Internet Appendix to
Expectations and Risk Premia at 8:30AM: Deciphering the Responses of Bond Yields to Macroeconomic Announcements

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This draft: January 15, 2018

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A1 Term Structure Model: Solution and Bond Prices

In order to solve the macro model presented in Section 2.1, we cast it in state-space form such that

$$\begin{bmatrix} \mathbf{Z}_{t+1} \\ \mathrm{E}_t \mathbf{X}_{t+1} \end{bmatrix} = \mathbf{J} \begin{bmatrix} \mathbf{Z}_t \\ \mathbf{X}_t \end{bmatrix} + \mathbf{S} r_t + \begin{bmatrix} \mathbf{v}_{t+1} \\ \mathbf{0} \end{bmatrix},$$

where $\mathbf{Z}_t = [x_{t-1}, \pi_{t-1}, \pi_t^*, \eta_t, \varepsilon_t^\pi, \varepsilon_t^x, r_{t-1}]'$ is the vector of predetermined variables of the model, and $\mathbf{X}_t = [x_t, \pi_t]'$ is the vector of nonpredetermined variables, and $\mathbf{v}_{t+1} = \boldsymbol{\Sigma\xi}_{t+1}$ represents a vector of shocks. Moreover, the policy rule is written in feedback form from the other variables as $r_t = \mathbf{G}_1'\mathbf{Z}_t + \mathbf{G}_2'\mathbf{X}_t$. Solving the model through standard numerical methods[1] yields

$$\begin{aligned} \mathbf{Z}_{t+1} &= \mathbf{M}\mathbf{Z}_t + \mathbf{v}_{t+1} \\ \mathbf{X}_{t+1} &= \mathbf{C}'\mathbf{Z}_{t+1} \\ r_t &= \boldsymbol{\Psi}'\mathbf{Z}_t \end{aligned}$$

where $\boldsymbol{\Psi}' \equiv -(\mathbf{G}_1 + \mathbf{G}_2\mathbf{C}')$.

Given that the short rate is linear in the predetermined state vector $\mathbf{Z}_t$, and that the law of motion of this vector is affine, we can proceed to price bonds by means of the affine term structure approach used in the finance literature (see e.g. Duffie and Kan, 1996 or Dai and Singleton, 2000). First, however, we need to impose the assumption of absence of arbitrage opportunities and specify a process for the stochastic discount factor. We choose a standard specification for the stochastic discount factor (with a log-normal Radon-Nikodym derivative), and assume that the market prices of risk are affine in the predetermined state vector $\mathbf{Z}_t$,

$$\boldsymbol{\lambda}_t = \boldsymbol{\lambda}_0 + \boldsymbol{\lambda}_1\mathbf{Z}_t,$$

along the lines of Duffee (2002). More precisely, we impose that only the four elements in $\boldsymbol{\lambda}_0$ and the 4×4 sub-matrix in $\boldsymbol{\lambda}_1$ that correspond to contemporaneous variables are allowed

[1] We use the methodology described in Söderlind (1999) based on the Schur decomposition.

to be non-zero:

$$\boldsymbol{\lambda}_0 = \begin{bmatrix} \underset{2\times1}{\mathbf{0}} \\ \lambda_{0,1} \\ \lambda_{0,2} \\ \lambda_{0,3} \\ \lambda_{0,4} \\ 0 \end{bmatrix}, \qquad \boldsymbol{\lambda}_1 = \begin{bmatrix} \underset{2\times2}{\mathbf{0}} & \underset{2\times1}{\mathbf{0}} & \underset{2\times1}{\mathbf{0}} & \underset{2\times1}{\mathbf{0}} & \underset{2\times1}{\mathbf{0}} & \underset{2\times1}{\mathbf{0}} \\ \underset{1\times2}{\mathbf{0}} & \boldsymbol{\lambda}_{1,11} & \boldsymbol{\lambda}_{1,12} & \boldsymbol{\lambda}_{1,13} & \boldsymbol{\lambda}_{1,14} & 0 \\ \underset{1\times2}{\mathbf{0}} & \lambda_{1,21} & \lambda_{1,22} & \lambda_{1,23} & \lambda_{1,24} & 0 \\ \underset{1\times2}{\mathbf{0}} & \boldsymbol{\lambda}_{1,31} & \boldsymbol{\lambda}_{1,32} & \boldsymbol{\lambda}_{1,33} & \boldsymbol{\lambda}_{1,34} & 0 \\ \underset{1\times2}{\mathbf{0}} & \boldsymbol{\lambda}_{1,41} & \boldsymbol{\lambda}_{1,42} & \boldsymbol{\lambda}_{1,43} & \boldsymbol{\lambda}_{1,44} & 0 \\ \underset{1\times2}{\mathbf{0}} & 0 & 0 & 0 & 0 & 0 \end{bmatrix}.$$

This implies that market prices of risk are allowed to vary with the levels of all shocks, and that term premia will depend on the variances of the shocks.

