

Financial Variables as Predictors of Real Growth Vulnerability

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Important Question for Macroprudential Policy

Can we extract advanced information about the risk of recessions from financial conditions?

Two Influential Approaches

1. Growth-at-Risk (short-medium term)

- Focus on the **tails**, not on the **mean**!
- Study the evolution over time of the GDP growth distribution **conditional** on financial stress
- Policy as **risk management**

Key empirical results

- Financial conditions affect GDP growth in recessions but are muted in normal times
- Key mechanism is to affect negatively the GDP growth **mean** positively its **variance**

2. The Basel credit-to-GDP gap as a macro-prudential tool (medium term)

- **Monitor** the **credit-to-GDP cycle** as an indicator of cumulation of financial risks
- Find evidence of **smooth credit cycle** different than business cycle

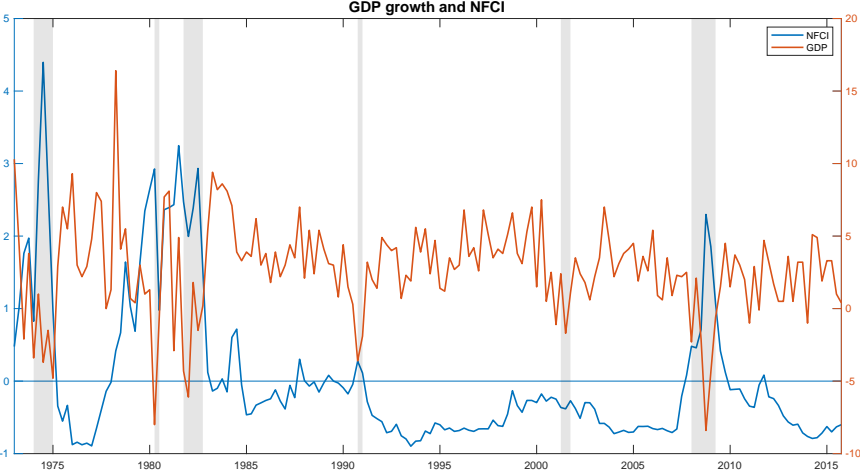
This Paper

An outsiders' look at these tools!

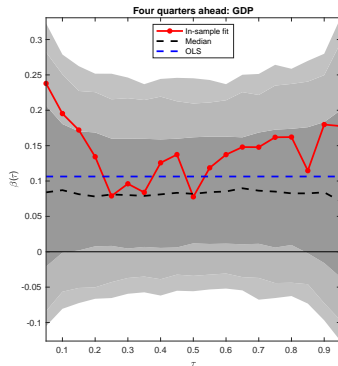
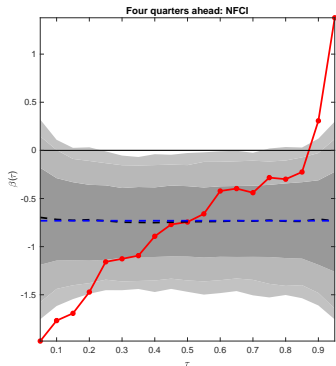
1. Some **illustrative exercises** using the **Growth-at-Risk** framework
 - How are the key results from this literature to be interpreted ?
 - How can this tool be used in policy?
2. Interpret the **Basel gap** using a more formal **multivariate time series model**

Growth-at-Risk

Intuition: GDP Growth and NFCI are Correlated in Recessions



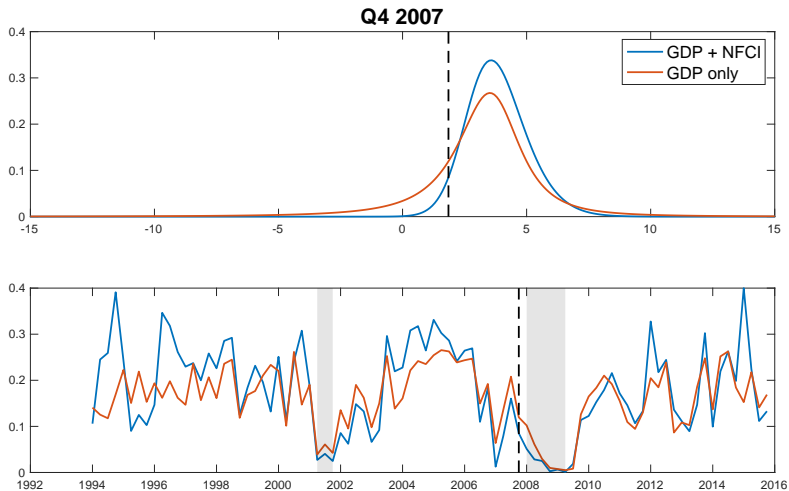
In-sample – Quantile Regressions: Baseline Model



- **NFCI and GDP growth: negative relation** on average
- As **financial conditions deteriorate**, the model assigns both **larger probability** of a **large negative event** and of a **large positive event**!
- The **slope is roughly constant** \implies **conditional variance increases** as NFCI goes up

