Perceived Unemployment Risks over Business Cycles

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ESWC 2025
August 2025

Disclaimer: views expressed in this paper are solely those of the authors instead of their respective institutions.

Introduction

- Unemployment risk amplifies business cycles fluctuations in state-of-the-art INCOMPLETE-MARKET HA-MACRO MODELS (Bayer et al., 2019; Haan et al., 2018; Broer et al., 2021; Graves, 2020)
  1. ex-ante channel: fears of unemployment $\rightarrow$ precautionary saving $\rightarrow$ consumption $\downarrow$
  2. ex-post channel: realized unemployment $\rightarrow$ reduced income $\rightarrow$ consumption $\downarrow$

- Standard approach does not distinguish (a) perceived risk, (b) true risk, (c) realized outcome
  - full-information-rational-expectations (FIRE) assumes (a) perceived risk = (b) true risk
  - empirical implementation assumes (b) true risk = (c) realized outcome

- This paper aims to:
  - measure these three conceptually different objects
  - quantify the consumption response to unemployment risks due to (a), (b), (c)

This paper

1. Separately measure
   (a) ex-ante perceived risk: expectations (and backcasts) in Survey of Consumer Expectations
   (b) ex-ante true risk: real-time machine-efficient forecasts à la Bianchi et al. (2022)
   (c) ex-post realized outcome: observed transition rates in Current Population Survey

   for job-finding rate and separation rate (the flow approach to unemployment)

2. "Plug" into the workhorse heterogeneous-agent model with unemployment risk and quantify consumption response to unemployment risk due to
   - ex-ante precautionary responses to (a)
   - ex-post impacts of (c)
   - **under**/over insurance due to misperception (a) − (b)

Data

Perceived and realized transition rates

- Realized job-finding and separation rates from Current Population Survey:

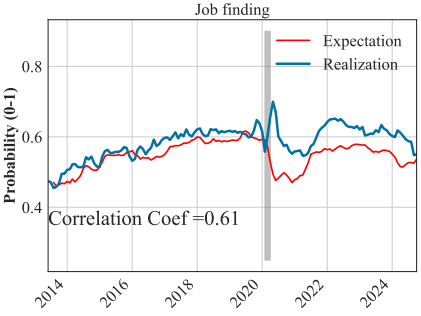
$$JF_t = \frac{UE_t}{U_{t-1}}, \quad JS_t = \frac{EU_t}{E_{t-1}}$$

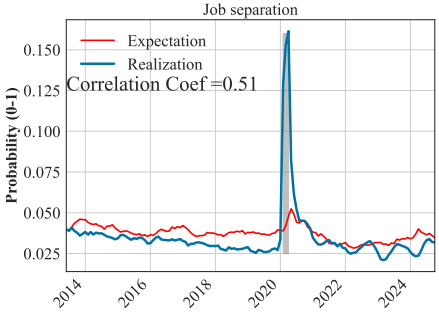
  where gross flows from U to E and E to U are measured using CPS panel dimension

- Perceived job-finding and separation rates from Survey of Consumer Expectations:
  - $\widetilde{JF}_t$: *"Suppose you were to lose your main job this month, what do you think is the percent chance that you will find a job within the following 3 months?"*
  - $\widetilde{JS}_t$: *"What do you think is the percent chance that you will lose your main (for those with multiple jobs) or current (for those with single job) job during the next 12 months?"*

- Time (dis)aggregation from monthly (12-month) to 3-month-horizon rates

Perceived and realized transition rates are highly correlated





- Over 3-month horizon
- A higher correlation if the month of Covid outbreak excluded
- Suggesting that perceptions do contain predictable future labor market movements
- Such pattern remains within each group: ⏩ by employment status ⏩ by education

Ex-ante Comparison

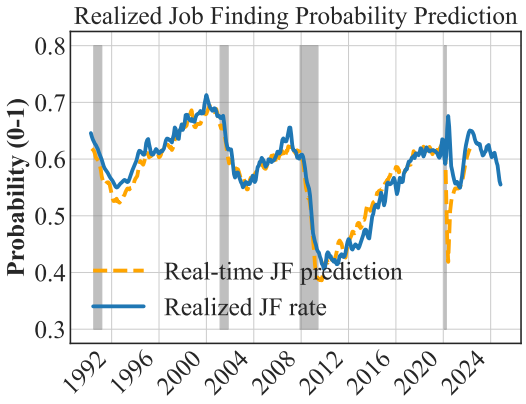
(Proxy for) true ex-ante unemployment risk

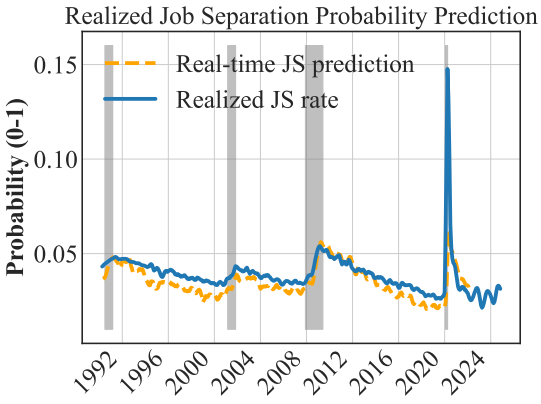
- Machine-learning efficient forecasts à la Bianchi et al. (2022):
  1. LASSO forecasting model $JF_{t+3|t} = \Gamma^t X_t + \epsilon_t$ with real-time data up to t
  2. Use the optimal model $\widehat{JF}^*_{t+3|t} = \widehat{\Gamma}^{t*} X_t$ to generate one-step out-of-sample prediction
  3. Repeat for each t

- Data: $600+$ time series
  - Real-time macroeconomic realizations, such as inflation, unemployment rate, GDP growth, etc.
  - Professional forecasts of the macroeconomy from Survey of Professional Forecasters (SPF)
  - Realized worker flow rates
  - Household expectations from Michigan Survey of Consumers (MSC)

[real time]