Under this structure, bond prices will be exponential affine functions of the $\mathbf{Z}_t$ vector

$$p_t^n = \exp\left(\bar{A}_n + \bar{\mathbf{B}}_n'\mathbf{Z}_t\right)$$

where the coefficients $\bar{A}_n$ and $\bar{\mathbf{B}}_n'$ are defined recursively as

$$\begin{aligned} \bar{A}_{n+1} &= \bar{A}_n - \bar{\mathbf{B}}_n'\boldsymbol{\Sigma}\boldsymbol{\lambda}_0 + \frac{1}{2}\bar{\mathbf{B}}_n'\boldsymbol{\Sigma}\boldsymbol{\Sigma}'\bar{\mathbf{B}}_n, \\ \bar{\mathbf{B}}_{n+1}' &= \bar{\mathbf{B}}_n'\left(\mathbf{M} - \boldsymbol{\Sigma}\boldsymbol{\lambda}_1\right) - \boldsymbol{\Psi}', \end{aligned}$$

where $\boldsymbol{\Sigma}$ is the covariance matrix of the state variables, and where the recursion starts from $\bar{A}_1 = 0$ and $\bar{\mathbf{B}}_1 = -\boldsymbol{\Psi}$. The yield on an n-period zero-coupon bond is thus given by

$$\begin{aligned} y_t^n &= -\frac{\ln\left(p_t^n\right)}{n} \\ &= -\frac{\bar{A}_n}{n} - \frac{\bar{\mathbf{B}}_n'}{n}\mathbf{Z}_t \\ &\equiv A_n + \mathbf{B}_n'\mathbf{Z}_t. \end{aligned}$$

A1.1 Kalman Filter Estimation

To implement ML estimation of the model, we first define a vector $\mathbf{W}_t$ containing the observable contemporaneous variables,

$$\mathbf{W}_t \equiv \begin{bmatrix} \mathbf{Y}_t \\ \mathbf{X}_t \end{bmatrix},$$

where $\mathbf{Y}_t = [y_t^1, ..., y_t^{120}]'$ is a vector of zero-coupon yields and where $\mathbf{X}_t = [x_t, \pi_t]'$ contains the macro variables. The dimension of $\mathbf{W}_t$ is denoted n_y.

Recalling the model solution,

$$\begin{aligned}
\mathbf{Z}_{t+1} &= \mathbf{M}\mathbf{Z}_t + \mathbf{v}_{t+1} \\
\mathbf{X}_{t+1} &= \mathbf{C}'\mathbf{Z}_{t+1} \\
r_t &= \mathbf{\Psi}'\mathbf{Z}_t
\end{aligned}$$

where $\mathbf{v}_{t+1} = \Sigma\boldsymbol{\xi}_{t+1}$, and the bond pricing equation (in vector form)

$$\mathbf{Y}_t = \mathbf{A} + \mathbf{B}\mathbf{Z}_t,$$

we can proceed to define the observation equation as

$$\begin{aligned}
\mathbf{W}_t &= \begin{bmatrix} \mathbf{A} \\ \mathbf{0} \end{bmatrix} + \begin{bmatrix} \mathbf{B} \\ \mathbf{C}' \end{bmatrix} \mathbf{Z}_t \\
&\equiv \mathbf{K} + \mathbf{H}'\mathbf{Z}_t,
\end{aligned}$$

and the state equation as

$$\mathbf{Z}_t = \mathbf{M}\mathbf{Z}_{t-1} + \mathbf{v}_t.$$

Next, the unobservable variables are estimated using the Kalman filter. In doing so, we first introduce a vector $\mathbf{w}_t$ of measurement errors corresponding to the observable variables $\mathbf{W}_t$. Letting $\mathbf{R}$ denote the variance-covariance matrix of the measurement errors and $\mathbf{Q}$ the variances of the unobservable state variables $\mathbf{X}^u_{1,t}$, we have

$$\begin{aligned}
\mathbf{W}_t &= \mathbf{K} + \mathbf{H}'\mathbf{Z}_t + \mathbf{w}_t, \qquad \mathrm{E}\left[\mathbf{w}_t\mathbf{w}_t'\right] = \mathbf{R} \\
\mathbf{Z}_t &= \mathbf{M}\mathbf{Z}_{t-1} + \mathbf{v}_t, \qquad \mathrm{E}\left[\mathbf{v}_t\mathbf{v}_t'\right] = \mathbf{Q}.
\end{aligned}$$

While we assume that all observable variables are subject to measurement error, we limit the number of parameters to estimate by assuming that all yield measurement errors have identical variance, and that all errors are mutually uncorrelated:

$$\mathbf{R} = \begin{bmatrix}
\sigma^2_{m,y} & 0 & 0 & 0 & 0 & 0 \\
0 & \ddots & 0 & 0 & 0 & 0 \\
0 & 0 & \sigma^2_{m,y} & 0 & 0 & 0 \\
0 & 0 & 0 & \sigma^2_{m,x} & 0 & 0 \\
0 & 0 & 0 & 0 & \sigma^2_{m,\pi} & 0 \\
0 & 0 & 0 & 0 & 0 & \ddots
\end{bmatrix}.$$

