Measuring the Effects of Expectations Shocks

Ana Beatriz Galvão; Michael P. Clements

University of Warwick; University of Reading

May 2019

Real-Time Data and Structural Analysis

- Literature surveyed by Croushore (2011).
- The use of macroeconomic data actually available for the policy maker in real-time affects the measurement of the monetary policy stance (Orphanides, 2001) and the output gap (Orphanides and Van Norden, 2002; Garratt et al, 2008; Clements and Galvao, 2013).

Sentiment Shocks

- Confidence–sentiment shocks have a short term positive effect on economic activity (Barsky and Sims, 2012; Feve and Guay, 2018; Leduc and Sill, 2013; Levchenko and Pandalai-Nayar, 2017).

Sentiment Shocks

- Confidence–sentiment shocks have a short term positive effect on economic activity (Barsky and Sims, 2012; Feve and Guay, 2018; Leduc and Sill, 2013; Levchenko and Pandalai-Nayar, 2017).
- Depending on the Structural VAR approach, these shocks may explain either a small fraction of short-term variation (Feve and Guay, 2018) or a large one (Levchenko and Pandalai-Nayar, 2017).

Expectations Shocks

- We measure expectations shocks as the innovations to forecast revisions that cannot be explained by the updating of the information set of the forecaster (as in Leduc and Sill, 2013).

Expectations Shocks

- We measure expectations shocks as the innovations to forecast revisions that cannot be explained by the updating of the information set of the forecaster (as in Leduc and Sill, 2013).
- We only use information (data) actually available in real time.

Expectations Shocks

- We measure expectations shocks as the innovations to forecast revisions that cannot be explained by the updating of the information set of the forecaster (as in Leduc and Sill, 2013).
- We only use information (data) actually available in real time.
- We show that expectations shocks are mildly correlated with consumer confidence (Barsky and Sims, 2012) and technological news shocks (Beaudry and Portier, 2006), and that:

Expectations Shocks

- We measure expectations shocks as the innovations to forecast revisions that cannot be explained by the updating of the information set of the forecaster (as in Leduc and Sill, 2013).
- We only use information (data) actually available in real time.
- We show that expectations shocks are mildly correlated with consumer confidence (Barsky and Sims, 2012) and technological news shocks (Beaudry and Portier, 2006), and that:
- They have substantial positive short-run effects on investment and hours, even as confidence and news effects are purged, that is, they capture *business sentiment*.

Measurement the Effects of Expectations Shocks

Two-Step Approach:

1. Measure expectations shocks using professional forecasters' predictions of economic activity (GDP) in a real-time mixed-frequency VAR model and an identification strategy that relies on the data release calendar and the timing of the survey.

Measurement the Effects of Expectations Shocks

Two-Step Approach:

1. Measure expectations shocks using professional forecasters' predictions of economic activity (GDP) in a real-time mixed-frequency VAR model and an identification strategy that relies on the data release calendar and the timing of the survey.
2. Measure the transmission of the shocks to a set of key macroeconomic aggregates using the latest data currently available – a macroeconomist VAR.