Machine-learning forecast of unemployment risks

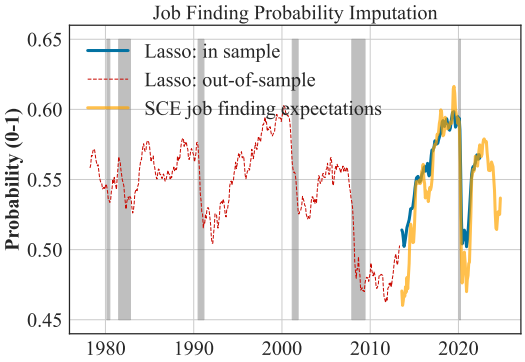


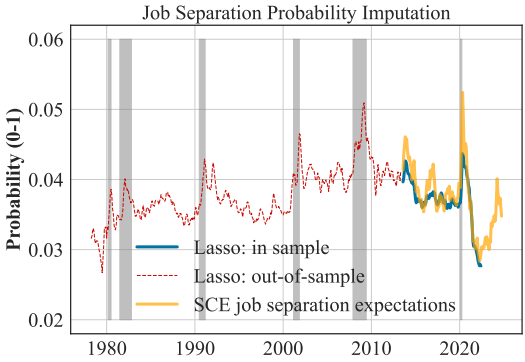


- Expectations in the MSC and real-time UE rate are the most important predictors
  - e.g., income expectations, inflation expectations, news heard, durable/vehicle-buying intentions, household finance expectations, etc.

Why real-time?

Backcasting beliefs: what were people thinking before the SCE?

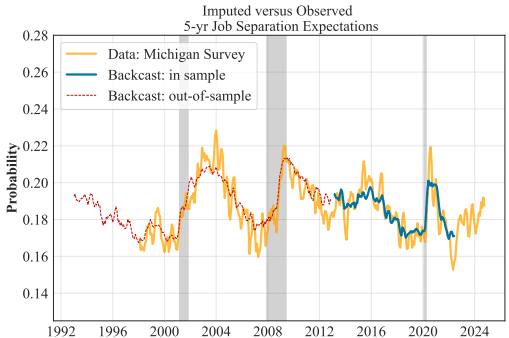


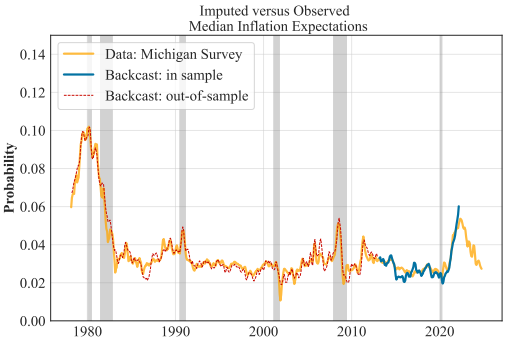


- Based on the optimal LASSO estimated on post-2013 SCE/MSC patterns
- No evidence for a structural break in survey beliefs based on the test of Andrews (1993)

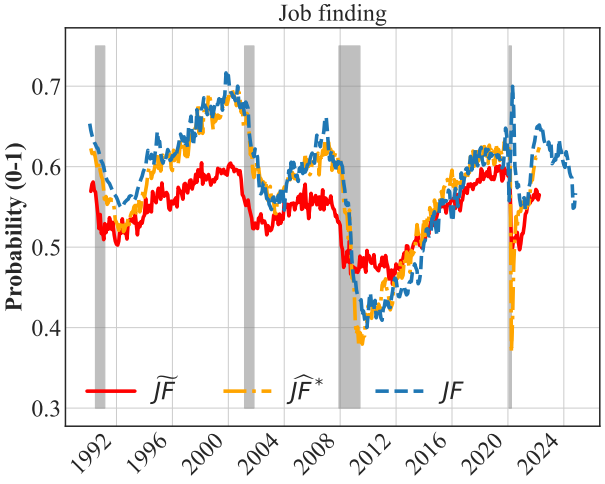
Validating the backcasting method: two examples

Imputed Beliefs versus Observed Expectations in the MSC





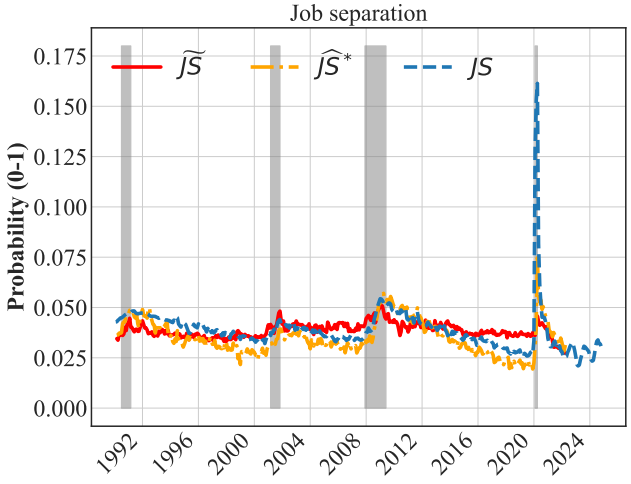
Surveys versus machine: job-finding



$$\log(\widetilde{JF}_{t+3|t}) = 1.92 + \mathbf{0.51}\log(\widehat{JF}^*_{t+3|t}) + \epsilon_t,$$

In-sample

Surveys versus machine: job-separation



$$\log(\widetilde{JS}_{t+3|t}) = 1.13 + \mathbf{0.19}\log(\widehat{JS}^*_{t+3|t}) + \epsilon_t,$$

In-sample

Heterogeneity in risks and perceptions

- Repeat the exercise with q-th percentile perceived risks $\widetilde{JF}^q$ and $\widetilde{JS}^q$, $\forall q \in \{0.25, 0.5, 0.75\}$
- Whose expectations react to their real-time unemployment risks the most?

$$\log(\widetilde{JF}^{0.25}_{t+3|t}) = -1.55 + \mathbf{1.22} \log(\widehat{JF}^{*}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JF}^{0.5}_{t+3|t}) = 1.54 + \mathbf{0.63} \log(\widehat{JF}^{*}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JF}^{0.75}_{t+3|t}) = 3.62 + \mathbf{0.20} \log(\widehat{JF}^{*}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JS}^{0.25}_{t+3|t}) = -0.42 + \mathbf{0.46} \log(\widehat{JS}^{*}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JS}^{0.5}_{t+3|t}) = 1.06 + \mathbf{0.68} \log(\widehat{JS}^{*}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JS}^{0.75}_{t+3|t}) = 2.57 + \mathbf{0.27} \log(\widehat{JS}^{*}_{t+3|t}) + \epsilon_t$$

