Why has GDP growth been so slow to recover?

Stock and Watson

Discussion

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Slow recovery? Potential explanations

1. Slower trend growth preceding the crisis
2. Demand or policy failures
3. One-off: international, fiscal, financial, uncertainty, ZLB
4. Measurement

The paper: two complementary ways to address the problem

1. Differences with previous recovery for key variables: trend or cycle?

Compute trend using supply side decomposition including demographic factors

Conclude: for all variables is mostly trend but for productivity it is not clear

2. Run a factor model on deterended data and compute projections: for which variables is the unanticipated component large?

Long term unemployment, labor force partecipation, government expenditure, government employment and export

Not for consumption, investment and employment

Conclude: explanation 3 or 4 are more likely

Overall conclusions

- A lot is “business as usual” for cyclical behaviour – in particular consumption, employment and investment - this rules out explanations such as inequality and deleveraging (affecting consumption) or uncertainty or secular stagnation (affecting investment)
- One-off factors such as fiscal policy and external factors explain the “unusually slow” recovery (cycle) but a lot is explained by supply side trends
- Productivity slowdown (unexplained cyclical component) remains a puzzle

My discussion

A. Basic observation

- Basic problem to answer the question of this paper/conference: time series models do not capture well low frequency movements
- SW's approach is to pre-detrend and then study the cycle. This is reasonable but under-estimate uncertainty

➢I will use two different statistical models as a complementary exercise

B. Predictability of C and I is not enough to rule out explanations of type 2 (e.g. deleveraging)

My discussion – based on two models

Two models:

1. Large Bayesian VAR in level

- *advantage*: do not need pre-detrending + take account of all uncertainty
- *disadvantage*: long term forecast may be distorted – problem partially addressed via sum of coefficients prior

2. Bayesian factor model in rates of growth with varying trend

- Take account of uncertainty of trend estimate

Exercise 1: VAR in levels – stress test

1. Large Bayesian VAR

Priors set to cope with large dimension + sum of coefficients prior

- Estimate parameters using sample 1984q1-2007q4

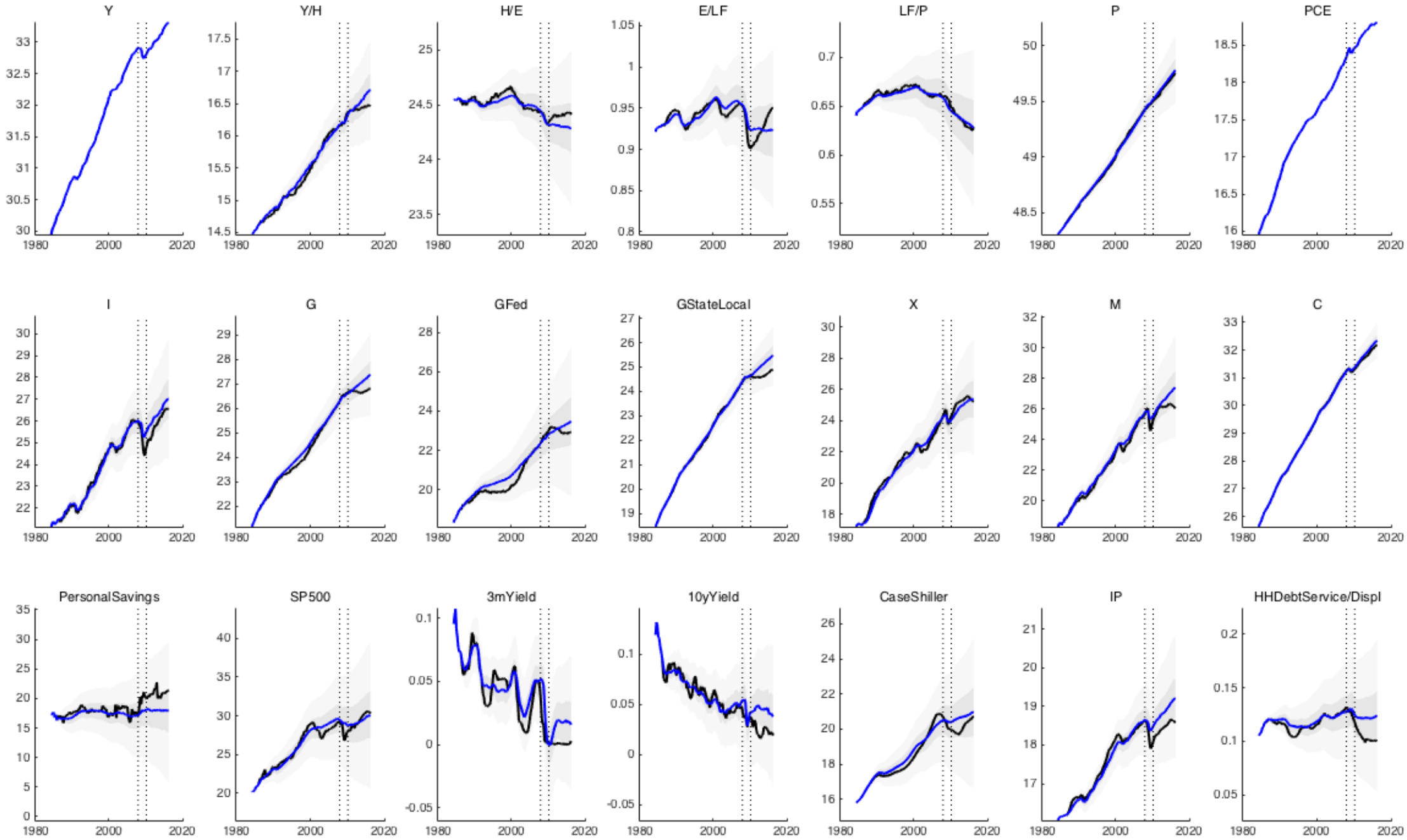
➢A STRESS TEST:

- Position myself in 2009q4 but assume I know the future path for GDP and PCE in 2010q1-2016q2 (stressed scenario).
- Compute conditional projections on the basis of those paths and estimated parameters 1984-2007

