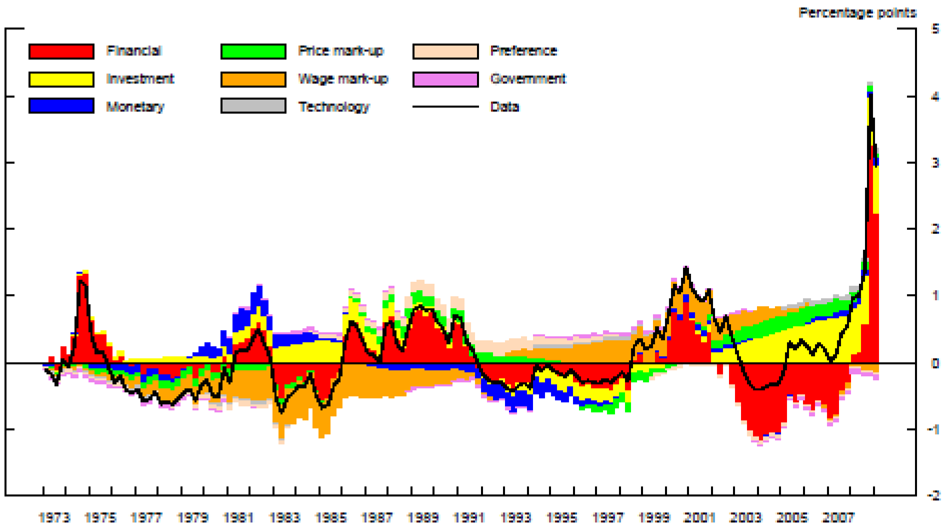
NOTE: The solid black line depicts the annualized quarterly growth rate in real GDP per capita, expressed in percentage point deviations from the model's steady state. The colored bars depict the estimated contributions of the various shocks (see text for details).

Figure 7: Historical Decomposition of Investment Growth



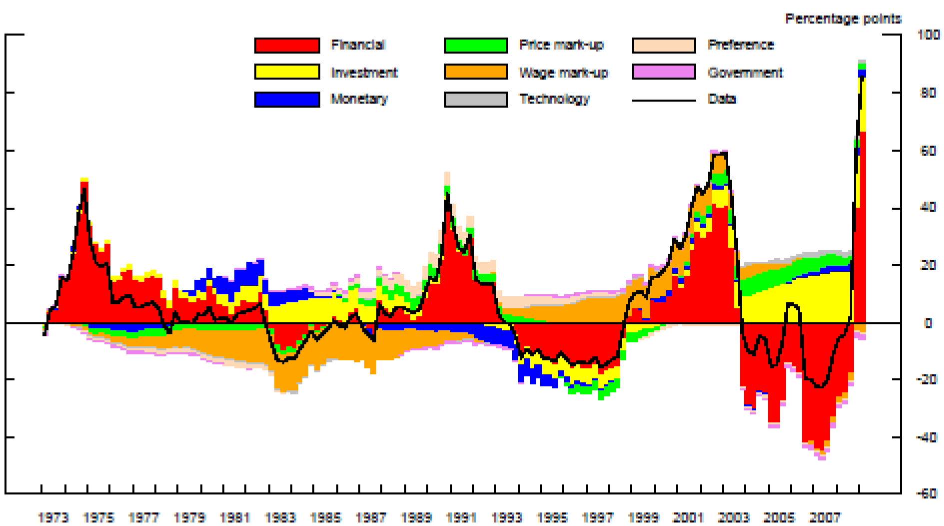
NOTE: The solid black line depicts the annualized quarterly growth rate in real fixed investment per capita, expressed in percentage point deviations from the model's steady state. The colored bars depict the estimated contributions of the various shocks (see text for details).

Figure 10: Historical Decomposition of Credit Spreads



NOTE: The solid black line depicts the annualized medium-risk, long-maturity credit spread, expressed in percentage point deviations from the model's steady state. The colored bars depict the estimated contributions of the various shocks (see text for details).

Figure 11: Historical Decomposition of Leverage



NOTE: The solid black line depicts the logarithm of leverage ratio, expressed in percentage point deviations from the model's steady state. The colored bars depict the estimated contributions of the various shocks (see text for details).