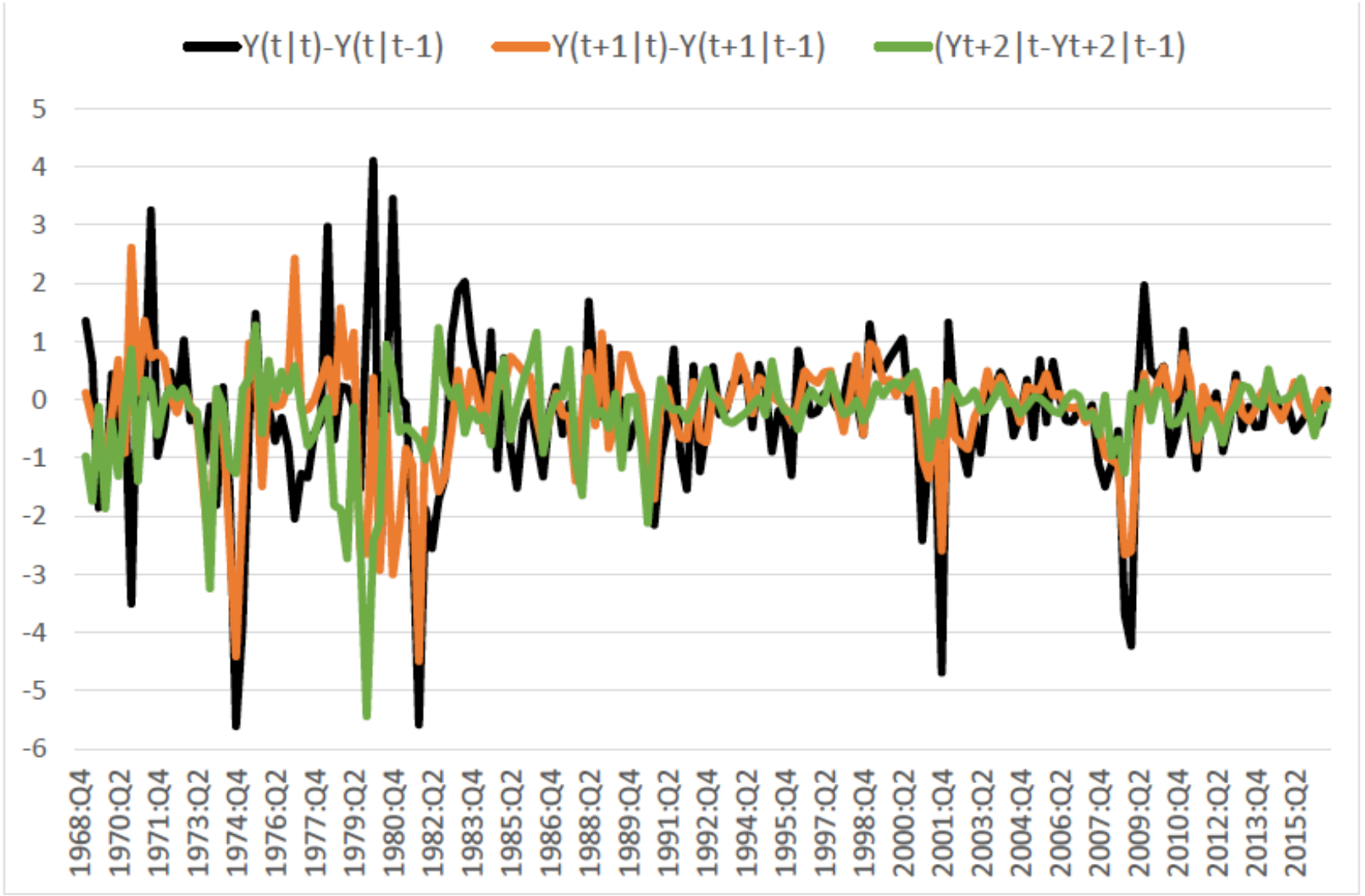
Expectations Updates/Revisions I

- We measure expectation shocks as the innovations to forecast revisions that cannot be explained by the updating of the information set of the forecaster.
- SPF forecasts are made around the middle of the middle month of the quarter. At quarter t, the value of the target variable Y_t is not available. In response to a survey at t, there is a nowcast $Y_{t|t}$ and forecasts for next three quarters $Y_{t+1|t}$, $Y_{t+2|t}$, $Y_{t+3|t}$. Forecasts revisions are:

$$Y_{t+n|t} - Y_{t+n|t-1},$$

  where $Y_{t+n|t}$ is the cross-sectional median of respondents' forecasts at time t of Y at $t+n$.
- We use the SPF forecasts for real GDP to compute forecasts for annualised quarterly GDP growth to avoid problems with real GDP rebasing (changes in deflator base year).

Characteristics of Expectations Updates I



Characteristics of Expectations Updates II

	$Y_{t\|t} - Y_{t\|t-1}$	$Y_{t+1\|t} - Y_{t+1\|t-1}$	$Y_{t+2\|t} - Y_{t+2\|t-1}$
Mean	-0.318	-0.210	-0.260
Median	-0.259	-0.066	-0.110
Std Dev	1.292	0.961	0.771
Corr with $Y_{t\|t} - Y_{t\|t-1}$	1		
Corr with $Y_{t+1\|t} - Y_{t+1\|t-1}$	0.479	1	
Corr with $Y_{t+2\|t} - Y_{t+2\|t-1}$	0.076	0.396	1

Nowcast revisions $Y_{t|t} - Y_{t|t-1}$ are more likely and might be more related to trend GDP (affect GDP in levels in all horizons).

The Real-Time VAR model I

- A forecast update at time t may be due to:
  1. new information that has arrived between $t-1$ and t
  2. sluggish adjustment to previous news due to inattentiveness or sticky information (see, e.g., Sims (2003), Mankiw and Reis (2002)), or
  3. changes in confidence (Barksy and Sims, 2012) and news about fundamentals (Beaudry and Portier, 2006).
- We aim to remove the effects of the first two possibilities by filtering forecast updates using a vector autoregressive model.

The Real-Time VAR model II

- At t, as forecasts are surveyed, the current GDP growth as in the current vintage, $Y_{t|16Q4}$, is not available due to a 30-day publication delay and data revisions.
- Forecasters are able to observe $Y_{t-1|t}$ and $Y_{t-2|t}$, that is, the first release of the last quarter and the second release of the earlier quarter.
- In the real-time VAR we use time series of $Y_{t|t+1}$ (first) and $Y_{t|t+2}$ (second) releases instead of $Y_{t|16Q4}$ (data at the latest vintage).
- The real-time VAR is in growth rates to avoid rebasing issues.

The Real-Time VAR model III

- At t, as forecasters are surveyed mid-quarter, monthly indicators on the current quarter are observed and their information employed to obtain $Y_{t|t}$. We use a mixed-frequency VAR, as in Ghysels (2016), to be able to capture their information.
- Monthly series may be also subject to revisions and publication delays as industrial production (IP) and employment (NP), which are included as $X_{t,m|m+1} = 100(\log(Z_{t,m|m+1}) - \log(Z_{t,m-1|m+1}))$. We use first releases for $IP_{t,m|m+1}$ and $NP_{t,m|m+1}$. In addition to IP and NP, we also consider stock returns (SP500), the short-rate and CPI inflation.
- The identification of expectations shocks relies on the calendar of data releases. Monthly series are ordered as:

$$\mathbf{x}_{t,m} = [SP_{t,m}, R_{t,m}, IP_{t,m|m+1}, NP_{t,m|m+1}, \pi_t]'$$

The Real-Time VAR model IV

- And the 19-variable VAR is set as:

$$\mathbf{y}_t = [\mathbf{x}'_{t,1|2}, Y_{t|t}, Y_{t+1|t}, \mathbf{x}'_{t,2|3}\mathbf{x}'_{t,3|4}, Y_{t|t+1}, Y_{t-1|t+1}]'.$$