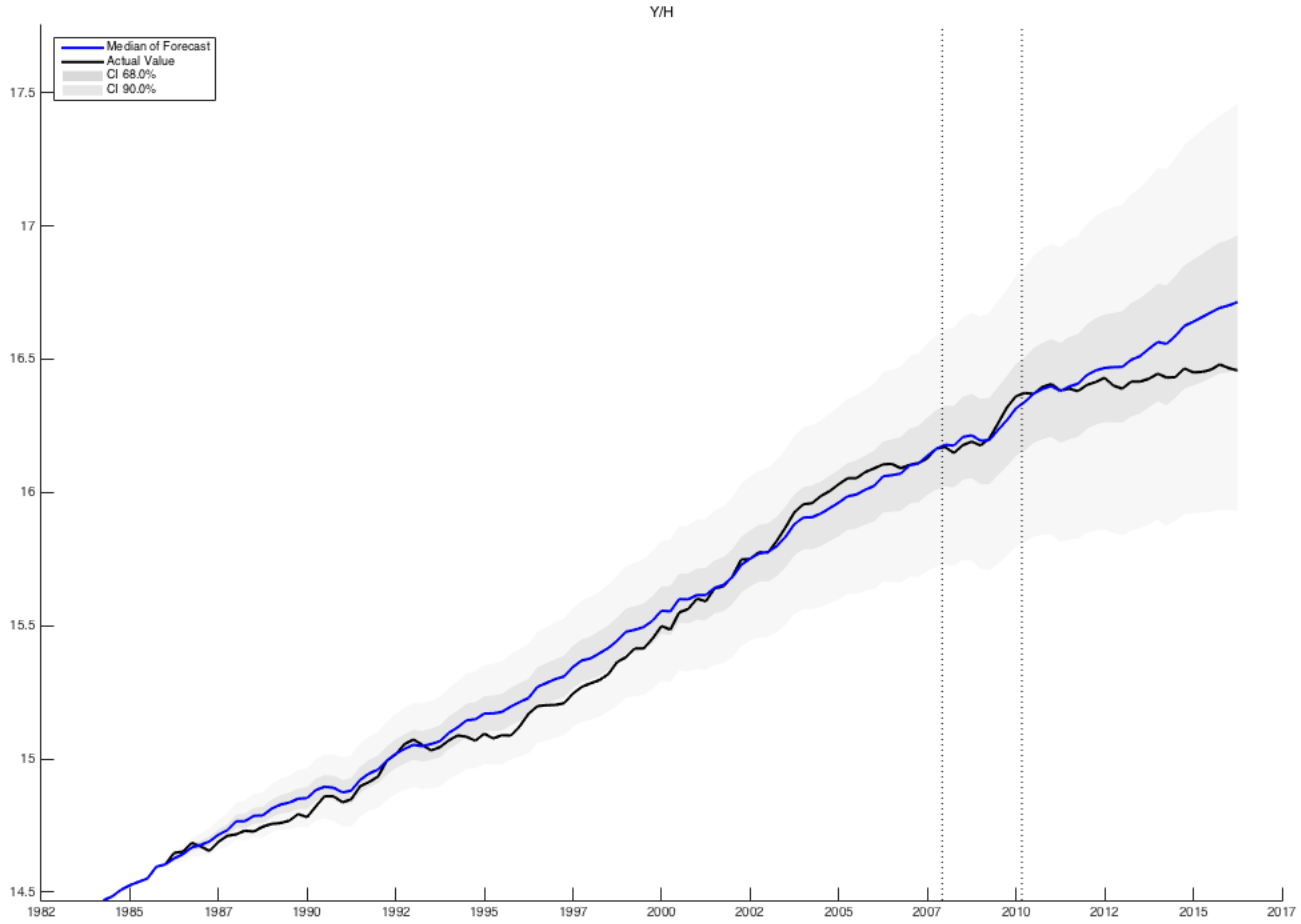
QUESTION: Controlling for output and inflation since 2010, how accurate would have been the predictions for key variables?

21 VARIABLES IN THE VAR

Real GDP	Exports
Labor Productivity	Imports
Hours per Worker	Personal Consumption Expenditures
Employment over Labor Force	Personal Saving
Labor Force Participation Rate	S&P 500 Index
Population	3-Month Treasury Bill Yield
PCE	10-Year Treasury Bill Yield
Gross Total Investment	Case-Shiller Home Price Index
Government Spending: Total	Industrial Production Index
Government Spending: Federal	HH Debt Payments as a % of Disposable Income
Government Spending: State & Local	

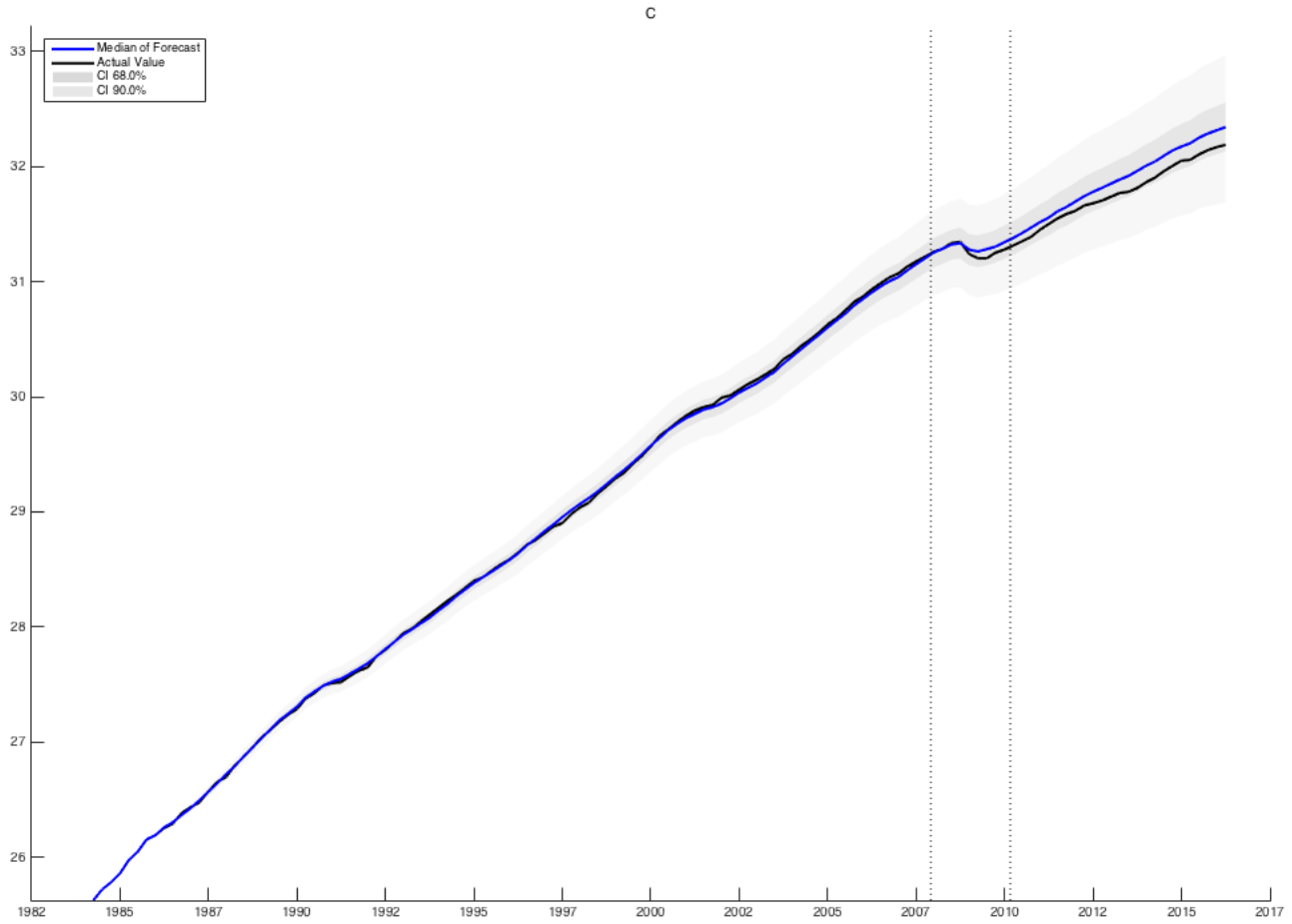

Y
Y/H
H/E
E/LF
LF/P
P
PCE
I
G
GFed
GStateLocal
X
M
C
PersonalSavings
SP500
3mYield
10yYield
CaseShiller
IP
HHDebtService/Displ