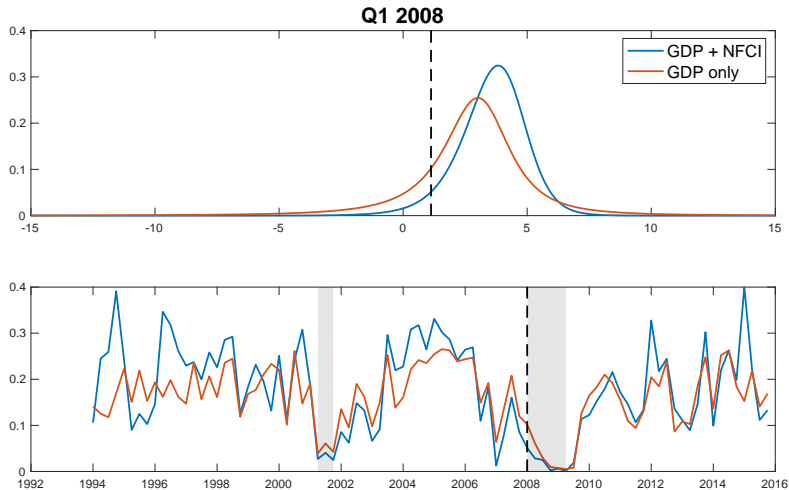
Out-of-Sample Predictive Distributions

The Great Recession (horizon $h = 4$)



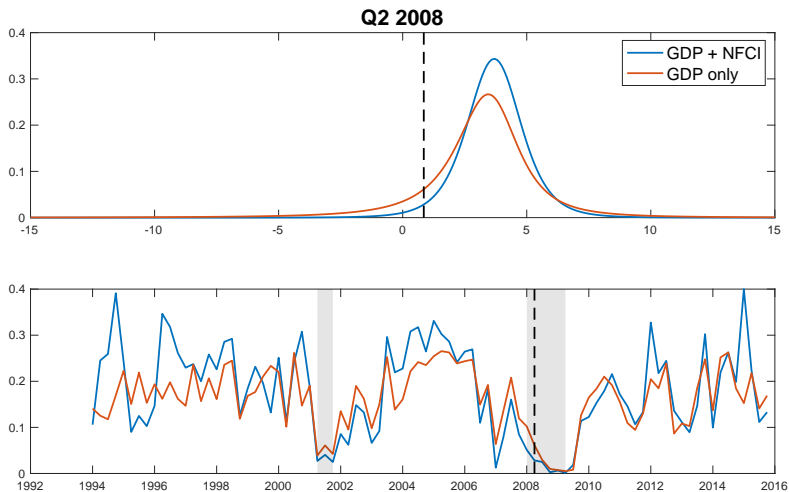
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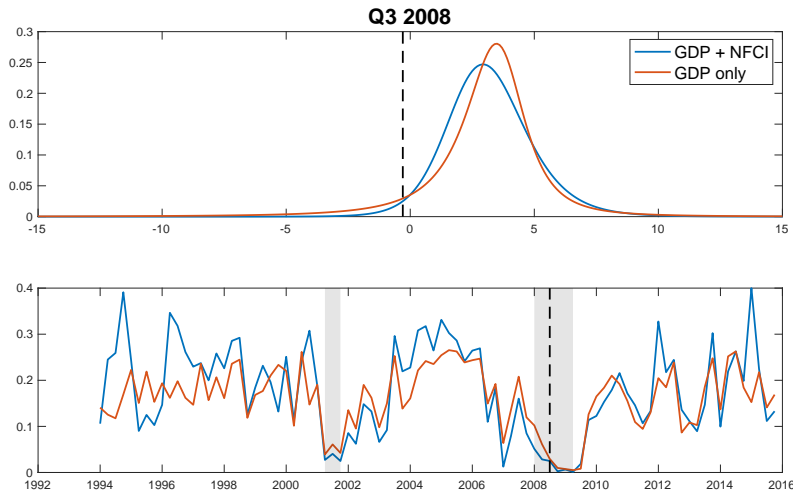
Out-of-Sample Predictive Distributions