⏩ In-sample ⏩ by education

Business cycle patterns of risks and perceptions: job-finding

Table: Peak-to-trough ratio of JF

	1990	2001	2007	2020	Mean
$\widetilde{JF}$	$\frac{0.57}{0.52} = 1.10$	$\frac{0.56}{0.53} = 1.06$	$\frac{0.53}{0.48} = 1.10$	$\frac{0.60}{0.50} = 1.20$	1.11
$\widetilde{JF}^{25}$	$\frac{0.34}{0.27} = 1.26$	$\frac{0.34}{0.29} = 1.17$	$\frac{0.28}{0.22} = 1.27$	$\frac{0.39}{0.27} = 1.44$	1.29
$\widetilde{JF}^{50}$	$\frac{0.66}{0.58} = 1.14$	$\frac{0.61}{0.52} = 1.17$	$\frac{0.58}{0.51} = 1.14$	$\frac{0.68}{0.52} = 1.31$	1.19
$\widetilde{JF}^{75}$	$\frac{0.86}{0.81} = 1.06$	$\frac{0.84}{0.78} = 1.08$	$\frac{0.84}{0.80} = 1.05$	$\frac{0.89}{0.81} = 1.10$	1.07
JF^*	$\frac{0.61}{0.56} = 1.09$	$\frac{0.66}{0.60} = 1.10$	$\frac{0.59}{0.39} = 1.51$	$\frac{0.62}{0.41} = 1.51$	1.30
JF	$\frac{0.64}{0.60} = 1.07$	$\frac{0.68}{0.63} = 1.08$	$\frac{0.59}{0.43} = 1.37$	$\frac{0.63}{0.62} = 1.02$	1.13

Business cycle patterns of risks and perceptions: job-separation

Table: Peak-to-trough ratio of JS

	1990	2001	2007	2020	Mean
$\widetilde{JS}$	$\frac{0.036}{0.040} = 0.90$	$\frac{0.042}{0.044} = 0.95$	$\frac{0.042}{0.047} = 0.89$	$\frac{0.036}{0.043} = 0.84$	0.90
$\widetilde{JS}^{25}$	$\frac{0.011}{0.014} = 0.79$	$\frac{0.012}{0.012} = 1$	$\frac{0.013}{0.015} = 0.87$	$\frac{0.010}{0.014} = 0.71$	0.84
$\widetilde{JS}^{50}$	$\frac{0.066}{0.082} = 0.80$	$\frac{0.064}{0.060} = 1.07$	$\frac{0.072}{0.120} = 0.6$	$\frac{0.053}{0.077} = 0.69$	0.79
$\widetilde{JS}^{75}$	$\frac{0.20}{0.20} = 1$	$\frac{0.20}{0.21} = 0.95$	$\frac{0.18}{0.24} = 0.75$	$\frac{0.16}{0.20} = 0.80$	0.88
JS^*	$\frac{0.037}{0.047} = 0.79$	$\frac{0.032}{0.039} = 0.82$	$\frac{0.033}{0.054} = 0.61$	$\frac{0.031}{0.055} = 0.56$	0.70
JS	$\frac{0.044}{0.047} = 0.94$	$\frac{0.034}{0.042} = 0.81$	$\frac{0.034}{0.051} = 0.67$	$\frac{0.026}{0.16} = 0.16$	0.64

Model quantification of consumption fluctuations due to (a), (b), (c)

Model elements

- Buffer-stock consumers
- Uninsured idiosyncratic income risks:
  - persistent unemployment
  - persistent + transitory wage risks
- CRRA utility
- Zero-borrowing constraint
- Self-insurance via one risk-free asset
- Homogeneous (baseline) $\rightarrow$ heterogeneous unemployment risks (extension)
- Monthly frequency

Calibration

Household block of the model: income process

Wage

$$\mathbf{z}_{i,t} = e_{i,t}\zeta_{it}$$

$$\log e_{i,t} = \rho_e \log e_{i,t-1} + \eta_{i,t}, \quad \eta_{i,t} \sim \mathcal{N}(0, \sigma_e^2)$$

$$\zeta_{it} = \begin{cases} \theta_{it}, \text{ if employed : } n_{i,t} = e \\ \\ \theta_{it}\gamma, \text{ if unemployed : } n_{i,t} = u \end{cases}$$

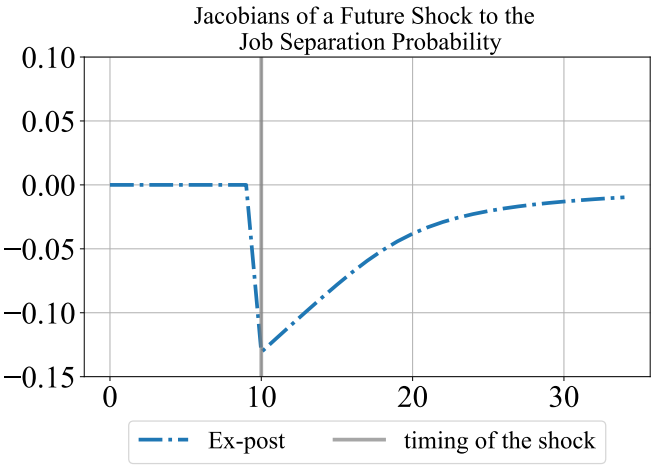
Labor market transitions

$$p(n_{i,t} = e | n_{i,t-1} = u) = JF_t$$
$$p(n_{i,t} = u | n_{i,t-1} = e) = JS_t$$

- $\beta \rightarrow$ average quarterly MPC of 0.21; UI replacement ratio $\gamma = 0.5$.