Note also that (for the non-lagged factors; zero elsewhere)

$$\mathbf{Q} = \begin{bmatrix} \sigma^2_{\pi^*} & 0 & 0 & 0 \\ 0 & \sigma^2_\eta & 0 & 0 \\ 0 & 0 & \sigma^2_\pi & 0 \\ 0 & 0 & 0 & \sigma^2_x \end{bmatrix}.$$

We start the filter from the unconditional mean

$$\mathbf{Z}_{1,1|0} = \underset{n\times 1}{\mathbf{0}},$$

and the unconditional MSE matrix, whose vectorised elements are

$$\text{vec}\left(\mathbf{P}_{1|0}\right) = \left(\mathbf{I}_{n_u^2} - \mathbf{M}\otimes\mathbf{M}\right)^{-1}\cdot \text{vec}\left(\mathbf{Q}\right),$$

(see Hamilton, 1994). The Kalman filter produces forecasts of the states and the associated MSE according to

$$\begin{aligned} \hat{\mathbf{Z}}_{t+1|t} &= \mathbf{M}\hat{\mathbf{Z}}_{t|t-1} + \mathbf{M}\mathbf{P}_{t|t-1}\mathbf{H}\left(\mathbf{H}'\mathbf{P}_{t|t-1}\mathbf{H}+\mathbf{R}\right)^{-1}\left(\mathbf{W}_t - \mathbf{H}'\hat{\mathbf{Z}}_{t|t-1}\right) \\ \mathbf{P}_{t+1|t} &= \mathbf{M}\mathbf{P}_{t|t-1}\mathbf{M}' - \mathbf{M}\mathbf{P}_{t|t-1}\mathbf{H}\left(\mathbf{H}'\mathbf{P}_{t|t-1}\mathbf{H}+\mathbf{R}\right)^{-1}\mathbf{H}'\mathbf{P}_{t|t-1}\mathbf{M}' + \mathbf{Q}. \end{aligned}$$

Given this, the likelihood can be expressed as

$$\begin{aligned} \sum_{t=1}^{T}\log f\left(\mathbf{W}_t \mid \mathbf{W}_{t-1},\boldsymbol{\theta}_0\right) &= -\frac{Tn_y}{2}\ln\left(2\pi\right) - \frac{1}{2}\sum_{t=1}^{T}\ln\left|\boldsymbol{\Sigma}_t\left[\boldsymbol{\theta}_0\right]\right| \\ &\quad -\frac{1}{2}\sum_{t=1}^{T}\left(\mathbf{W}_t - \boldsymbol{\mu}_t\left[\boldsymbol{\theta}_0\right]\right)'\left(\boldsymbol{\Sigma}_t\left[\boldsymbol{\theta}_0\right]\right)^{-1}\left(\mathbf{W}_t - \boldsymbol{\mu}_t\left[\boldsymbol{\theta}_0\right]\right) \end{aligned}$$

where n_y is the number of observable variables and

$$\begin{aligned} \boldsymbol{\Sigma}_t\left[\boldsymbol{\theta}_0\right] &\equiv \mathbf{H}\left[\boldsymbol{\theta}_0\right]'\mathbf{P}_{t|t-1}\left[\boldsymbol{\theta}_0\right]\mathbf{H}\left[\boldsymbol{\theta}_0\right] + \mathbf{R}\left[\boldsymbol{\theta}_0\right], \\ \boldsymbol{\mu}_t\left[\boldsymbol{\theta}_0\right] &\equiv \mathbf{K}\left[\boldsymbol{\theta}_0\right] + \mathbf{H}\left[\boldsymbol{\theta}_0\right]'\hat{\mathbf{Z}}_{t|t-1}\left[\boldsymbol{\theta}_0\right]. \end{aligned}$$

After maximizing the log-likelihood function to obtain our model parameter values, we calculate the variance-covariance matrix using a numerically estimated Hessian matrix.

A2 Data and Summary Statistics

Table A.1. Summary Statistics

The table shows the summary statistics of the data employed in the paper for the baseline estimation reported in Section 4 of the main text. Panels A) and B) contain descriptive statistics of bond yields and macroeconomic announcement shocks computed on the announcement dates over the sample period January 1993 - December 2000. Panels C) and D) contain descriptive statistics relative to the monthly data series used to estimate the affine model discussed in Section 2. The figures reported in Panels C) and D) are computed over the sample period August 1987 and January 2006. The average duration in Panel A) is computed as the time-series average of the McCauley duration for each of on-the-run benchmark bonds across the announcement dates. Duration is expressed in months. Average and St. dev of yield chg denote the time-series average and standard deviation of yield-to-maturity changes computed over the 20 minutes following the time of each announcement. Yield changes are expressed in terms of basis points. Average, Std dev, Min and Max in Panel B) denote the time-series average, standard deviation, minimum and maximum values of the non standardized macroeconomic announcement shocks recorded on the announcement dates. The units of the shocks are reported in the first column of Panel B). Average and Std dev of bond yields of bond yields in Panel C) denote the time-series average, standard deviation and first-order serial correlation coefficient of the zero-coupon yields used in the estimation of the macro term structure model. Average, Std dev, Min, Max and AR(1) in Panel D) denote the time-series average, standard deviation, minimum, maximum and first-order serial correlation coefficient of the two macroeconomic fundamental factors, respectively constructed as discussed in Section 4.1.