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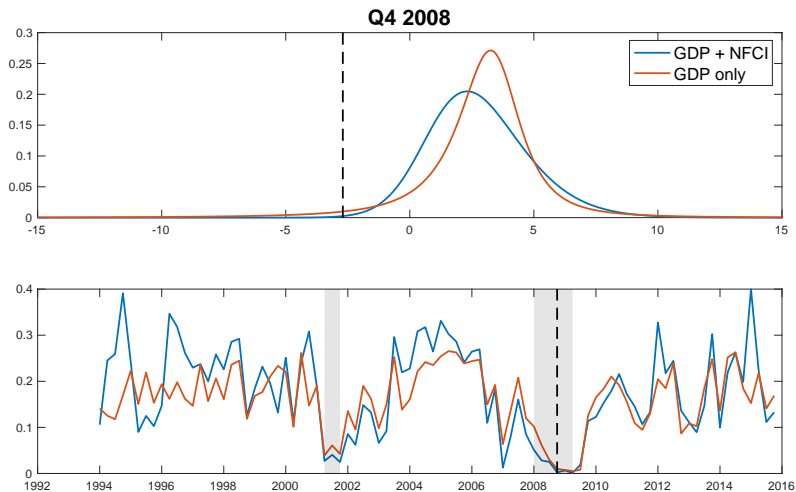
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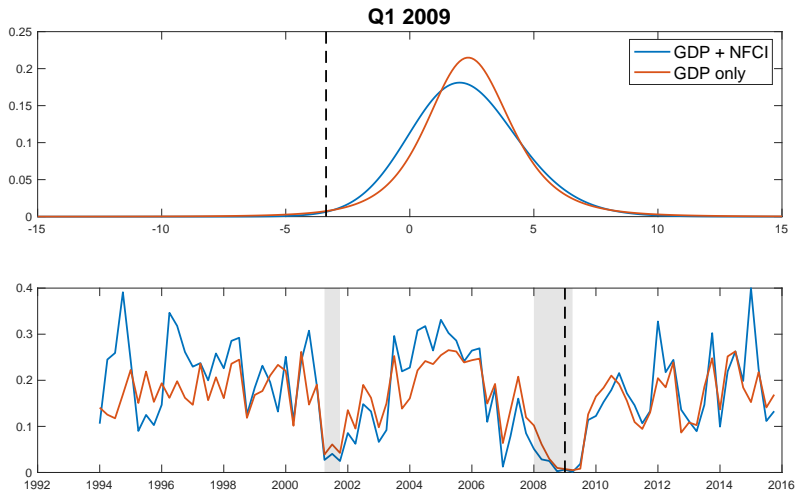
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Out-of-Sample Predictive Distributions

The Great Recession (horizon $h = 4$)



Comments

- During recession **both real and financial models do badly**: large forecast errors
- Expected shortfall adjusts with a delay [▶ Show Shortfall](#)

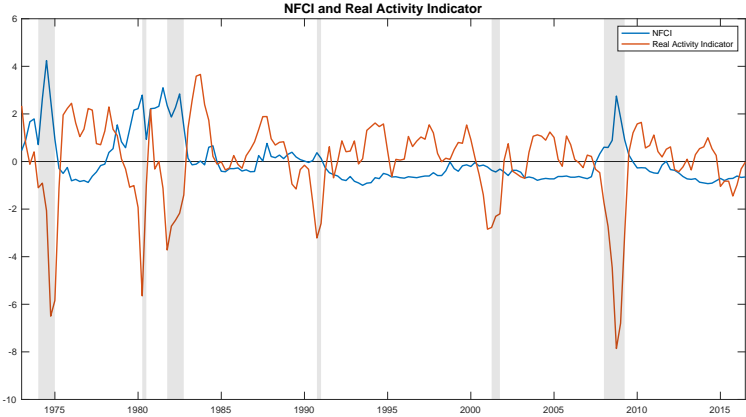
⇒ **Not a timely** warning signal

- Movements in the conditional distribution are driven by **increase in variance and decrease in mean**
- Not shift of other moments (e.g. **skweness** or **kurtosis**) [▶ Show Moments](#)

⇒ From a modelling point of view this is equivalent to what we get with a linear conditional heteroskedasticity model

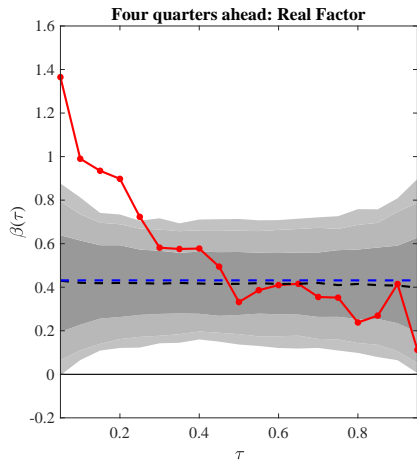
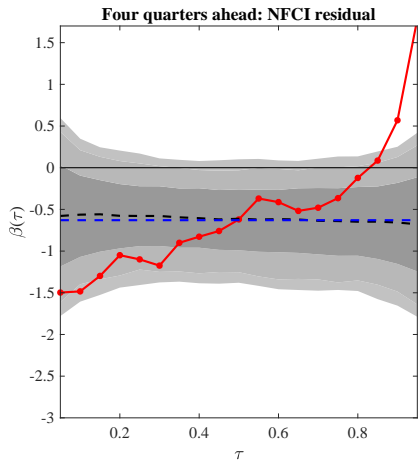
Financial and Real Factors

Strongly negatively correlated!



