Risk news shocks and the business cycle

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What we do

- Consider shocks to ‘risk’, and corresponding ‘news’
- =changes in variance of cross-section of returns, revelation about future changes
- Identify a risk news shock in US data [SW+3 financial series]
- ...Using a modification of Barsky-Sims’ method (which they used to identify news in future tfp)
- Document contribution of risk+risk news shock to the business cycle
- Fit a DSGE model with credit frictions [SW+BGG] to the IRFs from the VAR

What we find

- Risk+risk news contribute about 20% to fluctuations in output in post WW2 US data
- Contrast with CMR (2013,AER(f)): 60%
- Risk news shocks had small effect on spreads during crisis, but sizeable effects on output
- DSGE model can get near (shape of) IRFs to risk news shock IF we modify it to have rule of thumb consumers as in (eg) GLS (2004)
- Weak DSGE propagation means need larger shocks than in data

Risk/risk news shock

- In a DSGE (Eg SW+BGG, similar to CMR) model
- Entrepreneurs borrow from banks, build capital, get hit by idiosyncratic shock, leading to variance in the amount of effective capital sold on to producers of intermediate goods
- Risk shock is a shock to this variance
- Risk *news* is revelation today about *future* values of this variance

Examples of risk news shocks

- Announcement of invention of new technology e.g. mobile phones, internet, whose diffusion and effect will be uncertain
- Release of information about possible climate change
- CMR example: Steve Jobs
  - Successes and failures indicate a distribution
  - Revelation that his health was bad was news about future distribution of returns (being wider, as well as lower?)

Why is the risk news shock interesting?

- Anecdotal: changes in risk and perceptions of risk a central feature of the crisis according to market participants and policymakers
- Facts: prices of risky assets changed a lot during the crisis.

Previous work: news

- Beaudry-Portier (2006)
  - VAR identified using lr res.; tfp mostly news, news explains ½ variance in output; +'ve comovement between c,i,h, contrary to RBC
- Jaimovich and Rebello (2006)
  - Modify RBC by using GHH preferences to turn off wealth effect, reconciling effects of news shock
- Barsky-Sims (2009)
- SGU(2012)
  - RBC + real rigidities, with many news shocks
  - 80% of business cycle var due to tfp

Previous work: financial/risk shocks

- BGG(1999), KM(1997); financial frictions only weakly propagate conventional (eg technology) shocks
- Finance can't therefore explain business cycles
- CMR's(2013) 'risk shock' one of many, including: CMR(2008), Nolan-Thoenissen(2009), Gertler-Karadi(2011), Fuentes-Albero(2012)

We are not considering a*ggregate* uncertainty shocks

- Bloom (2009), Bloom *et al* (2012)
- Baker, Bloom and Davis (?) [economic policy]
- Bekaert *et al* (2012)
- Fernandez-Villaverde *et al* (2011) [fiscal]
- Born and Pfeifer (2011) [fiscal]

Barsky-Sims (2009)

- Construct tfp series from Solow residuals
- News shock to tfp:
  - Orthogonal to tfp_t, contributes maximally to forecast errors up to and including tfp_t+h
- Our paper: take proxy for uncertainty based on options prices and standard deviation of stock returns
  - Risk news shock is orthogonal to risk_t
  - Contributes maximally to risk_t+h
  - Satisfies certain sign restrictions

Sign restrictions recap

Var(1): $Y_t = AY_{t-1} + \varepsilon_t, E(\varepsilon_t \varepsilon_t') = \Sigma_\varepsilon$

Cholesky factorisation of VAR residuals: $\Sigma_\varepsilon = PP'$

Decompose further: $\Sigma_\varepsilon = PDD'P'$

where $D = D(\omega), s.t. DD' = I$

Take Givens matrix, e.g. $D_2(\omega) = \begin{bmatrix} \cos(\omega) & -\sin(\omega) \\ \sin(\omega) & \cos(\omega) \end{bmatrix}$

1. draw ω
2. keep if $sign(PDA) = R$
3. goto 1

Combining Barsky-Sims with sign restrictions

1. Rotate only a sub-matrix, to preserve that surprise risk shock only thing that moves today's risk proxy

$$D^*(\omega) = \begin{bmatrix} 1 & 0 \\ 0 & D_9(\omega) \end{bmatrix}$$

2. Once have sufficient draws, amongst those accepted....

$$\max_{\omega} \left[\Omega_{i,j}(h) = \frac{e_i' \left(\sum_{\tau=0}^{h} A_\tau P D(\omega) e_j e_j' D(\omega)' P' A_\tau' \right) e_i}{e_i' \left(\sum_{\tau=0}^{h} A_\tau \sum_{\varepsilon} A_\tau' \right) e_i} \right]$$

The sign restrictions encoded in our '*R*'

	t		
VAR	Supply	Demand	Policy
Uncertainty	0	0	0
Spread		+	
GDP-Growth	+	-	-
Consumption-Growth			
Investment-Growth		-	-
Hours			
Wages-Growth			
Inflation	-		-
Policy-Rate	-	-	+
Net-Worth	+	-	-

Estimation of VAR

- Bayesian VAR [not just in respect of sign restrictions..]
- Eliminates oscillatory impulse responses
- Priors:
  - Centred on zero for off diagonals (Minnesota)
  - Tighter for more distant lags
  - Conjugate priors chosen to produce analytical solutions for the posterior
  - See, e.g. Doan *et al* (1984)/Kaddiyala and Karlsson (1997)

Data

- Updated [55-2010] Smets-Wouters (2007) : C, I, Y, w/p, h, pi, r
- Plus:
  - Uncertainty proxy: VXO (Bloom,2009)
  - net worth(CMR): Dow Jones Wilshire 5000 index deflated by GDP deflator
  - Spread: BAA-AAA

