QE: What have we learned?

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What researchers and policymakers would like to know?

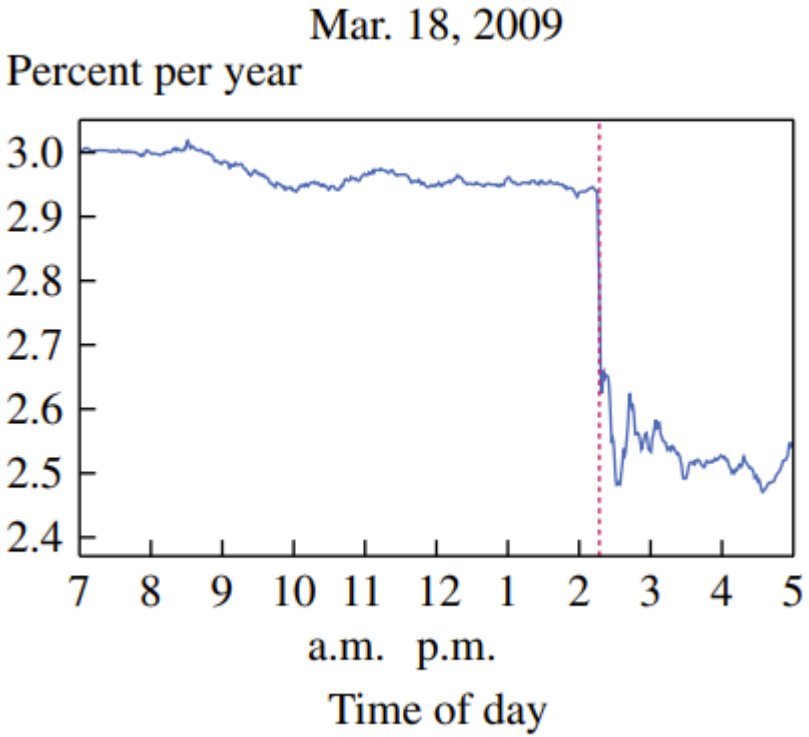
What is the impact of a given size of purchase/sale in a given asset market in a given economic state on the macroeconomy?

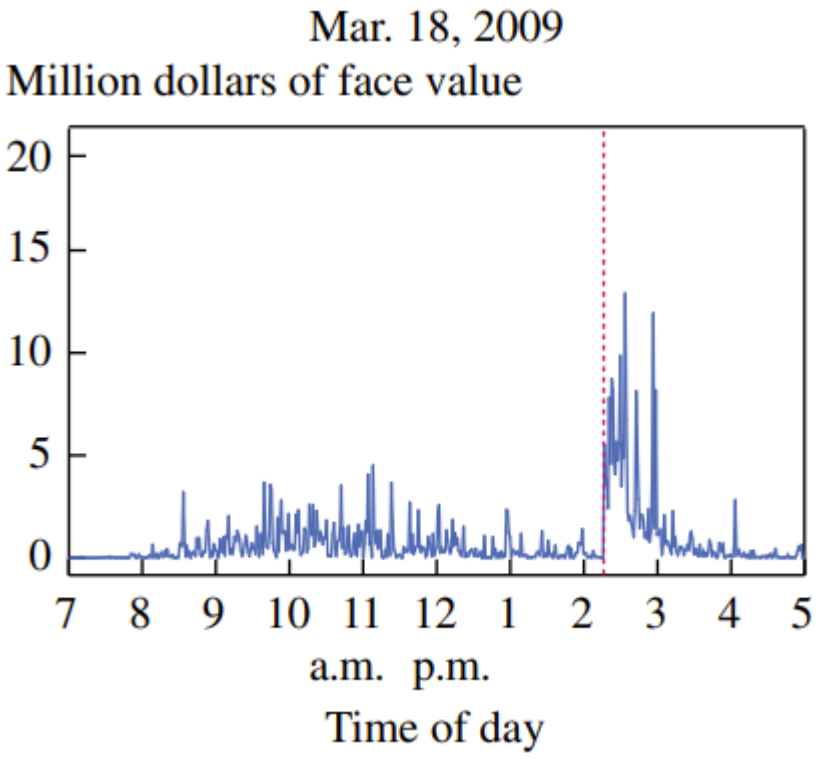
- What are impacts on output? Distributional consequences? International spillovers?
- Impact on inflation? Financial stability? Fiscal consequences?
- How do these impacts compare both in magnitude and extent to conventional monetary policy?

Outline

- Selective review of research findings
- What we know more about and what we know less about?
- Where does research go from here?

