# Discussion of "Rare Shocks vs. Non-linearities: What Drives Extreme Events in the Economy? Some Empirical Evidence"

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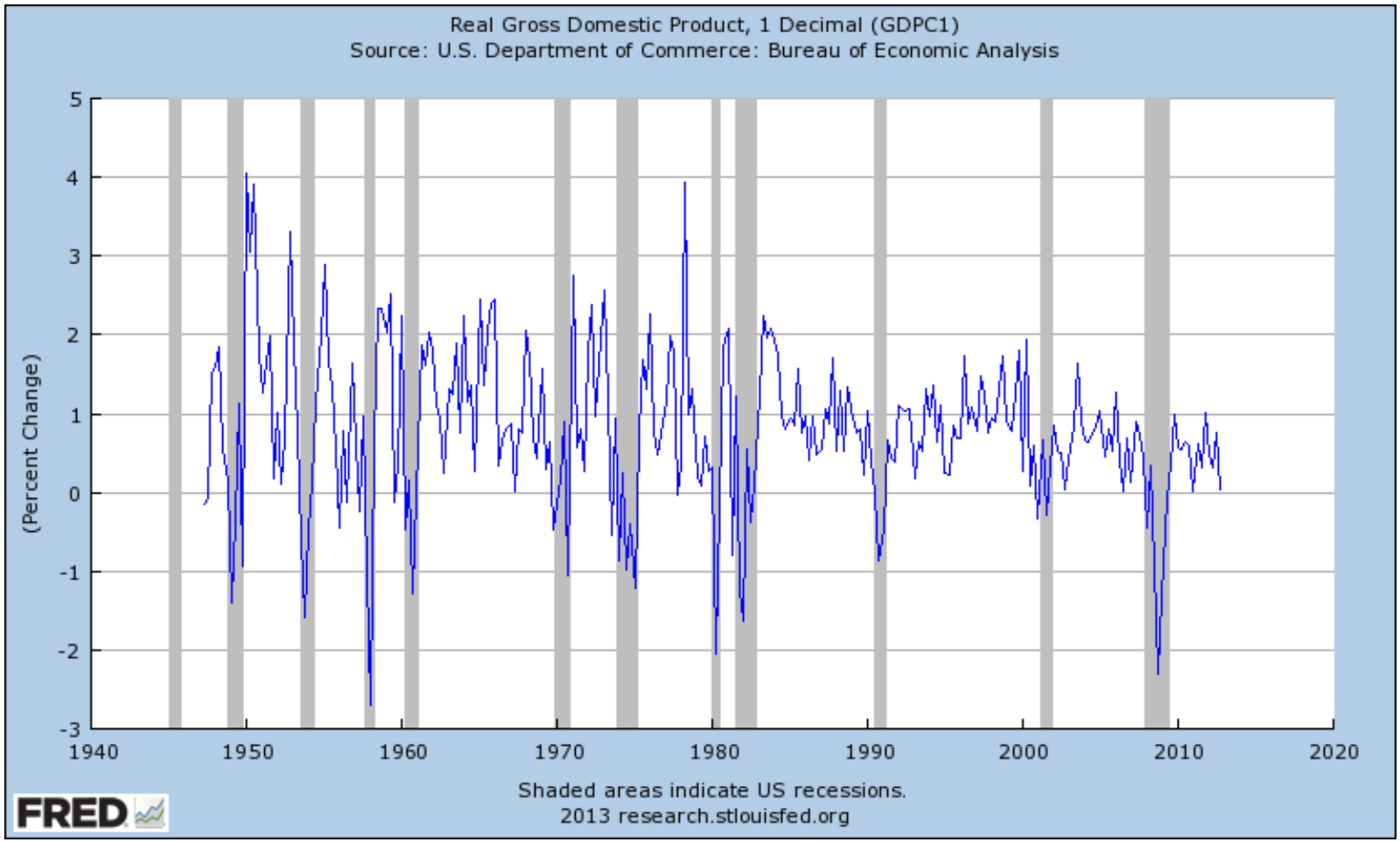
CNB Research Open Day, Prague 16 May 2016

# Great Moderation & Great Recession



# The Case for Non-Linear, Fat-Tailed Shock Macroeconomics

- Standard DSGE models accounted pretty well for fluctuations during the Great Moderation ...
- ... however they didn't forecast the Great Recession and they don't even conceive the possibility of such a crisis (Krugman, 2011)
- Why? DSGE models are not well suited to account for fat-tailed shocks and multiple macroeconomic regimes
- Stiglitz (2015): macroeconomic models should jointly account for mild recessions and deep downturns
- In fact, the Great Moderation and the Great Recession are intimately entangled