The external finance premium and the macroeconomy: US post-WWII evidence,

De Graeve (JEDC, 2008)

Table 1
Prior and posterior distribution for structural parameters

	Prior distribution			Posterior mode		Posterior sample			No financial friction
	Type	Mean/LB	St. Dev./UB	Mode	St. Dev.	5%	50%	95%	Mode
$\bar{K}/\bar{N}$	Uniform	0	5	1.4202	0.168	1.2354	1.5056	1.7683	n.a.
γ	Uniform	0.8	1	0.9923	0.0102	0.973	0.9858	0.9982	n.a.
ε	Uniform	0	0.5	0.1005	0.0349	0.0484	0.1047	0.1621	n.a.
$\bar{R}^K$	Normal	1.015	0.002	1.0131	0.002	1.0099	1.0133	1.0164	n.a.
φ	Normal	4	1.5	5.77	1.09	4.33	6.12	7.85	6.74
σ_c	Normal	1	0.375	2.19	0.24	1.76	2.15	2.53	1.80
h	Beta	0.7	0.1	0.41	0.07	0.33	0.43	0.54	0.70
σ_l	Normal	2	0.75	2.32	0.58	1.52	2.50	3.43	2.48
ϕ	Normal	1.25	0.125	1.69	0.08	1.57	1.70	1.82	1.71
ψ	Gamma	0.2	0.075	0.40	0.10	0.26	0.43	0.61	0.31
ξ_w	Beta	0.75	0.05	0.83	0.02	0.78	0.83	0.87	0.81
ξ_p	Beta	0.75	0.05	0.92	0.010	0.90	0.92	0.94	0.92
γ_w	Beta	0.5	0.15	0.43	0.12	0.24	0.43	0.62	0.38
γ_p	Beta	0.5	0.15	0.25	0.09	0.13	0.27	0.42	0.34
r_π	Normal	1.5	0.1	1.49	0.09	1.33	1.49	1.65	1.50
$r_{\Delta\pi}$	Gamma	0.3	0.1	0.08	0.03	0.04	0.08	0.13	0.10
r_Y	Gamma	0.125	0.05	0.09	0.03	0.04	0.10	0.16	0.09
$r_{\Delta Y}$	Gamma	0.063	0.05	0.27	0.03	0.21	0.26	0.32	0.22
ρ	Beta	0.75	0.1	0.89	0.02	0.86	0.89	0.92	0.90
ρ_A	Beta	0.85	0.1	0.98	0.01	0.97	0.98	0.99	0.98
ρ_B	Beta	0.85	0.1	0.70	0.11	0.46	0.64	0.83	0.33
ρ_G	Beta	0.85	0.1	0.96	0.01	0.92	0.95	0.98	0.95
ρ_L	Beta	0.85	0.1	0.94	0.01	0.91	0.94	0.97	0.97
ρ_I	Beta	0.85	0.1	0.64	0.05	0.55	0.64	0.73	0.61
$\sigma(\varepsilon_t^a)$	Uniform	0	5	0.46	0.02	0.43	0.47	0.51	0.47
$\sigma(\varepsilon_t^B)$	Uniform	0	5	0.52	0.22	0.28	0.68	1.06	2.31
$\sigma(\varepsilon_t^G)$	Uniform	0	5	0.57	0.02	0.53	0.57	0.62	0.58
$\sigma(\varepsilon_t^L)$	Uniform	0	5	3.04	0.54	2.27	3.21	4.25	3.44
$\sigma(\varepsilon_t^I)$	Uniform	0	5	0.68	0.06	0.60	0.70	0.81	0.55
$\sigma(\eta_t^R)$	Uniform	0	5	0.20	0.01	0.17	0.20	0.24	0.21
$\sigma(\eta_t^p)$	Uniform	0	5	0.08	0.01	0.06	0.08	0.11	0.08
$\sigma(\eta_t^Q)$	Uniform	0	5	0.20	0.01	0.18	0.20	0.22	0.20
$\sigma(\eta_t^w)$	Uniform	0	5	0.27	0.01	0.25	0.27	0.30	0.27

Note: For uniform priors the table presents lower (LB) and upper bound (UB) rather than mean and standard deviation.