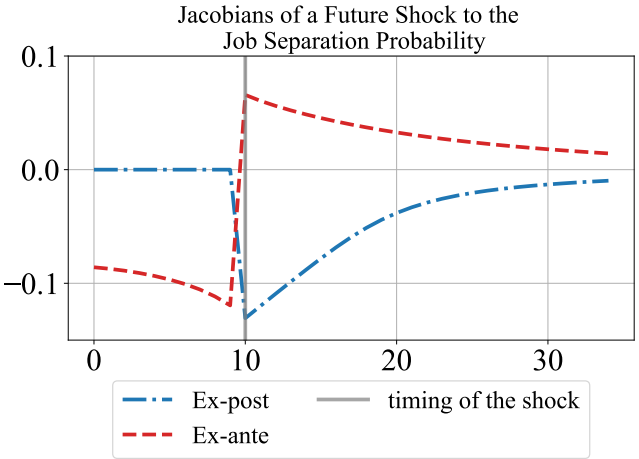
Calibration

Aggregate consumption response: ex-post impacts



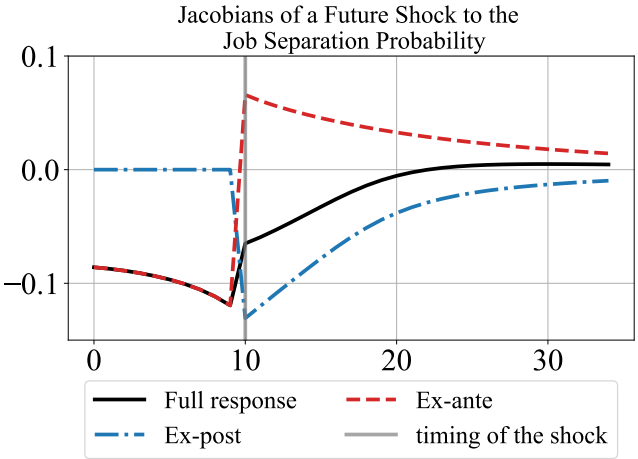
- Sequence-space Jacobian method Auclert et al. (2021)
- Jacobian decomposed into (a) ex-ante risk response (b) ex-post shock response

Aggregate consumption response: ex-ante response



- Sequence-space Jacobian method Auclert et al. (2021)
- Jacobian decomposed into (a) ex-ante risk response (b) ex-post shock response

Aggregate consumption response: ex-ante + ex-post



- Sequence-space Jacobian method Auclert et al. (2021)
- Jacobian decomposed into (a) ex-ante risk response (b) ex-post shock response

Mapping data to the model

Realizations

$$p(n_{i,t} = e | n_{i,t-1} = u) = JF_t$$
$$p(n_{i,t} = u | n_{i,t-1} = e) = JS_t$$

$$JF_t = \rho_{JF} JF_{t-1} + \varepsilon_{JF,t}$$
$$JS_t = \rho_{JS} JS_{t-1} + \varepsilon_{JS,t}$$

Perceptions

$$\tilde{p}(n_{i,t+1} = e | n_{i,t} = u) = \widetilde{JF}_t$$
$$\tilde{p}(n_{i,t+1} = u | n_{i,t} = e) = \widetilde{JS}_t$$

$$\widetilde{JF}_t = \rho_{\widetilde{JF}} \widetilde{JF}_{t-1} + \varepsilon_{\widetilde{JF},t}$$
$$\widetilde{JS}_t = \rho_{\widetilde{JS}} \widetilde{JS}_{t-1} + \varepsilon_{\widetilde{JS},t}$$

Objective/True risks

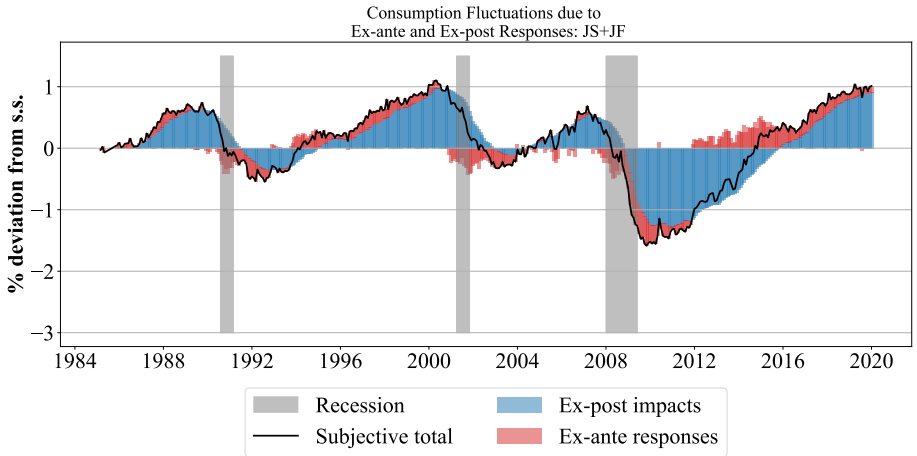
$$\hat{p}(n_{i,t+1} = e | n_{i,t} = u) = \widehat{JF}^*_t$$
$$\hat{p}(n_{i,t+1} = u | n_{i,t} = e) = \widehat{JS}^*_t$$

$$\widehat{JF}^*_t = \rho_{\widehat{JF}^*} \widehat{JF}^*_{t-1} + \varepsilon_{\widehat{JF}^*,t}$$
$$\widehat{JS}_t = \rho_{\widehat{JS}^*} \widehat{JS}^*_{t-1} + \varepsilon_{\widehat{JS}^*,t}$$

$$\Rightarrow \{\hat{\varepsilon}_{JF,t}, \quad \hat{\varepsilon}_{JS,t}, \quad \hat{\varepsilon}_{\widetilde{JF},t}, \quad \hat{\varepsilon}_{\widetilde{JS},t}, \quad \hat{\varepsilon}_{\widehat{JF}^*,t}, \quad \hat{\varepsilon}_{\widehat{JS}^*,t}\} \quad \text{for } t = 1, \ldots, T.$$

- Feeding these shocks into the model, we obtain the partial equilibrium deviations of aggregate consumption relative to the model's steady state level

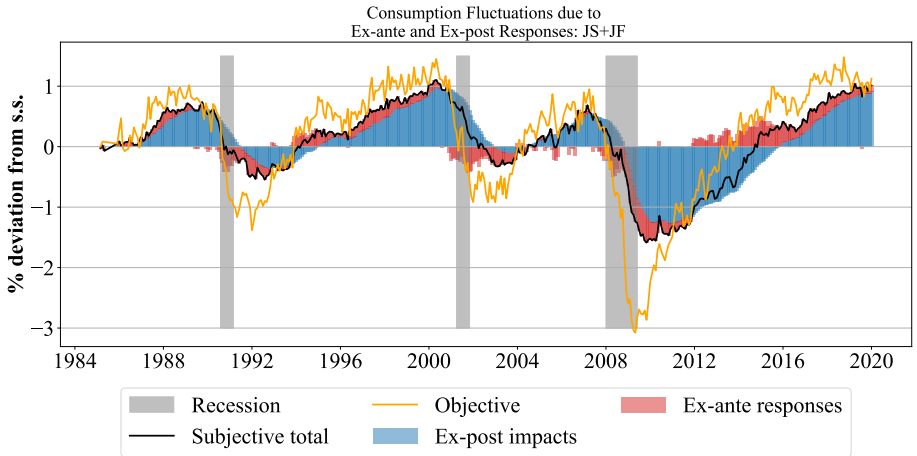
Consumption fluctuations under subjective perceptions