Figure 7: Forecast Variance Decomposition: VIX

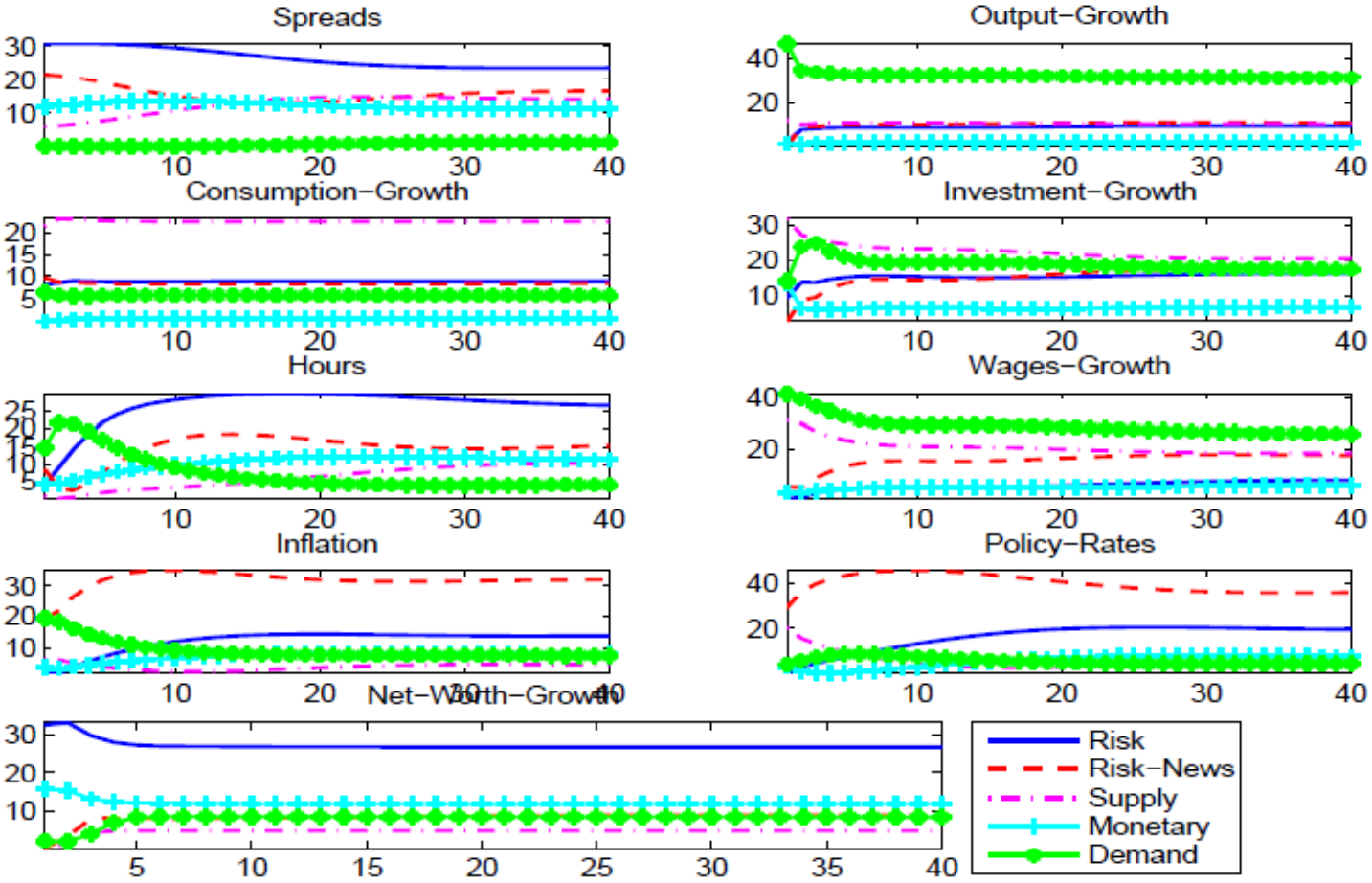


Figure 6: Historical Decomposition Between $2007Q1 - 2010Q2$

Crisis chart: key points

- Shocks that have small effect on spreads have sizeable effects on consumption, investment, inflation....
- Not large effects on output, suggesting that perhaps eg fiscal policy compensating

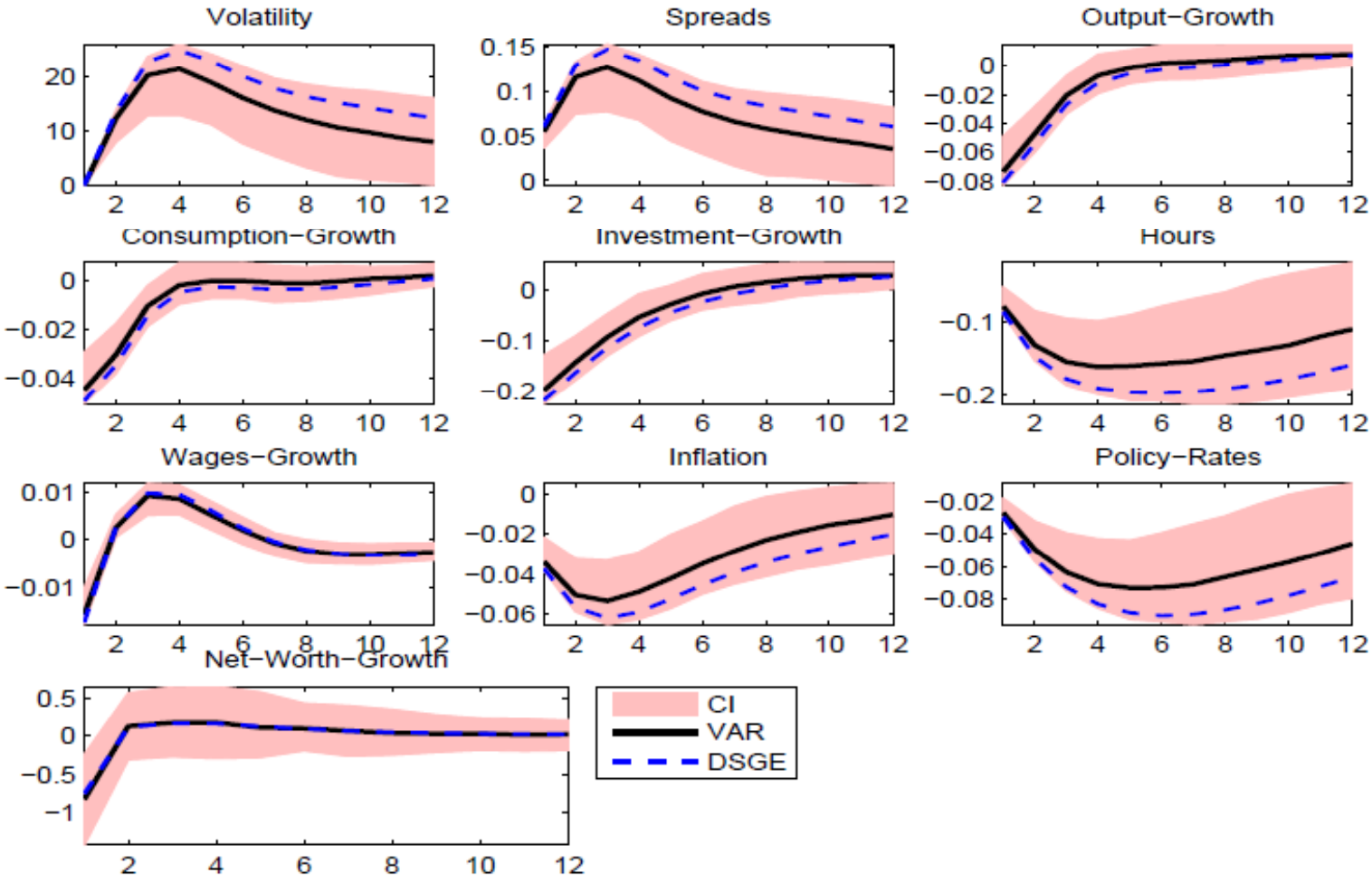
Some supportive evidence

- Monte Carlo
- Alternative risk proxy
- Alternative h’s
- Sense check on the VAR IRFs

Monte Carlo evidence

- Barsky-Sims conducted Monte Carlo experiment in an RBC laboratory
- We follow suit using a DSGE (SW+BGG) model with a risk news shock
- Generate 1000 datasets of 200 obs
- Ask whether the VAR identification applied to the DSGE-generated data recovers the IRF computed directly from the DSGE model

Figure 12: Monte Carlo Simulations



Alternative risk proxy

- Risk proxy may be flawed: measured with error or capturing instead simply volatility of an aggregate shock, not idiosyncratic shock.
- So do results survive use of other proxies?

Stock option-based, uncertainty proxy

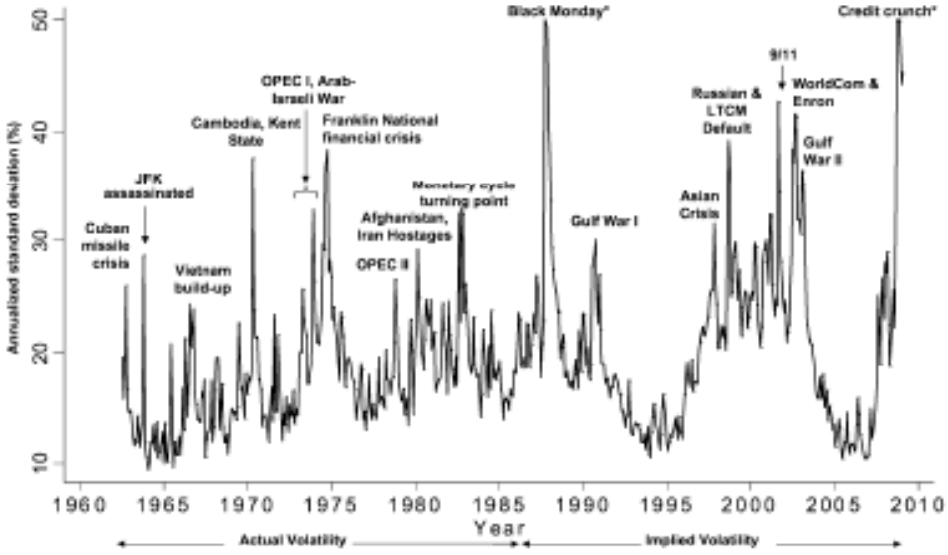
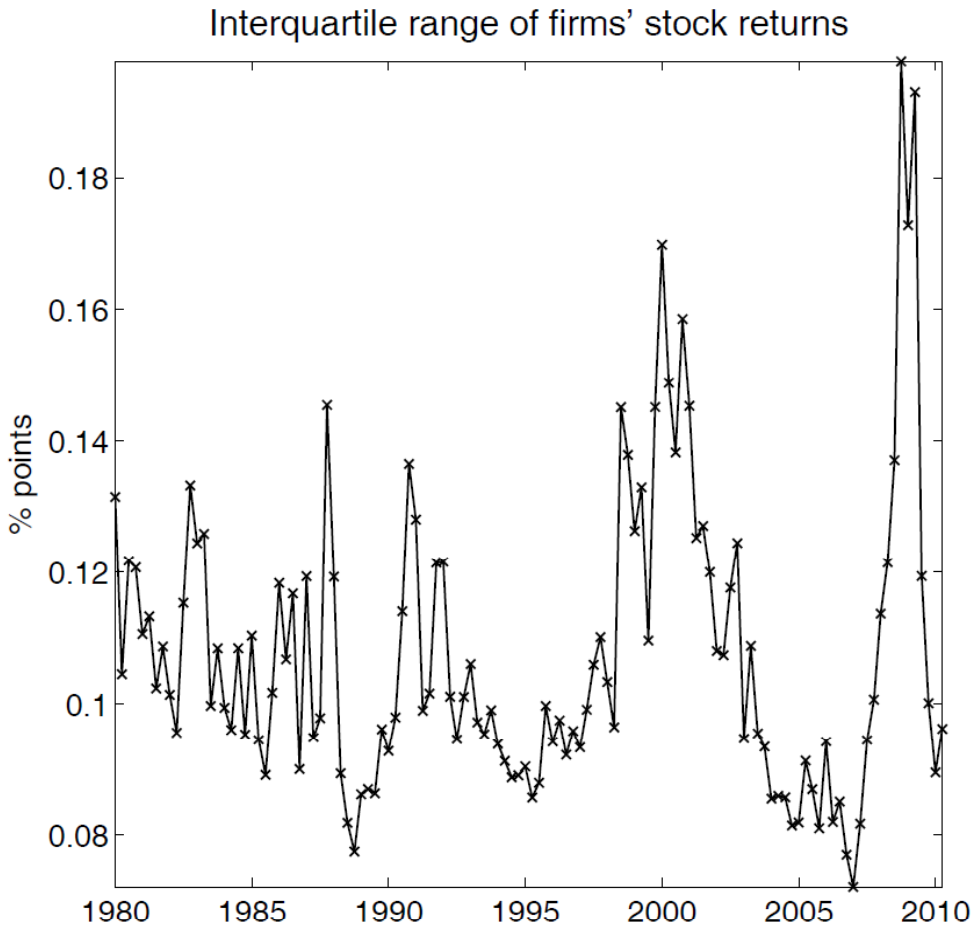