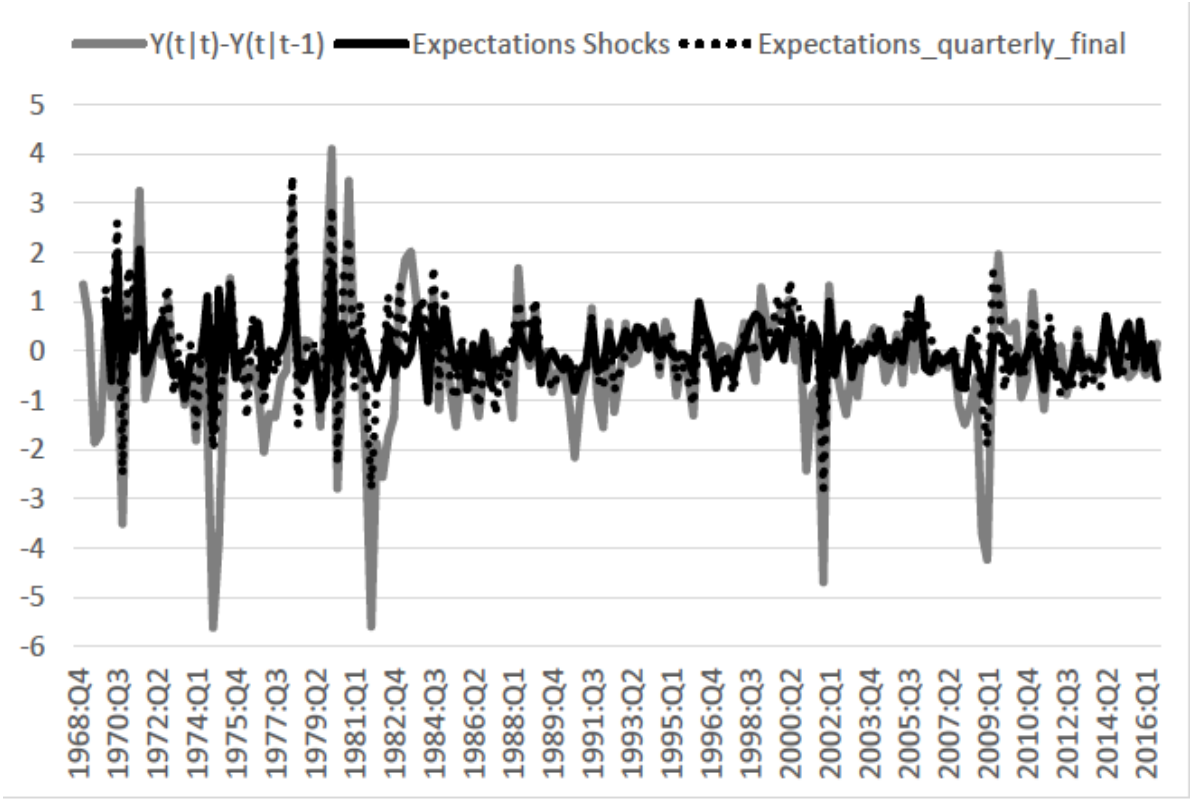
- The expectations shock is the sixth shock via recursive identification:

$$u^{\exp}_{t|t} = Y_{t|t} - E[Y_{t|t}|Y_{t+1|t-1}, \mathbf{x}'_{t,1|2}, \mathbf{x}'_{t-1,2|3}, \mathbf{x}'_{t-1,3|4}, Y_{t-1|t}, Y_{t-2|t}, ...]$$

The Real-Time VAR model V

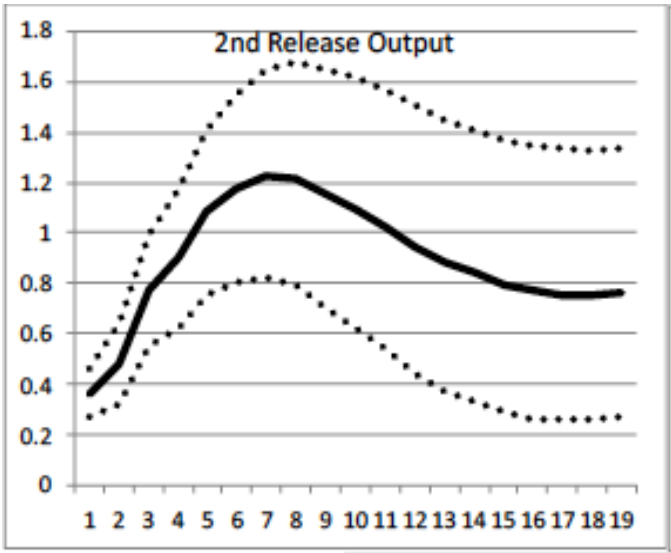
- Bayesian estimation as in Giannone, Lenza and Primiceri (2015); $p = 5$ with only the overall prior tightness for a Minnesota prior. Estimation period: 1968Q4-2016Q3.
- The version of the model with latest available data ("final") uses $Y_{t|16Q4}$ instead of $Y_{t|t+1}$ and $Y_{t-1|t+1}$ and the current available vintages for IP and NP.
- We also consider the case of a quarterly VAR with latest available data as only past values of the indicators in $\mathbf{x}_t$ affect expectation shocks.