QE Event Studies





10 Year Treasury Yield (Left) and Trading Volume (Right)

Source: Krishnamurthy and Vissing-Jorgensen (2011)

Identification challenges

- Tight event windows ⇒ unlikely that economic news cause QE and asset market reaction

- Identification challenge is around the channel(s) for QE

- "Conventional" broad channels:
  - Signaling path of policy rate; signaling policy marker preferences
  - Signaling news about economy

- "Unconventional" narrow channels:
  - Impacts on liquidity premia (QE increases reserve balances)
  - Impacts on risk premia (duration, credit, mortgage…)
  - Impacts on safety/scarcity premia (QE changes supply of safe assets)

More on narrow channels

1. Impacts on safety/scarcity premia (QE changes supply of safe assets)

   - In the context of sovereign debt (U.S. Treasury, Bund, Gilt): Investors have mandates/special demands for safe bonds, sometimes of specific maturities

   - In the context of mortgage-backed securities: mortgage-specific funds have mandates to invest in the MBS market, track MBS index, etc.

2. Impacts on risk premia (duration, credit, mortgage…)

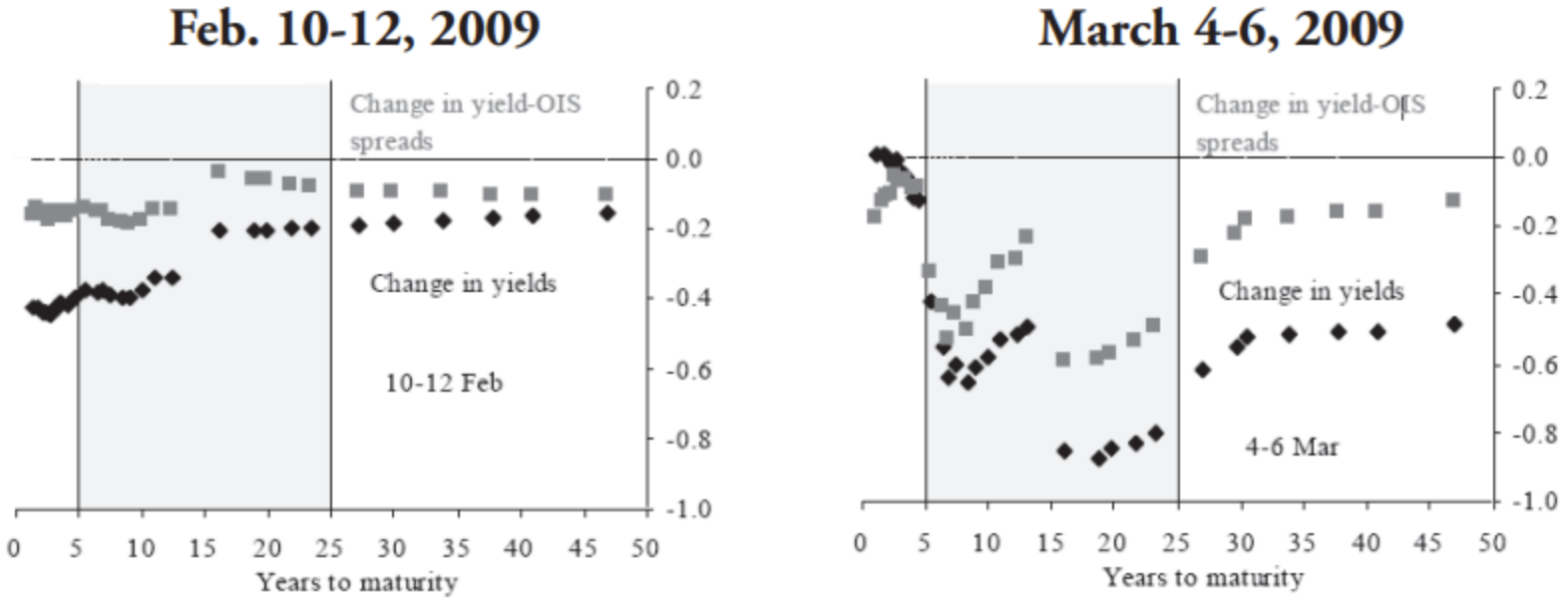
   - Investor SDF for a given risk is a function of the quantity of risk held by investor
   - For example,

$$\lambda^{risk} \propto \gamma\sigma_W, \qquad where, \qquad \sigma_w = f(quantity\ of\ risk)$$

   - The "how narrow" question: what else does this SDF price?

