News and uncertainty about COVID-19: Survey evidence and short-run economic impact

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ECB-FYFED conference on expectations surveys:
A tool for research and monetary policy, November 11 and 12, 2021

The question

How fast do consumer expectations adjust to large shocks? And why should we care?

- COVID-19 pandemic as natural experiment

Real-time survey of U.S. consumers, with daily observations since March 10, 2020

- Elicits expected effect of pandemic on income and inflation over one-year horizon

State-of-the-art business cycle model

- Calibrate model to capture these *conditional* expectations:
  identified moments à la Nakamura Steinsson (2018)
- Study the role of expectations for the transmission of large shocks:
  in particular, via a) news and b) uncertainty

What do we learn?

Survey evidence

- Consumer expectations react fast and strongly to large shock
- And so does consumer uncertainty about economic impact of the shock

Counterfactuals in business cycle model calibrated to survey evidence

- Rise in consumer uncertainty explains 2/3 of recession
- Ability of monetary policy to dampen uncertainty in short run limited by lower bound

Literature

Response of expectations to macro shocks

- Professional forecasters: Coibion Gorodnichenko 2012, Baker et al 2020a
- Consumers update less often: Carroll 2003, Carroll et al 2020

Economic impact of news and uncertainty

- Beaudry Portier 2006, Barsky Sims 2012, Schmitt-Grohé Uribe 2012
- Bloom 2009, Fernandez-Villaverde et al 2015, Basu Bundick 2017, Coibion et al 2021, Baker et al 2020b

Surveying expectations about the economic impact of the pandemic

- Inflation: Candia et al 2020, Binder 2020, Armantier et al 2020, Meyer et al 2021
- Lockdowns: Coibion et al 2020, Hanspal et al 2020, Miescu Rossi 2021

Our survey

Federal Reserve Bank of Cleveland's daily tracking survey: $N = 60{,}003$

- Daily observations from March 10, 2020 to July 12, 2021
- Representative of U.S. consumers (age, region, gender, race, income, education)

Questions demographics, behavior and economic impact of COVID-19 pandemic

- GDP, personal household income, and inflation
- 12-months ahead point forecasts but also subjective probability distribution

Question structure similar to NYFED Survey of Consumer Expectations, except that we

- Ask for overall impact in terms of GDP in addition to personal household income
- Elicit *conditional* expectations

Survey Results

Survey: 4 main observations

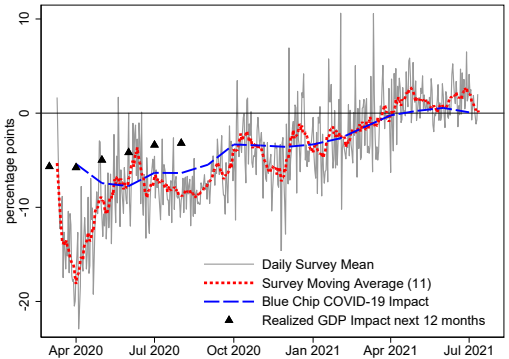
1. Income expectations respond quickly and strongly to the pandemic
2. Uncertainty about the output loss very large
3. Consumers expect strong inflationary effect
4. Uncertainty about inflationary effects large

Benchmarks

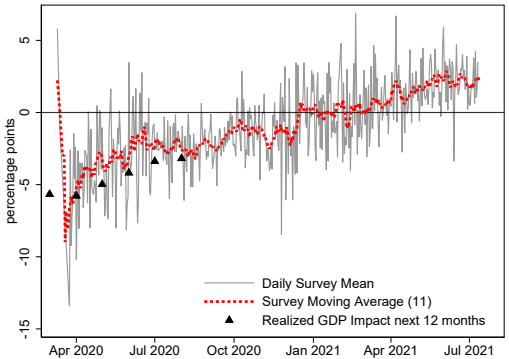
- At the beginning of the survey (March 10, 2020): about a total of 1,000 infections in U.S.
- Blue Chip survey: unconditional forecast $\rightarrow$ compare forecasts to pre-pandemic trend
- Actual GDP 12 months later, relative to pre-pandemic trend