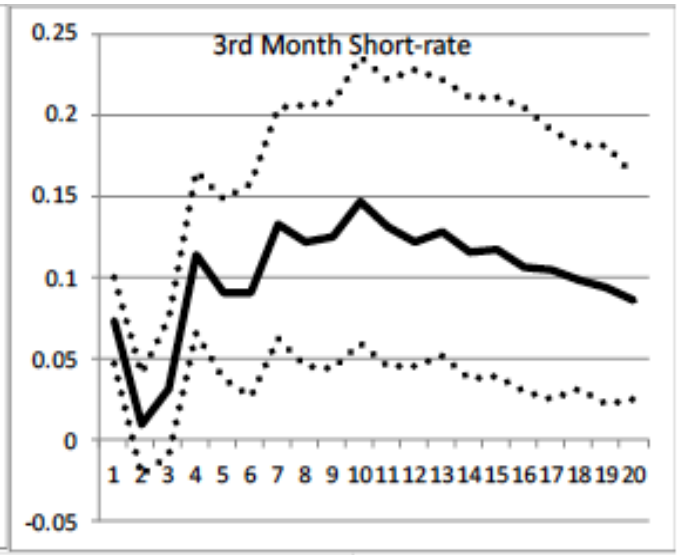
The Expectations Shocks (at posterior mean) I

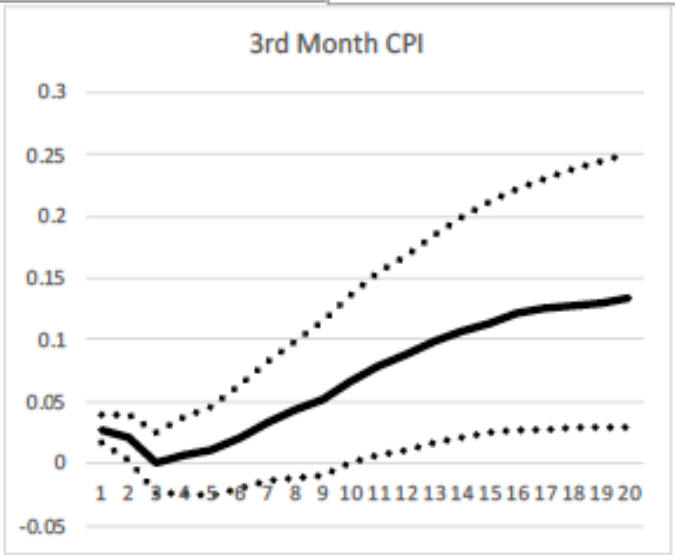


ES nowcasting shocks have a 53% correlation with expectations updates, but if only quarterly and latest vintage is employed the correlation is 76%. The ES correlation with mixed-frequency "final" ES is 84%.

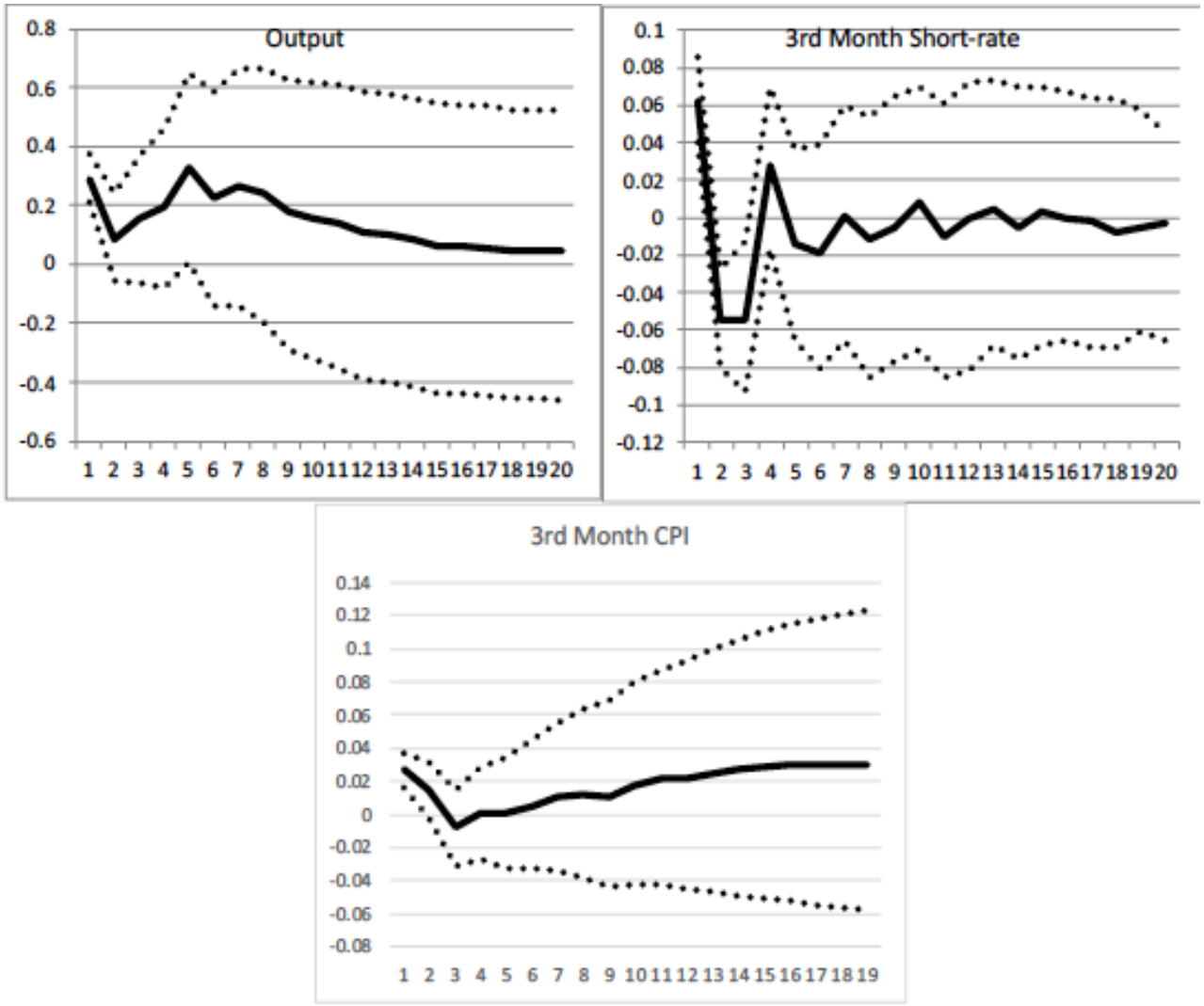
Real-time Mixed-Frequency VAR Responses to ES I