FIGURE 1.—Monthly U.S. stock market volatility. *Notes*: Chicago Board of Options Exchange VXO index of percentage implied volatility, on a hypothetical at the money S&P100 option 30 days to expiration, from 1986 onward. Pre-1986 the VXO index is unavailable, so actual monthly returns volatilities are calculated as the monthly standard deviation of the daily S&P500 index normalized to the same mean and variance as the VXO index when they overlap from 1986 onward. Actual and VXO are correlated at 0.874 over this period. A brief description of the nature and exact timing of every shock is contained in Appendix A. The asterisks indicate that for scaling purposes the monthly VXO was capped at 50. Uncapped values for the Black Monday peak are 58.2 and for the credit crunch peak are 64.4. LTCM is Long Term Capital Management.

Source: Bloom (2009)

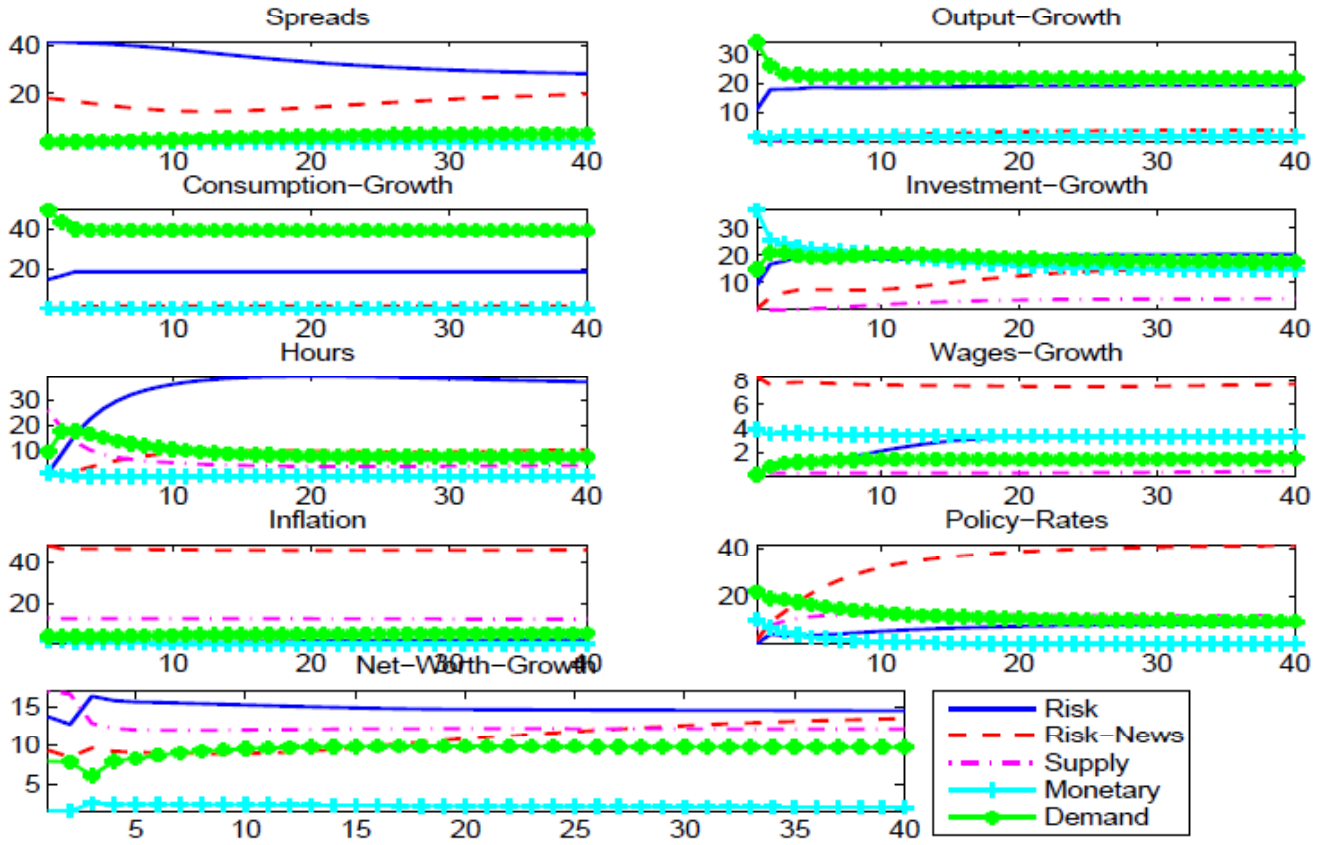
Alternative measure of cross-sectional uncertainty