Obervation 1: income expectations respond strongly and quickly

GDP

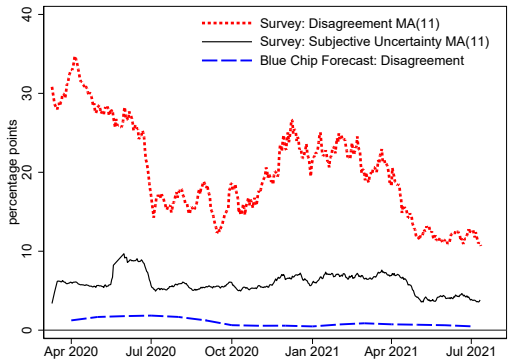


Personal Household Income

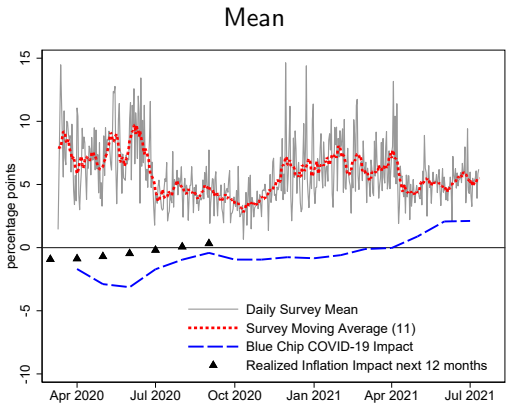


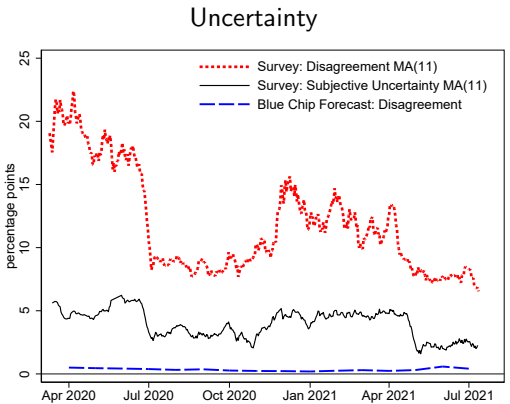
Observation 2: uncertainty about income effect *very* large

Standard deviation across respondents and of fitted beta distribution (mean)

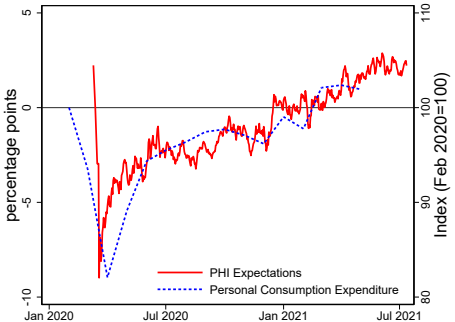


Observations 3&4: positive inflation effect, uncertainty large





Consumption drops with expectations



New Keynesian business cycle model

Striking in survey: consumer expectations adjust quickly and uncertainty spikes

- How important for economic impact of pandemic?
- What role for policy?

Simplified version of Basu Bundick (2017)

- Delivers predictions for the effects of uncertainty shocks in line with VAR evidence
- Features demand and productivity shocks as well as demand uncertainty shocks
- Solve model to account for ELB and uncertainty simultaneously

Calibration at two levels

Regular business cycle

- Specify model parameters to capture business cycle moments for period 1984–2008
- Simple, but quantitatively successful model

Devise **specific shock** scenario by targeting survey response of expectations

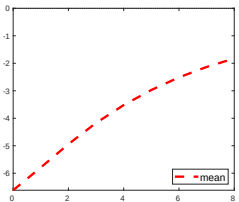
- Shock to demand uncertainty (17 STD)
- Adverse shock to TFP (5 STD)
- Adverse news shock to TFP (15 STD)