Labor Productivity

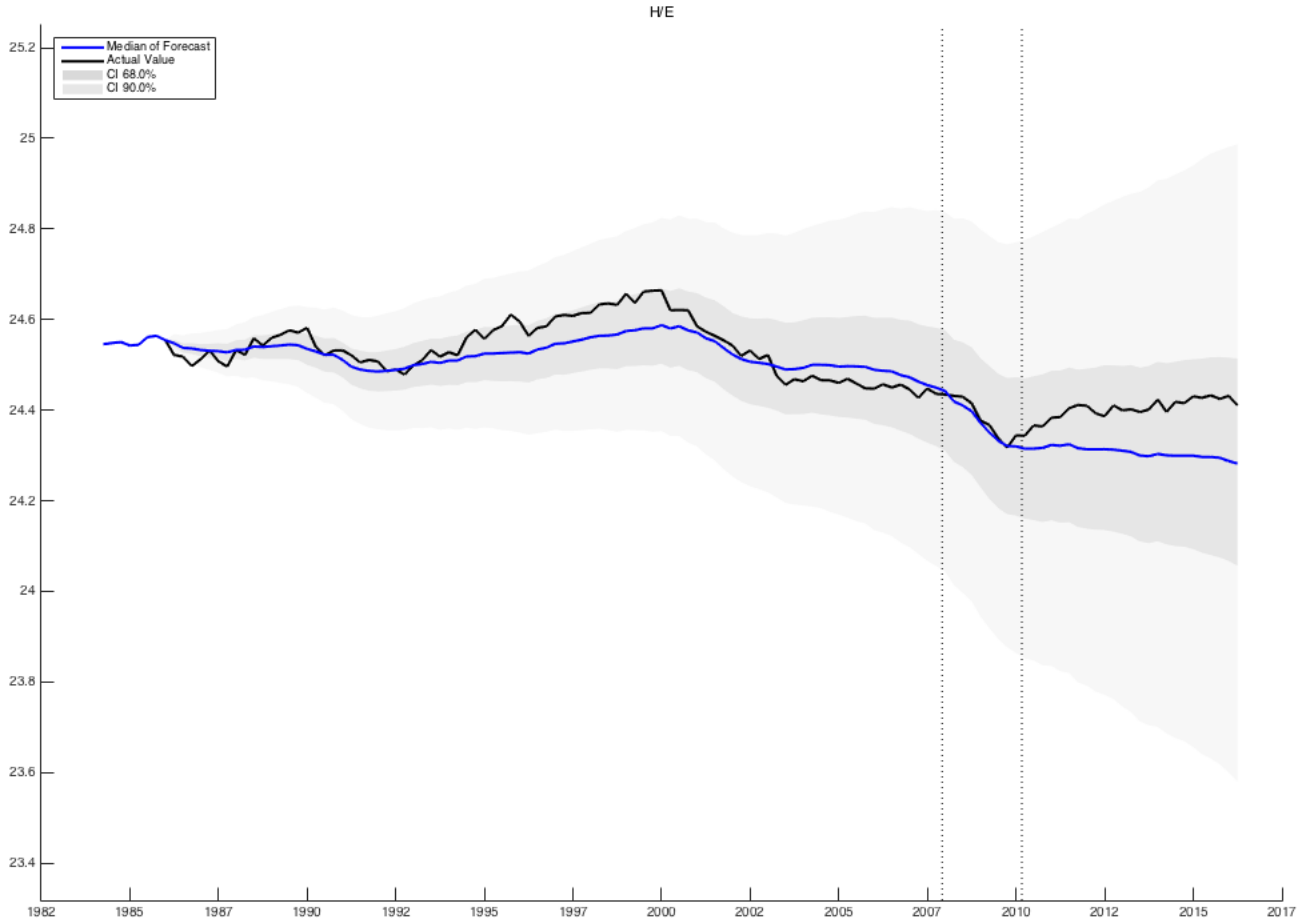


Other results: a lot of stable stuff!