Difference-in-Difference (OIS vs. Gilt yield)

Yield Changes by Maturity from U.K. QE for U.K. Gilts and Gilt-OIS Spreads (percent)



Source: Joyce, Lasaosa, Stevens and Tong (2011)

More “narrow” channel evidence

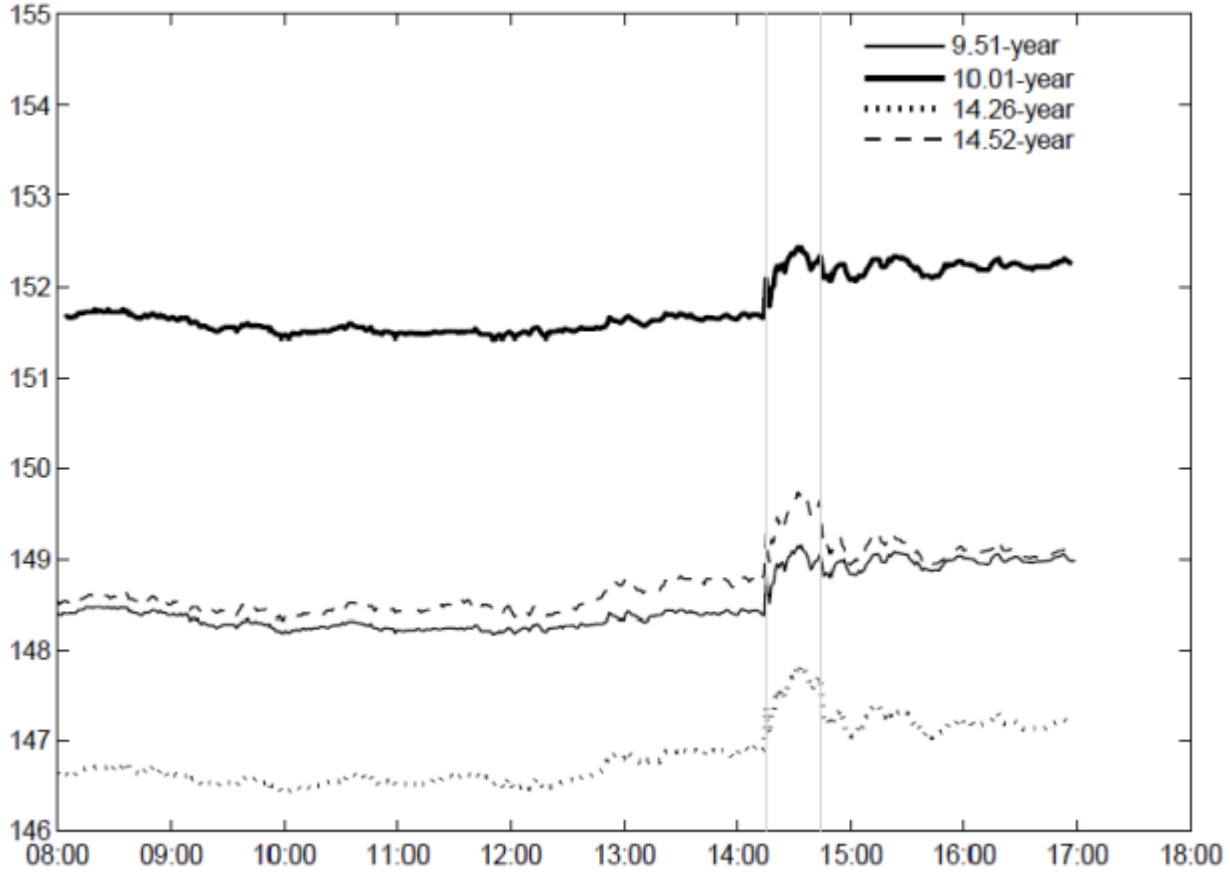


Figure 3: CUSIP-level intraday prices on August 10, 2010:

Source: D’Amico, English, Lopez-Salido and Nelson (2012)

Many more [unconventional] narrow-channel studies

- Krishnamurthy and Vissing-Jorgensen (2011, 2013): MBS purchases moved MBS yields on current-coupon MBS particularly; and moved affected primary mortgage rates and loan originations (Di Maggio, Kermani, and Palmer, 2015)

- Eser and Schwab (2016): SMP announcements by ECB lowered particularly the target countries' sovereign yields during stress periods
  - Altavilla, Giannone and Lenza (2014): OMT announcements by ECB particularly compressed spreads of GIPS sovereigns to bunds
  - Similar evidence in Nagel, Krishnamurthy, and Vissing-Jorgensen (2018)

- Grosse-Rueschkamp, Steffen, and Streitz (2019), Todorov (2020): ECB CSPP lowered eligible bond yields

- Haddad, Muir and Moreira (2020): Fed IG Corporate bond purchase program and IG yields
  - Similar results in Gilchrist, Wei, Xu, Zakrajsek (2020) for corporate bonds and Moussawi (2022) for municipal bonds

MBS quantity evidence from DiMaggio, Kermani and Palmer (2015)

- If it is narrow channel mechanism, then MBS purchases should particularly spur conforming (not jumbo) mortgage originations, because Fed purchased conforming