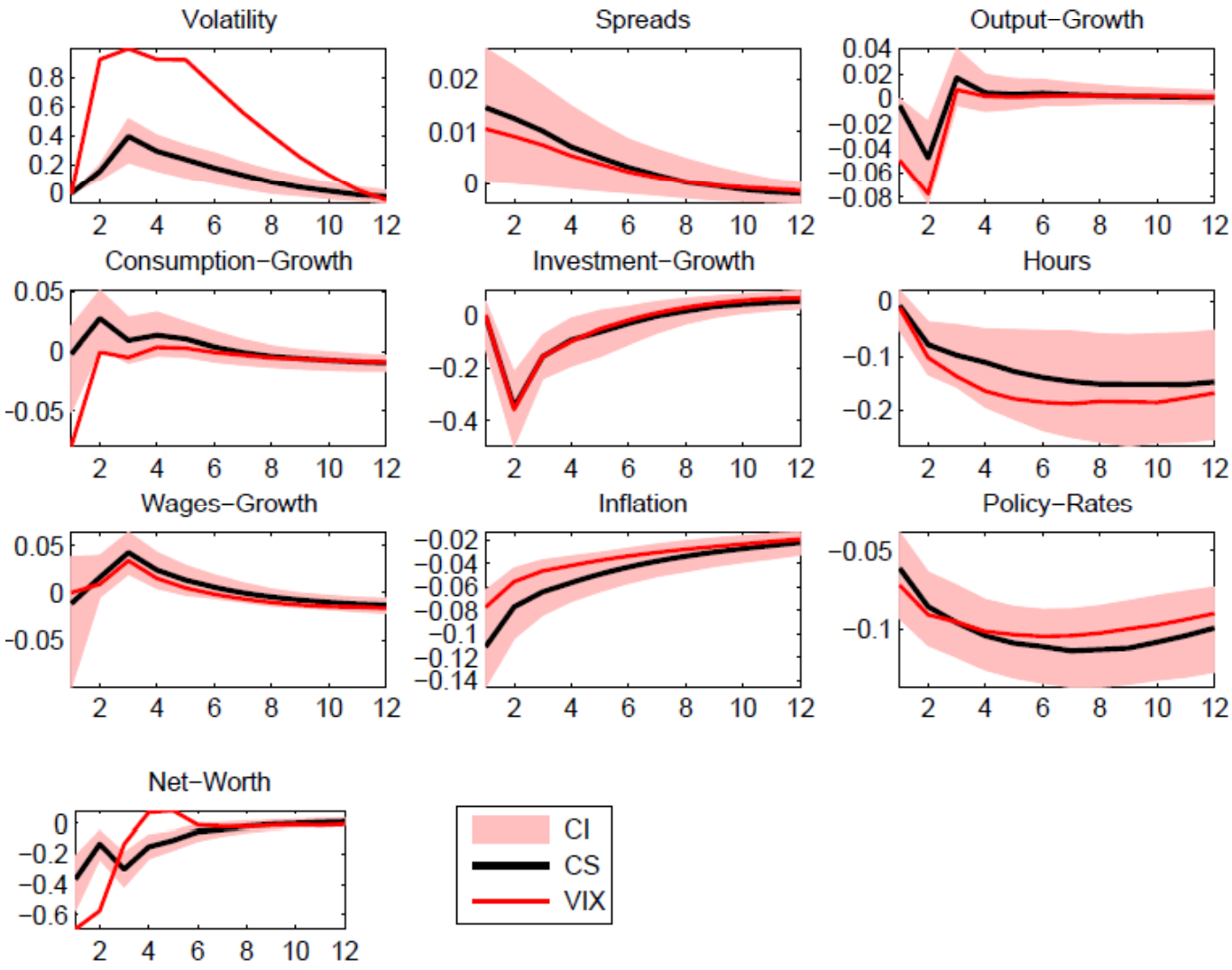
Source: Bloom

FEVD for cross section measure

Figure 9: Forecast Variance Decomposition: Cross-Section



IRF to a risk news shock: VIX vs CSR

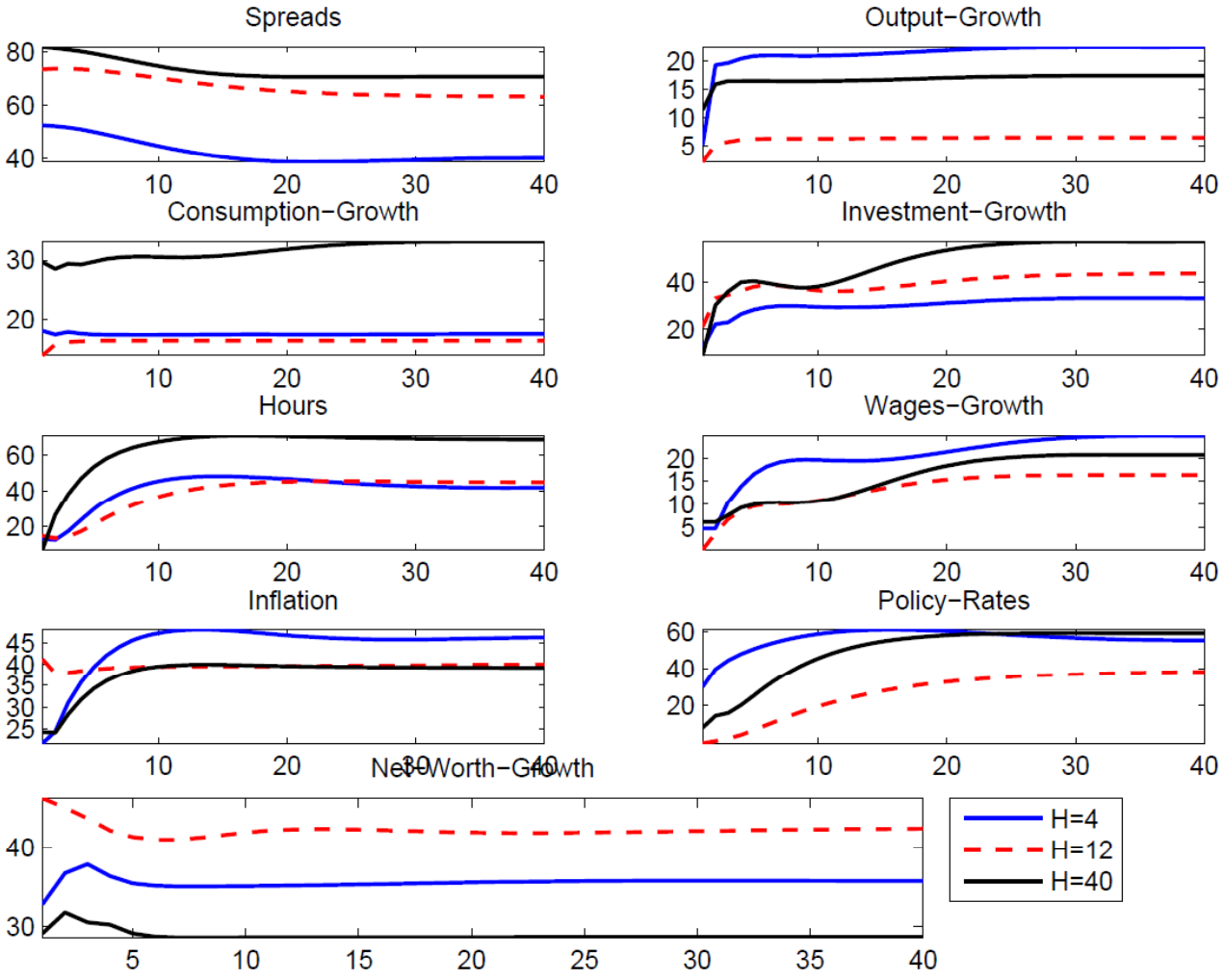


Alternative h's

- Recall the horizon h, in:

$$\max_{\omega}\left[\ \Omega_{i,j}(h) = \frac{e_i'(\sum_{\tau=0}^{h} A_\tau P D(\omega) e_j e_j' D(\omega)' P' A_\tau')e_i}{e_i'\left(\sum_{\tau=0}^{h} A_\tau \sum_{\varepsilon} A_\tau'\right)e_i}\ \right]$$

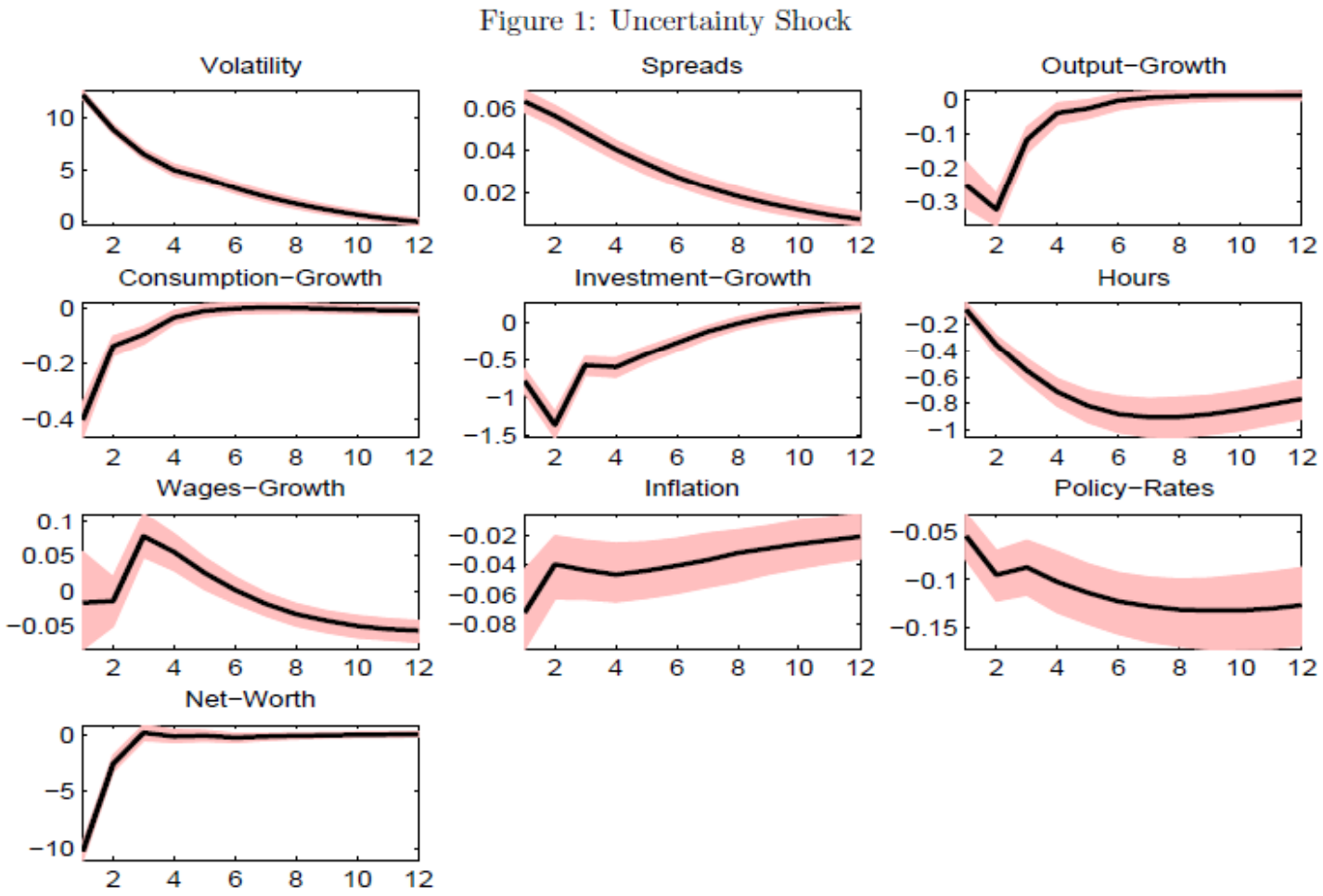
FEVD for alternative h's [VXO]