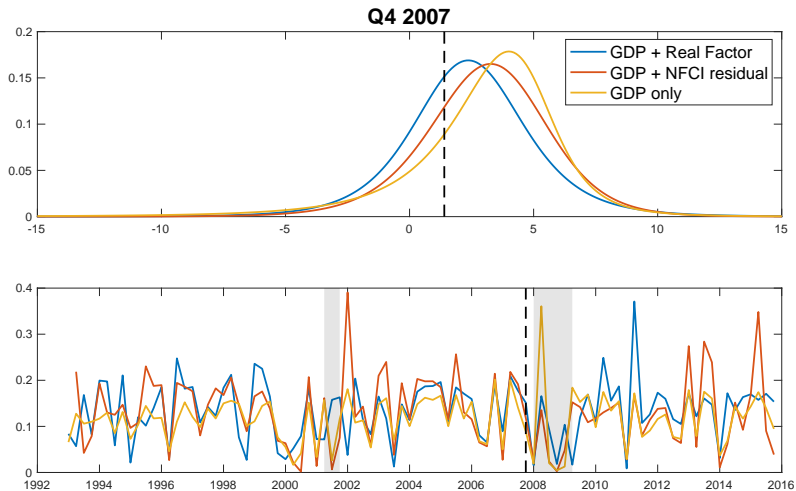
Financial and Real Factors

Considering Both



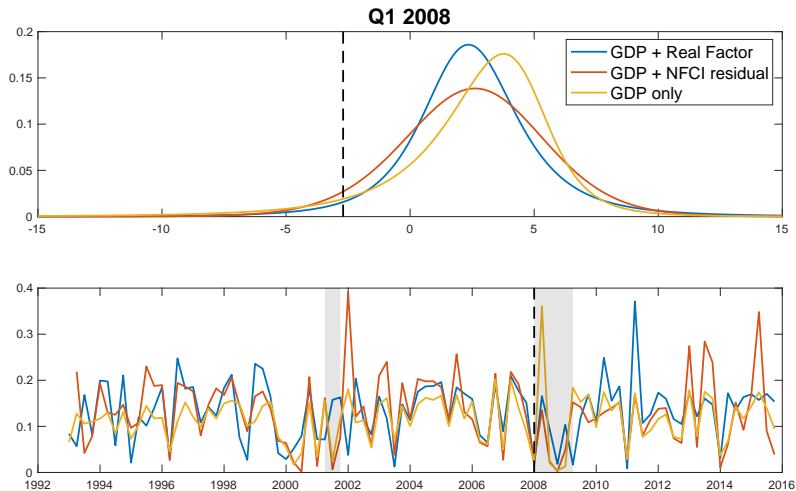
Out-of-Sample Predictive Distributions

The Great Recession (horizon $h = 1$)



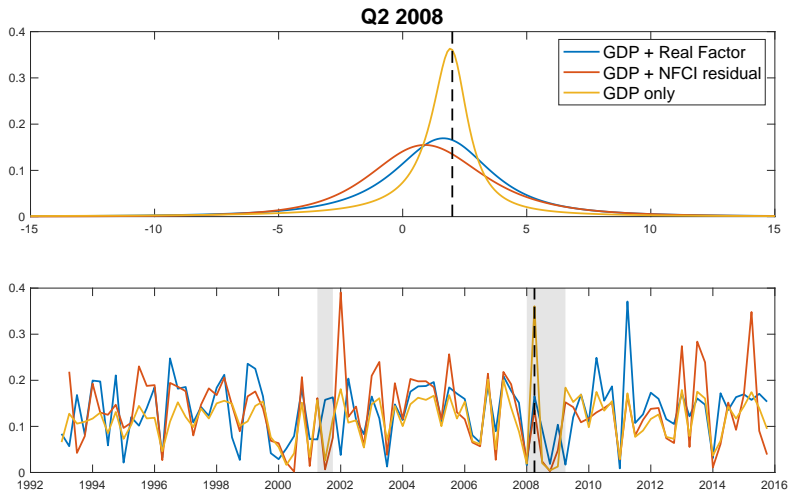
Out-of-Sample Predictive Distributions

The Great Recession (horizon $h = 1$)



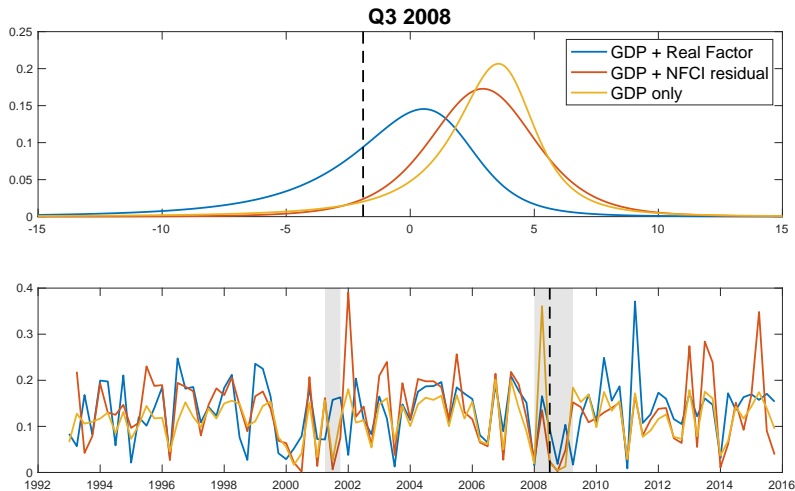
Out-of-Sample Predictive Distributions

The Great Recession (horizon $h = 1$)