TABLE 3

Effect of QE commencement on log refinance origination volumes by QE program

	(1)	(2)	(3)	(4)	(5)
Program	QE1	QE2	MEP	QE3	Tapering
Panel I. Without controls					
Program indicator	1.019***	0.597***	0.544***	0.122	−0.346**
	(0.279)	(0.164)	(0.075)	(0.080)	(0.139)
Jumbo indicator	−2.138***	−2.169***	−1.757***	−1.543***	−1.435***
	(0.156)	(0.188)	(0.116)	(0.098)	(0.036)
Program × Jumbo	−0.831**	0.067	−0.057	0.060	0.416**
	(0.289)	(0.208)	(0.143)	(0.114)	(0.146)
Observations	492	492	492	492	492
R-squared	0.637	0.560	0.466	0.355	0.292

Rodnyansky and Darmouni (2017): MBS QE and bank lending

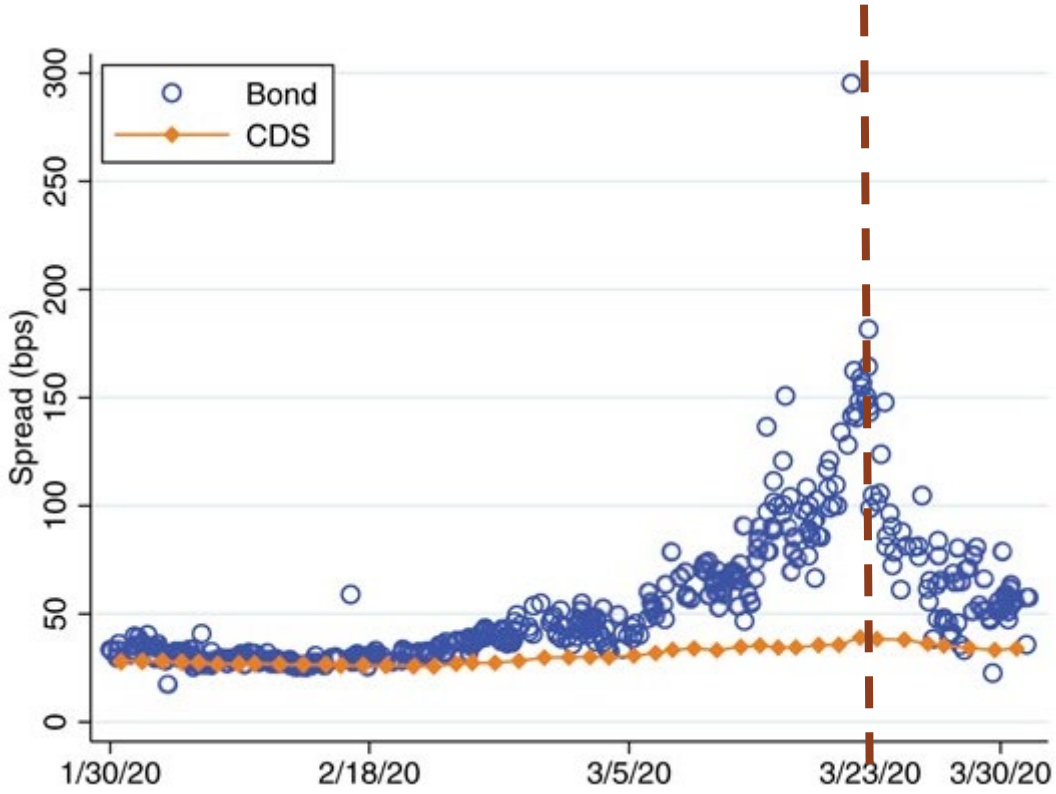
- If it is narrow channel, then MBS not Treasury purchases should drive lending
- Banks hold different amounts of MBS and Treasuries in 2008Q1 (pre-QE)

Table 6
Pooled QE regression

	$\log(Lending_{it})$		$\log(RE\ Lending_{it})$		$\log(CI\ Lending_{it})$	
	(1)	(2)	(3)	(4)	(5)	(6)
$Treat_{M,i} \cdot QE1_t$	0.034***		0.047***		0.004	
	[0.008]		[0.009]		[0.028]	
$Treat_{T,i} \cdot QE2_t$	0.028		−0.008		0.034	
	[0.018]		[0.014]		[0.037]	
$Treat_{M,i} \cdot QE3_t$	0.017**		0.021**		0.011	
	[0.008]		[0.010]		[0.039]	

- Spillovers to real estate lending, but less (none?) to C&I Lending

QE in distressed states of the world



Google Bond Yield and CDS;
Fed Bond Purchase Program Announced 3/23

Source: Haddad, Muir and Moreira (2020)