Panel A) Bond yields (announcement dates)

	Average duration (months)	Average yield chg. (bps)	St.dev. of yield chg. (bps)
3 months	3.00	−0.007	2.082
6 months	6.00	−0.029	2.459
12 months	11.95	−0.148	5.170
24 months	22.16	−0.024	4.475
60 months	52.79	−0.088	4.591
120 months	91.37	−0.186	4.101

Panel B) Macroeconomic announcement shocks (announcement dates)

	Average	Std. Dev	Min.	Max.
1. NAPM index	−0.251	1.834	−4.80	3.80
2. Unemployment rate (%)	−0.042	1.298	−0.40	0.30
3. Nonfarm payrolls (1000 jobs)	−3.646	120.397	−284.00	408.00
4. Industrial production (%)	0.070	0.243	−0.50	0.90
5. Producer price index (%)	−0.058	0.262	−0.80	0.60
6. Retail sales (%)	−0.055	0.402	−1.10	1.20
7. Consumer price index (%)	−0.024	0.111	−0.30	0.30
8. Housing starts (million)	0.009	0.068	−0.16	0.15
9. New orders durables (%)	0.112	2.589	−6.40	10.00
10. New home sales (1000 homes)	12.591	57.688	−139.00	126.00
11. Consumer confidence	0.891	4.431	−10.50	13.30

Panel C) Zero-coupon bond yields

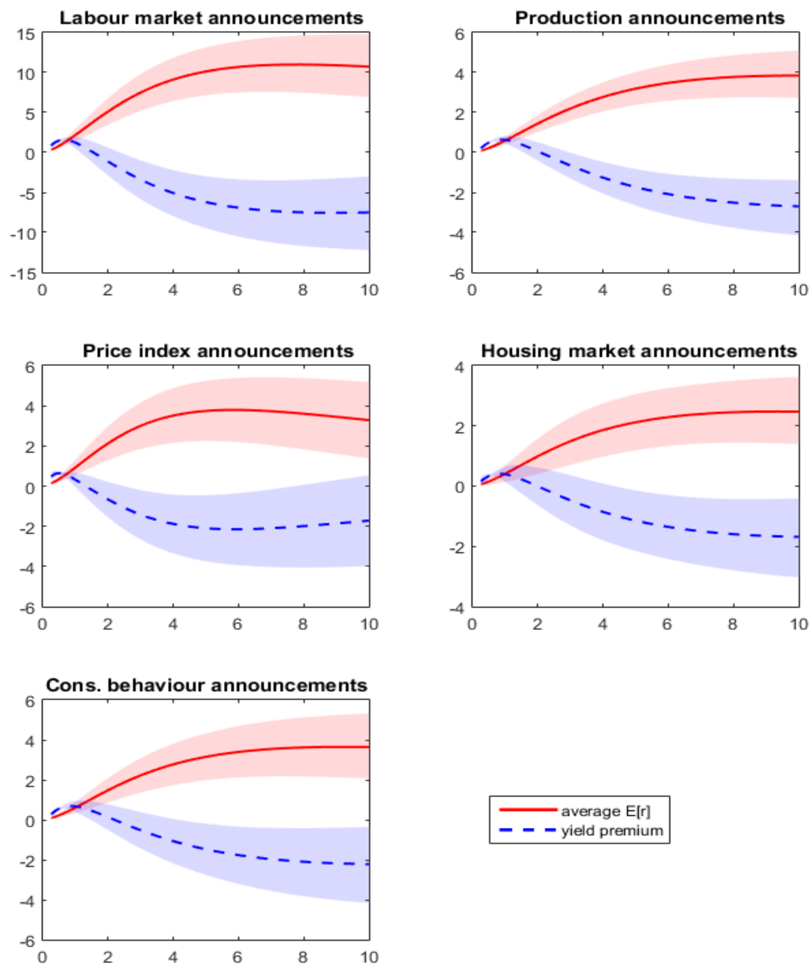
Maturity	Average yield (% p.a.)	St.dev. of yield (% p.a.)
1 month	4.52	2.07
3 months	4.46	1.97
6 months	4.63	1.99
1 year	4.93	2.06
2 years	5.26	1.95
3 years	5.52	1.85
5 years	5.85	1.69
7 years	6.13	1.60
10 years	6.33	1.49