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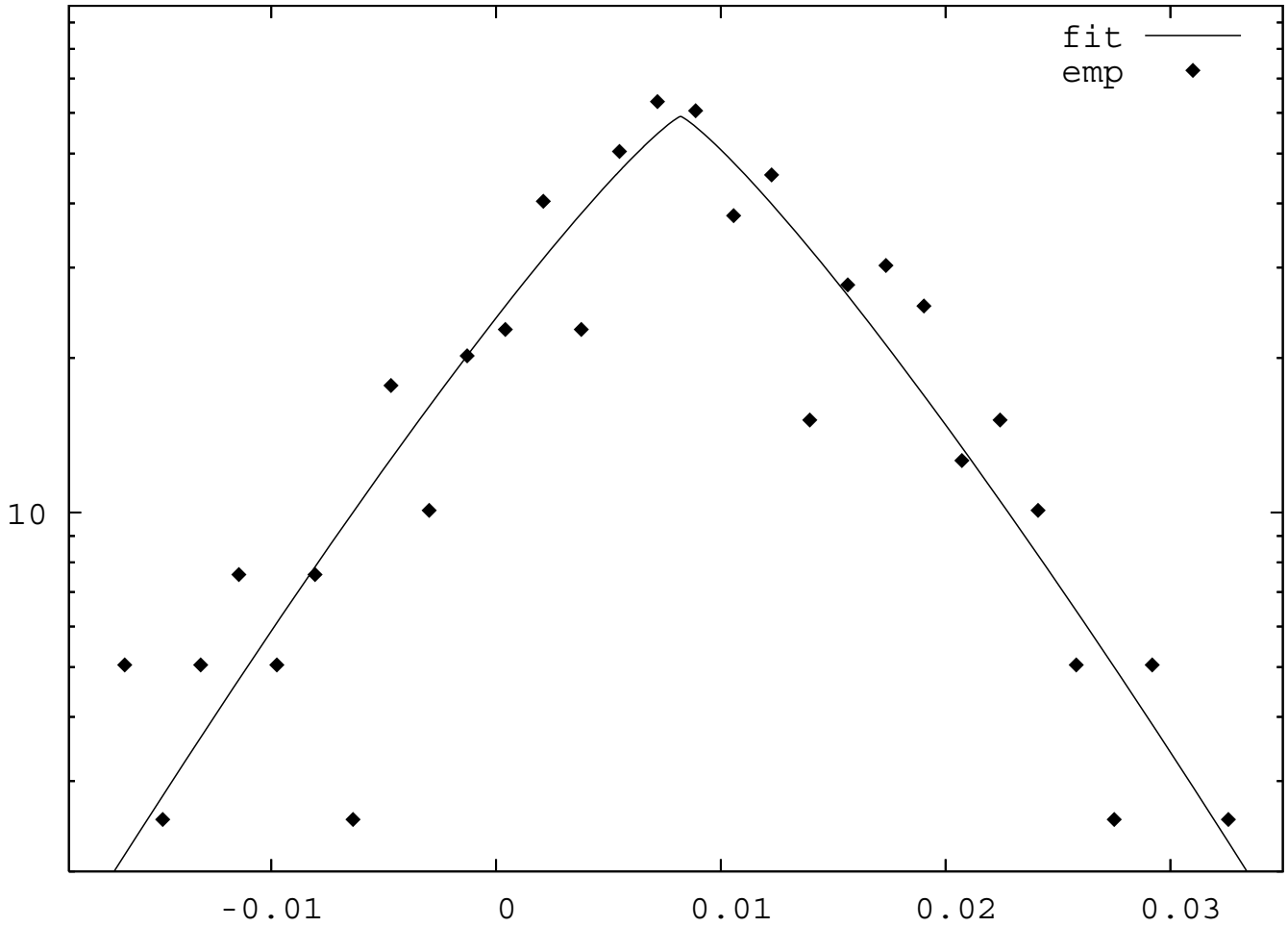
# Fat-Tailed Output Growth-Rate Distributions

Fagiolo, Napoletano and Roventini (2008), Journal of Applied Econometrics

- U.S. GDP growth rate distributions are fat-tailed and well approximated by Laplace densities
- Such evidence holds also for other macroeconomic series and in other OECD countries
- Implications:
  - coexistence of small and rare, large shocks
  - macroeconomic models should account for higher moments of GDP growth-rate distributions
  - macroeconomic models should explain both mild downturns and crises