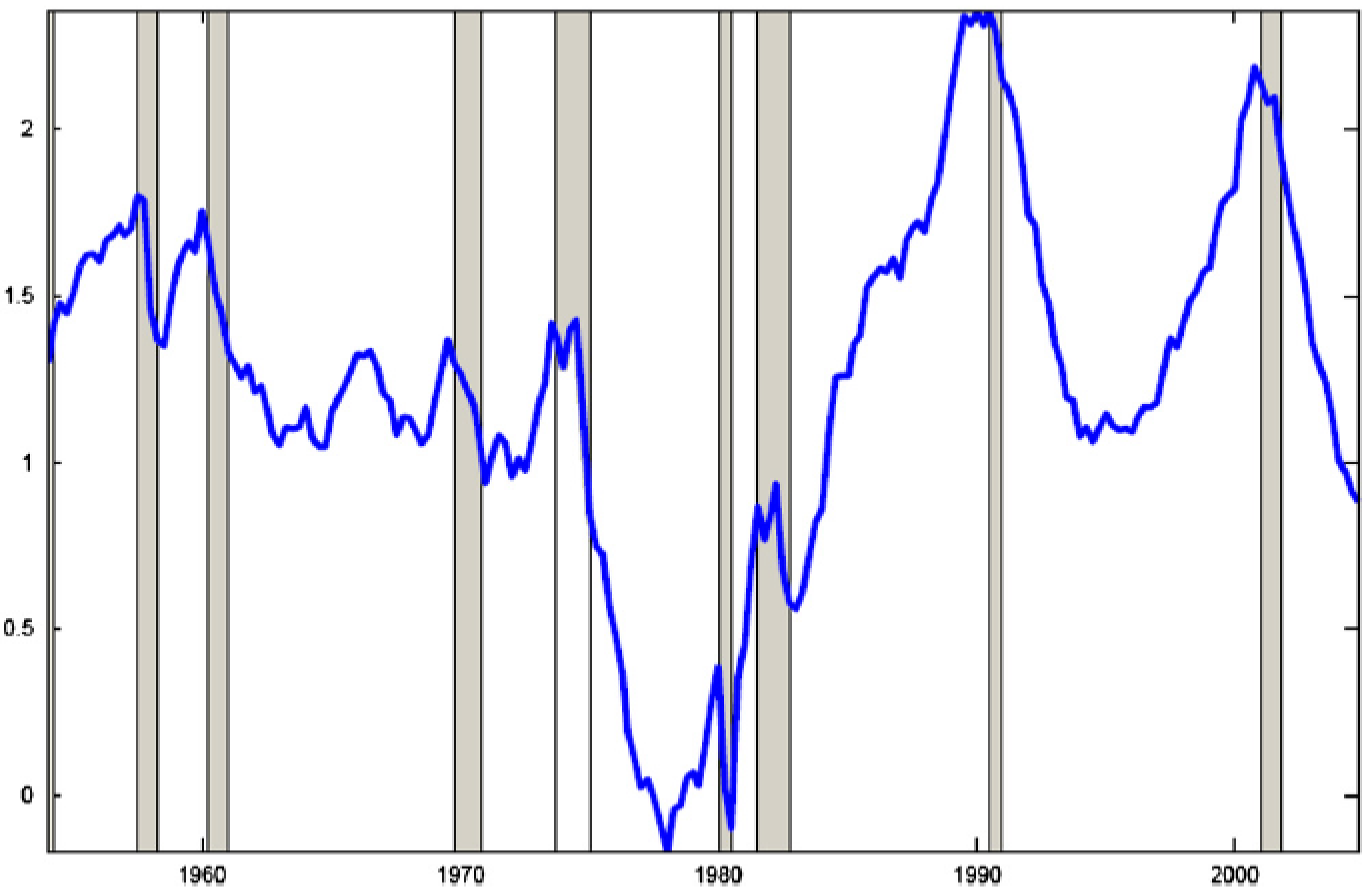


Fig. 2. The external finance premium.