Panel D) Macroeconomic risk factors

	Average	Std. Dev	Min.	Max.	AR(1)
Inflation (m-o-m CPI log-changes in %)	0.25	0.21	−0.50	1.37	0.29
Output gap (log-changes in %)	−0.82	1.58	−4.04	3.18	0.98

A3 Decomposition of Yield Responses

Figure A.1: Estimated responses of expectations component and term premium



The solid curves show the model-implied responses of the term structure of average expected short rates (up to the horizon indicated on the horizontal axis) to macroeconomic announcement surprises (one standard deviation). The dashed curves represent the implied responses of the corresponding term (yield) premium. The vertical axis shows responses in basis points; the horizontal axis shows the maturity in years. Shaded areas represent 95 percent MC confidence bands based on 100,000 parameter draws,

A4 Results with Daily Yield Data

Table A.2. Impact of Announcement Surprises on Treasury Yields

The table reports the estimates of the reaction of bond yields at different maturities to standardized macroeconomic announcement shocks. $\phi_j^{(n)}$ denote the slope parameter estimates where n denotes the maturity of the on-the-run benchmark used in the estimation. Yield responses are measured as daily changes. The estimates are carried out over the sample period January 1990 - September 2008. Figures in parenthesis are asymptotic standard errors. See also notes to Table 1.

	$n =$					
$\phi_j^{(n)}$	3 months	6 months	12 months	24 months	60 months	120 months
1. Labour market	1.837	2.772	3.321	3.738	3.394	2.655
	(0.352)	(0.362)	(0.396)	(0.471)	(0.514)	(0.498)
2. Production	0.758	1.159	1.640	2.033	2.097	1.819
	(0.239)	(0.222)	(0.266)	(0.310)	(0.322)	(0.293)
3. Prices	0.511	0.474	0.599	0.643	0.709	0.613
	(0.247)	(0.242)	(0.279)	(0.325)	(0.347)	(0.323)
4. Housing market	0.235	0.371	0.484	0.614	0.687	0.586
	(0.188)	(0.200)	(0.242)	(0.285)	(0.299)	(0.278)
5. Consumer behavior	0.755	1.124	1.727	2.097	2.199	1.949
	(0.173)	(0.211)	(0.248)	(0.283)	(0.324)	(0.319)

Table A.3. Factor Sensitivities to Macroeconomic Announcement Surprises

The table reports the estimates of the sensitivity parameters α_j of bond yields reactions to announcement shocks with respect to the three relevant macroeconomic risk factors (inflation target, inflation and output gap). These slope parameter estimates correspond to the median of the distribution of the parameter obtained by simulation using observations drawn from the distributions of both the estimated model-free yield responses Φ_j (based on daily data) and the factor loadings $\tilde{B}$ (see Section 3.3). The figures reported in the table are based on 100,000 draws. Figures in parenthesis are standard errors from the simulated distribution of $\hat{\alpha}_j$ based on draws using the asymptotic distribution of Φ_j and $\tilde{B}$. See also notes to Table 3.

Announcement group	Macroeconomic risk factors		
	inflation target	inflation	output gap
1. Labor market	0.042	0.558	0.233
	(0.061)	(0.150)	(0.187)
2. Production	0.033	0.173	0.163
	(0.039)	(0.097)	(0.122)
3. Prices	0.031	0.146	−0.019
	(0.042)	(0.103)	(0.129)
4. Housing market	0.015	0.057	0.040
	(0.035)	(0.084)	(0.108)
5. Consumer behavior	0.035	0.159	0.178
	(0.038)	(0.085)	(0.113)

A5 Alternative Proxy For the Output Gap

The baseline results reported in the paper are based on a measure of output gap that uses the CBO estimate of potential output; a quantity that cannot be observed in real time and is subject to large revisions over time. In order to assess the robustness of our results against our reliance on the CBO measure, we have carried out the analysis as described in Section 3 using an alternative proxy for the output gap. This alternative gap measure is computed as the deviation of real log-GDP from a linear-quadratic trend. The trend is estimated in real time, so that the trend parameter estimates are updated at each point in time. The results, reported in Table A.4 below, confirm that our baseline findings are robust against this issue.