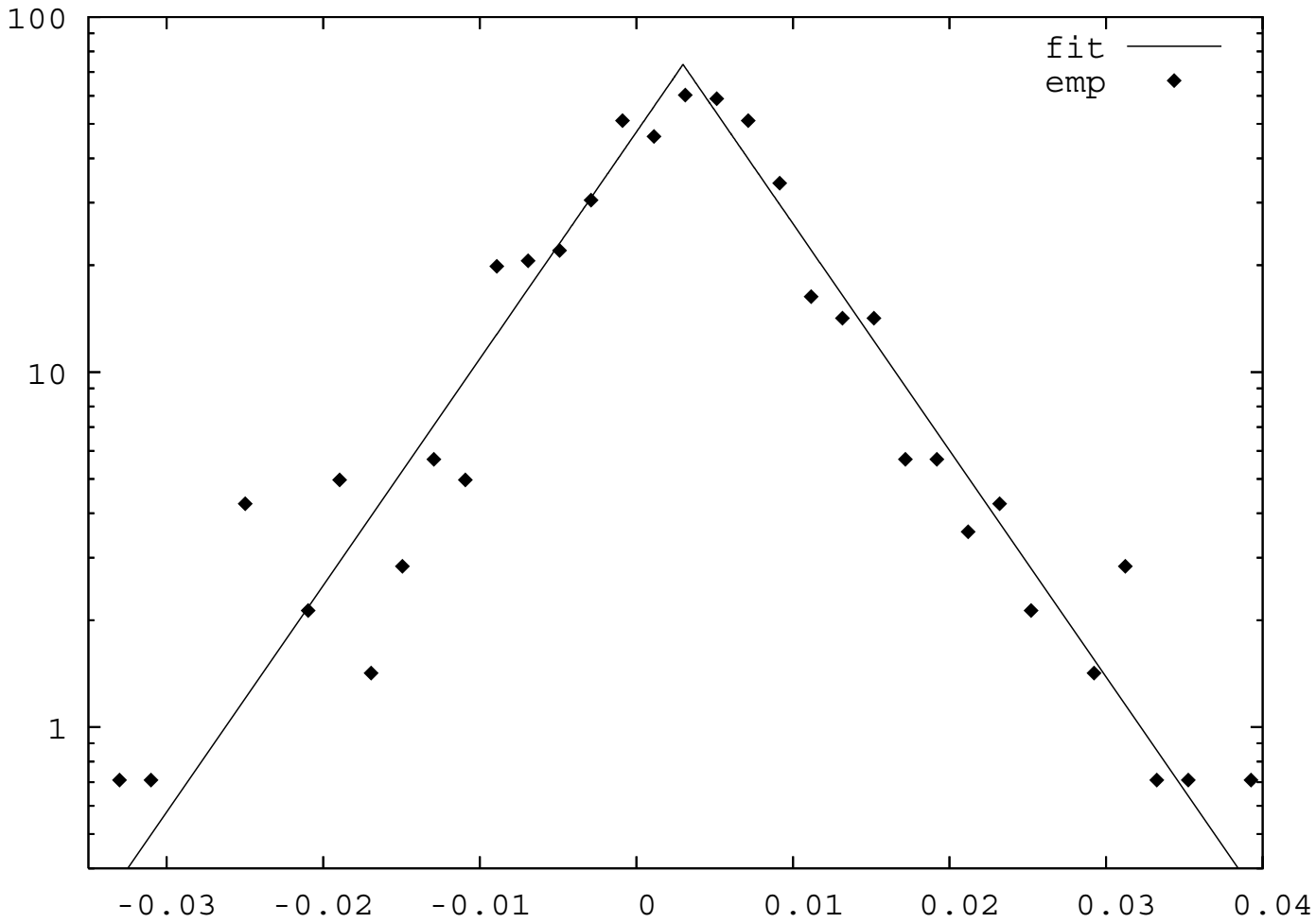
# U.S. GDP Growth-Rate Distribution (1947-2005)

Source: Fagiolo, Napoletano and Roventini (2008), Journal of Applied Econometrics



# U.S. IP Growth-Rate Distribution (1947-2005)

Source: Fagiolo, Napoletano and Roventini (2008), Journal of Applied Econometrics