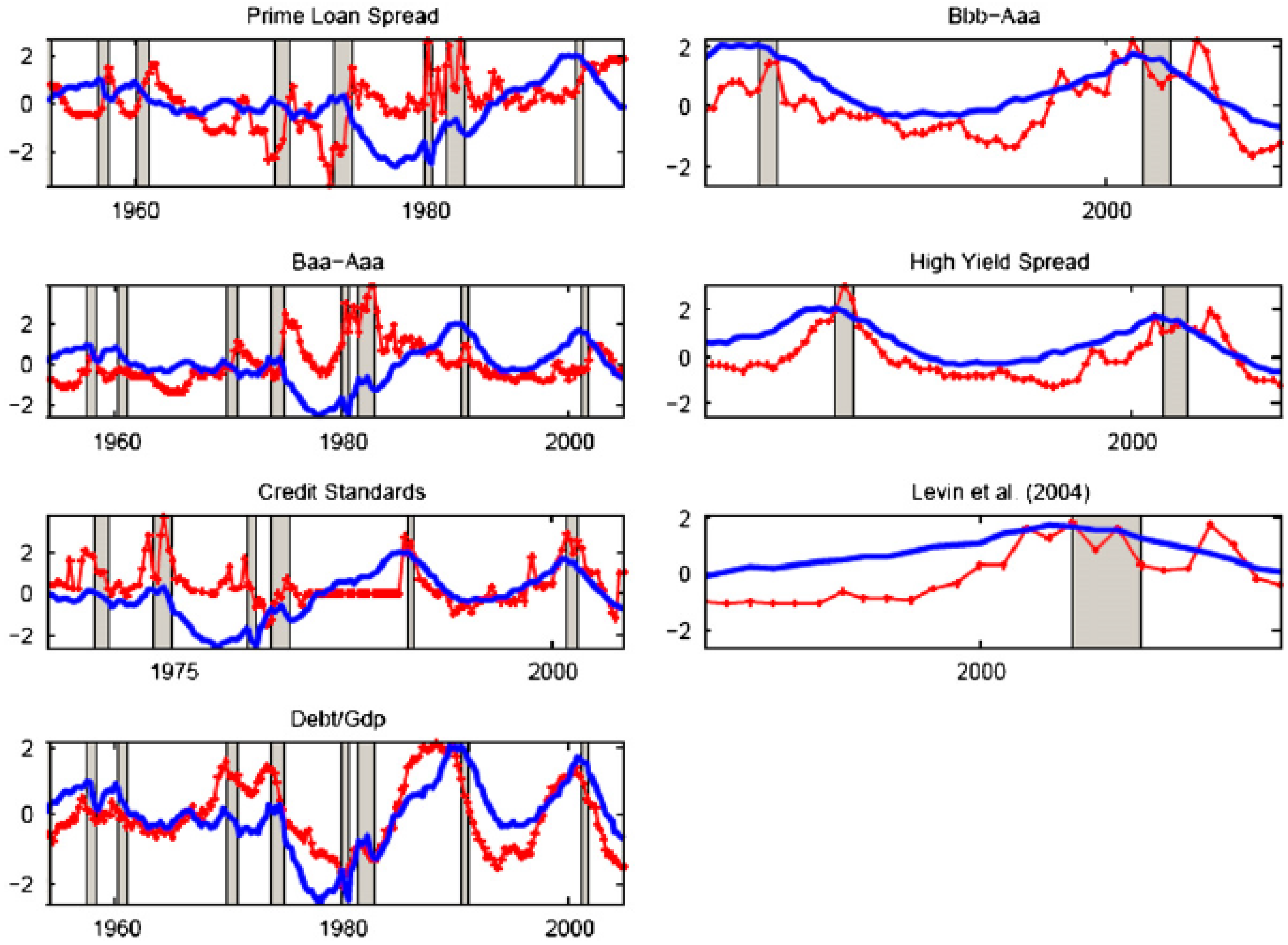


Fig. 3. The external finance premium (solid line) and alternative indicators (+).

Decomposing the EFP

Table 3
Variance decompositions: 5–95% bounds

Shock	Output			Premium		
	$t=1$	$t=10$	$t=20$	$t=1$	$t=10$	$t=20$
$\hat{\varepsilon}_t^{\mathrm{A}}$	0.01–0.04	0.11–0.24	0.16–0.33	0.00–0.03	0.00–0.01	0.00–0.02
$\hat{\varepsilon}_t^{\mathrm{B}}$	0.08–0.16	0.02–0.05	0.01–0.03	0.03–0.10	0.00–0.03	0.00–0.02
$\varepsilon_t^{\mathrm{G}}$	0.31–0.44	0.09–0.17	0.08–0.16	0.00–0.02	0.00–0.00	0.00–0.01
$\hat{\varepsilon}_t^{\mathrm{I}}$	0.25–0.37	0.18–0.37	0.14–0.30	0.58–0.83	0.86–0.98	0.89–0.97
$\hat{\varepsilon}_t^{\mathrm{L}}$	0.04–0.11	0.11–0.28	0.11–0.29	0.02–0.10	0.00–0.03	0.00–0.02
η_t^{π}	0.01–0.03	0.02–0.06	0.02–0.06	0.01–0.05	0.00–0.01	0.00–0.01
η_t^{R}	0.05–0.11	0.11–0.24	0.10–0.24	0.06–0.21	0.01–0.07	0.01–0.05
η_t^{P}	0.00–0.01	0.01–0.02	0.00–0.02	0.00–0.01	0.00–0.00	0.00–0.00
η_t^{W}	0.00–0.01	0.00–0.00	0.00–0.00	0.00–0.01	0.00–0.01	0.00–0.01