Sense check on the VARs IRFs

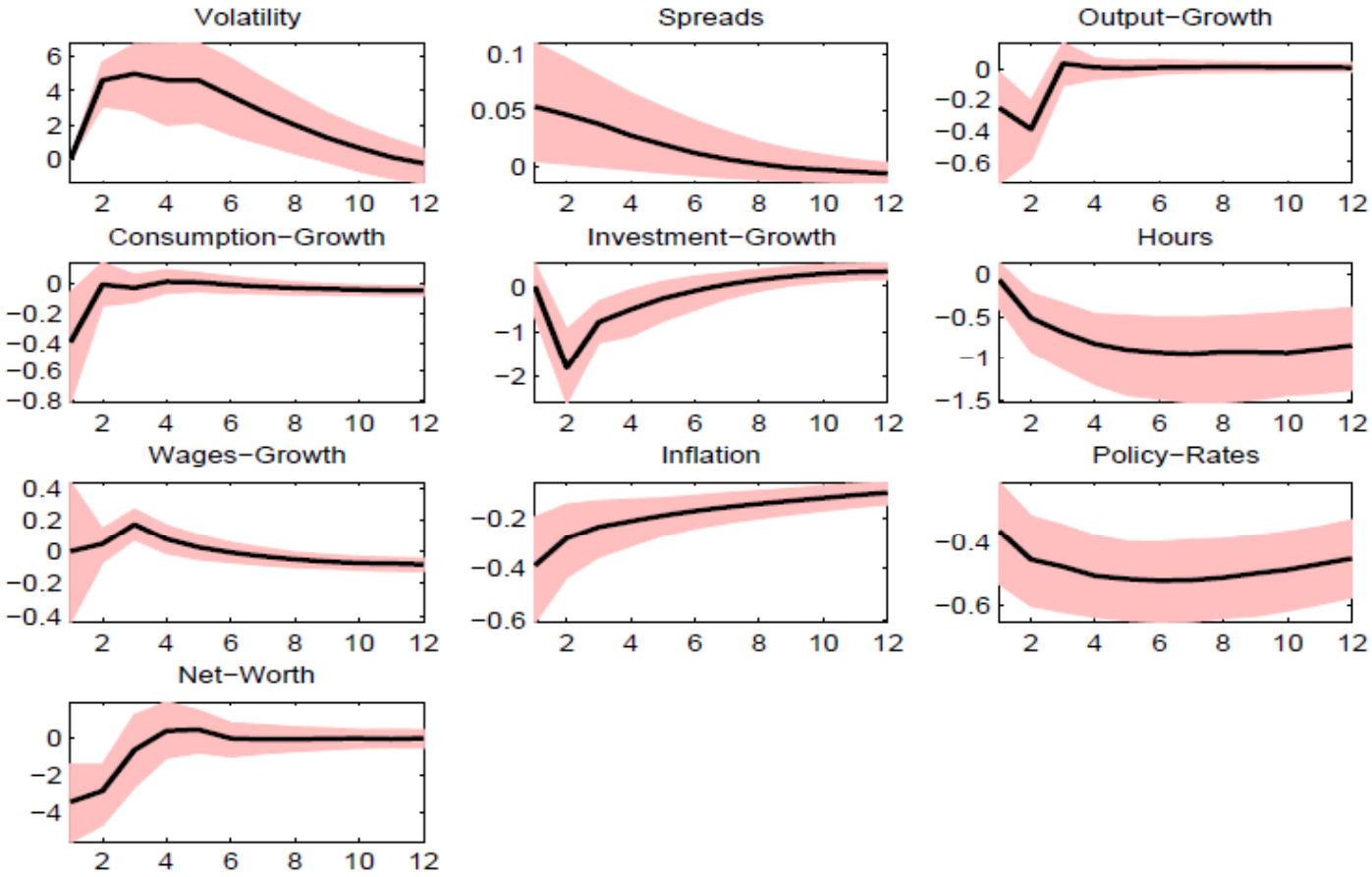
- Does the VARs other shocks do what you would expect? Yes.
- Does the VARs risk shocks do things that seem sensible?