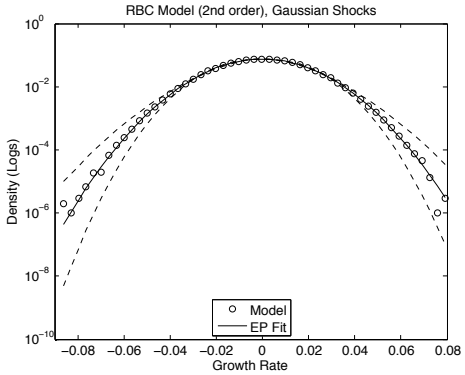


# Can Macroeconomic Models Account for Fat Tails?

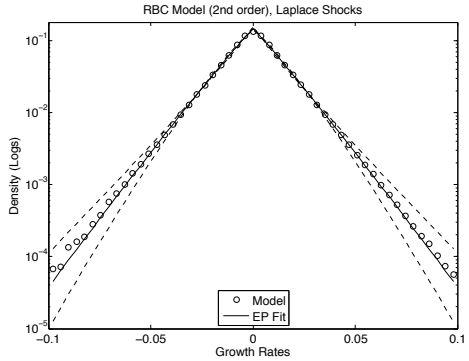
- Output and other macro growth-rate time series are well approximated by Laplace, fat-tail densities
- Can RBC and DSGE models explain such empirical regularities?
- NO!!! (Ascari, Fagiolo and Roventini (2015), Macroeconomic Dynamics)
  - the tautological nature of RBC models
  - propagation mechanisms in DSGE models smooth fat-tailed shocks

# GDP Distributions Generated by RBC and DSGE Models,

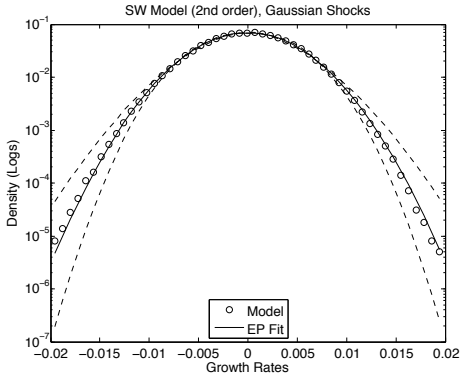
Ascari, Fagiolo and Roventini (2015), Macroeconomic Dynamics