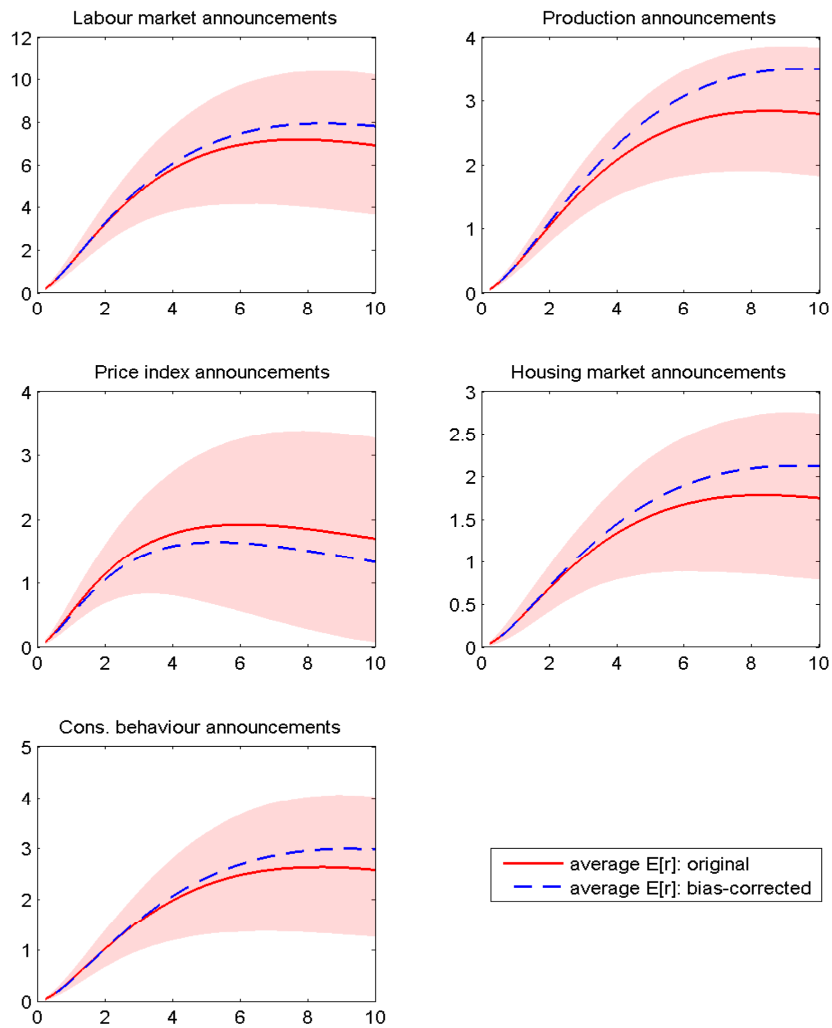
Table A.4. Factor Sensitivities to Macroeconomic Announcement Surprises

The table reports the estimates of the sensitivity parameters α_j of bond yields reactions to announcement shocks with respect to the three relevant macroeconomic risk factors (inflation target, inflation and output gap). These slope parameter estimates correspond to the median of the distribution of the parameter obtained by simulation using observations drawn from the distributions of both the estimated model-free yield responses Φ_j and the factor loadings $\tilde{B}$ (based on a model estimated with an output gap measured as log-GDP deviations from a linear-quadratic trend). The figures reported in the table are based on 100,000 draws. Figures in parenthesis are standard errors from the simulated distribution of $\hat{\alpha}_j$ based on draws using the asymptotic distribution of Φ_j and $\tilde{B}$. See also notes to Table 4.

Announcement group	Macroeconomic risk factors		
	inflation target	inflation	output gap
1. Labor market	0.090	0.382	0.353
	(0.065)	(0.117)	(0.229)
2. Production	0.018	0.072	0.212
	(0.019)	(0.030)	(0.064)
3. Prices	0.082	0.212	−0.0118
	(0.033)	(0.060)	(0.115)
4. Housing market	0.016	0.056	0.123
	(0.020)	(0.044)	(0.076)
5. Consumer behavior	0.041	0.090	0.173
	(0.026)	(0.042)	(0.091)