Mixed-Frequency VAR Responses to ES I



Macroeconomist VAR I

- The Macroeconomist' VAR includes a set of macroeconomic variables usually included to evaluate the impact of structural shocks (and as Forni et al, 2019). The values are in log-levels (Ramey, 2016) to capture long-run common components.
- The VAR include the following variables: $\mathbf{y}_t = [TFP_t, Inv_t, Cons_t, GDP_t, H_t, CPI_t, R_t]'$ (and TFP is the utilization-adjusted measure published by Fernald (2014).
- To measure the dynamic effects of expectation shocks, we employ a recursive identification with the expectations shocks as the first variable $\mathbf{z}_t = [u^{\exp}_{t|t}, \mathbf{y}'_t]$ since all variables in $\mathbf{y}_t$ are only observed after the shock. We also consider $\mathbf{z}_t = [u^{final}_{t|t}, \mathbf{y}'_t]$ to evaluate the impact of using real-time data.

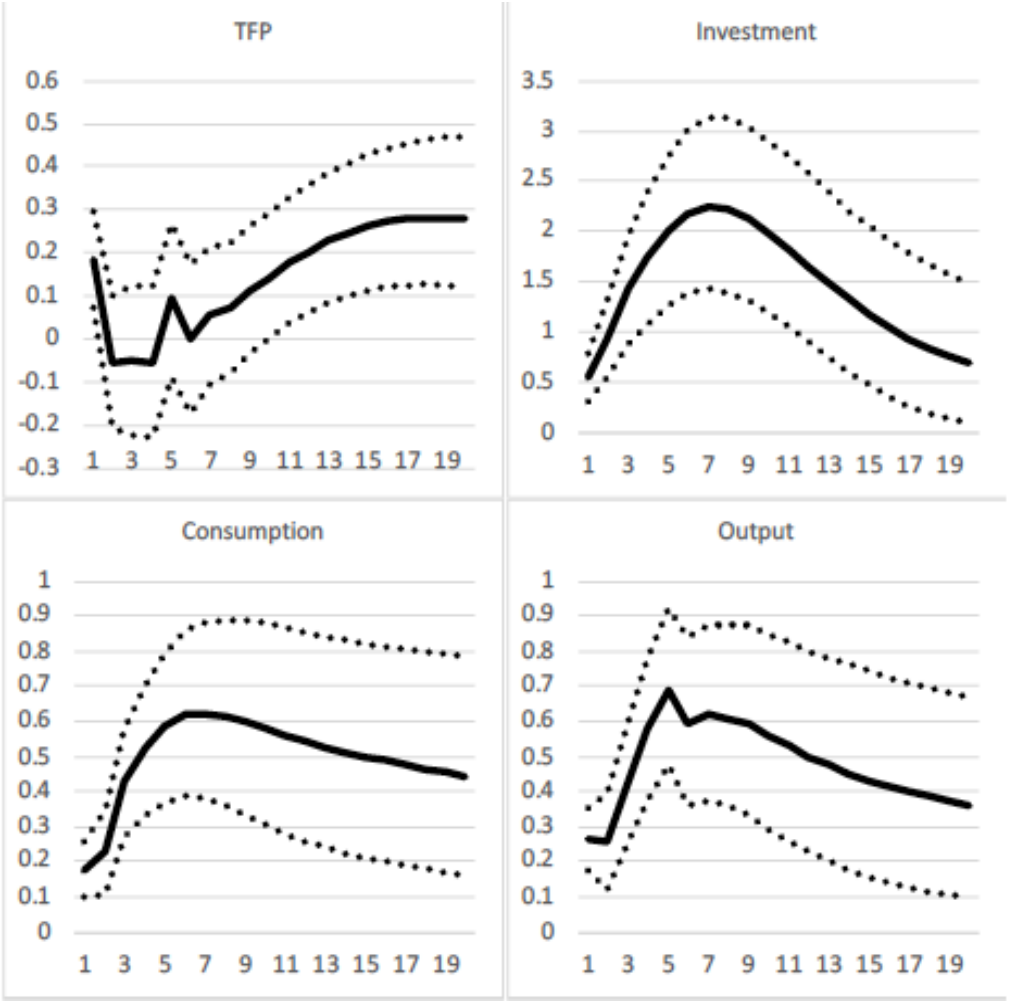
Macroeconomist VAR II

- The VAR is estimated with 5 lags using the Minnesota prior and the 'dummy-initial-observation' prior with estimated hyperparameters (Giannone, Lenza, Primiceri, 2015).
- We compute responses and variance-decompositions using 20,000 draws from the posterior distribution and the recursive identification scheme.