- Ex-ante ← (a) perceived risks × ex-ante Jacobians
- Ex-post ← (c) realized transitions × ex-post Jacobians

} Subjective total

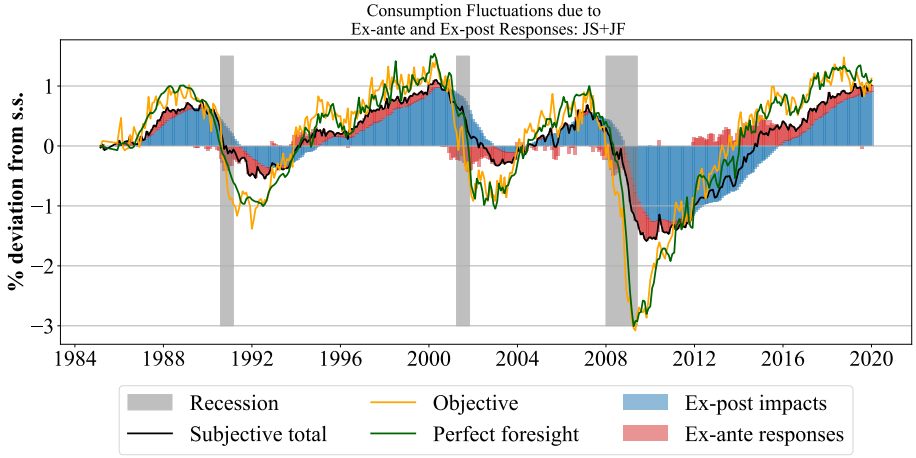
Counterfactual I: (a) perceptions = (b) objective risks



- **Ex-ante** ← (b) objective risks × ex-ante Jacobians
- Ex-post ← (c) realized transitions × ex-post Jacobians

} Objective

Counterfactual II: (b) objective risks = (c) realized transitions

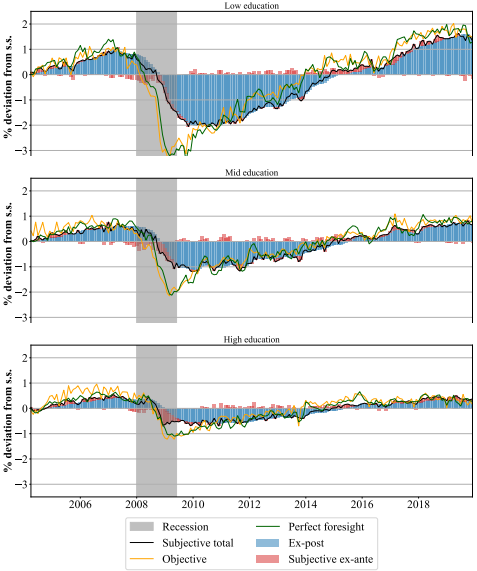


- **Ex-ante** ← (c) realized transitions × ex-ante Jacobians
- Ex-post ← (c) realized transitions × ex-post Jacobians

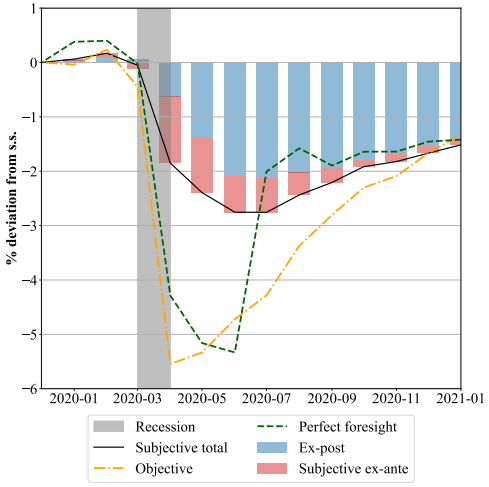
} "Perfect foresight"

Allowing for **heterogeneity** in risks and perceptions by education

- Calibrated to match education-specific MPCs (Fuster et al., 2021)
- Group with the larger risk exposure has stickier belief, hence more underinsured



A case study of the COVID recession



- Job-finding impacts were primarily due to precautionary responses
- Job-separation impacts were mostly income losses

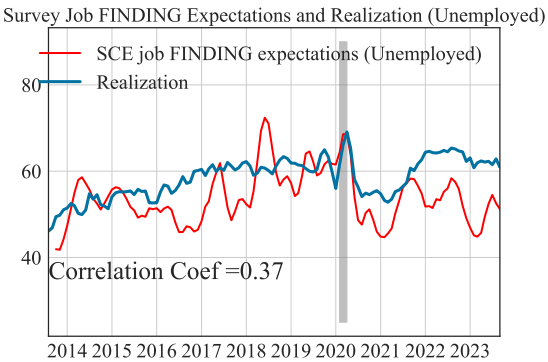
Shocks in Covid times
JS v.s. JF

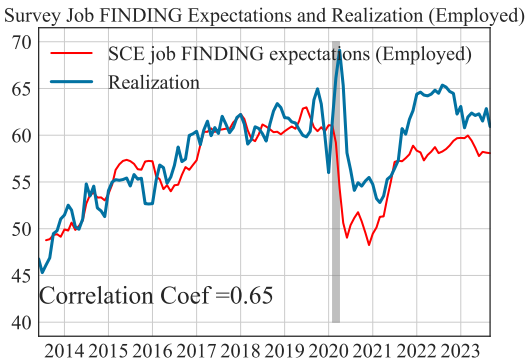
Conclusion

- We quantify the aggregate consumption fluctuations due to
  - Perceived risks $\rightarrow$ ex-ante responses
  - Realized shocks $\rightarrow$ ex-post impacts
  - True risks (a counterfactual benchmark as opposed to perceived risks)
- Ex-ante risk response is important and sizable in past recessions
- But the **stickiness** of risk perceptions limited the role of self-insurance behaviors
- Both risks and perceptions are widely **heterogeneous**
- The correlation pattern of risk exposure and belief distortion as an **amplification** mechanism