Shock scenario: model expectations consistent with identified moments

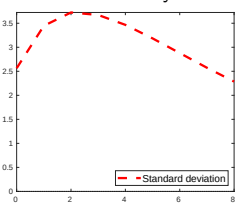
Expected time path in shock period, time measured in quarters along horizonal axis

Output (Observations 1 & 2)

Level forecast

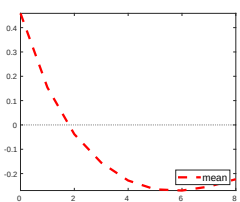


Uncertainty

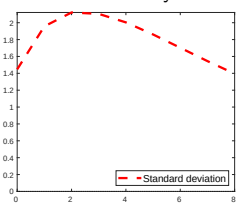


Inflation (Observation 3 & 4)

Level forecast



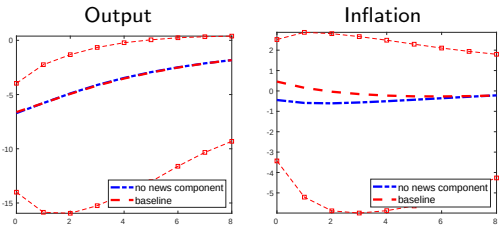
Uncertainty



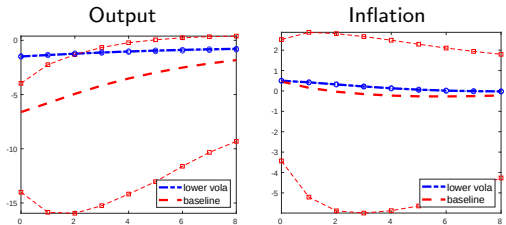
Shock scenario: the role of expectations

Expected time path in shock period with ± 2 STD bands, time measured in quarters along horizonal axis

Baseline v no news

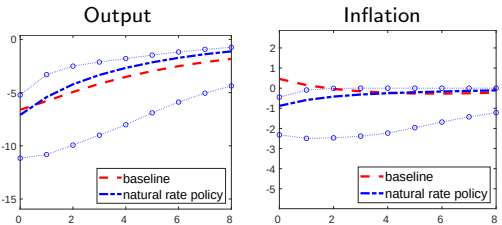


Baseline v no increased uncertainty



The role of monetary policy

y-axis: 2STD confidence bands in baseline



Natural rate policy

- Dampens uncertainty
- But ELB prevents notable effect on output
- Reduction of uncertainty reduces precautionary pricing

Conclusion

Survey shows that **consumer expectations** respond quickly and strongly to large shock

- Response **stronger, faster and more uncertain** than those of professional forecasters
- Increase of uncertainty massive

State-of-the-art business cycle model calibrated to survey evidence

- Uncertainty accounts for 2/3 of recession
- Monetary policy has trouble containing uncertainty due to lower bound

Households

Consume, work, and save via bond or shares in order to

$$\begin{aligned} \max \quad & \left[a_t \left(C_t^{\eta} (1 - N_t)^{1-\eta} \right)^{(1-\sigma)/\theta_V} + \beta \left(\mathbb{E}_t V_{t+1}^{1-\sigma} \right)^{1/\theta_V} \right]^{\theta_V/(1-\sigma)} \\ \text{s.t.} \quad & C_t + \frac{P_t^E}{P_t} S_{t+1} + \frac{1}{R_t^R} B_{t+1} = \frac{W_t}{P_t} N_t + \left(\frac{D_t^E + P_t^E}{P_t} \right) S_t + B_t. \end{aligned} \tag{1}$$

- Consumption is a standard Dixit-Stigliz aggregate
- Household hold firms' fixed capital stock in terms of shares $S_t = \nu K_t$
- One period discount bond B_t