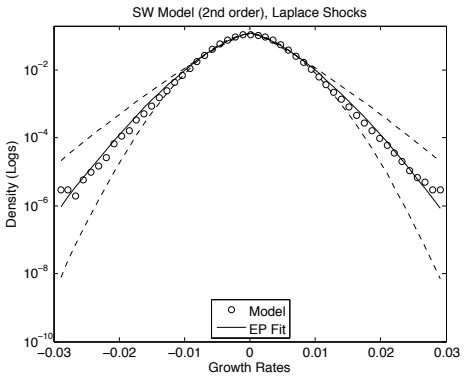

(a) RBC, Gauss




(b) RBC, Laplace




(c) SW, Gauss



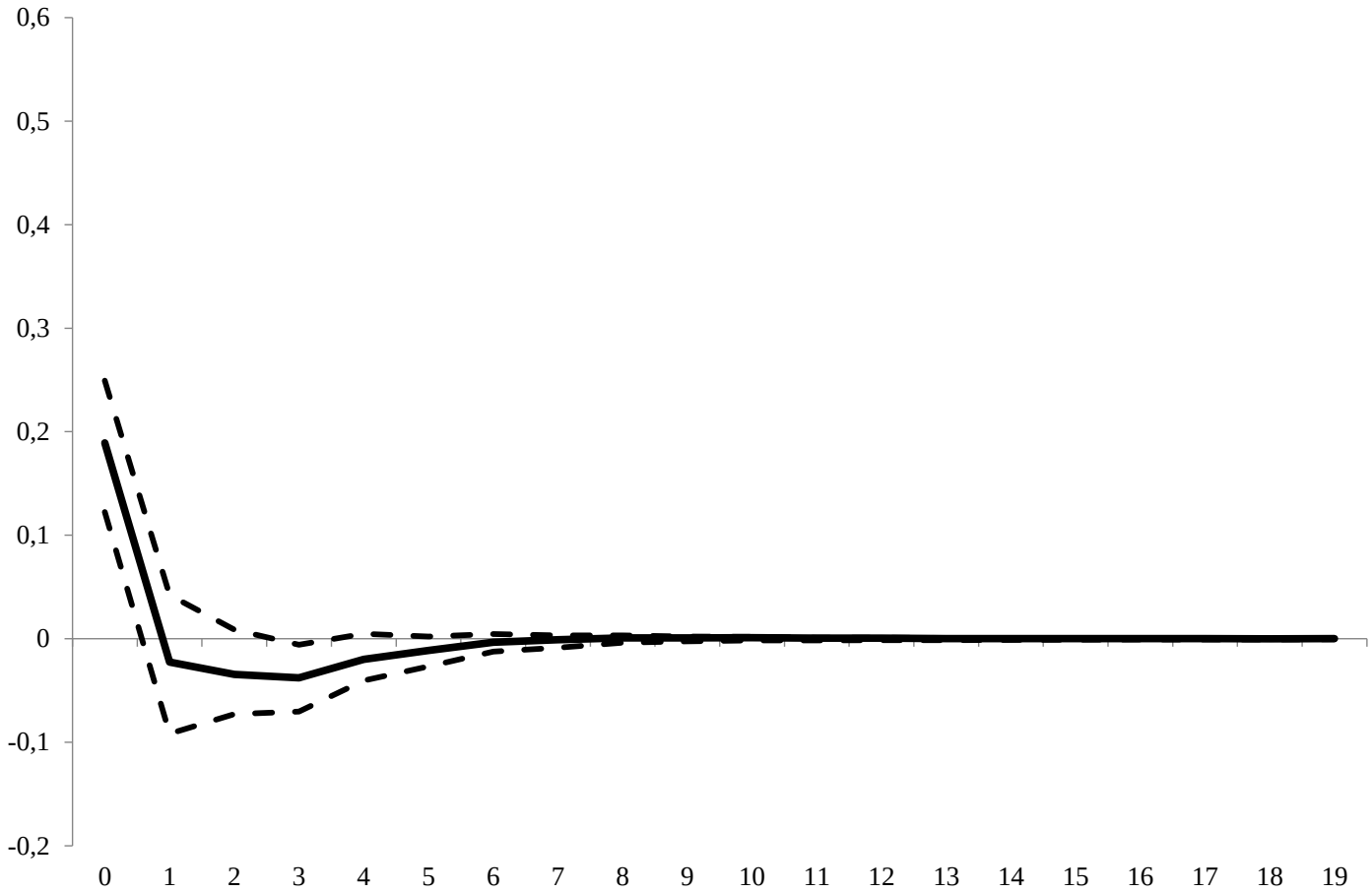

(d) SW, Laplace

# Financial Frictions and Multiple Macroeconomic Regimes

- All post-1985 recessions originated in financial markets (NG and Wright, 2013)
- Increasing evidence supporting the existence of multiple macroeconomic regimes
- Credit market regimes:
  (Ferraresi, Roventini and Fagiolo, 2015, JAE)
  - TVAR model for the U.S. (1984-2010)
  - Proxy for credit conditions: spread between BAA-rated corporate bond yield and 10-year treasury constant maturity rate
  - The effects of fiscal policy depends on the state of credit markets