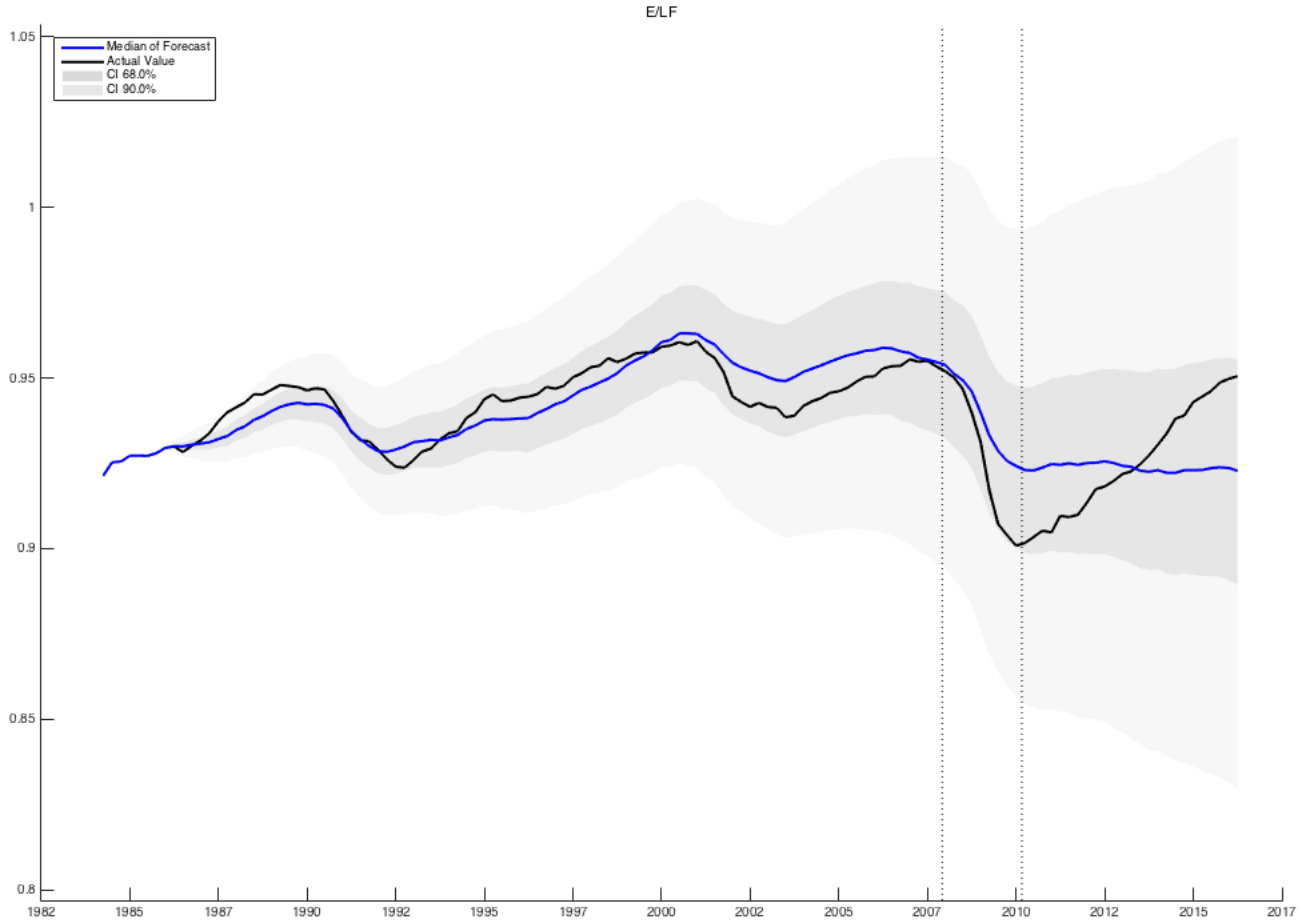
Consumption



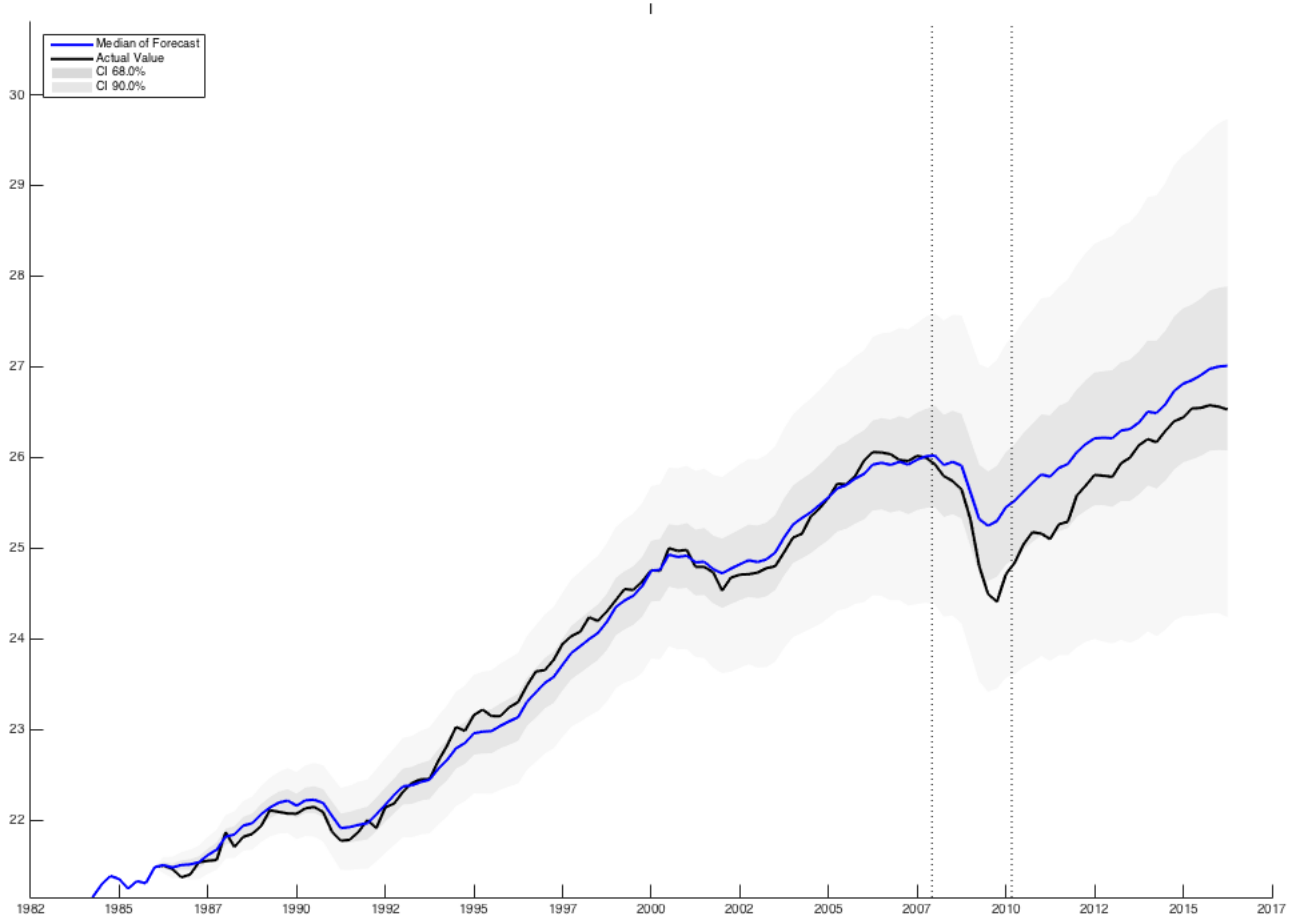
Hours per worker



Employed over LF



Investment


Median of Forecast
Actual Value
CI 68.0%
CI 90.0%
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