Asset Pricing Theory with Narrow Channels

- Any theory of QE must depart from a complete markets model and go towards segmented markets
  1. QE effects are “narrow” not “broad” --- they do not change the rep agent’s SDF. Instead, they must be changing the SDF of significant investors in the narrow market
  2. Macro-calibration of rep agent SDF will get a demand curve that is too elastic to be consistent with data

- Research needs to model the demand curves in the narrow market, and map out what “narrow” means

Vayanos and Vila (2021)

- Model of the Treasury market yield curve delivering risk premia that are a function of supply

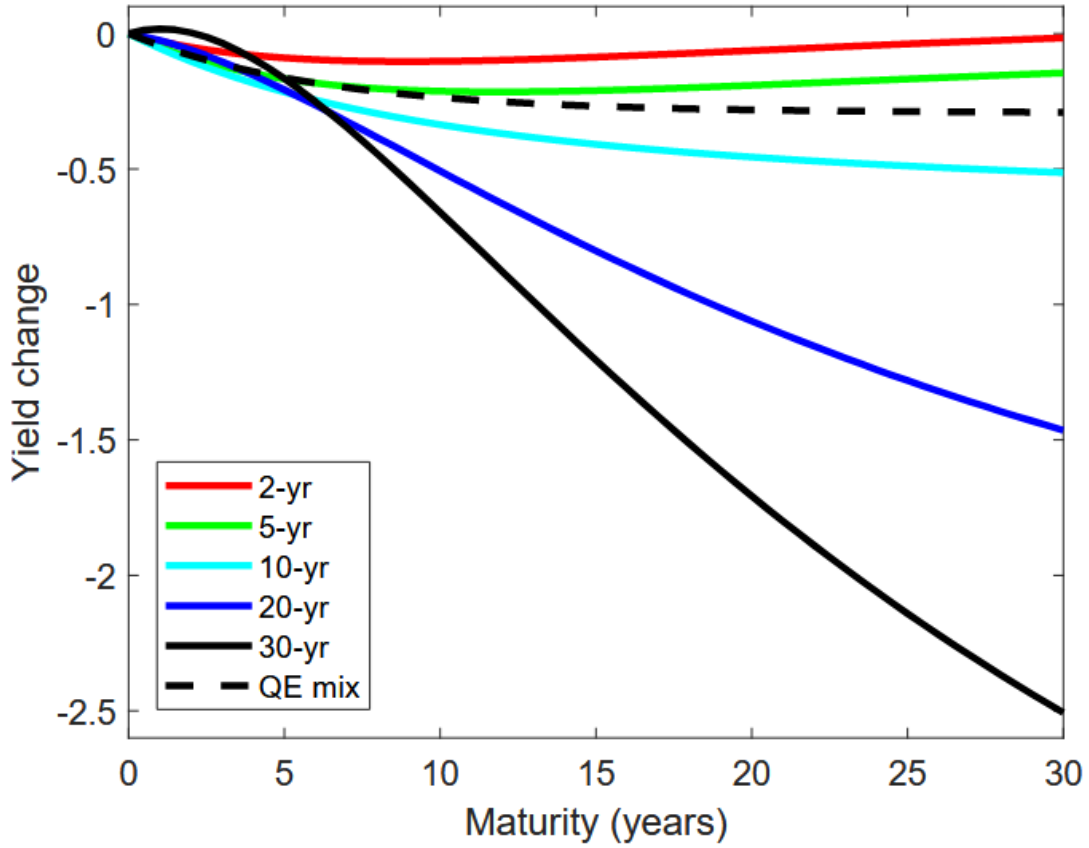
- Players:
  - Preferred habitat investors (pension funds, insurance companies, bond mutual funds)
  - Yield curve arbitrageurs (hedge funds, bond dealers/bond trading desks)

- Arbitrageurs integrate the yield curve, demanding risk premia as compensation for interest rate shocks and future supply shocks:

$$\lambda^{risk} \propto \gamma \sigma_W, \qquad where, \qquad \sigma_w = f(quantity\ of\ risk)$$

- Risk premium on interest rate shocks give a way of thinking about a duration risk premium
  - If arbitrageur risk aversion is high (e.g., balance sheet constraints) then risk premia are higher, and QE has a bigger impact
  - Duration local effects come from risk premia to future supply shocks

Vayanos and Vila (2021): Model output



Effect on Treasury yield curve of announcement of purchase of $X of given maturity bond

Duration Risk Premium and Spillovers

- Treasury yield also affected by safe asset demand effects.
  - If 10-year preferred habitat investors (e.g., insurance company demanding 10 year safe bonds) increase their demand for 10-year bonds … the 10-year yield will fall.