VIX: IRF to contemp. risk shock



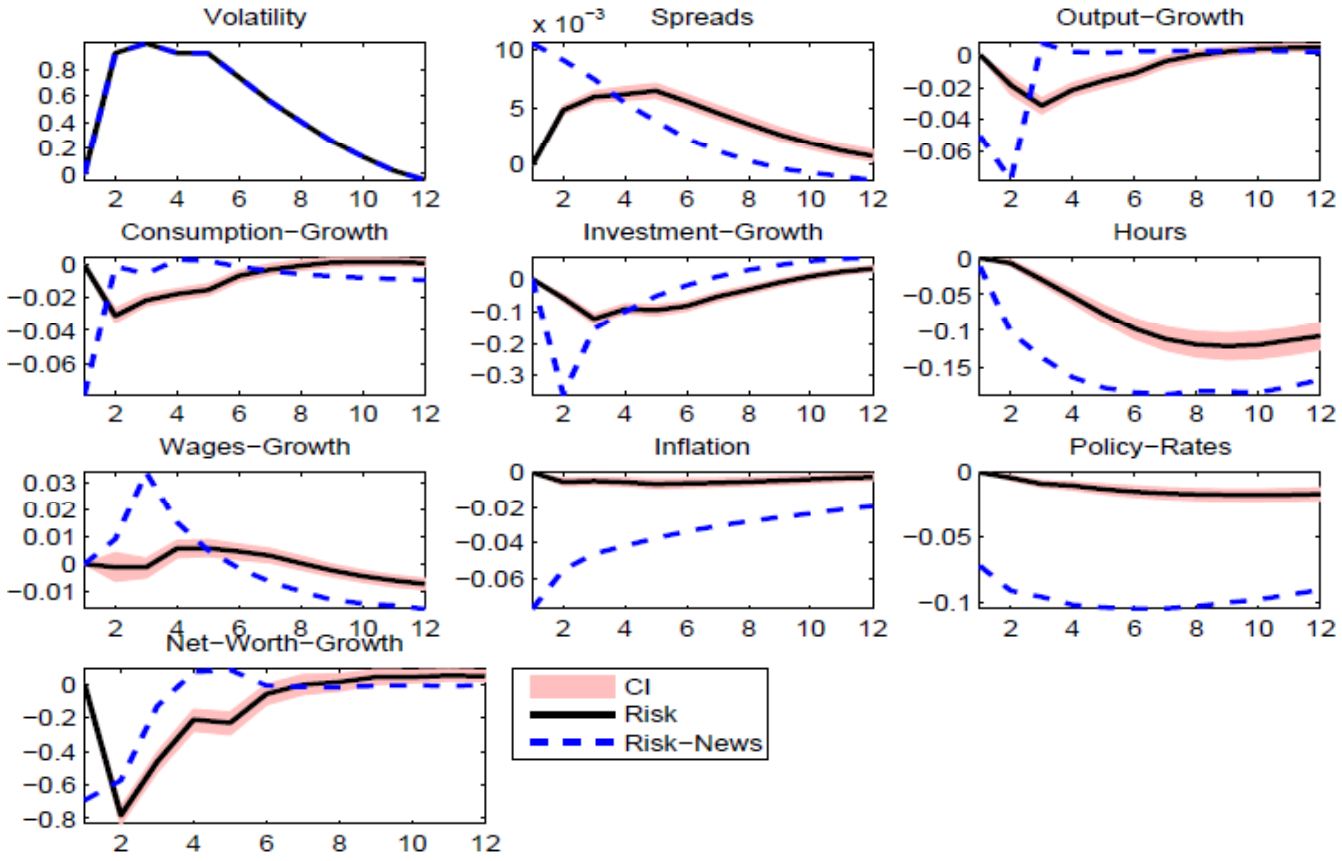
VIX: IRF to a risk news shock

Figure 2: Risk Shock

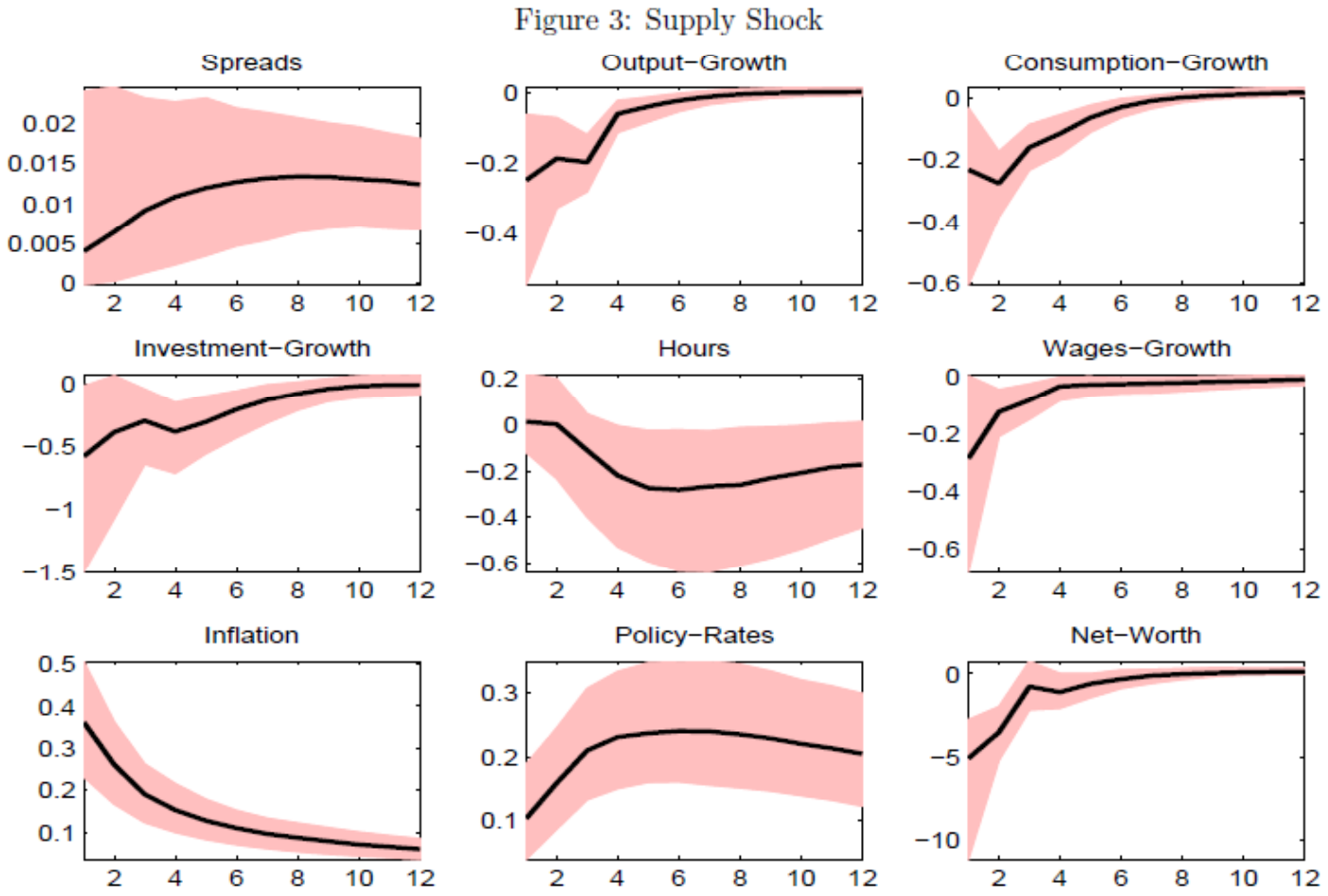


VIX, IRFs to risk shocks, contemp. vs news

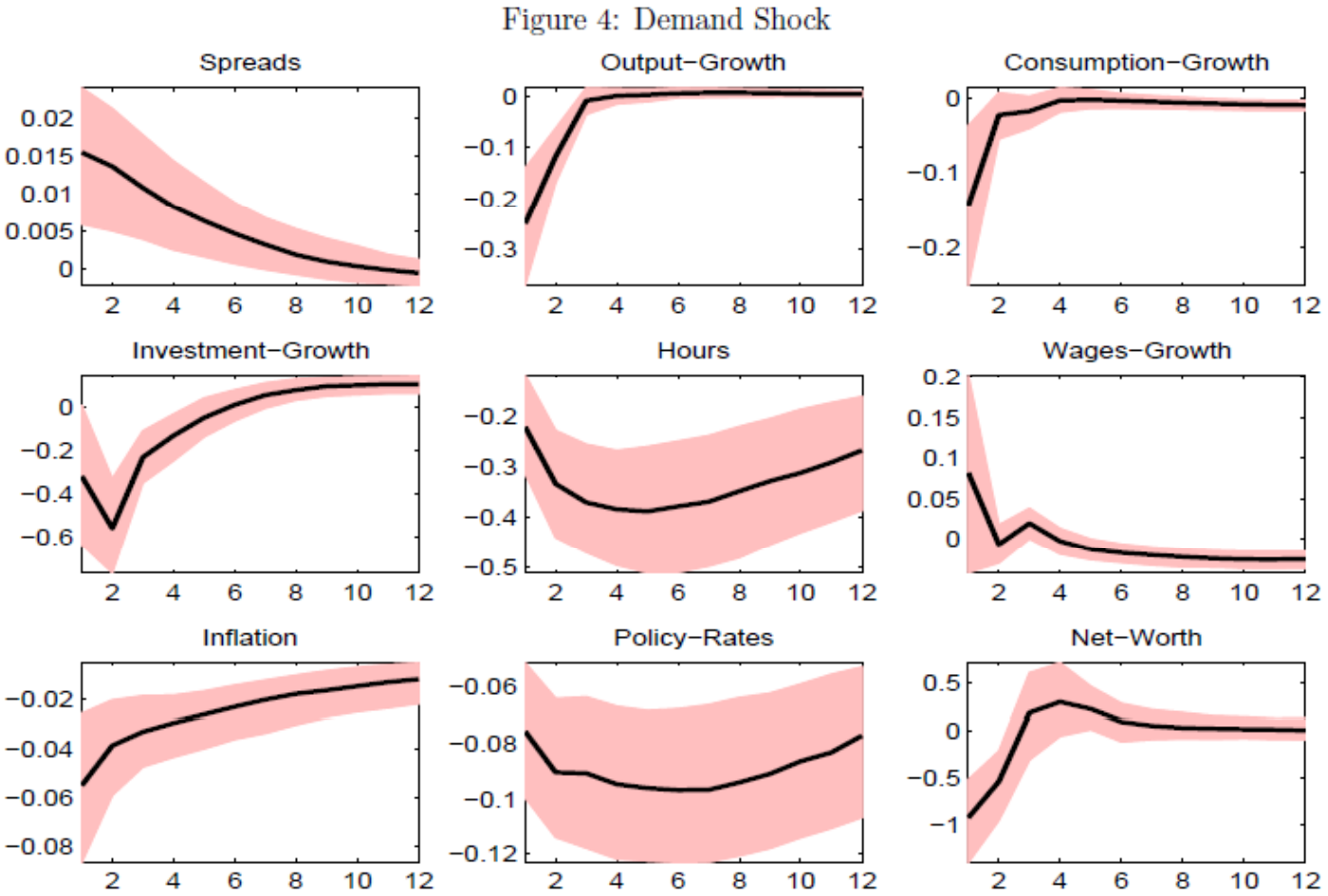
Figure 8: Uncertainty versus Risk Shock



VIX: IRF to a technology shock

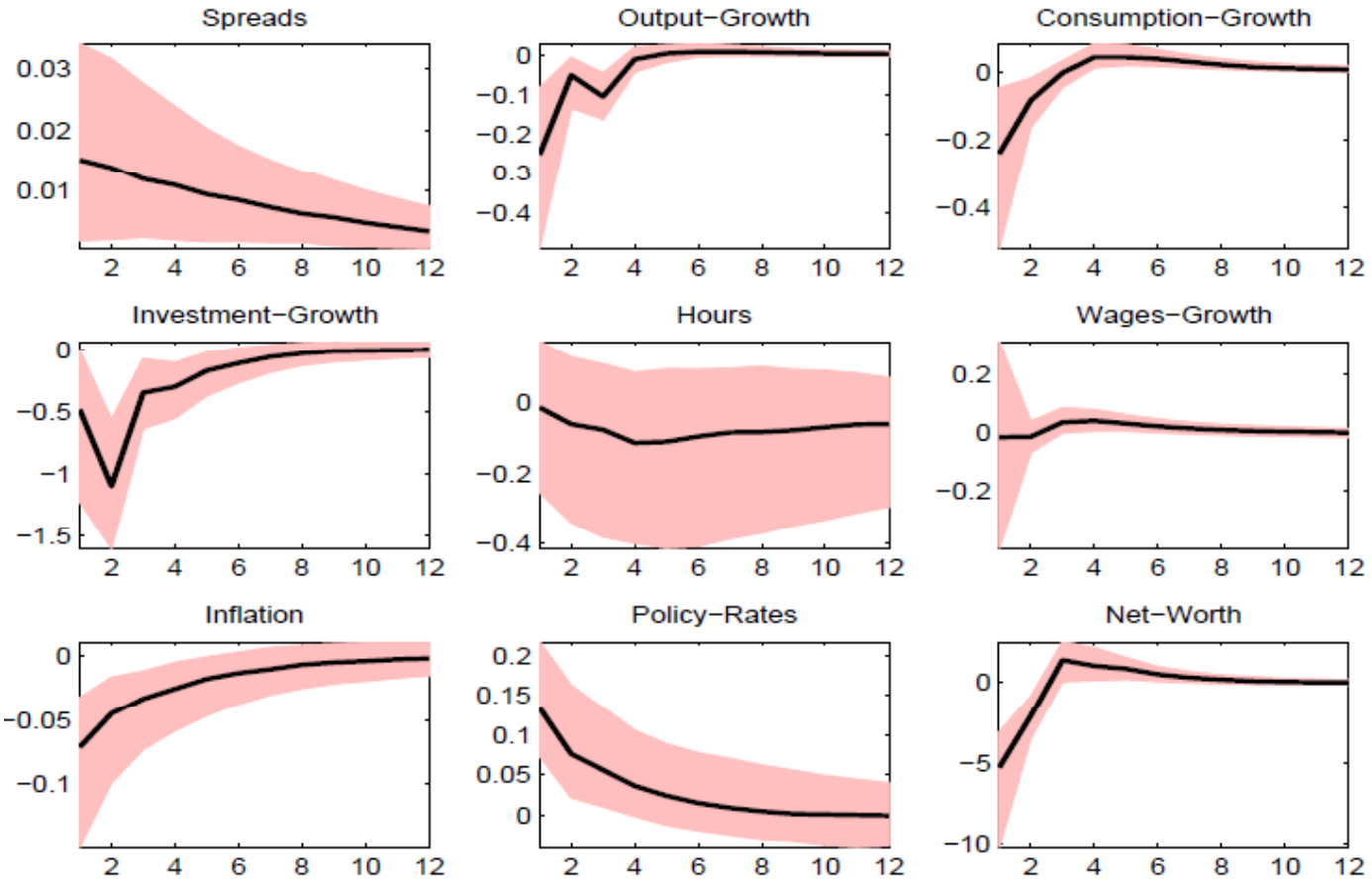


VIX: IRF to 'demand' shock



VIX: IRF to a mon pol shock

Figure 5: Monetary Policy Shock



The DSGE model

- Smets-Wouters+BGG