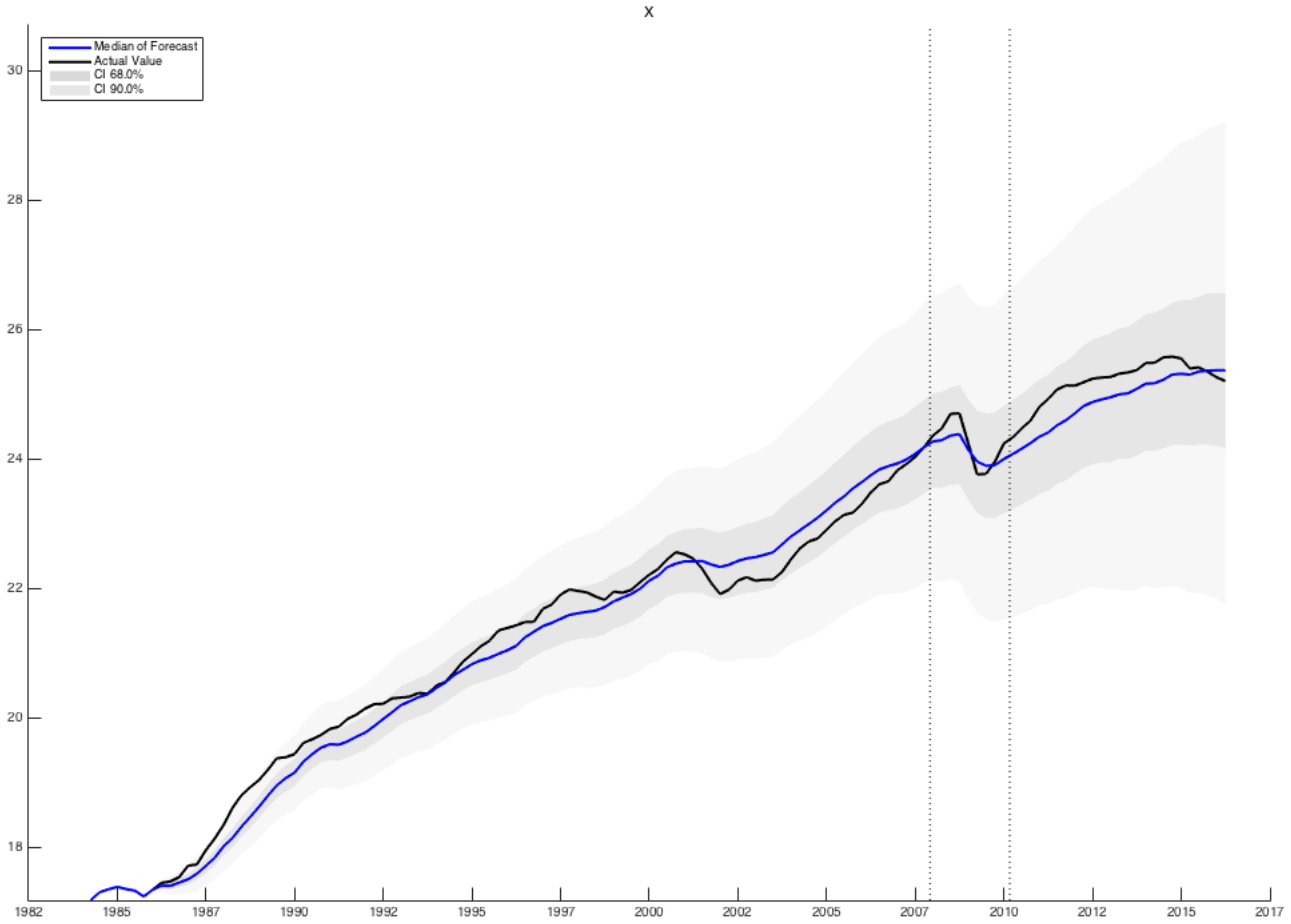
Exports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Median of Forecast
Actual Value
CI 68.0%
CI 90.0%
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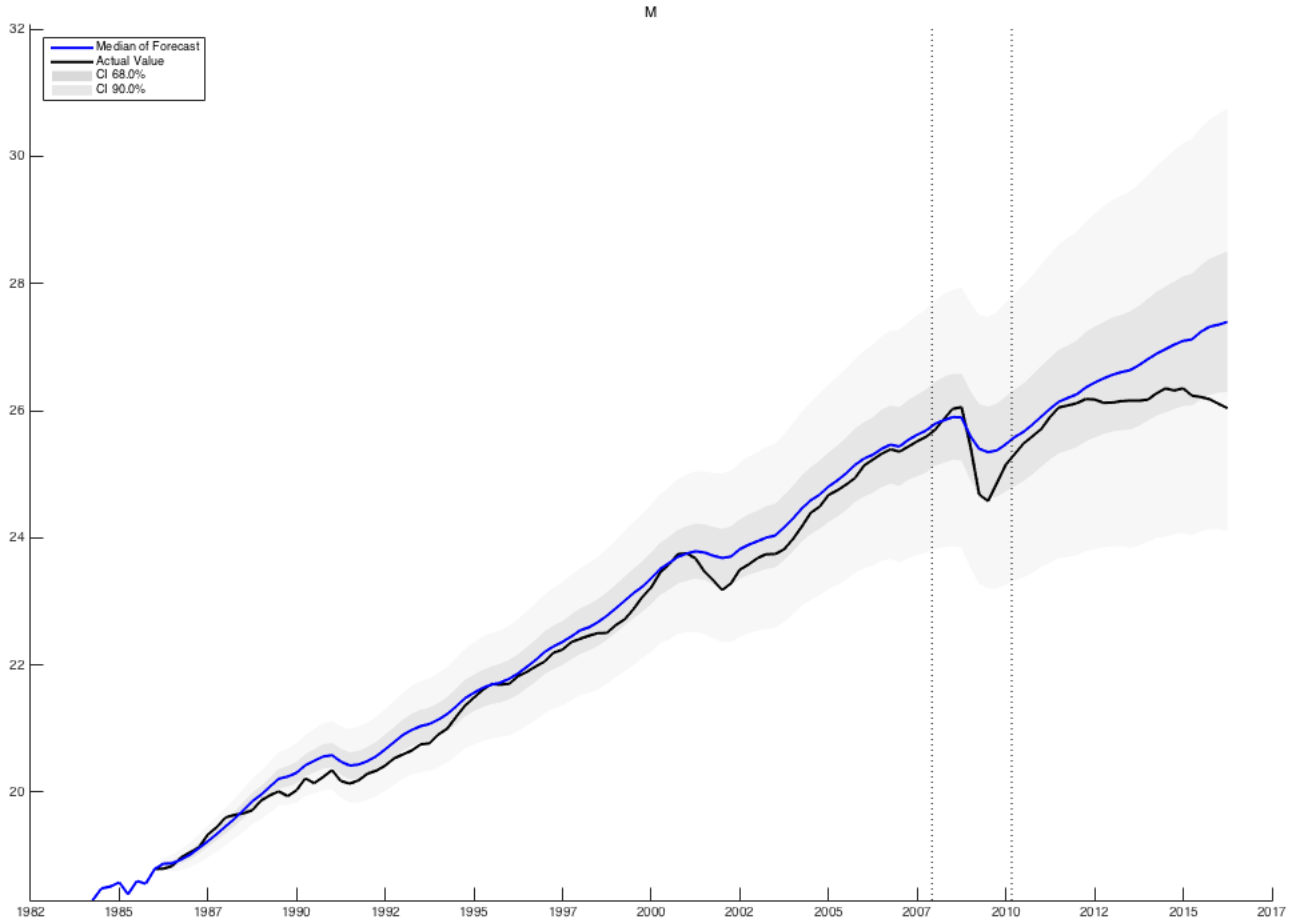
Imports


