BANK OF ENGLAND

Deutsche Bundesbank Spring Conference 2019:
Systemic Risk and the Macroeconomy

Discussion of:

‘Forecasting and stress testing with quantile vector autoregression’ by Sulkhan Chavleishvili and Simone Manganelli

David Aikman (Bank of England)

15 May 2019

Summary of the paper

- A nice paper!
- The authors present a methodology for modelling the interaction between quantiles of endogenous variables in a VAR
- They apply this to a bivariate quantile VAR on euro area data for industrial production and a financial stress indicator
- And they find that financial shocks shift the shape of the distribution of industrial production in the short term, increasing the fatness of the tail

Results from a bivariate VAR application

- Estimated model:

$$IP_{t+1} = \omega_1^\theta + a_{11}^\theta IP_t + a_{12}^\theta CISS_t + \varepsilon_{1,t+1}^\theta$$

$$CISS_{t+1} = \omega_2^\theta + a_0^\theta IP_{t+1} + a_{21}^\theta IP_t + a_{22}^\theta CISS_t + \varepsilon_{2,t+1}^\theta$$

- Cholesky identification: industrial production (IP) responds to financial variables (CISS) only with a lag

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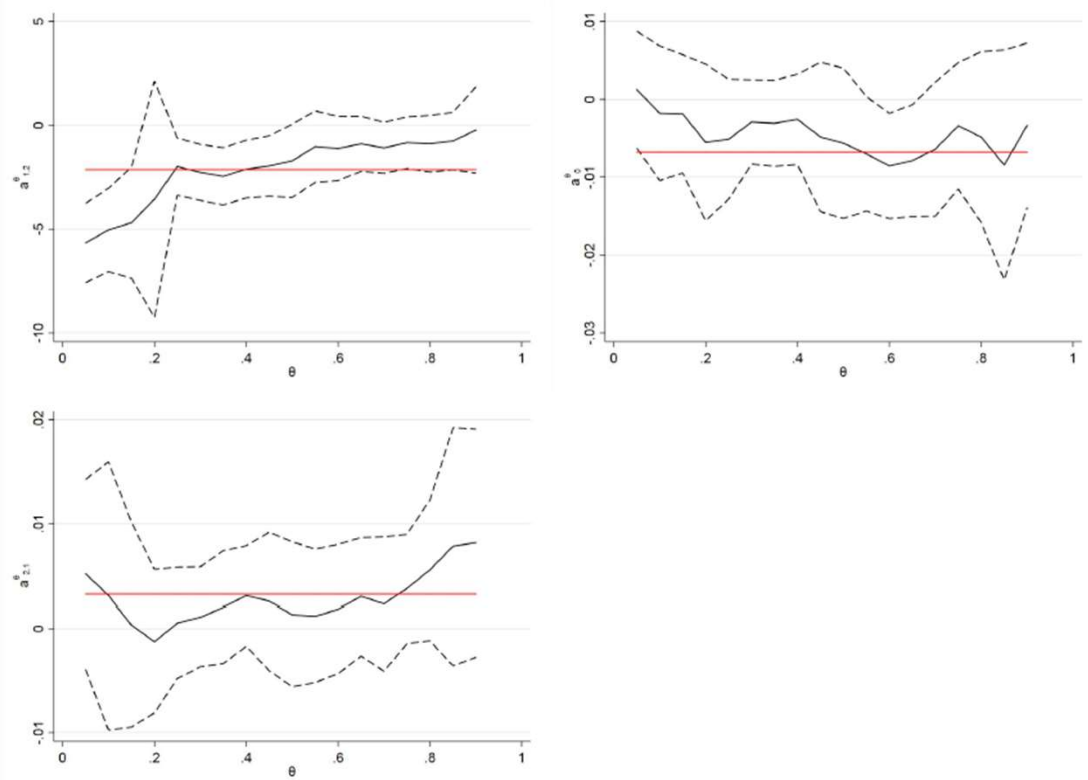
- Cholesky identification: industrial production (IP) responds to financial variables (CISS) only with a lag