- What is a pure duration risk-premium effect?
  - Look at yield change on an asset not demanded by safe asset investors, but has duration risk, which the arbitrageur also prices
  - E.g., non-investment grade corporate debt?

- And this is related to spillovers: what else does the arbitrageur pricing kernel price?

$$\lambda^{risk} \propto \gamma \sigma_W, \qquad where, \qquad \sigma_w = f(quantity\ of\ risk)$$

“Narrow” analysis from non-QE asset pricing research

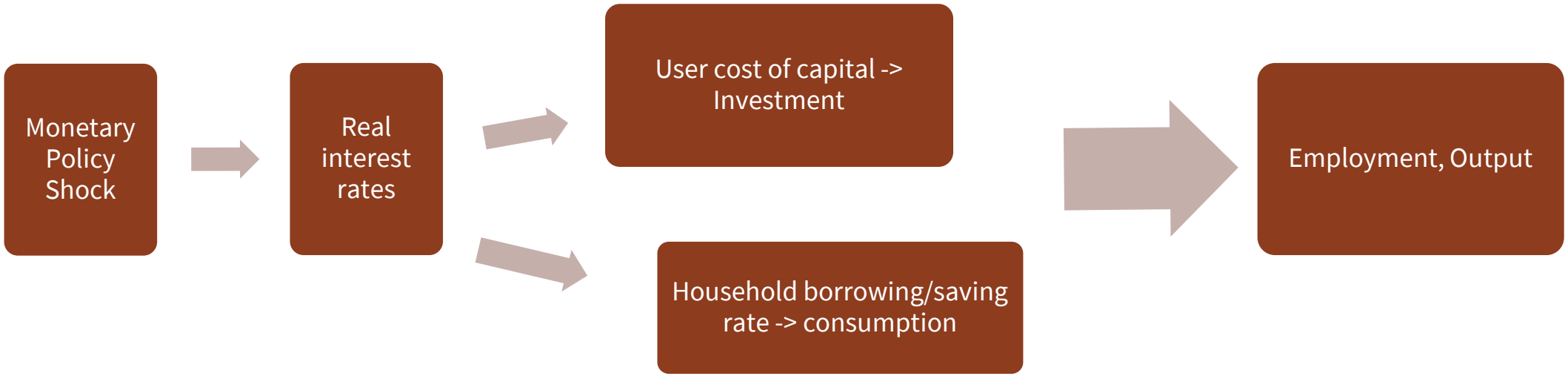
- We can learn from understanding the impact of (---) buying 10-year bonds, where (---) doesn’t have to be Fed

- Intermediary SDF, market segmentation, specialized demands
  - Intermediary asset pricing (He and Krishnamurthy, 2013)
  - Koijen and Yogo (2019) for equities
  - Bretscher, Schmid, Sen and Sharma (2022) for corporate bonds

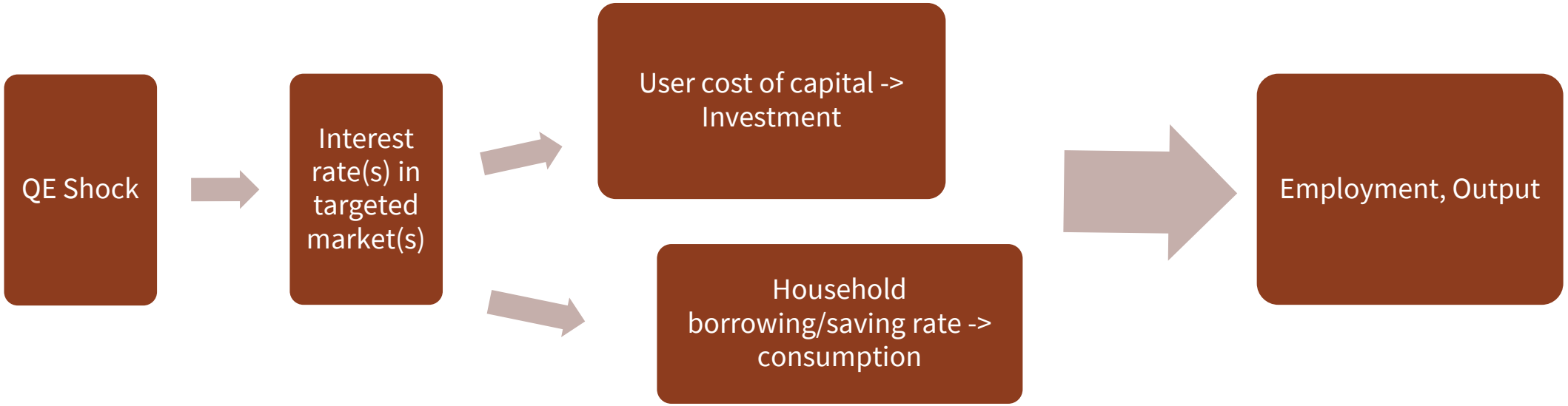
Macro effects, conventional

Conventional monetary policy research has pursed VARs with *identified* monetary policy shocks