Table 4
Percentage gain (+)/ loss (−) in RMSE and marginal density

	Y	*C*	*I*	*L*	*P*	*W*	*R*
DSGE without financial friction vs. VAR(1)							
1Q	17.43	10.00	13.65	13.28	16.83	0.75	13.00
2Q	25.71	27.28	13.90	14.74	35.56	1.88	13.26
4Q	32.73	43.75	9.96	17.74	48.26	1.99	16.11
8Q	46.88	63.46	11.58	22.19	36.01	9.69	20.13
DSGE with financial friction vs. VAR(1)							
1Q	24.29	10.70	16.08	19.26	22.04	2.39	8.99
2Q	39.52	29.28	18.91	25.70	41.07	4.80	12.02
4Q	48.30	44.23	16.65	31.48	50.35	5.78	19.03
8Q	59.73	56.48	22.12	39.09	34.35	13.99	25.18
DSGE with vs. without financial friction							
1Q	8.30	0.77	2.82	6.91	6.27	1.65	−4.61
2Q	18.59	2.74	5.82	12.86	8.55	2.98	−1.43
4Q	23.15	0.86	7.43	16.71	4.04	3.87	3.47
8Q	24.20	-19.11	11.91	21.72	-2.60	4.77	6.32
Marginal likelihood							
VAR(1)	−1003.8						
DSGE without financial friction	−944.9						
DSGE with financial friction	−933.1						

Note: Sample period is 1954:Q1 to 2004:Q4. For the computation of RMSE the forecasting period is 1990:Q1 to 2004:4. The VAR is re-estimated every quarter, the DSGE models every four quarters. For the computation of the marginal likelihood the first 10 years (1954:Q1 to 1963:Q4) serve as a training sample.

Housing Market Spillovers: Evidence from an Estimated DSGE Model

By MATTEO IACOVIELLO AND STEFANO NERI

TABLE 3—PRIOR AND POSTERIOR DISTRIBUTION OF THE STRUCTURAL PARAMETERS

	Prior Distribution			Posterior Distribution			
Parameter	Distr.	Mean	St.Dev	Mean	2.5 perc.	Median	97.5 perc.
ε	Beta	0.5	0.075	0.32	0.25	0.33	0.40
ε'	Beta	0.5	0.075	0.58	0.46	0.58	0.68
η	Gamma	0.5	0.1	0.52	0.34	0.52	0.75
η'	Gamma	0.5	0.1	0.51	0.33	0.50	0.70
ξ	Normal	1	0.1	0.66	0.35	0.66	0.94
ξ'	Normal	1	0.1	0.97	0.78	0.97	1.19
$\phi_{k,c}$	Gamma	10	2.5	14.25	11.50	14.21	17.15
$\phi_{k,h}$	Gamma	10	2.5	10.90	6.99	10.74	15.76
α	Beta	0.65	0.05	0.79	0.72	0.79	0.85
r_R	Beta	0.75	0.1	0.59	0.50	0.59	0.67
r_π	Normal	1.5	0.1	1.44	1.33	1.44	1.55
r_Y	Normal	0	0.1	0.52	0.40	0.52	0.64
θ_π	Beta	0.667	0.05	0.83	0.80	0.84	0.87
ι_π	Beta	0.5	0.2	0.69	0.52	0.68	0.87
$\theta_{w,c}$	Beta	0.667	0.05	0.79	0.75	0.79	0.83
$\iota_{w,c}$	Beta	0.5	0.2	0.08	0.02	0.08	0.17
$\theta_{w,h}$	Beta	0.667	0.05	0.91	0.87	0.91	0.93
$\iota_{w,h}$	Beta	0.5	0.2	0.40	0.17	0.40	0.63
ζ	Beta	0.5	0.2	0.69	0.46	0.69	0.87
$100\gamma_{AC}$	Normal	0.5	1	0.32	0.30	0.33	0.34
$100\gamma_{AH}$	Normal	0.5	1	0.08	-0.04	0.08	0.21
$100\gamma_{AK}$	Normal	0.5	1	0.27	0.24	0.26	0.29