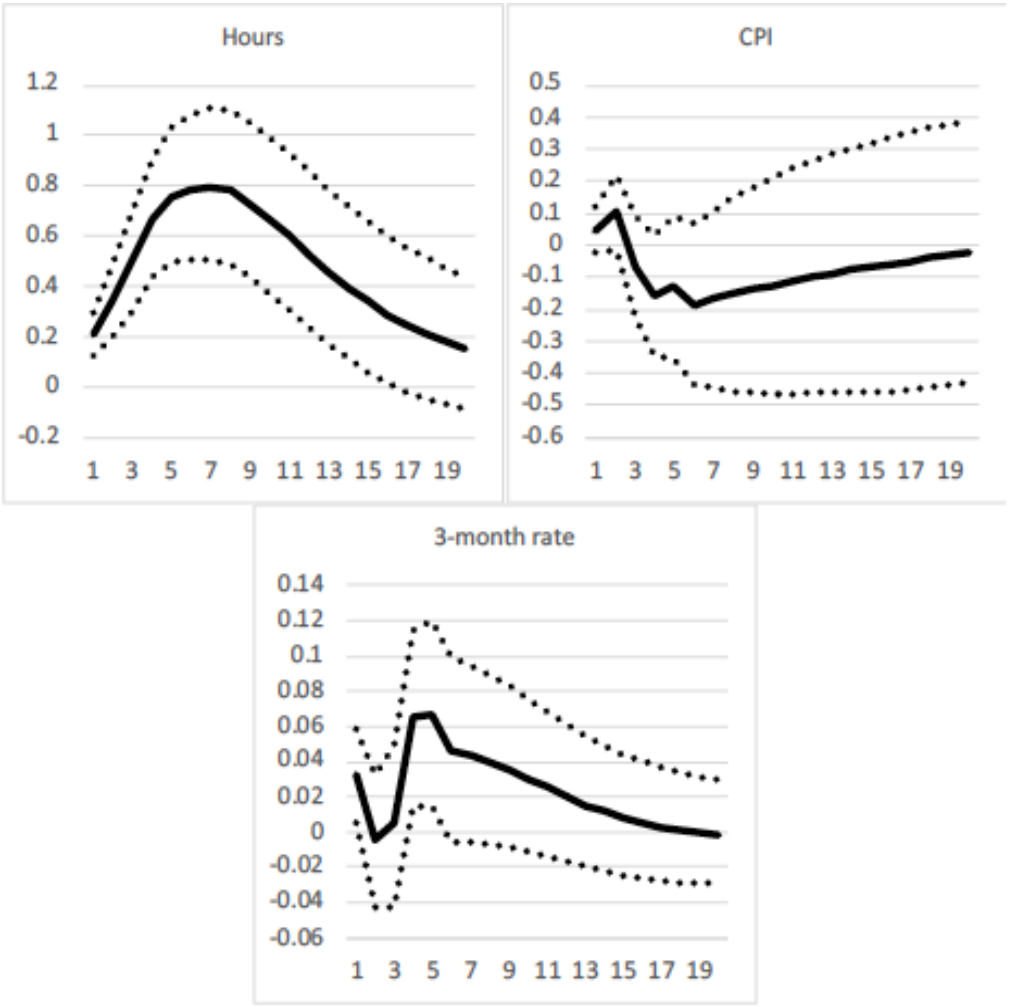
Variance Decomposition: Real-Time Data matters!

	RT			Final			RT			Final		
h	lo		up	lo		up	lo		up	lo		up
	Output						Consumption					
1	0.02	0.043	0.08	0.01	0.022	0.05	0.01	0.026	0.05	0.00	0.005	0.02
2	0.01	0.038	0.07	0.00	0.014	0.04	0.01	0.032	0.07	0.00	0.007	0.02
3	0.02	0.055	0.10	0.01	0.016	0.04	0.02	0.060	0.11	0.01	0.020	0.05
4	0.04	0.080	0.14	0.01	0.026	0.06	0.03	0.080	0.14	0.01	0.029	0.07
8	0.05	0.117	0.19	0.01	0.037	0.09	0.05	0.109	0.19	0.01	0.040	0.10
40	0.03	0.083	0.16	0.01	0.037	0.09	0.03	0.082	0.17	0.01	0.035	0.09
	Investment						Hours					
1	0.01	0.028	0.06	0.00	0.010	0.03	0.01	0.030	0.06	0.00	0.005	0.02
2	0.02	0.041	0.08	0.00	0.014	0.04	0.01	0.040	0.08	0.00	0.006	0.02
3	0.02	0.059	0.11	0.00	0.020	0.05	0.02	0.055	0.10	0.00	0.007	0.02
4	0.03	0.073	0.13	0.00	0.024	0.06	0.03	0.076	0.13	0.00	0.011	0.04
8	0.05	0.117	0.20	0.01	0.036	0.09	0.06	0.121	0.20	0.00	0.019	0.06
40	0.04	0.103	0.19	0.01	0.038	0.09	0.04	0.092	0.16	0.01	0.025	0.06

Dynamic Effects of Expectation Shocks: I



Dynamic Effects of Expectation Shocks: II



Is ES a new shock?