- Patient consumers/impatient entrepreneurs
- Lending to entrepreneurs at spread related to net worth
- Entrepreneurs build capital and rent out to sticky price intermediate goods producers
- Imperfectly competitive intermediate producers, final goods aggregator
- Central bank, govt

Frictions

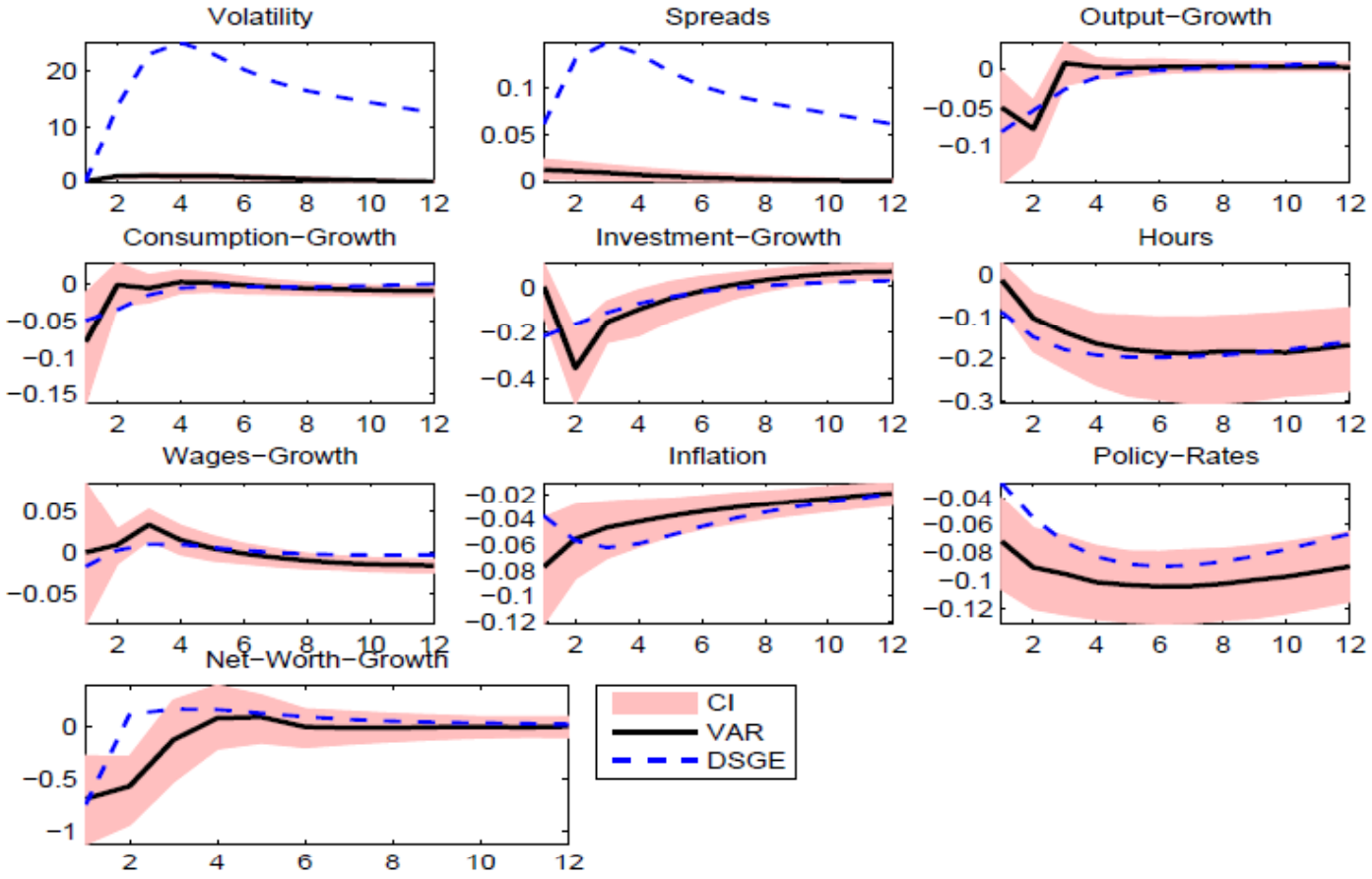
- Credit friction a la BGG
- Habits in consumption
- Investment adjustment costs
- Sticky prices, price indexation
- Sticky wages, wage indexation
- Variable capacity utilisation