TABLE 4—PRIOR AND POSTERIOR DISTRIBUTION OF THE SHOCK PROCESSES

	Prior Distribution			Posterior Distribution			
Parameter	Distr.	Mean	St. Dev.	Mean	2.5 perc.	median	97.5 perc.
ρ_{AC}	Beta	0.8	0.1	0.95	0.91	0.95	0.97
ρ_{AH}	Beta	0.8	0.1	0.997	0.993	0.997	0.999
ρ_{AK}	Beta	0.8	0.1	0.92	0.89	0.92	0.95
ρ_j	Beta	0.8	0.1	0.96	0.92	0.96	0.98
ρ_z	Beta	0.8	0.1	0.96	0.92	0.97	0.98
ρ_τ	Beta	0.8	0.1	0.92	0.87	0.92	0.96
σ_{AC}	Inv.gamma	0.001	0.01	0.0100	0.0090	0.0100	0.0111
σ_{AH}	Inv.gamma	0.001	0.01	0.0193	0.0173	0.0193	0.0214
σ_{AK}	Inv.gamma	0.001	0.01	0.0104	0.0082	0.0104	0.0129
σ_j	Inv.gamma	0.001	0.01	0.0416	0.0262	0.0413	0.0581
σ_R	Inv.gamma	0.001	0.01	0.0034	0.0029	0.0034	0.0042
σ_z	Inv.gamma	0.001	0.01	0.0178	0.0115	0.0172	0.0267
σ_τ	Inv.gamma	0.001	0.01	0.0254	0.0188	0.0249	0.0339
σ_p	Inv.gamma	0.001	0.01	0.0046	0.0039	0.0046	0.0055
σ_s	Inv.gamma	0.001	0.01	0.0004	0.0003	0.0004	0.0005
$\sigma_{n,h}$	Inv.gamma	0.001	0.01	0.1218	0.1079	0.1216	0.1361
$\sigma_{w,h}$	Inv.gamma	0.001	0.01	0.0071	0.0063	0.0070	0.0080