Appendix

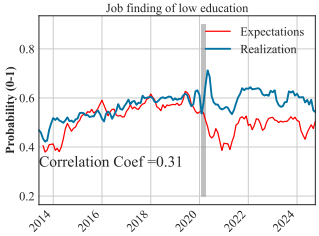
JF perceptions by the unemployed and employed

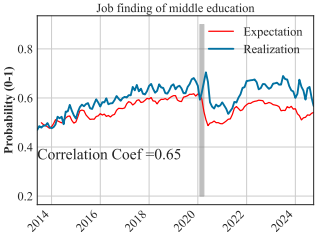


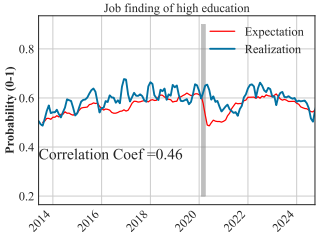


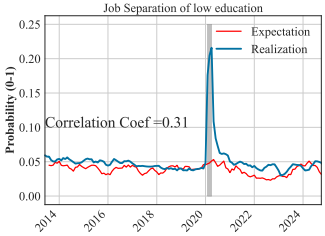
Back

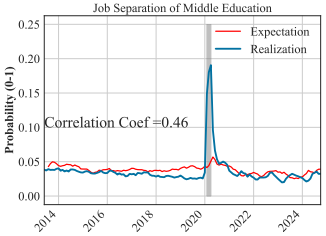
Perceived and realized transition rates remain correlated within education

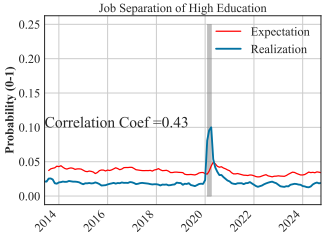




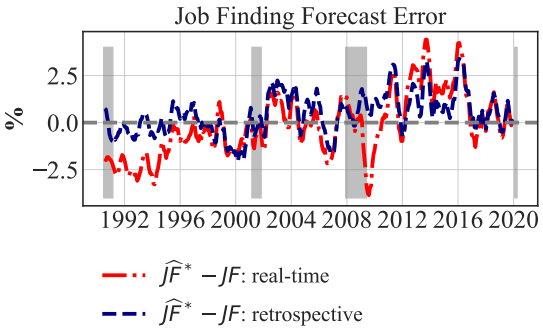


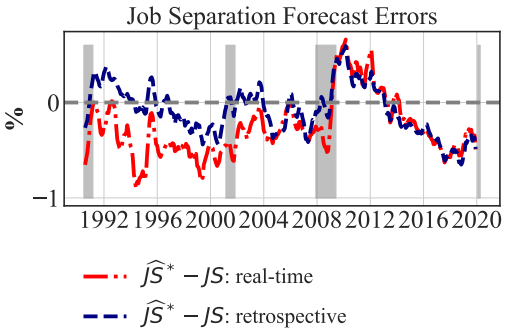






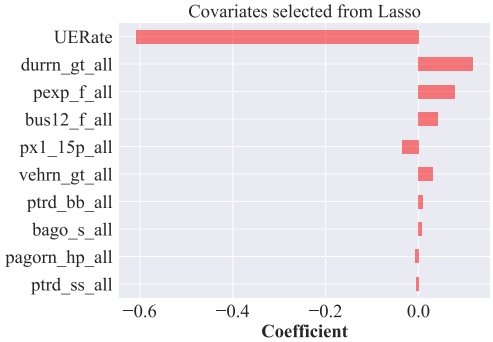
Why is real-time important?

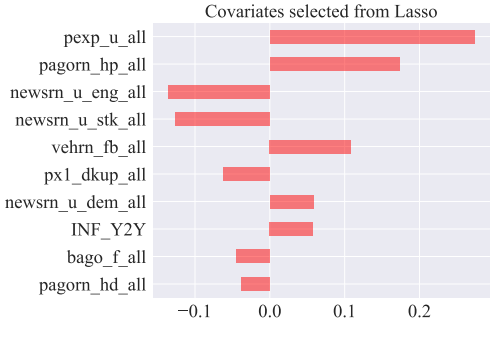




Back

The most important covariates of perceived unemployment risks





- UERate: real-time unemployment rate.
- Durrn_gt_all: good time to buy durables.
- Pexp_f_all: expecting better finance.
- Bus12_f_all: better business conditions.
- Px1_15p_all: expected inflation above 15 percent.
- Vehrn_gt_all: good time to buy vehicles.
- ptrd_bb_all: better off financially now and future.
- bago_s_all: same business conditions.
- Pagorn_hp_all: worse finance due to higher prices.
- Ptrd_ss_all: same personal finance now and future.

- Pexp_u_all: expecting worse personal finance.
- Newsrn_u_eng_all: heard unfavorable news about energy crisis.
- Newsrn_u_stk_all: heard about unfavorable news regarding stock market.
- Vehrn_fb_all: bad time to buy vehicles due to uncertain future.
- Px1_dkup_all: do not know about future inflation.
- Newsrn_u_dem_all: heard unfavorable news about lower consumer demand.
- INF_Y2Y: real-time inflation rate.
- Bago_f_all: better business conditions.
- Pagorn_hd_all: worse personal finance due to higher debt.

Heterogeneity in risks and perceptions (2013-2023)

$$\log(\widetilde{JF}_{t+3|t}) = 0.71 + \mathbf{0.81}\log(\widehat{JF}^{*}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JF}^{0.25}_{t+3|t}) = -5.73 + \mathbf{2.26}\log(\widehat{JF}^{*}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JF}^{0.5}_{t+3|t}) = -0.84 + \mathbf{1.22}\log(\widehat{JF}^{*}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JF}^{0.75}_{t+3|t}) = 2.66 + \mathbf{0.44}\log(\widehat{JF}^{*}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JS}_{t+3|t}) = 1.11 + \mathbf{0.14}\log(\widehat{JS}^{*}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JS}^{0.25}_{t+3|t}) = -0.91 + \mathbf{0.61}\log(\widehat{JS}^{*}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JS}^{0.5}_{t+3|t}) = 0.12 + \mathbf{0.34}\log(\widehat{JS}^{*}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JS}^{0.75}_{t+3|t}) = 1.40 + \mathbf{0.06}\log(\widehat{JS}^{*}_{t+3|t}) + \epsilon_t$$