M
Median of Forecast
Actual Value
CI 68.0%
CI 90.0%
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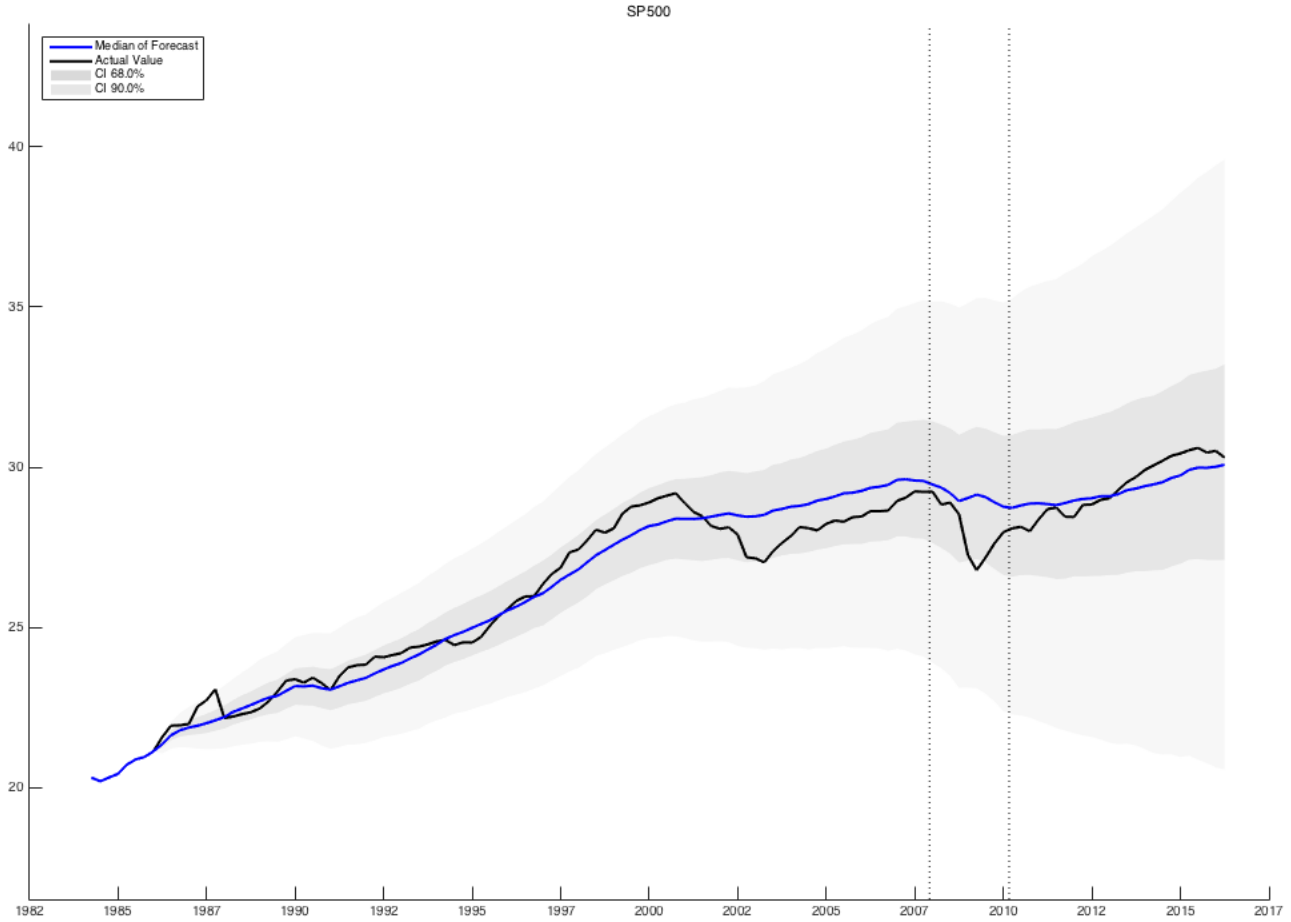
SP500


SP500
Median of Forecast