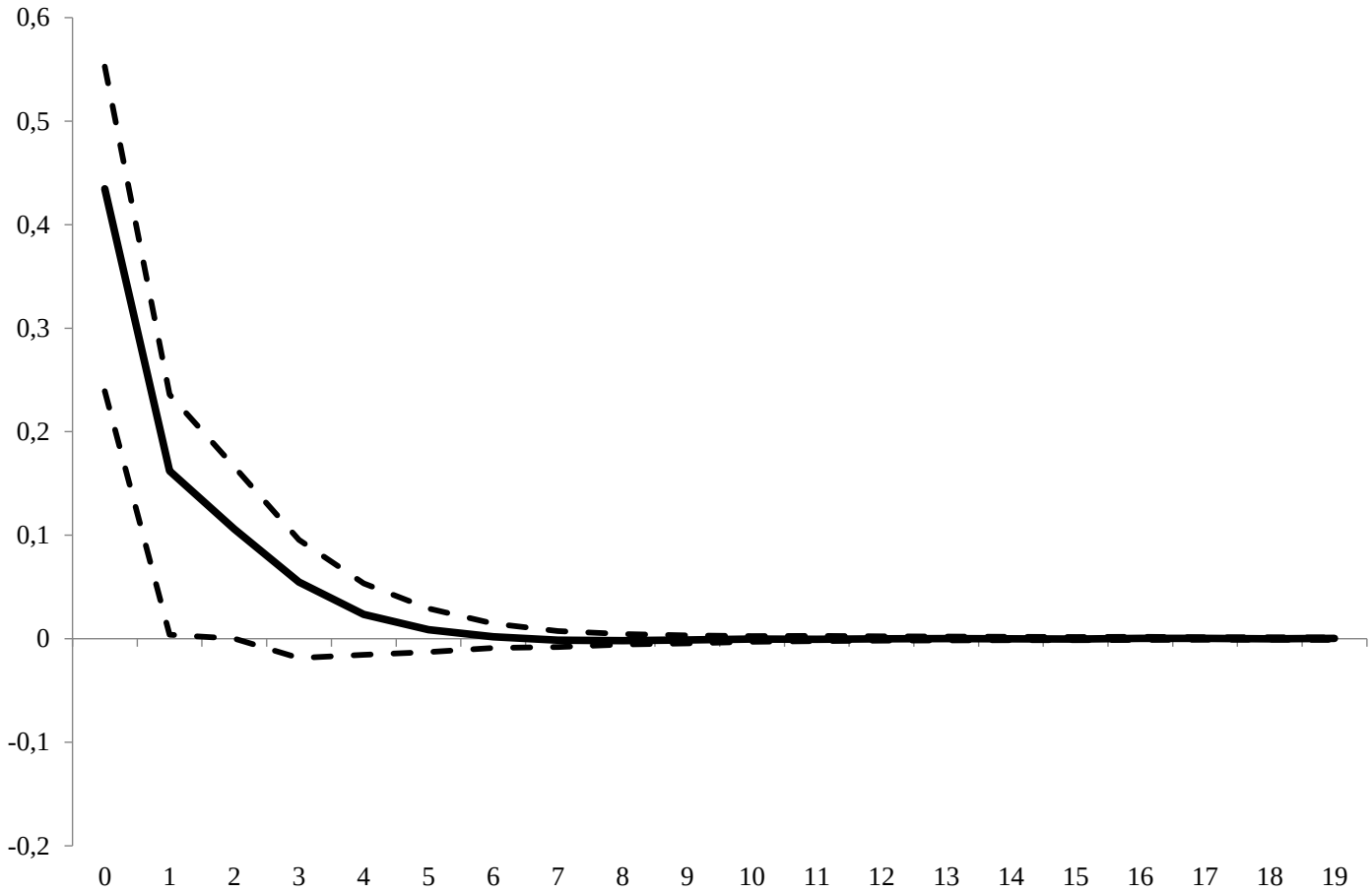
# Response of GDP to a Fiscal Shock

## Normal Credit Regime (Ferraresi, Roventini and Fagiolo, 2015, J. of App. Econ.)



# Response of GDP to a Fiscal Shock

Tight Credit Regime (Ferraresi, Roventini and Fagiolo, 2015, J. of App. Econ.)



# Motivations of the Paper

- After the Great Recession some macroeconomic models have assumed t-distributed shocks in a linear framework
- Other models have considered non-linearities and multiple regimes with Gaussian errors
- The paper jointly studies fat-tailed shocks and non-linearities in a TVAR with t-distributed or Gaussian shocks
- This allows to assess the contributions of multiple regimes vis-à-vis fat-tailed shocks

# Data and Model Specification

- Data: U.S. quartely data from 1984 to 2013
- Model:
  - GDP, CPI inflation, federal funds rate
  - threshold variable: spread between BAA-rated corporate bond yield and 10-year Treasury constant maturity rate (also MIX and FCI)

# Main Results

- According to the Deviance Information Criterion, models with t-distributed shocks outperform the ones with Gaussian shocks regardless of the number of regimes
- Multiple regimes alone do not improve the explanatory power of the model
- Multiple regimes cum fat-tailed shocks considerably improve out-of-sample forecasting
  - the Root Mean Squared Errors suggest that specifications with one regime outperform multiple regime ones
  - however, density forecasts accuracy (measured with the Kullback-Leibler Information Criterion) considerably improve when non-linearities and fat-tailed errors are considered
- The results holds also when monthly data are employed and when the Great Recession is excluded

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# What I Like in the Paper

1. The paper provides a fresh and insightful assessment of two of the most hot topics in the current macroeconomic debate
2. The econometric model is “simple as possible, but not simpler”
3. The econometric analysis is very well executed
4. The results are crystal clear and can have relevant policy implications

# Comments and Suggestions

1. Exponential-power (e.g. Laplace) vs. t-student shocks
2. Employing as threshold the spread variable developed by Gilchrist and Zakrajsek (2012)
3. STVAR vs. TVAR models
4. Accounting for structural monetary policy shocks and GIRFS