- Real-financial linkages test (for various quantiles θ):

$$H_0: a_{12}^\theta = a_0^\theta = a_{21}^\theta = 0$$

Estimated quantile coefficients

Figure 2: Testing interactions between real and financial variables

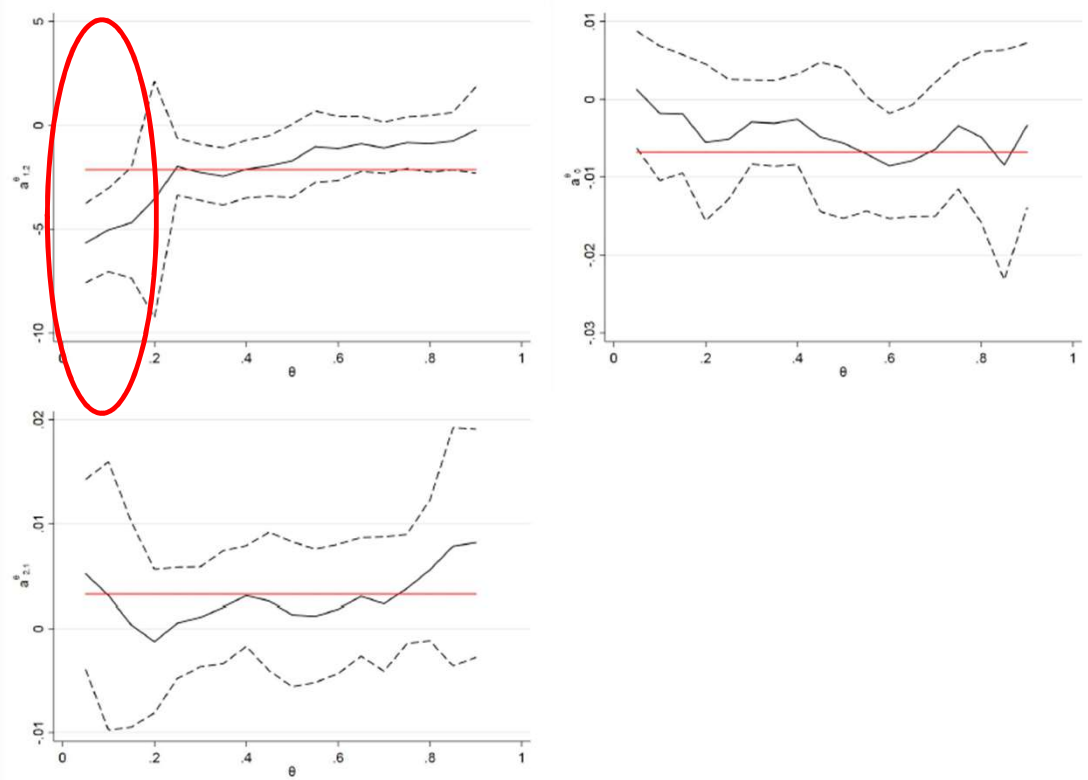


Note: Estimated coefficients of the off diagonal elements at different θ quantiles, with 90% confidence intervals. The flat line represent the OLS estimate.

Estimated quantile coefficients

- Shocks to financial conditions affect the left-tail of the distribution of industrial production

Figure 2: Testing interactions between real and financial variables



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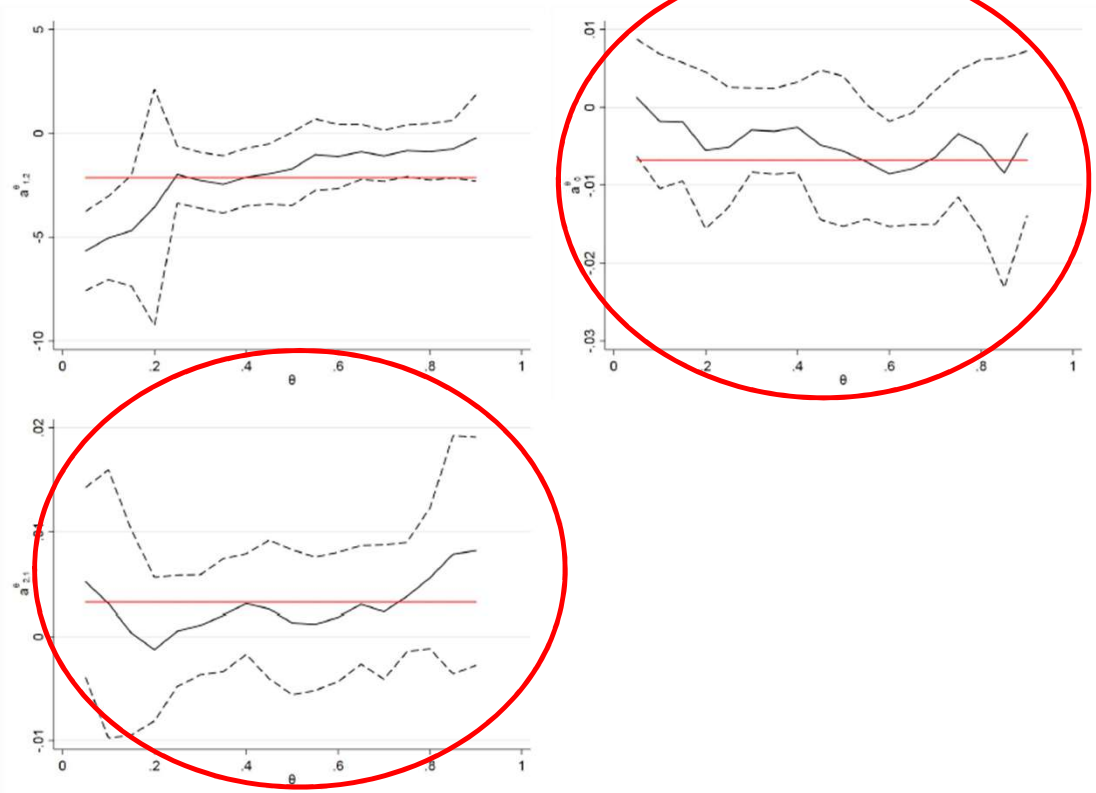
Estimated quantile coefficients