Actual Value
CI 68.0%
CI 90.0%
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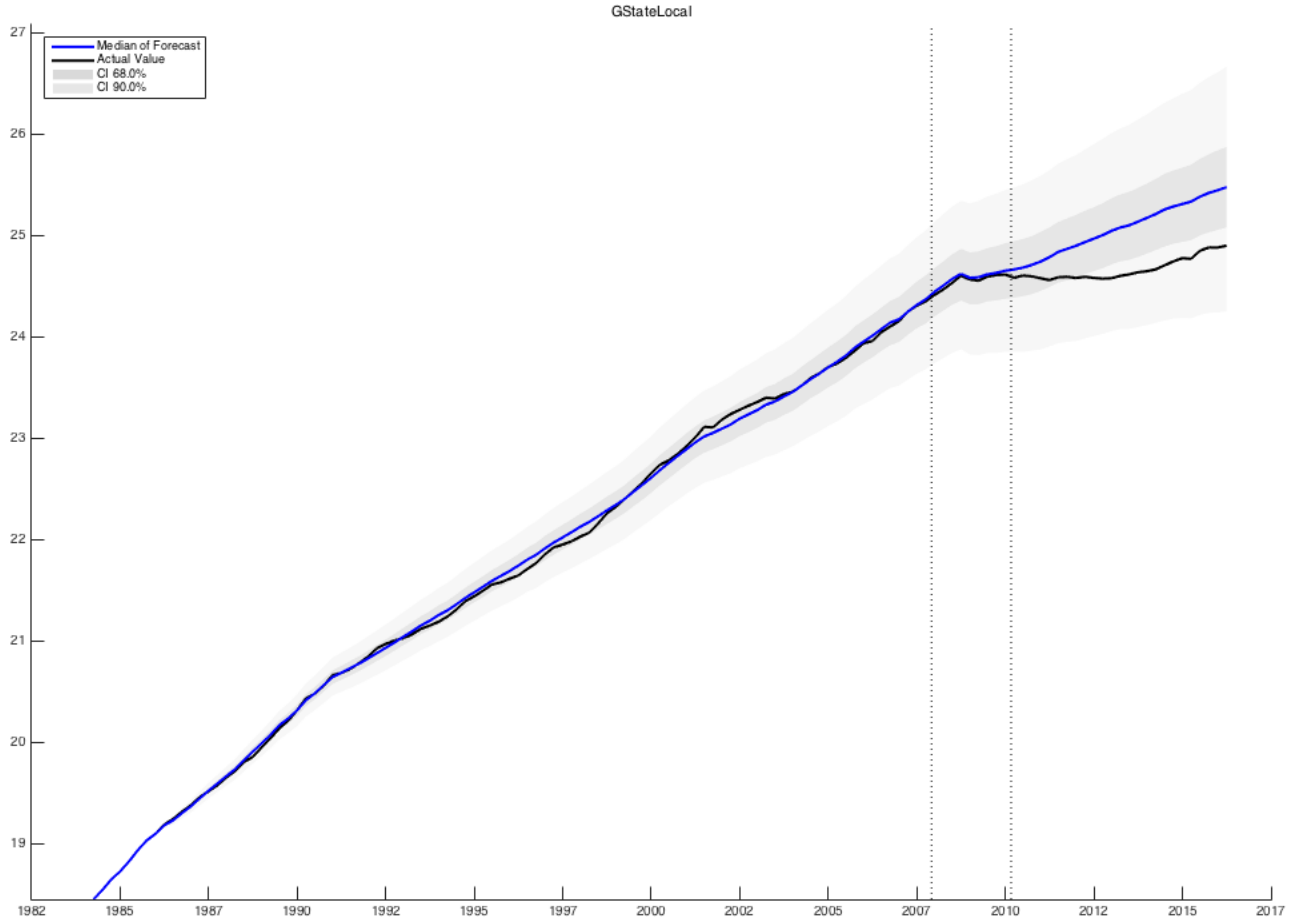
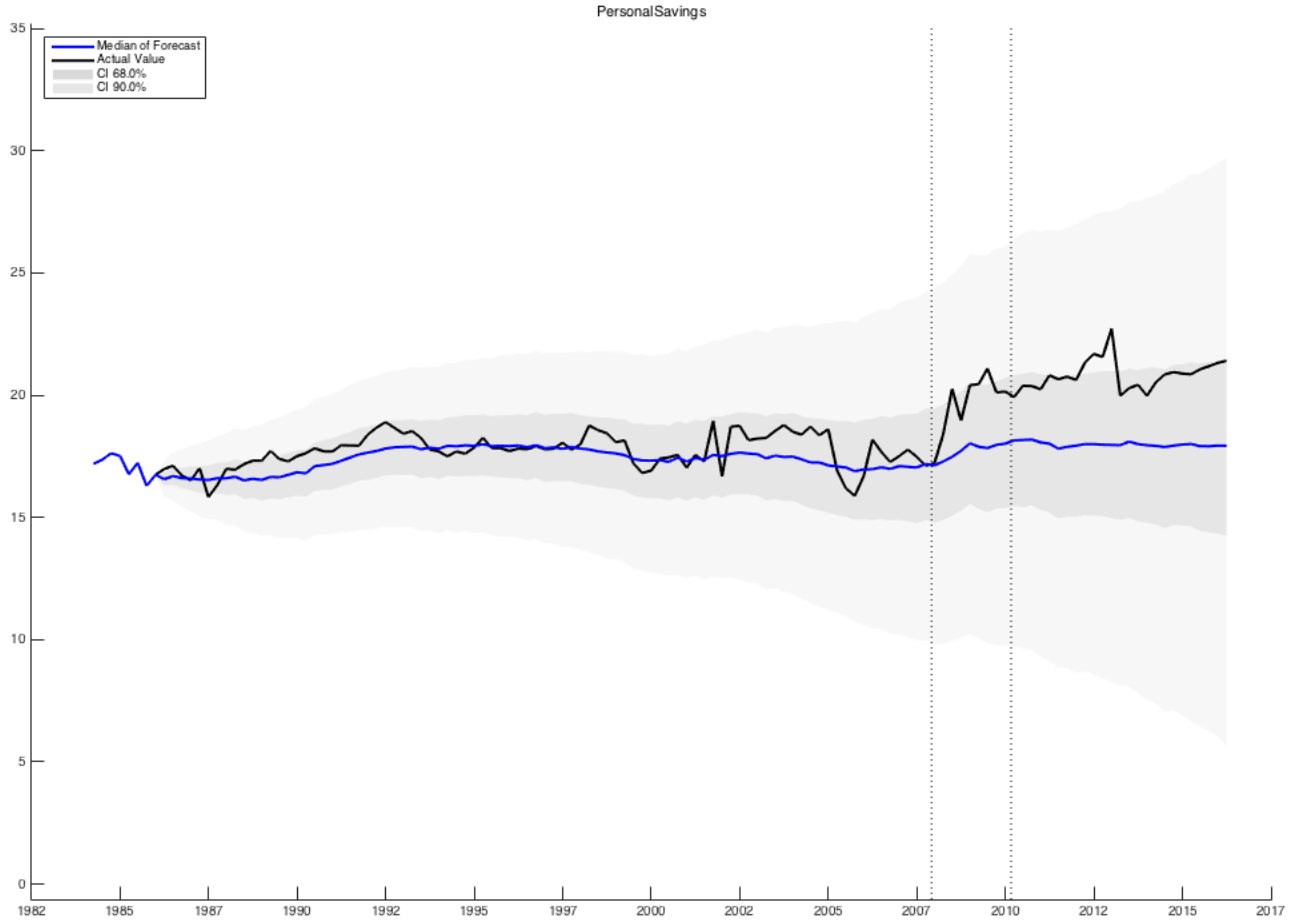
2017