Here is a modeling way of understanding the steps in any identified mechanism



Macro effects of QE



User cost of capital and firm investment

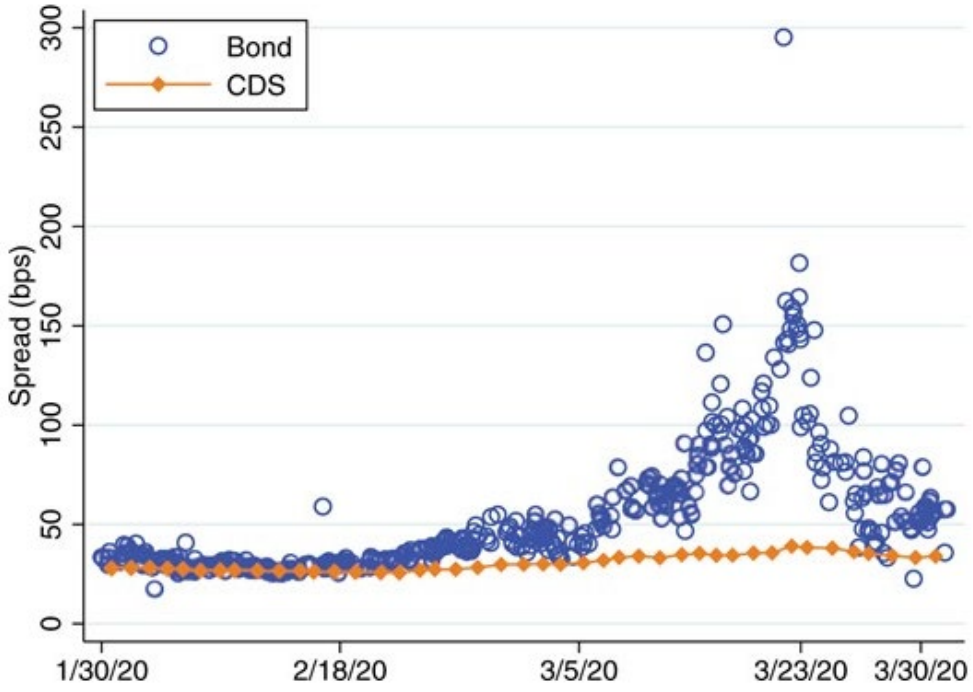
- Corporate expenditures will only respond to QE if QE affects the user cost of capital on the marginal unit of capital

- Suppose Google had two sources of capital
  - Cash (it has a lot…)
  - Corporate bond market

- The marginal source of capital is almost surely cash, where the user cost of capital is the nominal interest rate

- Corporate bond QE should be expected to have no effects on Google investment

- Evidence for the "no effect": Acharya and Steffen (2020), Darmouni and Siani (2022)



Google Bond Yield and CDS;
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Bonds, Loans and QE

- Take a firm with 5-year bonds and 5-year bank loans only
- Suppose suppliers of capital increase required returns
  - But bond investors more so than banks
- Since the firm will tap the lower cost source of capital at the margin
- *QE should target the financing with the lower yield (less fire-sold)*
  - That is, bank loans