- Shocks to financial conditions affect the left-tail of the distribution of industrial production

- Financial conditions are unresponsive to developments in industrial production

➢ **Not the best example for why a VAR model is needed!**

Figure 2: Testing interactions between real and financial variables



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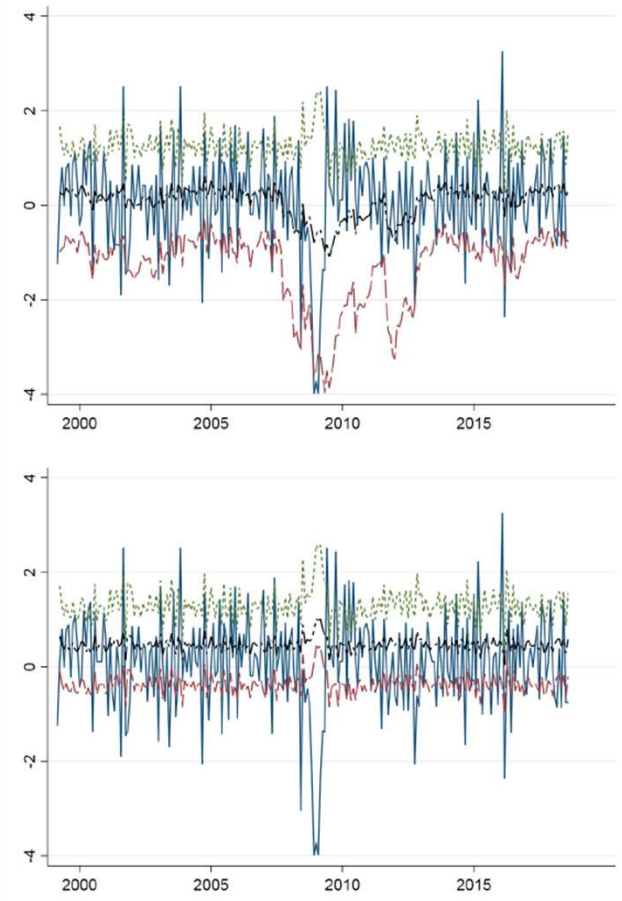
GDP-at-Risk estimate