Firms

Intermediate good producers maximize

$$\begin{aligned} \max \quad & \mathbb{E}_t \sum_{s=0}^{\infty} M_{t,t+s} \frac{D_{t+s}(i)}{P_{t+s}}, \\ \text{s.t.} \quad & \left[\frac{P_t(i)}{P_t}\right]^{-\theta_\mu} Y_t = K^\alpha \left[Z_t N_t(i)\right]^{1-\alpha} - \Phi \end{aligned} \tag{2}$$

where

$$\frac{D_t(i)}{P_t} = \left[\frac{P_t(i)}{P_t}\right]^{1-\theta_\mu} Y_t - \frac{W_t}{P_t} N_t(i) - \delta K - \frac{\phi_p}{2} \left[\frac{P_t(i)}{\overline{\Pi} P_{t-1}} - 1\right]^2 Y_t.$$

- Final goods producer aggregates $Y_t(i)$ into Y_t using a Dixit-Stigliz function
- Firms are subject to a price adjustment cost

Driving processes

Demand shock

$$\begin{aligned} a_t &= (1-\rho_a) + \rho_a a_{t-1} + \sigma^a_{t-1}\,\epsilon^a_t \\ \sigma^a_t &= = (1-\rho_{\sigma^a})\sigma^a + \rho_{\sigma^a}\sigma^a_{t-1} + \sigma^{\sigma^a}\epsilon^{\sigma^a}_t \end{aligned}$$

Productivity shock

$$\begin{aligned} \log(Z_t) &= \log(A_t) + \log(X_t) \\ \log\left(A_t/\overline{Z}\right) &= \rho_A \log\left(A_{t-1}/\overline{Z}\right) + \sigma^A \epsilon^A_t \\ \log(X_t) &= \rho_{X,1}\log(X_{t-1}) + \rho_{X,2}\log(X_{t-2}) + \sigma^X \epsilon^X_t \end{aligned}$$

Monetary Policy an Market clearing

Monetary policy follows a Taylor rule:

$$\log\left(R_t^{\text{tar}}/\overline{R}\right) = \left[\rho_{\Pi}\cdot\log(\Pi_t/\overline{\Pi}) + \rho_y\cdot\log(Y_t/Y_t^n)\right], \tag{3}$$

Effective lower bound as constraint on monetary policy:

$$R_t = \max[R_t^{\text{tar}}, \underline{R}].$$

Market clearing implies:

$$Y_t = C_t + \delta K + \phi_p/2\left[\Pi_t/\overline{\Pi} - 1\right]^2 Y_t.$$

- Price adjustment costs $\left[\Pi_t/\overline{\Pi} - 1\right]^2 Y_t$

Level 1 calibration: parameters

param.	value	source/target	param.	value	source/target
Preferences			*Monetary policy*		
β	0.994	Basu Bundick /2007) (BB).	ρ_{Π}	1.5	conventional value
η	0.326	Frisch elasticity of 2, BB.	ρ_{y}	0.5/4	conventional value.
ψ	0.95	BB.	$\overline{\Pi}$	1.0057	inflation rate 2% p.a.
σ	80	BB.	*Shocks*		
Production			ρ_{a}	0.935	BB.
α	1/3	BB.	σ^{a}	0.0026	BB.
δ	0	abstract from capital dynamics.	$\rho_{\sigma^{a}}$	0.742	BB.
K	10	capital stock 2.5 times ann. GDP.	$\sigma^{\sigma^{a}}$	0.0025	BB.
θ_{μ}	6	BB.	$\overline{Z}$	2.206	Targets $\overline{Y} = 1$.
Φ	0.584	dividend/GDP ratio of 1%, BB.	ρ_{A}	0.987	BB.
ν	0.85	BB.	σ^{A}	0.0013	BB.
ϕ_{p}	400	slope of Phillips curve, see text.	$\rho_{X,1}$	1.5	judgmental
			$\rho_{X,2}$	-0.6	judgmental
			σ^{X}	.001	judgmental