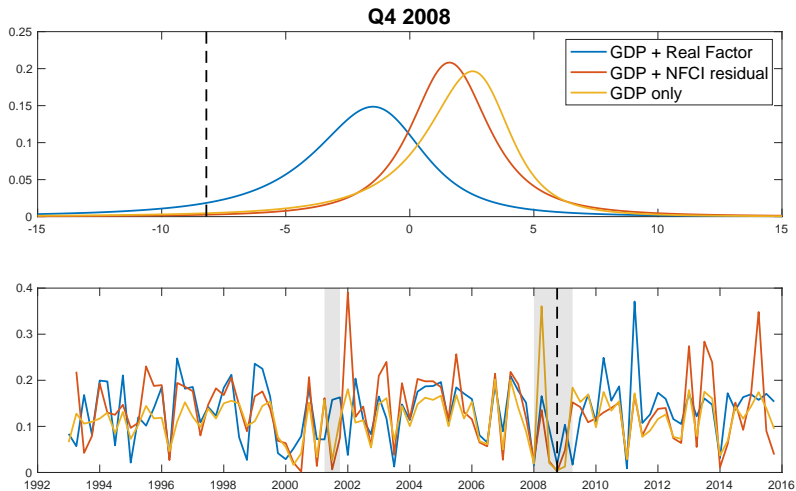
Out-of-Sample Predictive Distributions

The Great Recession (horizon $h = 1$)



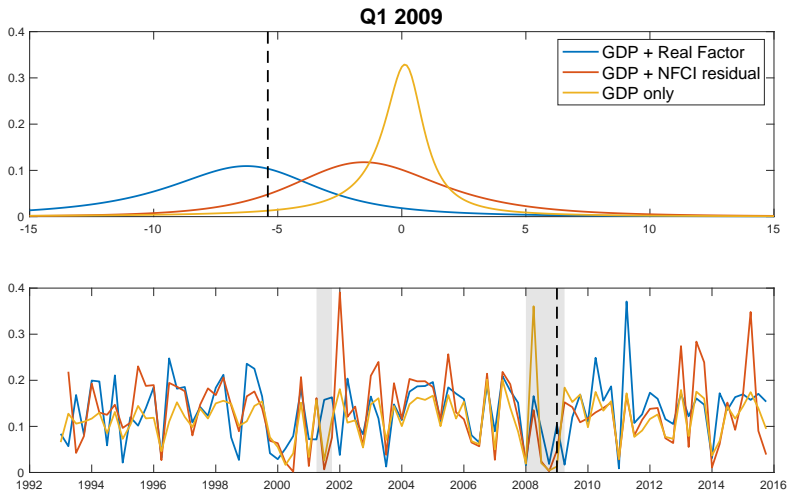
Out-of-Sample Predictive Distributions

The Great Recession (horizon $h = 1$)



Out-of-Sample Predictive Distributions

The Great Recession (horizon $h = 1$)

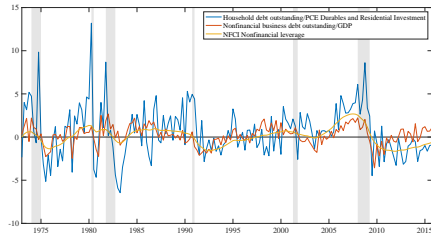
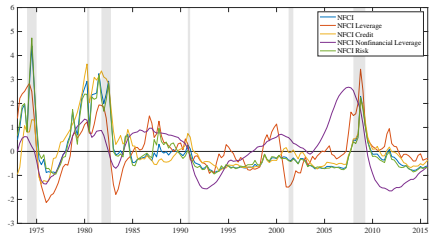


Results and Interpretation

- Both **real** and **financial conditions** detect **increase in GDP-at-Risk**
- Real factor captures downward shift the **conditional mean** rather than an increase in the conditional variance
- Both variables have **low predictive power in bad times**

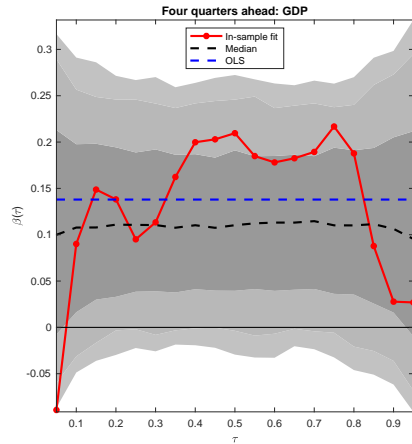
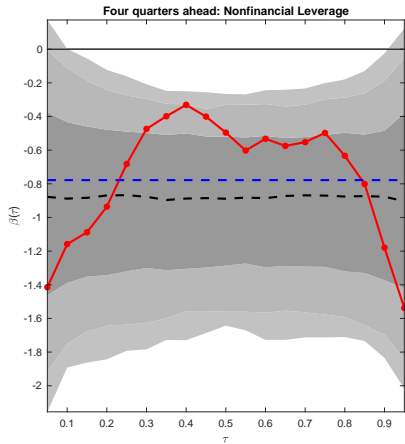
Looking Inside the NFCI