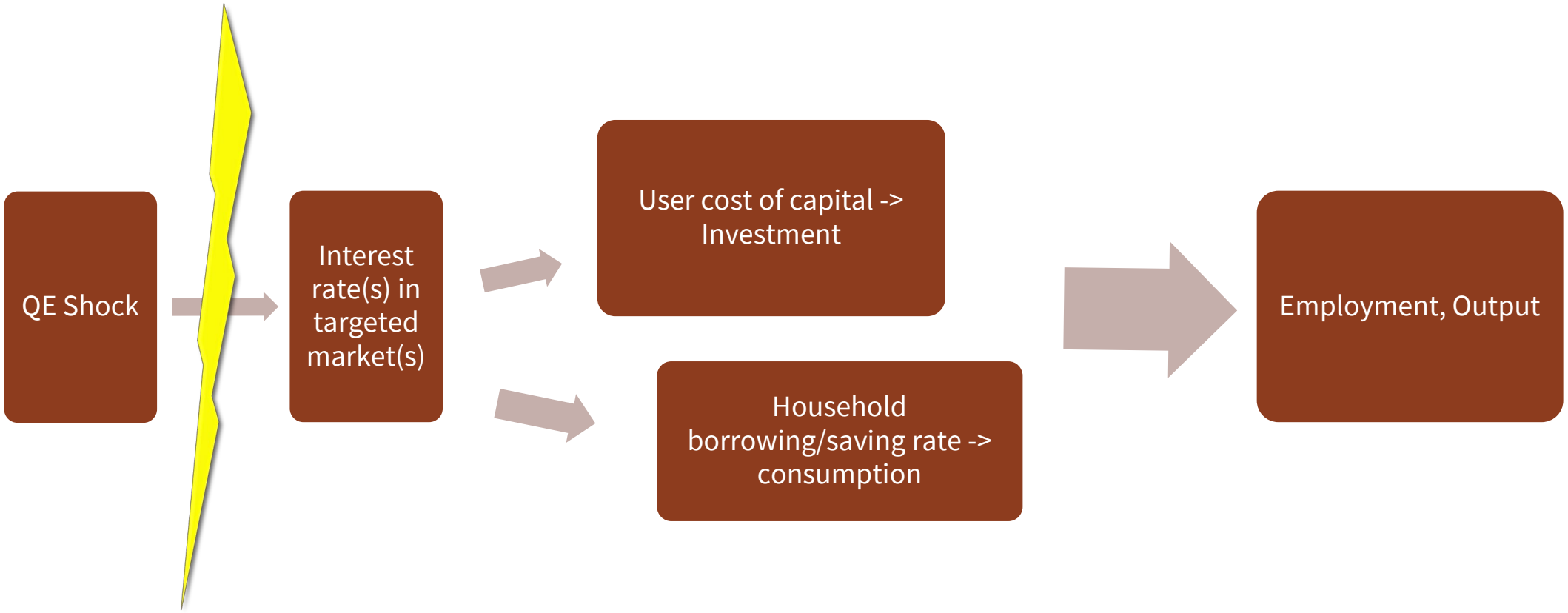
QE and corporate finance

- Evidence for a pure cash hoarding effect from Fed 2020 COVID intervention in Acharya and Steffen (2020), Darmouni and Siani (2022)

- Grosse-Rueschkamp, Steffen, and Streitz (2019):
  - CSPP lowered bond yields, but had limited impact on treated firms' investment

  - But banks that were more exposed to treated firms increased lending to other firms; a spillover through a bank lending channel

Macro effects via intermediation SDF



$$\lambda^{risk} \propto \gamma \sigma_W, \qquad where, \qquad \sigma_w = f(quantity\ of\ risk)$$

Intermediation Channel

- Suppose instead that we considered a financial intermediation channel
  - The macro analog of He and Krishnamurthy (2013) and Vayanos and Vila (2021)
  - The SDF of these intermediaries prices both the narrow assets as well as related credit assets such as loans
  - Macro financial intermediation models (Gertler and Kiyotaki, 2010, Gertler and Karadi, 2011, Brunnermeier and Sannikov, 2014, He and Krishnamurthy, 2019, Papousi, Piazzesi and Schneider, 2021) build on this observation

1. *In this model, QE should purchase the low-price ("fire-sold") assets, to shore up the balance sheet of the intermediary, lowering risk prices and increasing lending*
2. *In this model, QE is particularly effective when constraints on financial intermediation is tight (e.g., distressed periods)*

Further modeling?

- Suppose we mix corporate finance and intermediation:
  - Buy the expensive bonds in normal times and the cheapest bonds in distressed times?

- Modeling details matter for thinking about spillovers. Why did MBS purchases matter more than Treasury purchases? Why did real estate lending react more strongly than C&I lending?
  - There is ample room for more modeling work to interface with data patterns.

Policy implications

- We are far from a compelling macro-finance model to study QE
  - Comparisons of conventional to unconventional within a single model is premature

- Research is still in the insights stage

1. The asset market targeted matters for transmission and design of optimal policy. It is more subtle than buy stuff … good things happen

2. Crisis interventions are more powerful than non-crisis interventions

3. Communication matters

Communication and QT

- Financial markets infer reaction functions ("Taylor rules") over QE and conventional policy from QE actions and QE announcements
  - Is there a Fed "put"? What is the strike?
  - Is the put for QE and/or conventional policy?
- In an environment where there is uncertainty over the reaction function, signal effects will be very strong
  - We saw this in 2013 with the taper tantrum
  - Likely important in today's environment

Taking stock and a wishlist for research

1. Empirical evidence on the impact of asset purchases on asset prices
   - ➢ Many compelling studies. We have a pretty clear idea of the relevant channels

2. Asset pricing models that fit this evidence
   - ➢ Coherent models exist, but room for more work

3. Evidence on some of the macro consequences
   - ➢ Less compelling than the asset pricing work

4. Positive macro models of transmission mechanism
   - ➢ Many papers, but the weakest area of QE research thus far

5. Normative analyses to guide optimal policy and policy communication
   - ➢ Less work, and even less in the way of a compelling framework