

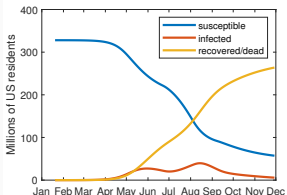
# Interest Rates and Rare, Disasterous Events

- What are the long-term effects of COVID-19?
  - for output?
  - for interest rates?
- Why would effects persist after disease is contained?  
Belief scarring, capital scarring (intertwined)
- Tail (extreme, adverse) events typically scar beliefs.
- Fear deters investment, makes riskless, liquid assets more desirable.
- Our goal: Quantify this “**scarring**” effect.

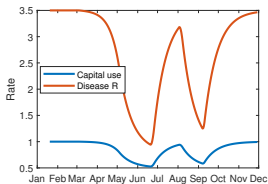
Our finding: **Belief scarring will depress output and investment substantially, and interest rates modestly, for decades to come.**

# Scenarios: Infections, Shutdowns and Beliefs

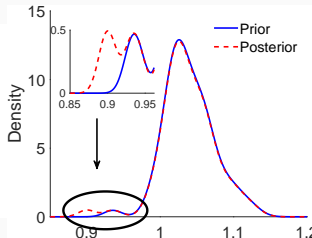
## Scenario 1: Aggressive



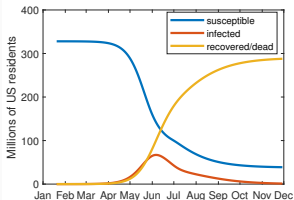
## Policy



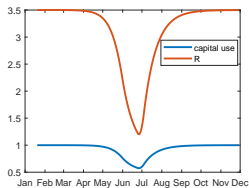
## Beliefs with $\tilde{\phi} = 0.9$



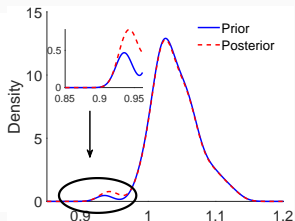
## Scenario 2: Lax



## Policy

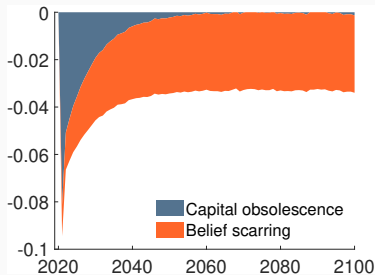


## Beliefs with $\tilde{\phi} = 0.95$

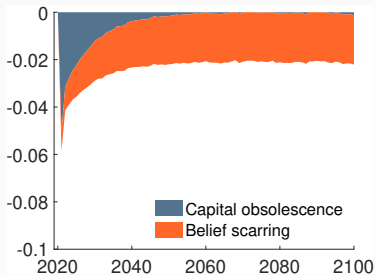


# Long-Run Output Losses

Scenario 1



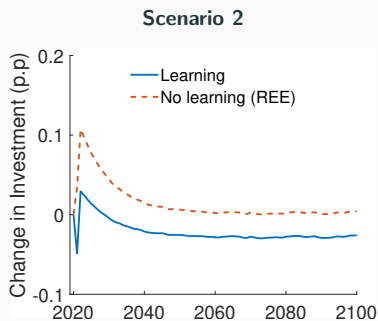
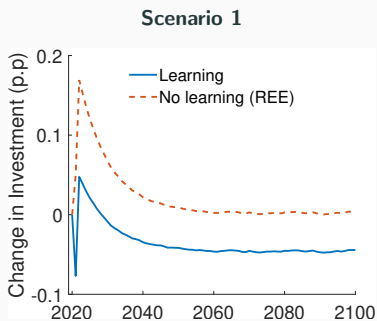
Scenario 2



	2020	Long-Term Costs		
	GDP loss	NPV in % of 2019 GDP		
		Belief Scarring	Obsolete Capital	Total
Scenario 1	-9%	-52%	-38%	-90%
Scenario 2	-6%	-33%	-24%	-57%

Total cost: 57-90% of a year's GDP. **Ten times larger than one-year cost.**

# Results: Average Future Investment



**Belief scarring deters risky investment.**  
Capital scarring alone is quickly repaired.

# The Future of the Risk Free Rate, $R^*$

Long-run predictions:

Modest financial changes (Scenario 1)

Credit Spreads (bps)	0.5
Equity / Assets	0.01

Option-Implied Skew

Third moment $R^e$	-1.21
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With Liquidity Friction

Risk free rate	-0.7%
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**Belief scarring makes liquid, safe assets valuable ( $R_f \downarrow 67$  bps).**

Scenario 1