- We compute news shocks as in Barsky and Sims (2011) and confidence shocks as Barksy and Sims (2012).
- We estimate a VAR with latest vintage values: $\mathbf{z}_t = [TFP_t, SP500_t, Conf_t, Y_{t|16Q4}, P_t, R_t]'$, then we identify new shocks by maximizing the FEDV of TFP after 40 quarters and by imposing that has zero effect at TFP at impact (orthogonal to technology surprises).
- We estimate a VAR with latest vintage values: $\mathbf{z}_t = [C_{t|16Q4}, Y_{t|16Q4}, Conf_t]'$, then we identify confidence shocks with a recursive scheme (confidence ordered last).

And if we use expanding windows with data up to t?

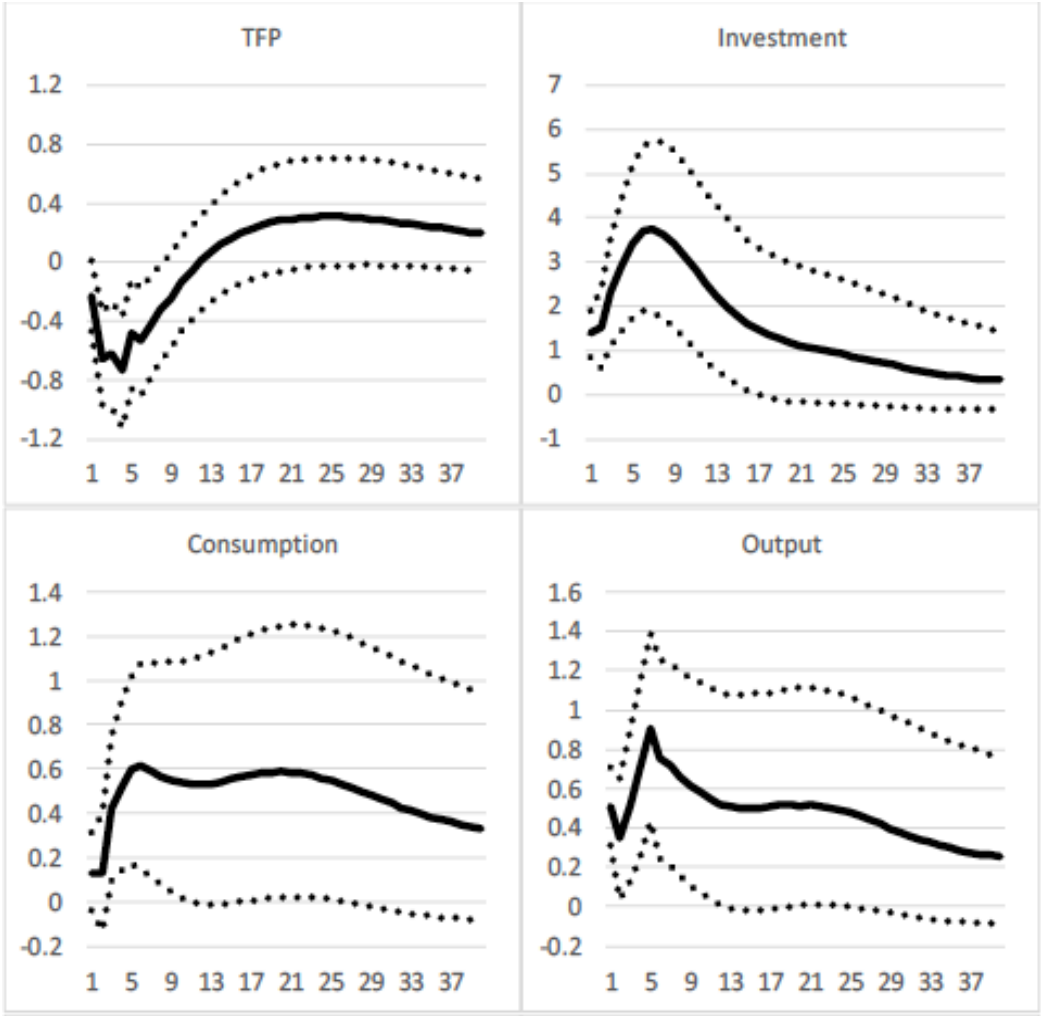
- We employ the traditional way to deal with real-time data as in Orphanides (2001). We estimate the mixed-frequency VAR with the data actually available at the vintage at t. Then for each t, we save the expectation shock for the last observation (at the posterior mean) to get $u_{t|t}^{\exp,EOS}$ for $t = 1978Q4$ up to $2016Q3$.
- This might remove the ability of the VAR to measure effects of shocks that are anticipated by economic agents since the econometrician removes access to future information that may have been anticipated.