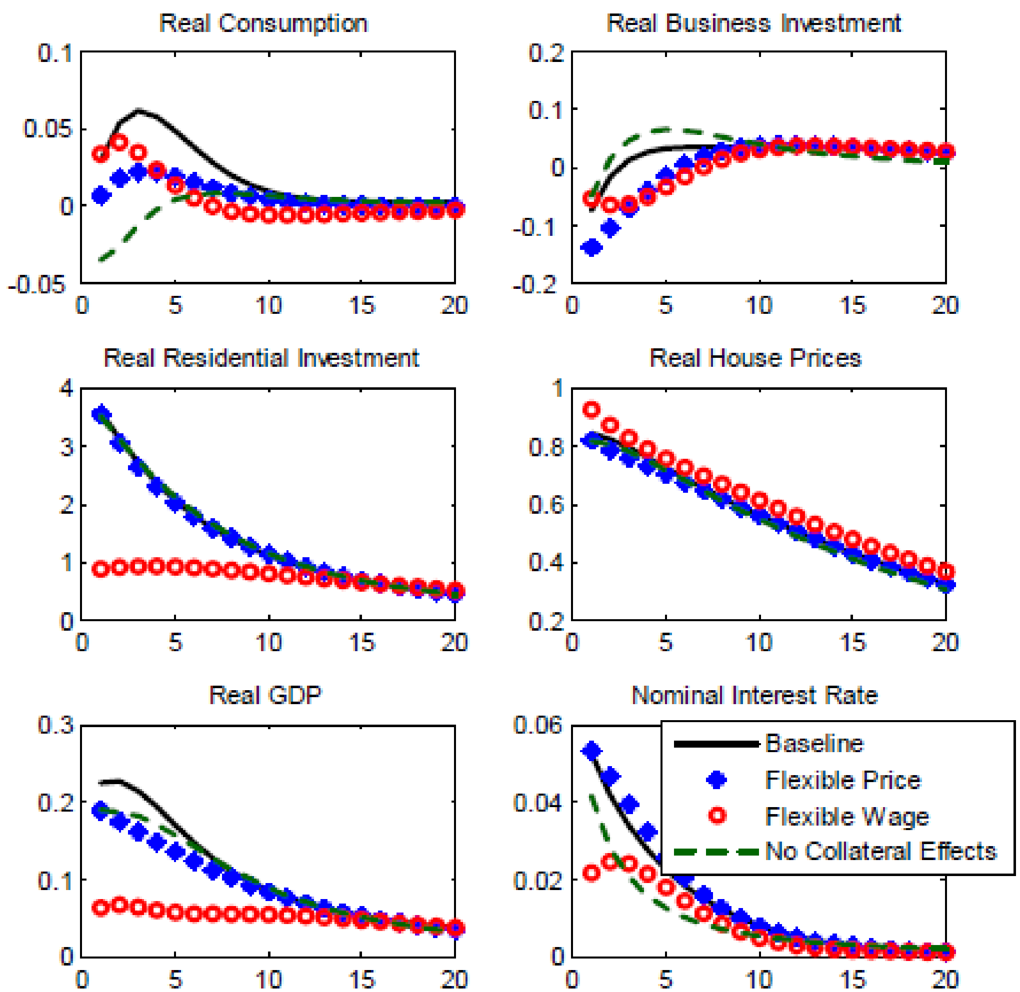


FIGURE 2. IMPULSE RESPONSES TO A HOUSING PREFERENCE SHOCK: BASELINE ESTIMATES AND SENSITIVITY ANALYSIS.

Note: The y-axis measures percent deviation from the steady state.

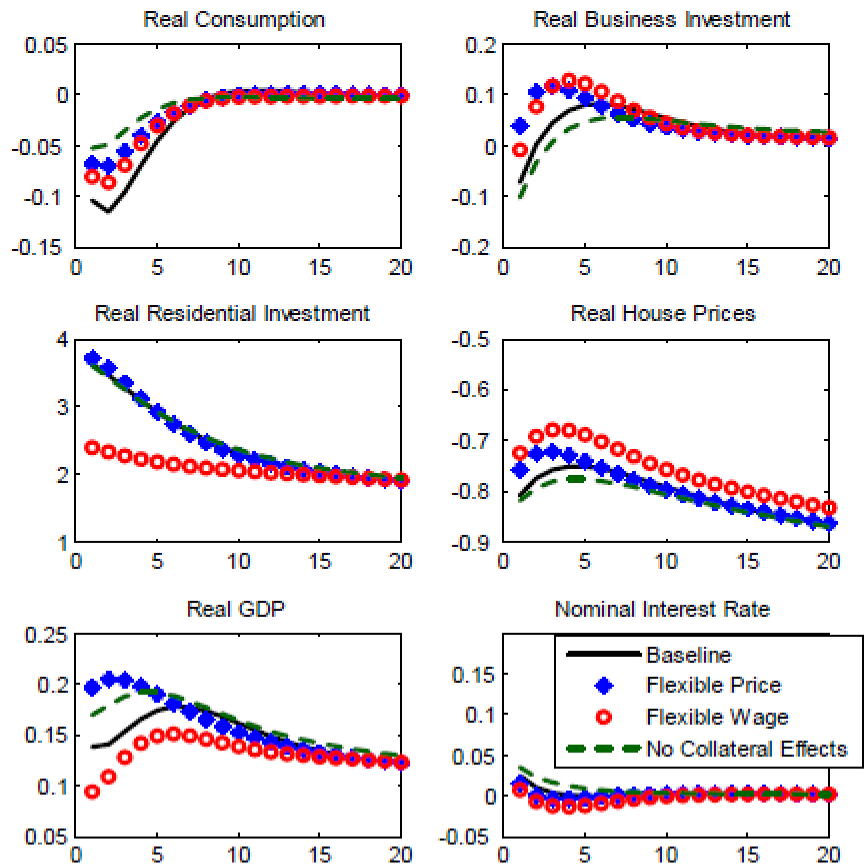


FIGURE 4. IMPULSE RESPONSES TO A HOUSING TECHNOLOGY SHOCK: BASELINE ESTIMATES AND SENSITIVITY ANALYSIS.

Note: The y-axis measures percent deviation from the steady state.