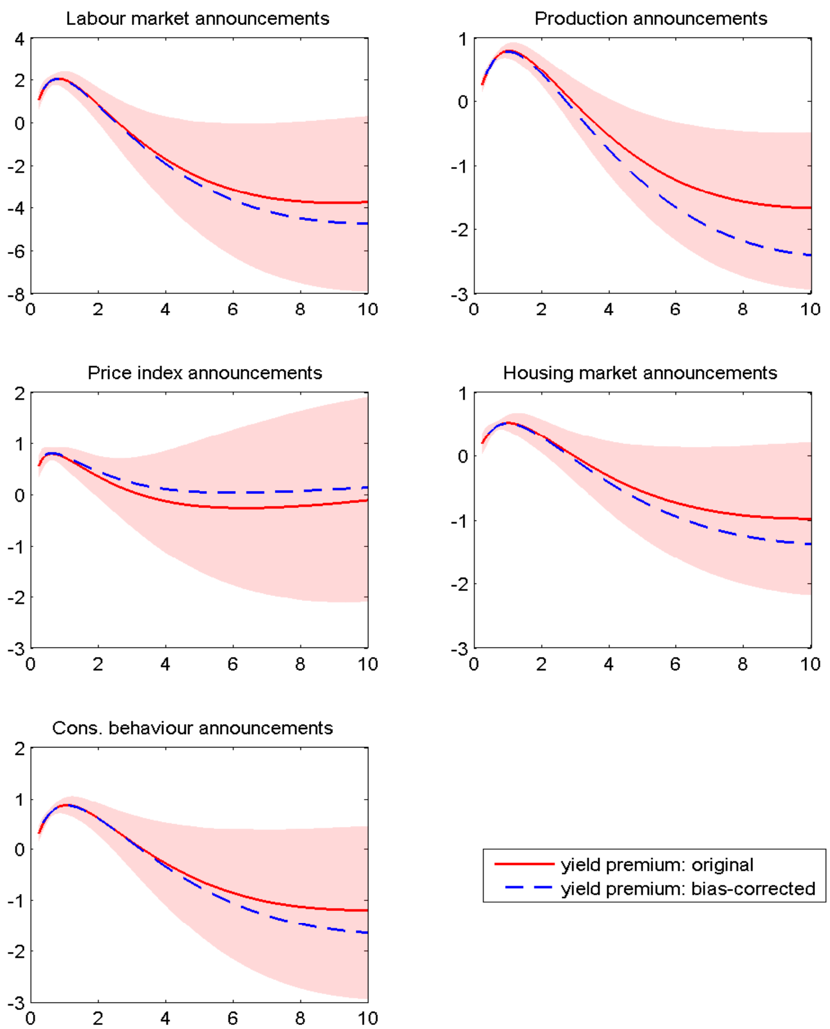
A6 Bias-corrected Responses

Figure A.2: Original baseline and bias-corrected estimates



The curves show the baseline estimates of model-implied average expected short-term interest rate responses (solid curves) to macroeconomic announcement surprises (one standard deviation) and 95 percent MC confidence bands based on 100,000 parameter draws. Dashed curves are median bias-corrected estimates based on ML estimation of the macro-finance model on 5,000 simulated samples and subsequent reestimation of the factor sensitivity parameters. The vertical axis shows responses in basis points; the horizontal axis shows the maturity in years.

Figure A.3: Original baseline and bias-corrected estimates



The curves show the baseline estimates of model-implied term premium responses (solid curves) to macroeconomic announcement surprises (one standard deviation) and 95 percent MC confidence bands based on 100,000 parameter draws. Dashed curves are median bias-corrected estimates based on ML estimation of the macro-finance model on 5,000 simulated samples and subsequent reestimation of the factor sensitivity parameters. The vertical axis shows responses in basis points; the horizontal axis shows the maturity in years.

A7 Grouped vs. Individual Announcement Effects

The baseline results reported in the paper are based on a grouping of individual announcement types into five groups, in order to reduce the noise in the announcement response data. To check whether instead allowing for individual announcement type responses would have any material impact on our results, we conduct the following excercise. In a first step, we run the group estimations as in the case of the baseline results reported in Table 3. In a second step, we then control for these responses within each group (i.e. the group alphas), and estimate the additional marginal individual responses in order to gauge whether they are statistically significantly different from zero. We do so by using the same type of simulation estimation approach as we do for the baseline set-up. The results, reported below in Table A.5, in the form of 95% Monte Carlo confidence bands for each of the estimated alpha parameters, show that in all cases the marginal individual responses do not significantly deviate from the corresponding group responses.