NFCI components have heterogenous time series behaviour



Focus on Nonfinancial Leverage

Less strong non-linearities + equally large negative effect at low and high quantiles



Nonfinancial Leverage as a Signal of Risk

The Great Recession

Nonfinancial Leverage – Expected Shortfall

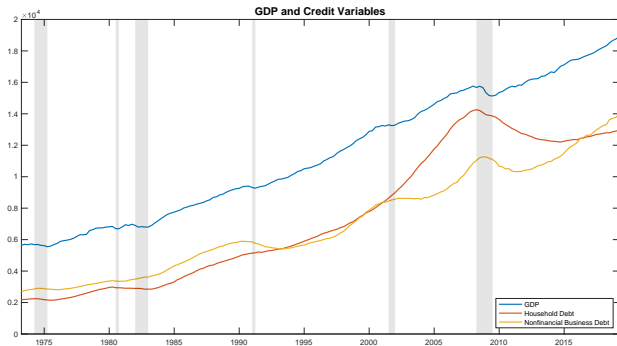


Tentative Appraisal

1. Big **difference** in results depending on **key indicator of financial conditions**
2. NFCI move conditional variance of GDP growth (positively) and conditional mean (negatively)...
3. ... but **low predictability for risk** even at short-horizon
4. **Negative correlation** in left tail also explained by an index of **real economic activity**
5. **Nonfinancial leverage** has some **predictive information for risk** but non-linearities not as strong
6. **Little advance information** on risk for growth **in financial variables**

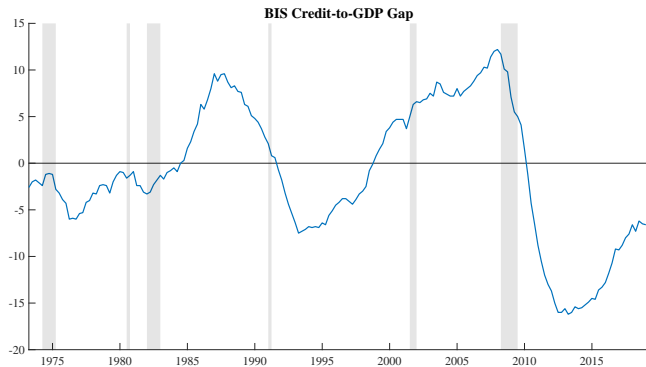
Leverage and Real Activity

GDP and Credit Variables



- **Persistent and faster growth of debt** w.r.t output are **followed by deleveraging**
- In the medium term **credit fluctuates with the business cycle**
- Debt variables can **deviate from long-run equilibrium**
- This is when **fragilities build-up!**

The Basel Gap



- Detrended credit-to-GDP ratio
- Hodrick-Prescott filter with $\lambda = 400,000$
- Very **smooth long cycle** ~ 30 year

Problems with the Basel Gap

1. HP is a **blackbox**
2. **End-point problem**
3. High-pass behaviour – it **correlates negatively with GDP growth**
4. **Contaminated by business cycle** (common) dynamic
5. ‘Downward bias’ in the estimates – **very negative today!**

Can We do Better in Identifying Excess Leverage?

- Filter through a **multivariate trend-cycle model**
- Use **real and labour market** variables to **discipline the model**
- **Minimal assumptions** but more **transparent**

Model Assumptions:

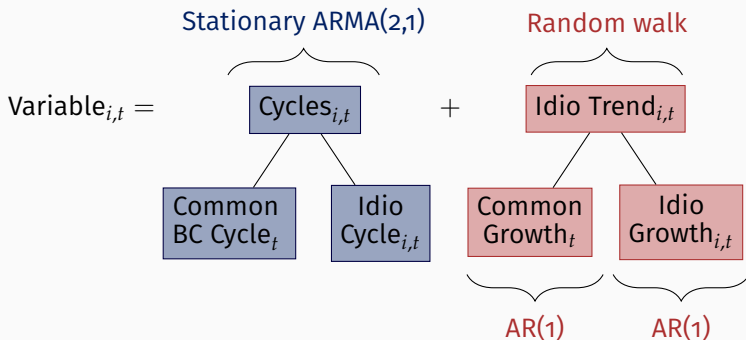
1. Credit variables comove (at lags) with the **output gap** \implies common **business cycle**
2. In the long-run credit and real variables should **grow at same rate**
3. but deviations are possible \implies **common** and **idiosyncratic trend growth**