Back

Observable heterogeneity: education

$$\log(\widetilde{JF}^{LEdu}_{t+3|t}) = 1.28 + \mathbf{0.66}\log(\widehat{JF}^{*LEdu}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JF}^{MEdu}_{t+3|t}) = 2.53 + \mathbf{0.36}\log(\widehat{JF}^{*MEdu}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JF}^{HEdu}_{t+3|t}) = 1.87 + \mathbf{0.53}\log(\widehat{JF}^{*HEdu}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JS}^{LEdu}_{t+3|t}) = 1.1 + \mathbf{0.17}\log(\widehat{JS}^{*LEdu}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JS}^{MEdu}_{t+3|t}) = 0.95 + \mathbf{0.35}\log(\widehat{JS}^{*MEdu}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JS}^{HEdu}_{t+3|t})) = 1.08 + \mathbf{0.33}\log(\widehat{JS}^{*HEdu}_{t+3|t}) + \epsilon_t$$

- Low-education group's perceptions, especially regarding job separations, are the most underreactive to "true" risks.

In-sample back

Observable heterogeneity: education (2013-2023)

$$\log(\widetilde{JF}^{LEdu}_{t+3|t}) = 0.05 + \mathbf{0.82}\log(\widehat{JF}^{*LEdu}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JF}^{MEdu}_{t+3|t}) = 0.12 + \mathbf{0.73}\log(\widehat{JF}^{*MEdu}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JF}^{HEdu}_{t+3|t}) = 0.19 + \mathbf{0.62}\log(\widehat{JF}^{*HEdu}_{t+3|t}) + \epsilon_t$$

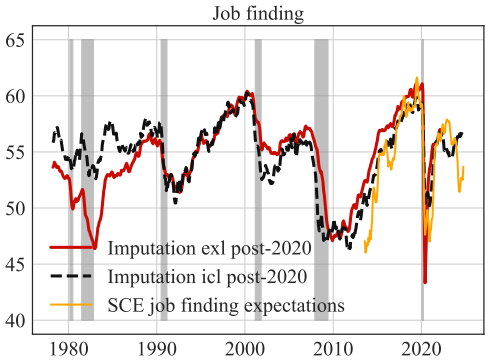
$$\log(\widetilde{JS}^{LEdu}_{t+3|t}) = 0.88 + \mathbf{0.25}\log(\widehat{JS}^{*LEdu}_{t+3|t}) + \epsilon_t$$

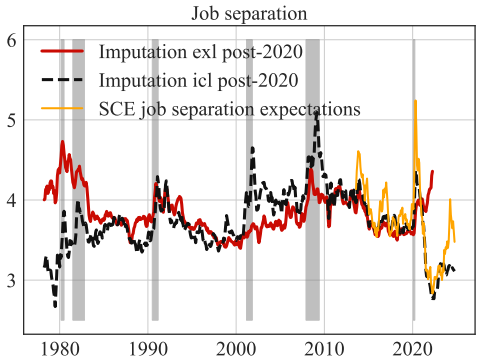
$$\log(\widetilde{JS}^{MEdu}_{t+3|t}) = 0.99 + \mathbf{0.24}\log(\widehat{JS}^{*MEdu}_{t+3|t}) + \epsilon_t$$

$$\log(\widetilde{JS}^{HEdu}_{t+3|t})) = 1.06 + \mathbf{0.22}\log(\widehat{JS}^{*HEdu}_{t+3|t}) + \epsilon_t$$

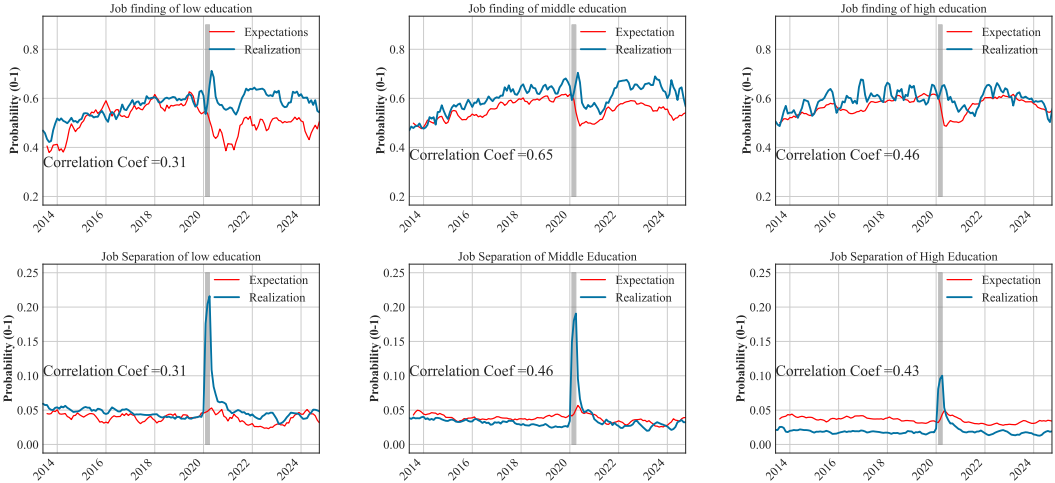
Back

Imputing beliefs including or excluding the Covid era



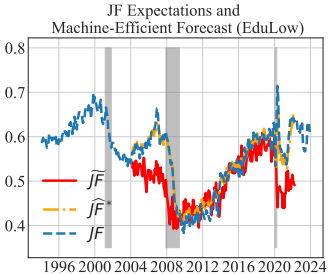


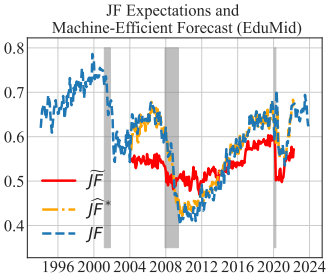
Observable heterogeneity: education

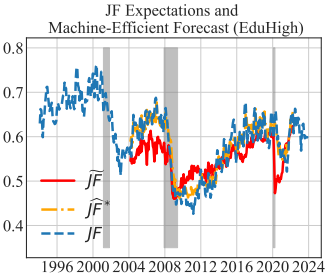


- low education group faces higher separation rate, but perceived separation risks did not go up as much