Figure 3: Euro area growth at risk

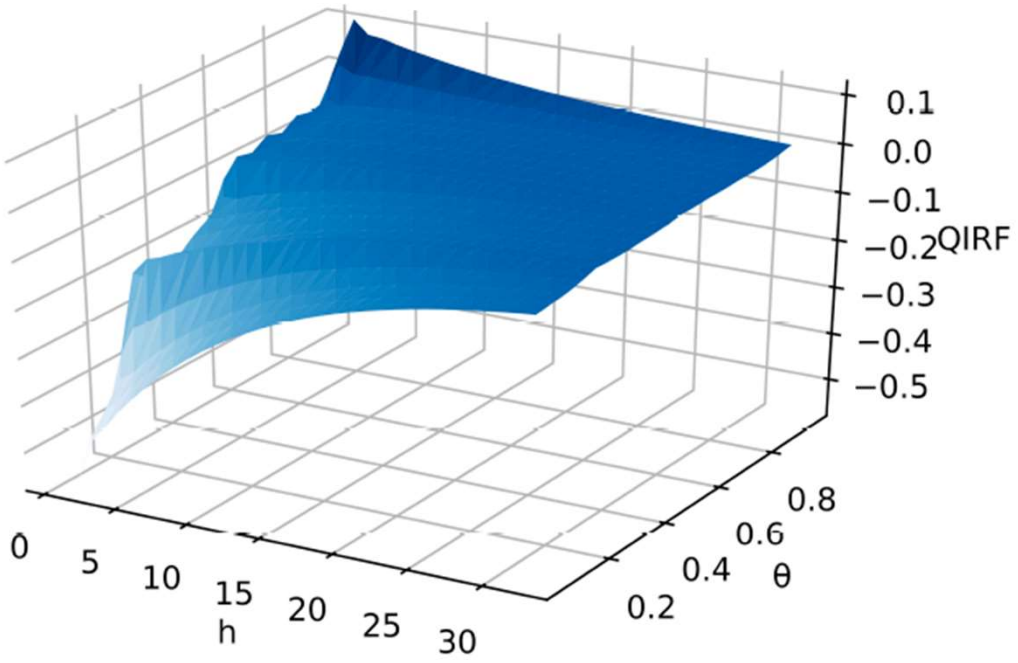


Note: Time series estimates of the 10% and 90% quantiles of euro area industrial production, together with the mean estimate according to a standard OLS VAR. The top panel represents the unrestricted estimates, the bottom panel restricts the off-diagonal coefficients to be zero.

Estimated model

With financial-to-real economy linkages shut down ($a_{12} = 0$)

Quantile impulse response function



Note: The figure reports how a shock to the financial variable would affect the estimates of the different quantiles of euro area industrial production at different time horizons.

Comment 1

- I'd find it useful to see more discussion of how the authors' approach compares with others proposed in the literature

➢ Cecchetti and Li (2008) present a panel quantile VAR to study the effects of house price and equity price booms on GDP-at-Risk

➢ Schuler (2014) presents a Bayesian quantile VAR for examining the effects of uncertainty shocks on GDP

➢ Ando et al (2017) use a quantile VAR set-up to estimate financial networks

Comment 2

- It would be useful also to consider the advantages of the authors' quantile VAR approach vis-à-vis the local projections used by other papers in this literature (eg Adrian et al. 2018, 'The term structure of growth-at-risk')

➢ What's the benefit of imposing a finite-order AR structure?

➢ Not a forecasting issue per se

Comment 3

- I encourage the authors to explore insights from this approach in a richer model where tail risks to growth depend on factors other than financial conditions

Aikman et al (forthcoming)

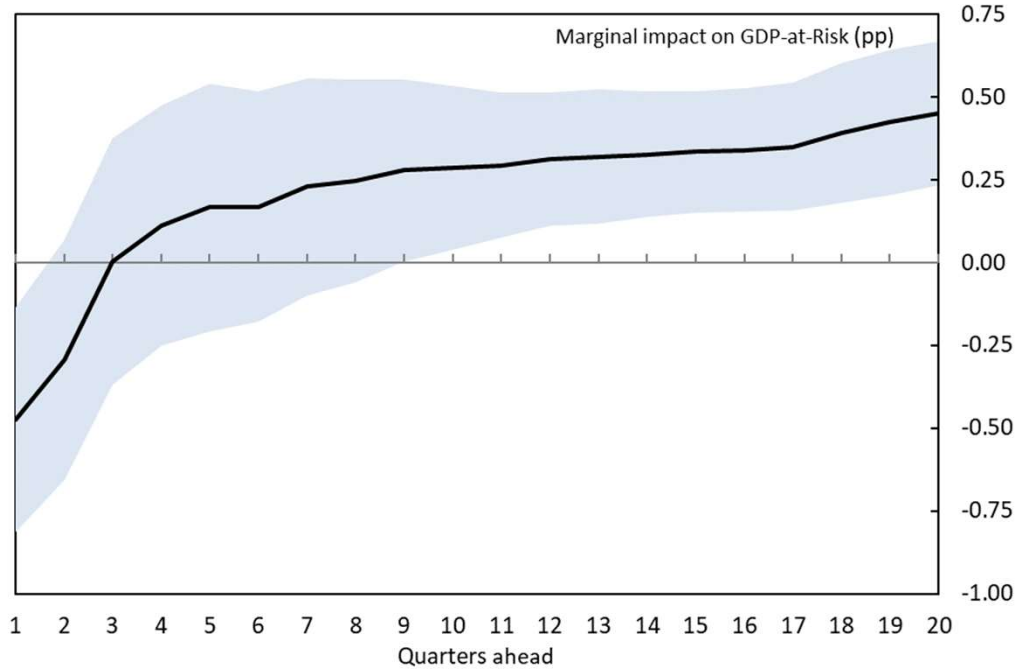
- We have explored a cross-country panel with 16 advanced economies, estimated over the period 1980Q1-2017Q4

- We model the quantiles of real GDP growth as a function of:

Risk Variables	Resilience Variables	Macro Controls
Credit-to-GDP growth Real house price growth Current account Volatility	Banking system tangible common equity ratio	Inflation Policy rate Lagged GDP

Results from Aikman et al (forthcoming)

- Response of 5% GDP-at-Risk following a 1 sd shock to bank capital



Results from Aikman et al (forthcoming)

- Historical decomposition of 5% UK GDP-at-Risk (3 years ahead)