	$u_{t\|t}^{exp}, s_t$	$u_{t\|t}^{exp,final}, s_t$	$u_{t\|t}^{exp,EOS}, s_t$
$s_t = tfpnews_t$	0.158	0.183*	0.020
	[1.524]	[1.725]	[0.237]
$s_t = consconf_t$	0.179**	0.198**	0.185**
	[2.321]	[2.529]	[2.347]
$s_t = u_{t\|t}^{exp,final}$	0.845***		0.724***
	[19.59]		[9.56]

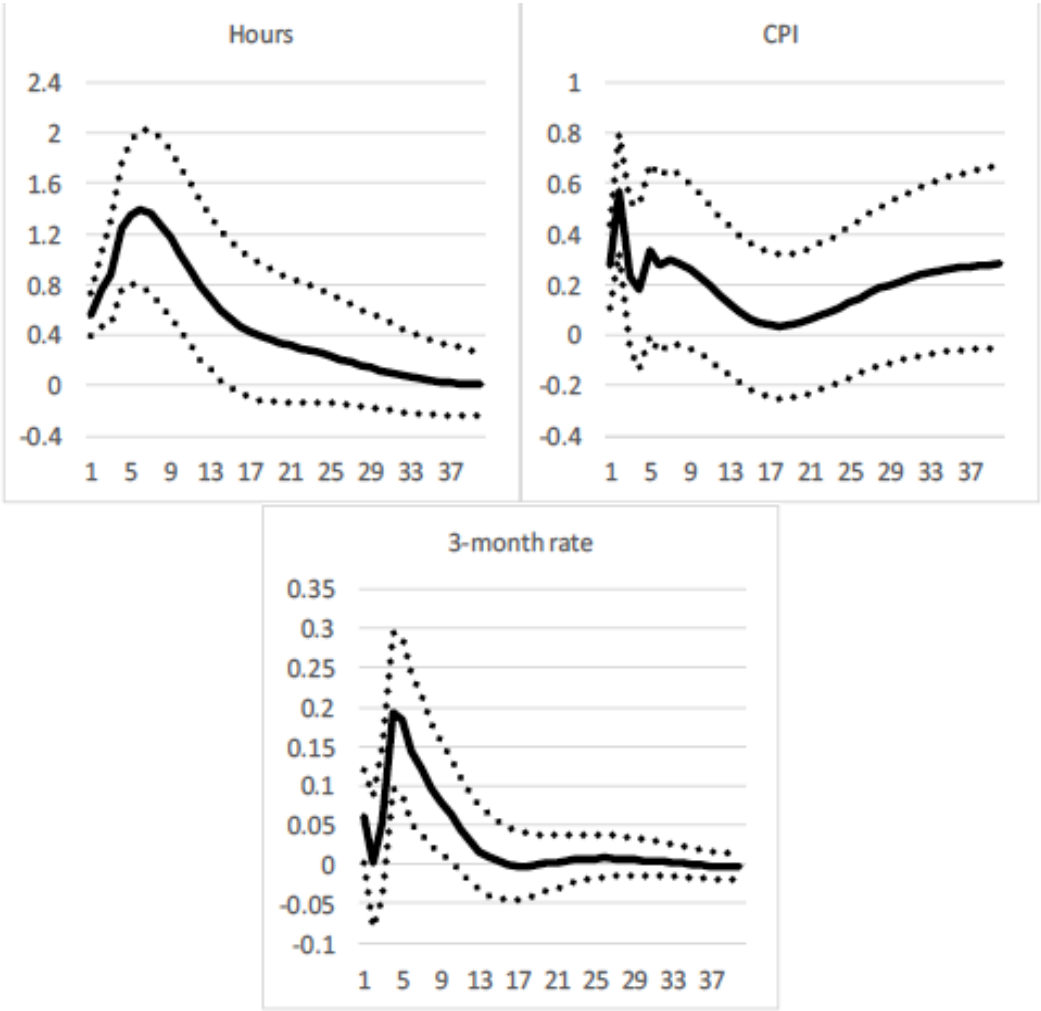
ES and Alternatives: Variance Decomposition 1978-2016

	Exp	Exp, Final	Exp, EOS	Exp, ort. conf. + news	Exp	Exp, Final	Exp, EOS	Exp, ort. conf. + news
	Output				Consumption			
1	0.064	0.034	0.014	0.043	0.009	0.004	0.005	0.005
2	0.043	0.018	0.013	0.028	0.010	0.007	0.010	0.007
3	0.044	0.015	0.014	0.030	0.021	0.013	0.012	0.015
4	0.054	0.018	0.015	0.036	0.031	0.016	0.013	0.022
8	0.065	0.023	0.016	0.050	0.044	0.021	0.014	0.032
40	0.048	0.021	0.019	0.043	0.044	0.021	0.016	0.037
	Investment				Hours			
1	0.048	0.017	0.013	0.043	0.057	0.012	0.008	0.067
2	0.042	0.012	0.010	0.035	0.056	0.008	0.007	0.066
3	0.050	0.011	0.009	0.042	0.056	0.008	0.011	0.065
4	0.061	0.012	0.009	0.050	0.074	0.010	0.011	0.079
8	0.090	0.018	0.011	0.074	0.093	0.013	0.017	0.099
40	0.073	0.023	0.017	0.064	0.065	0.021	0.023	0.075

Short-run effects of ES - Business Sentiment (78-16): I



Short-run effects of ES - Business Sentiment (78-16): II



Conclusions

- Expectations shocks are forecasts' updates that are not explained by changes in fundamentals. These expectations changes go beyond technological news and consumer confidence – Business Sentiment.
- The effect of expectations shocks on key macroeconomic variables (output, consumption, investment, hours) are attenuated if we disregard the data actually available for forecasters in real time.
- Expectations shocks raise investment, hours and output in the short-run (up to two years) with positive short run effects on consumption, inflation and the short rate and negative effects on TFP.