Level 1 calibration targets: business cycle moments for normal times

	Data			Model		
	SD	AR(1)	Cor($\cdot$, Y_t)	SD	AR(1)	Cor($\cdot$, Y_t)
Y_t	1.19	0.84	1	0.92	0.91	1
N_t	1.36	0.92	0.82	0.57	0.83	0.19
R_t	1.19	0.90	0.61	0.60	0.92	0.22
Π_t	0.96	0.14	0.20	0.32	0.93	-0.04
R_t^e	23.57	-0.15	0.10	18.53	-0.02	0.04

Sample question: point estimate

Over the next 12 months, do you think that the coronavirus will cause the total income of all members of your household (including you), after taxes and deductions to be higher or lower?

- o *Higher*
- o *Lower*

Depending on the answer, the respondents is asked:

How much higher do you expect total income of all members of your household to be over the next 12 months because of coronavirus? Please give your best guess.
I expect total income of all members of my household to be _____ percent **higher/ lower** *because of coronavirus.*

Sample question: probability distribution

In your view, what would you say is the percent chance that over the next 12 months, the coronavirus will cause total income of all members of your household (including you), after taxes and deductions, to be . . .

Lower, by 12 percent or more _____

Lower, by 8 to 12 percent _____

Lower, by 4 to 8 percent _____

Lower, by 2 to 4 percent _____

Lower, by 0 to 2 percent _____

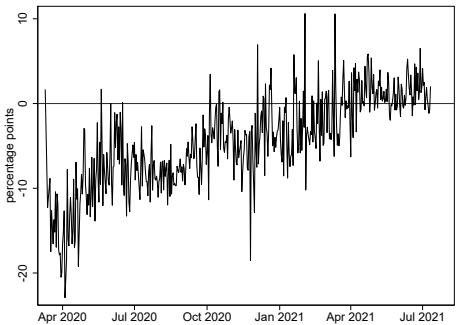
Higher, by 0 to 2 percent _____

. . .

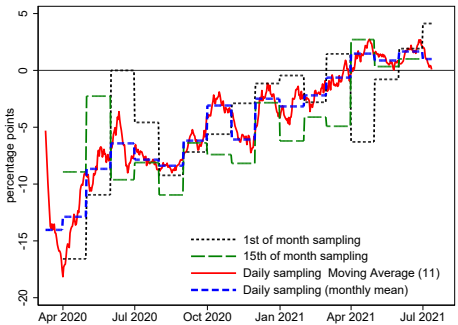
Higher, by 12 percent or more _____

Sampling frequency

Daily observations (mean)



Time aggregation



Sample throughout the months and compute moving average

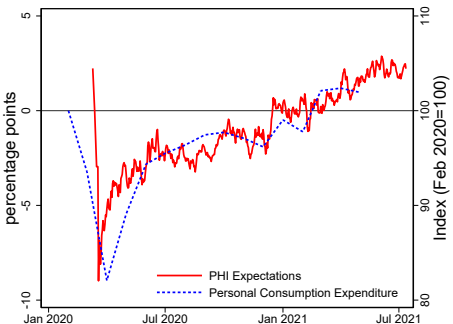
- Capture high frequency volatility, but filter out some of the noise

Joint distribution of income and inflation expectations: Large fraction of respondents expect pandemic to be stagflationary

		Inflation Expectations			
		negative	0	positive	
GDP Expectations	negative	16.18%	0.46%	44.16%	60.81%
	0	0.19%	0.71%	0.42%	1.32%
	positive	9.20%	0.28%	28.39%	37.87%
		25.57%	1.46%	72.97%	

Consumption drops with expectations (left) although disposal income drops less than expected (right)

Consumption v PHI expectations



Disposable Personal Income v PHI expectations