The Data

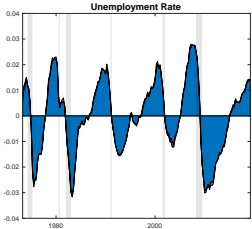
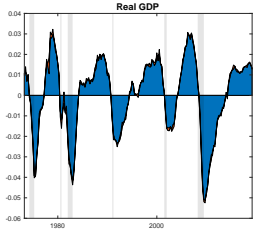
Variable	Transformation	Loads on	
		Common Business Cycle	Common Growth Rate
Gross Domestic Product	Log-Levels	✓	✓
Employment	Log-Levels	✓	✗
Unemployment Rate	Log-Levels	✓	✗
Household Debt	Log-Levels	✓	✓
Nonfinancial Business Debt	Log-Levels	✓	✓

Sample: Quarterly, Q1-1973 to Q1-2019

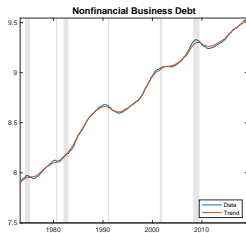
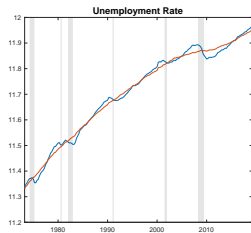
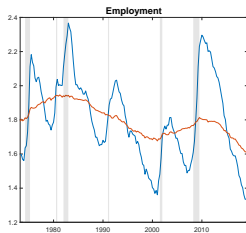
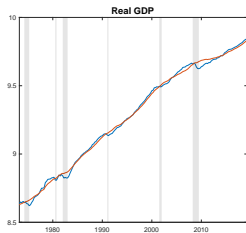
A Sketch of the Model



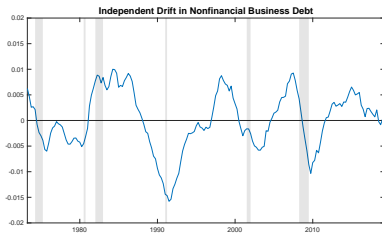
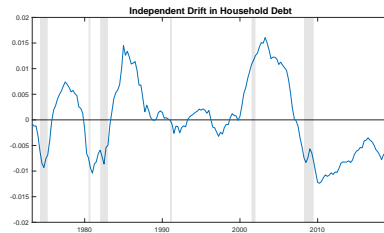
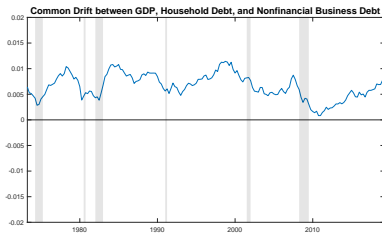
Business Cycle and Idiosyncratic Cycles



Trends



Idiosyncratic and common drifts in credit variables growth



Cumulated Idiosyncratic Drift and the Basel Gap Interpretation

In our model the Basel gap in growth rate is:

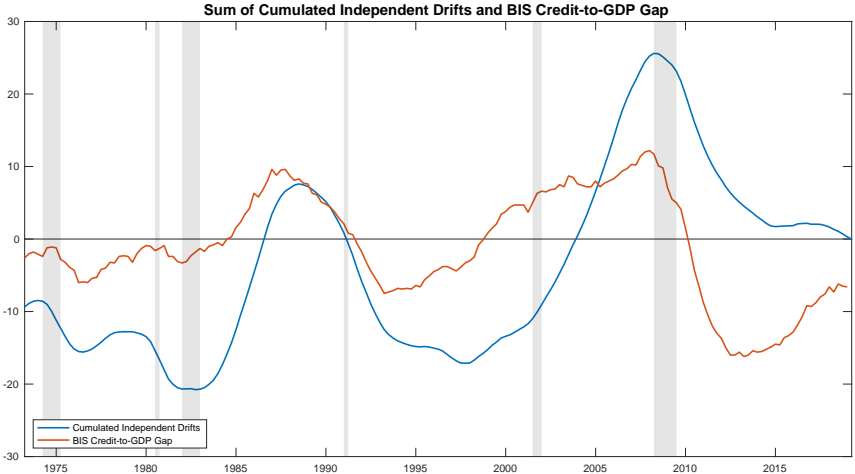
$$\Delta \frac{\text{Credit}_t}{\text{GDP}_t} \simeq \mu^i + c(L)\psi_t^{bc}$$

i.e.

Growth rate of **Credit-to-GDP** \simeq **idiosyncratic drift** + **business cycle**

- Idiosyncratic drift \sim measure of **excess credit growth**
- Resuming the idiosyncratic drift we obtain a **clean measure** of **credit gap**
- No business cycle contamination!