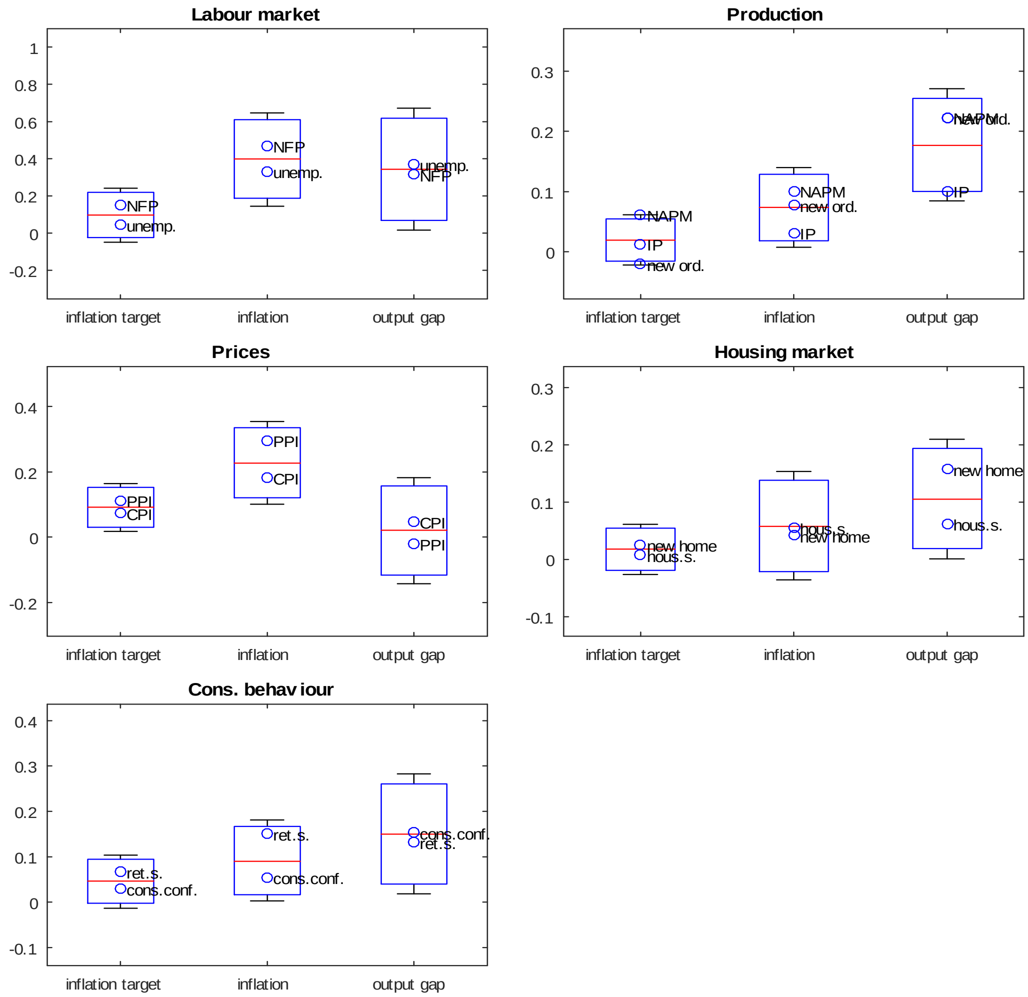
Figure A.4 provides an alternative check on whether individual announcement responses differ materially from grouped responses. It shows point estimates of individual responses (alphas) within each group, against a type of box and whisker plot of the baseline group response estimates. Specifically, in each panel of Figure A.4, the box and whiskers represent the estimated group alphas and their confidence limits, where the horizontal lines inside the boxes are the median alphas from our simulations, the upper and lower limits of each box show the 5% and 95% confidence limits, and the end of the whiskers are the 2.5% and 97.5% limits. The individual point estimates of each announcement are illustrated by the small blue circles. In all cases, the individual alpha estimates are close to their respective group alpha estimates, and the former lie within the 95% confidence interval of the latter (the alpha estimates for NAPM and New Orders within the Production group inflation target responses are close to the group 95% limits, but this group alpha is in any case statistically insignificant from zero).

Table A.5. Marginal Factor Sensitivities to Individual Announcement Surprises

The table reports the estimates of the marginal sensitivity parameters α_k of bond yields reactions to individual announcement shocks with respect to the three relevant macroeconomic risk factors (inflation target, inflation and output gap), in excess of the estimated group sensitivity parameters. The table reports the median, 2.5, and 97.5 percentiles of the distribution of the parameter estimates, obtained by simulation using observations drawn from the distributions of both the estimated model-free yield responses, estimated analogously to the baseline group parameters. The figures reported in the table are based on 100,000 draws, based on draws from the asymptotic distribution of Φ_k.

Announcement	Macroeconomic risk factors								
	inflation target			inflation			output gap		
	2.5%	median	97.5%	2.5%	median	97.5%	2.5%	median	97.5%
NAPM index	−0.045	0.042	0.129	−0.097	0.026	0.153	−0.142	0.047	0.236
Unemployment	−0.301	−0.050	0.199	−0.505	−0.068	0.368	−0.546	0.024	0.593
Nonfarm pay.	−0.188	0.055	0.300	−0.365	0.067	0.497	−0.583	−0.026	0.527
Ind.Prod.	−0.080	−0.005	0.068	−0.159	−0.040	0.078	−0.241	−0.076	0.089
PPI	−0.103	0.021	0.147	−0.156	0.071	0.299	−0.321	−0.041	0.238
Ret. sales	−0.099	0.021	0.143	−0.144	0.060	0.264	−0.294	−0.016	0.259
CPI	−0.141	−0.018	0.105	−0.260	−0.044	0.169	−0.251	0.028	0.305
Housing starts	−0.096	−0.010	0.075	−0.241	−0.004	0.233	−0.263	−0.041	0.178
New orders	−0.126	−0.040	0.045	−0.150	0.005	0.162	−0.151	0.045	0.241
New home sale	−0.064	0.007	0.079	−0.141	−0.016	0.107	−0.113	0.052	0.217
Cons. conf.	−0.093	−0.017	0.060	−0.154	−0.036	0.080	−0.166	0.003	0.173

Figure A.4: Individual Factor Sensitivities vs Group Sensitivities



The figure shows estimates of the sensitivity parameters (alphas) of bond yields reactions to individual as well as grouped announcement shocks, with respect to the three relevant macroeconomic risk factors (inflation target, inflation and output gap). The box and whiskers represent the estimated group alphas and their confidence limits, where the horizontal lines inside the boxes are the median alphas from the simulations, the upper and lower limits of each box show the 5 percent and 95 percent confidence limits, and the end of the whiskers are the 2.5 percent and 97.5 percent limits. The individual point estimates of each announcement are illustrated by the small blue circles. Based on 100,000 parameter draws.