Estimation of the DSGE model

- Match responses of DSGE model to a risk news shock to those from the VAR
- e.g. CEE (2005) match to IRFs to a mon pol shock
- Partial information method:
  - Cost: inefficiency, bias, worsens identification?
  - Benefit: immunity to misspecification of the stochastic parts of the model about which we stay silent

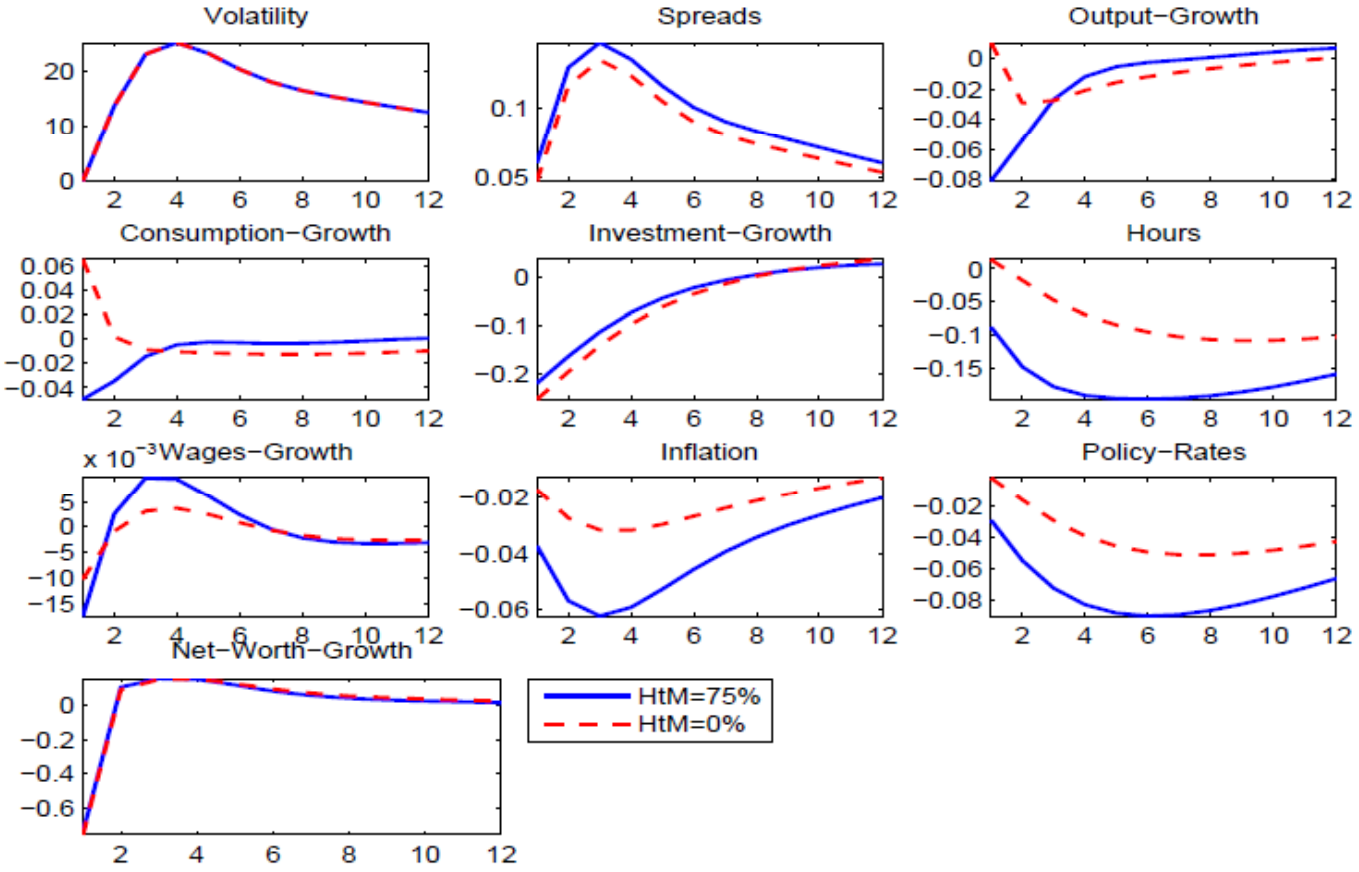
DSGE vs the VAR, IRFs to a risk news shock

Figure 11: DSGE Model Fit



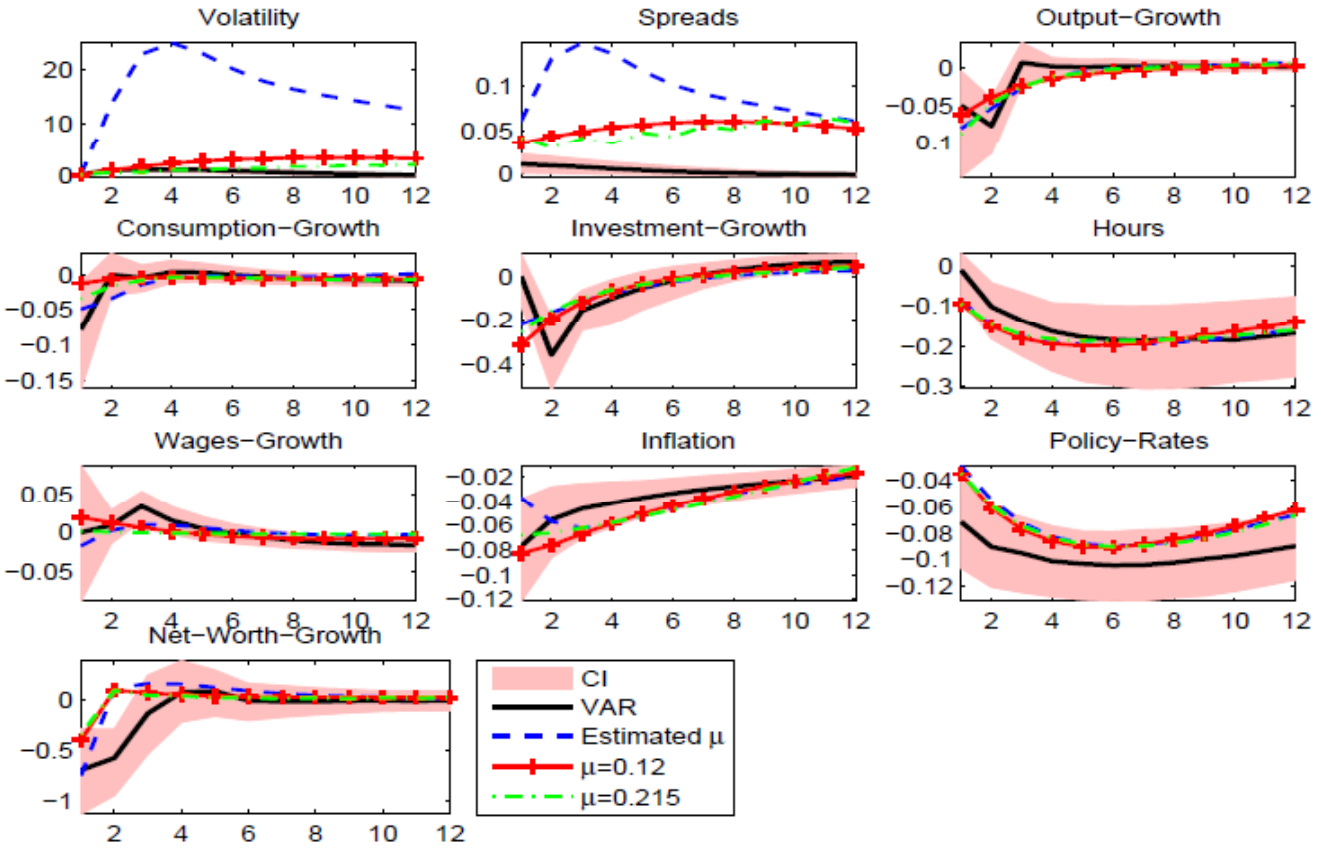
DSGE IRF to risk news shock with and without htm consumers

Figure 14: HtM versu No HtM Consumers: Risk News Shock



Effect of strength of ff on DSGE estimates

Figure 15: The relationship between the size of financial frictions and the magnitude of the shock



Recap

- Risk and risk news proposed as shock to explain the cycle eg in CMR (2013) [nb 60%]
- Our VAR identified risk news shock implies much smaller contribution from these shocks (to eg output) [ie about 20%]
- Scheme works in MC, robust to using alternative risk proxy
- DSGE model has to be greatly modified with inclusion of HTM consumers to get close to matching IRFs to risk news shock.