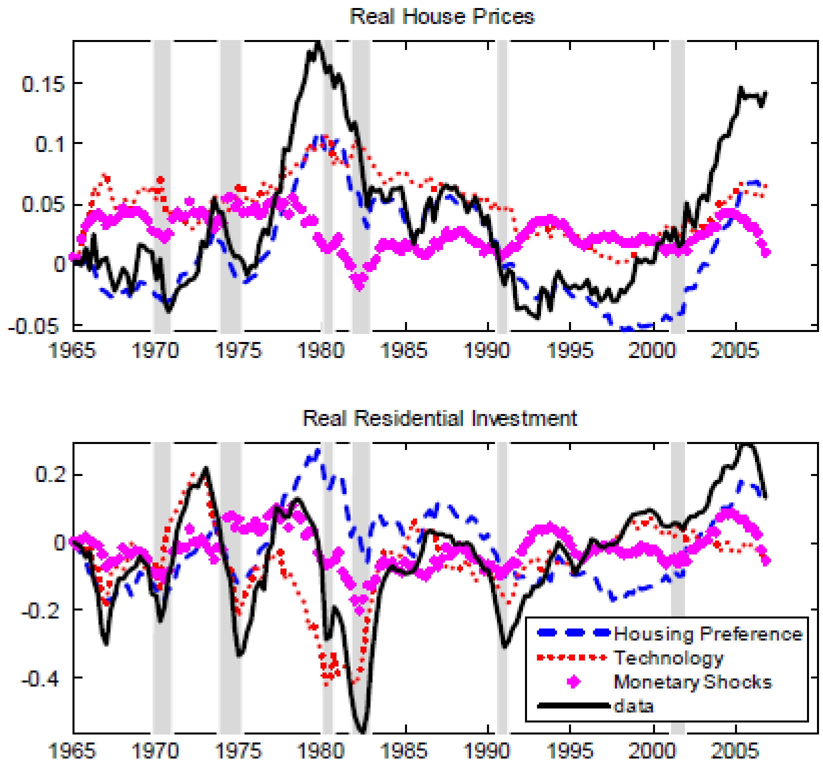


FIGURE 6. HISTORICAL DECOMPOSITION OF REAL HOUSE PRICES AND REAL RESIDENTIAL INVESTMENT.

Note: Monetary shocks include i.i.d. monetary policy shocks and changes in the inflation objective. Technology shocks include housing, non-housing and investment specific technology shocks. All series are in deviation from the estimated trend. Shaded areas indicate recessions as determined by the NBER.

Table 6—Decomposition of the Asymptotic Variance of the Forecast Error

	u_C C tech.	u_H IH tech.	u_K IK tech.	u_j H pref.	u_R iid monetary
C	18.1	1.0	0.9	0.3	18.3
IH	3.3	30.5	0.7	28.4	15.4
IK	9.4	0.1	34.3	0.1	14.8
q	8.6	20.2	0.7	27.3	11.5
π	4.3	0.1	0.5	0.4	5.4
R	4.0	0.6	9.8	3.8	19.5
GDP	15.5	1.0	8.0	2.0	22.6

	u_z intert. pref.	u_τ L supply	u_p cost-push	u_s infl. object.
C	11.3	19.1	22.6	8.5
IH	7.4	6.6	4.2	3.7
IK	7.1	9.4	18.6	6.4
q	9.2	6.2	13.0	3.6
π	3.4	2.4	59.0	24.5
R	6.6	5.6	16.7	33.6
GDP	1.0	17.7	23.2	9.3

Note: The table reports the posterior median value of the variance of the forecast errors at business cycle frequencies (extracted using the HP filter with smoothing parameter equal to 1,600).

TABLE 8—PREDICTABILITY OF THE HOUSING PREFERENCE IMPULSE

x-vector	t-statistic	Significance level test $H_0 : B(L) = 0$
(a)	corrected $R^2 = 0.14$	
All variables below		0.0107
ΔIFAC(-1)	−1.78	0.0743
ΔCLF(-1)	1.29	0.1978
ΔLEV(-1)	−0.28	0.7778
ΔCS(-1)	0.79	0.4303
ΔPOP2539(-1)	2.37	0.0179
ΔSUBPRIME(-1)	3.02	0.0025
INFL(-1)	−1.80	0.0714
ΔRTAX(-1)	−0.72	0.4701
(b)	corrected $R^2 = 0.15$	
All variables below		0.0016
ΔIFAC(-1)	−1.85	0.0637
ΔPOP2539(-1)	2.74	0.0062
ΔSUBPRIME(-1)	2.81	0.0049
INFL(-1)	−1.99	0.0462

Note: Predictability of our housing preference impulse $u_{j,t} = A(L)\, u_{j,t-1} + B(L)\, x_{t-1} + v_t$. One lag of $u_{j,t}$ and x_t were chosen.