Model-Implied Excess Credit and the Basel Gap



Takeaways

Trend-Cycle Model

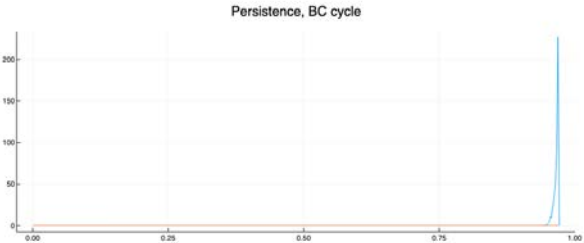
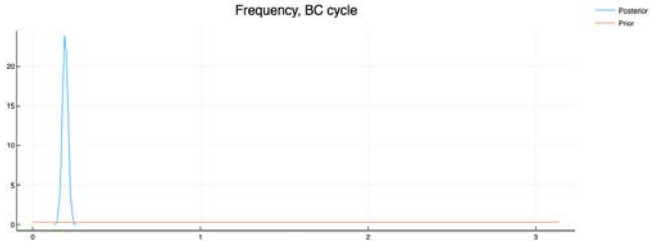
- **Idiosyncratic** credit growth **leads recessions...**
- and **may have some predictive value** for recessions or risk of recessions
- Its level has the **same interpretation of the Basel gap** and can be used for monitoring excess credit risk
- The model can be easily extended to incorporate several credit variables (and asset classes)...
- **more granular approach** to be tested

Some Concluding Observations

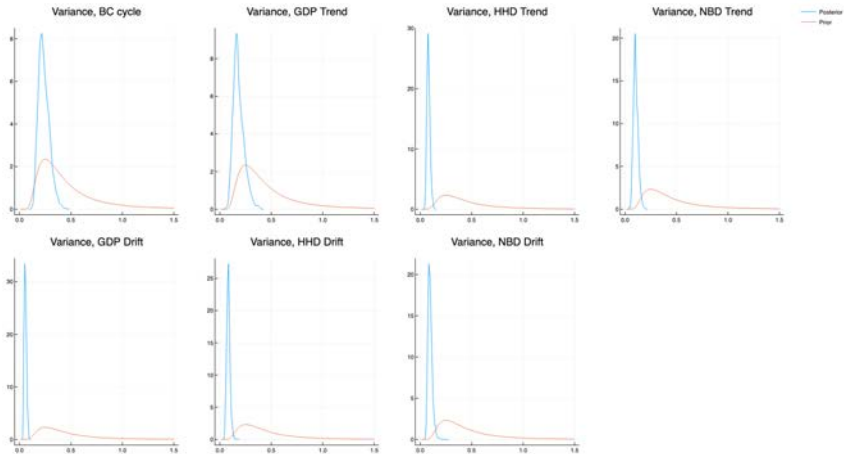
1. **Monitoring risk** and **focusing on the tails** is very appealing. GDP at risk methodology is a nice way to summarize the concept but more data and model extensions needed to make it a tool for stress testing and predictions (some is under way)
2. **Risk management is about combining different models** – we have presented two very different models in a stylised form but a more systematic approach to model and data combinations is desirable
3. Both **dynamic heterogeneity** (trends and cycles) and **cross-variables heterogeneity** relevant for empirical modelling

Appendix

Priors BC

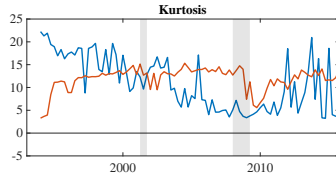
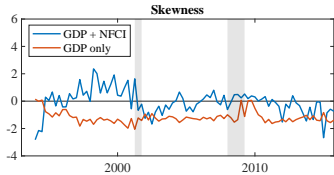
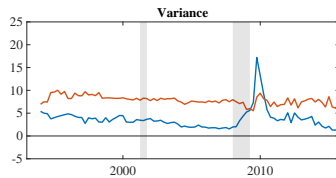
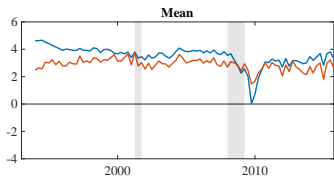


Priors Variance



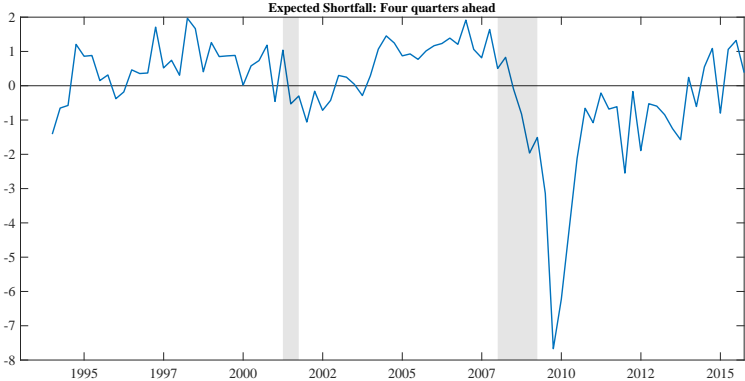
Moments

Four Quarters Ahead



▶ Go Back

Shortfall



▶ Go Back