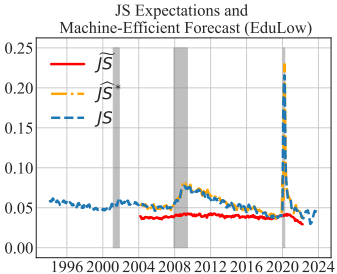
Belief distortions by education: job finding

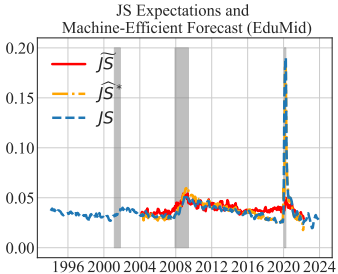


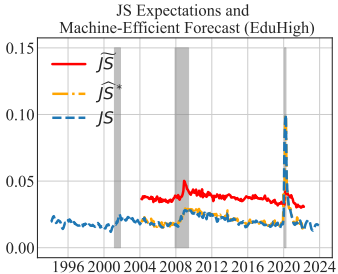




Belief distortions by education: job separation







Household block of the model

$$v_t\left(\mathbf{m}_{it}, e_{it}, n_{it}\right) = \max_{\{\mathbf{c}_{it}, \mathbf{a}_{it}\}} \left\{ U\left(\mathbf{c}_{it}\right) + \beta_i (1 - D) \mathrm{E}_{\mathrm{t}} \left[v_{t+1}\left(\mathbf{m}_{t+1}, e_{it+1}, n_{it+1}\right) \right] \right\}$$

$$\begin{aligned} s.t. \qquad \mathbf{a}_{it} &= \mathbf{m}_{it} - \mathbf{c}_{it} \\ \mathbf{a}_{it} + \mathbf{c}_{it} &= \mathbf{z}_{it} + (1 + r_t^a)\mathbf{a}_{it-1} \\ \mathbf{a}_{it} &\geq 0 \end{aligned}$$

Calibration

Description	Parameter	Value	Source/Target
CRRA	CRRA	2	Standard
Real Interest Rate	r	$1.05^{\frac{1}{12}} - 1$	5% annualized real rate
UI replacement rate	γ	0.5	50% replacement rate
Persistence of idiosyncratic income process	ρ_e	0.997	Kekre (2023)
Std Dev of idiosyncratic income process	σ_e	0.057	Kekre (2023)
Std Dev of Log Transitory Shock	σ_θ	0.244	Kekre (2023)
Steady state Job-Finding Rate	JF	0.25	CPS
Steady state Job-Separation Rate	JS	0.017	CPS
Discount Factor	β	0.988	Quarterly MPC $= 0.21$

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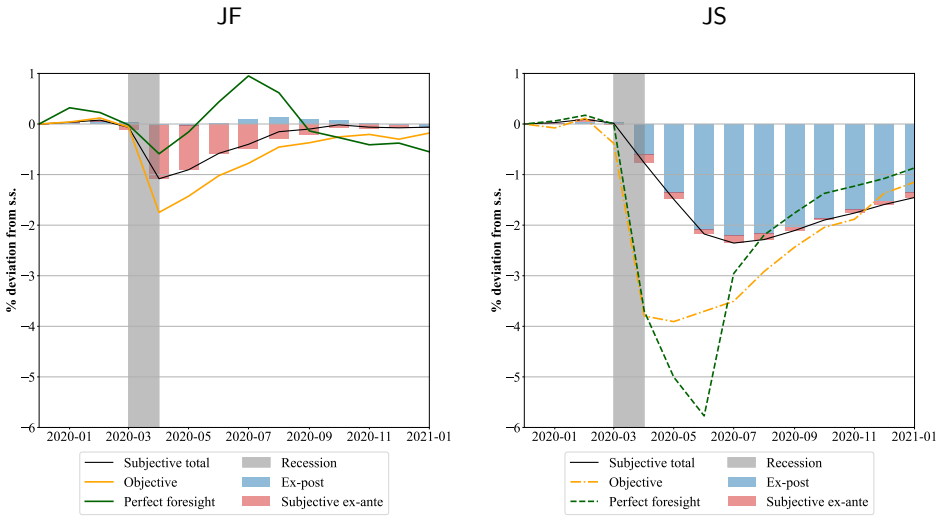
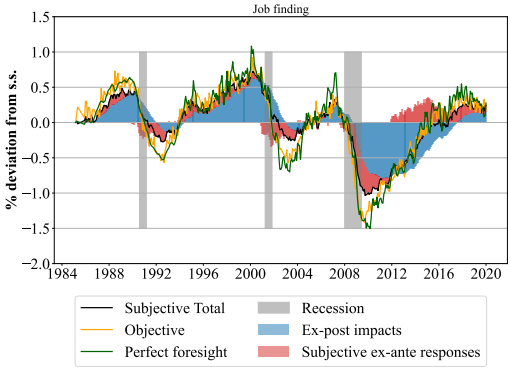
A case study of the COVID recession



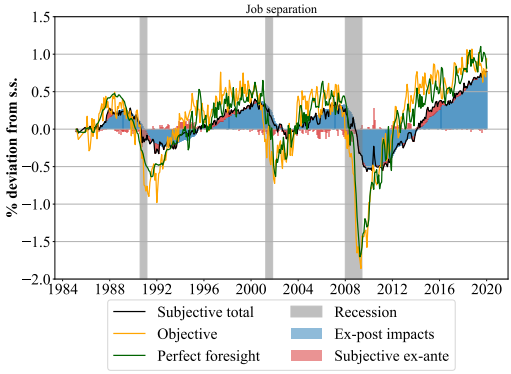
Shocks in Covid times

Job-finding versus job-separation

JF

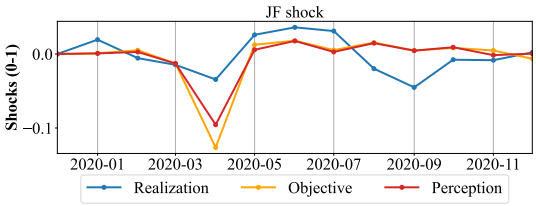


JS



Perception and realization shocks during COVID

JF



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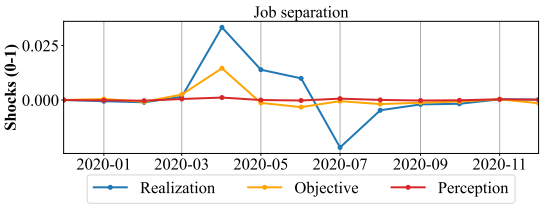

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