Results: but also some “exceptional” dynamics

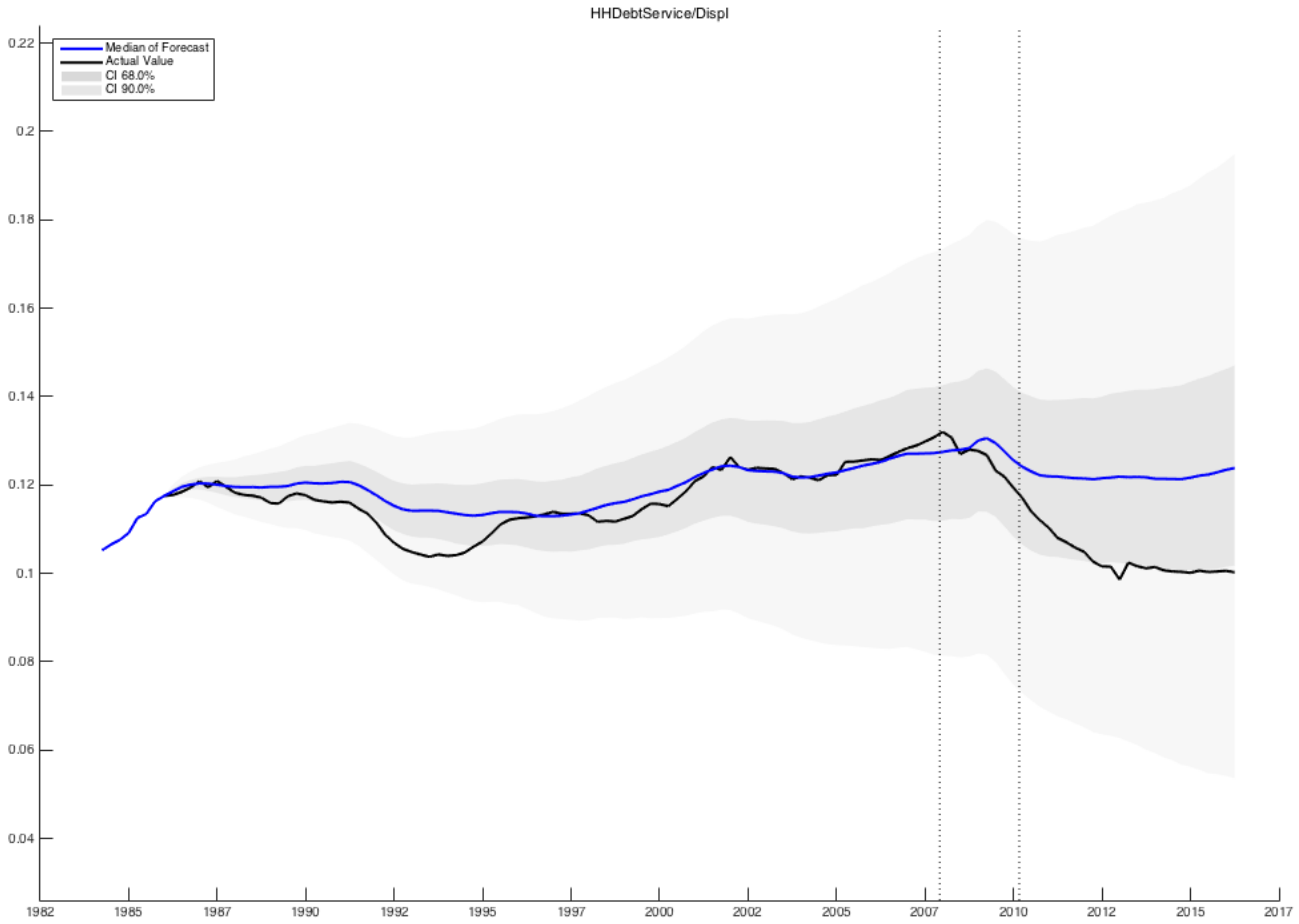
Gov Spending State and Local



Personal Savings



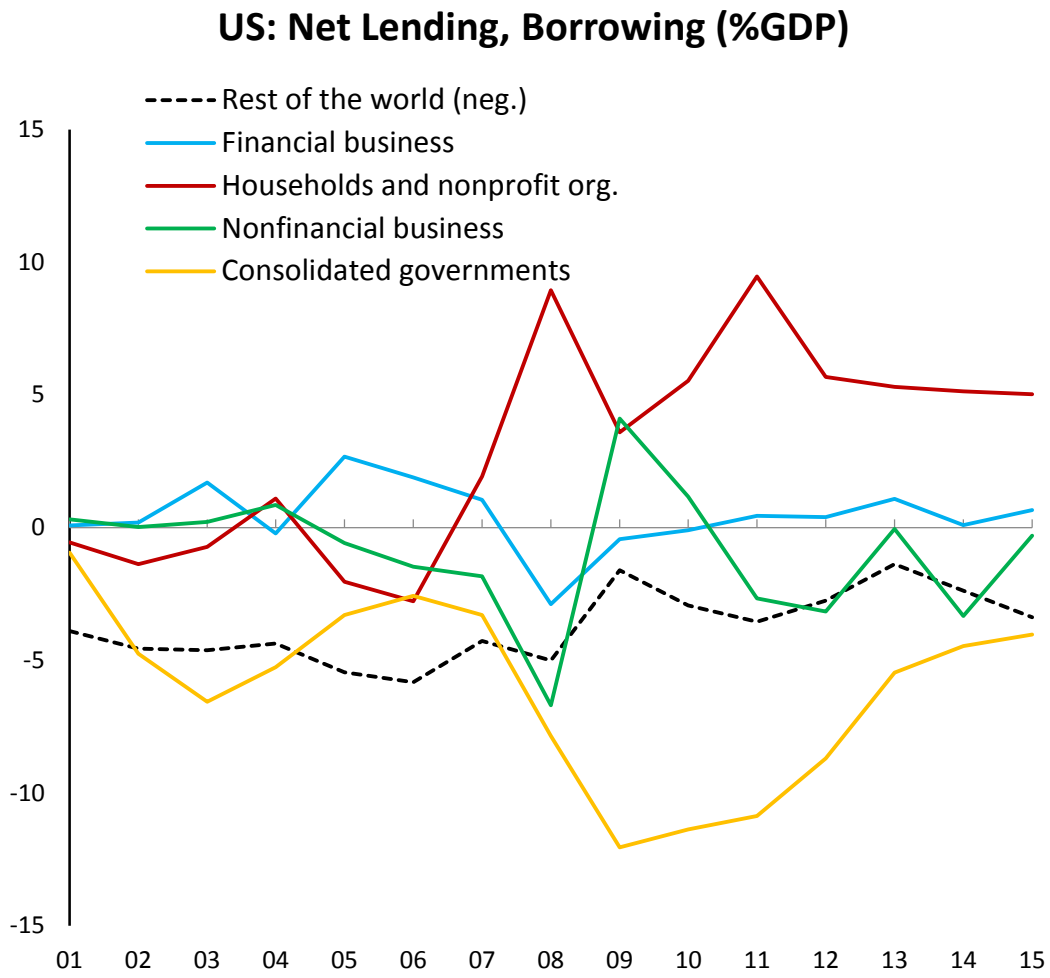
HH Debt Payments over Income

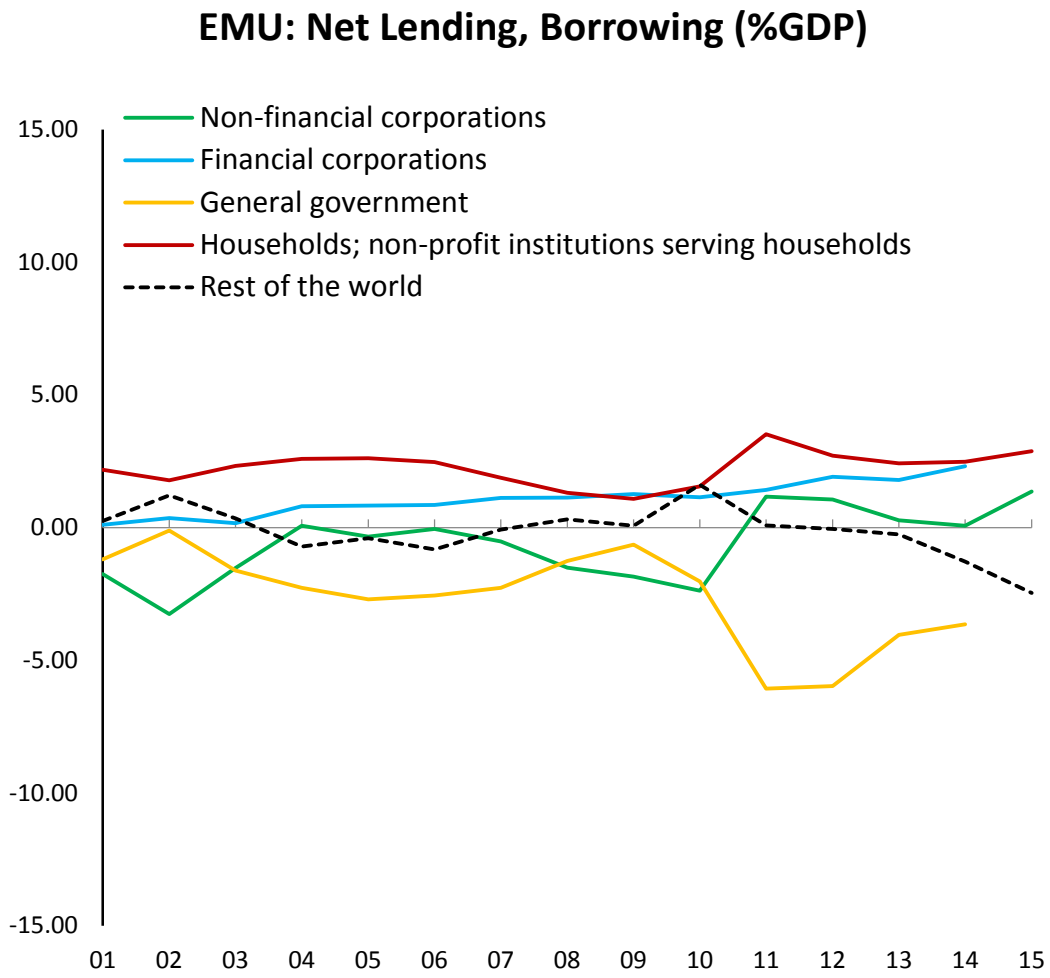


Missing story in SW paper

- Households' debt payments unusual decline collapse during the crisis and continue to decline in the recovery
- Households savings increase exceptionally during the crisis and remains exceptionally large

The US and the euro area: sectoral flows





Source: Authors' calculations based on ECB, Eurostat and Federal Reserve data.

Household liabilities over disposable income– the US and the Euro Area

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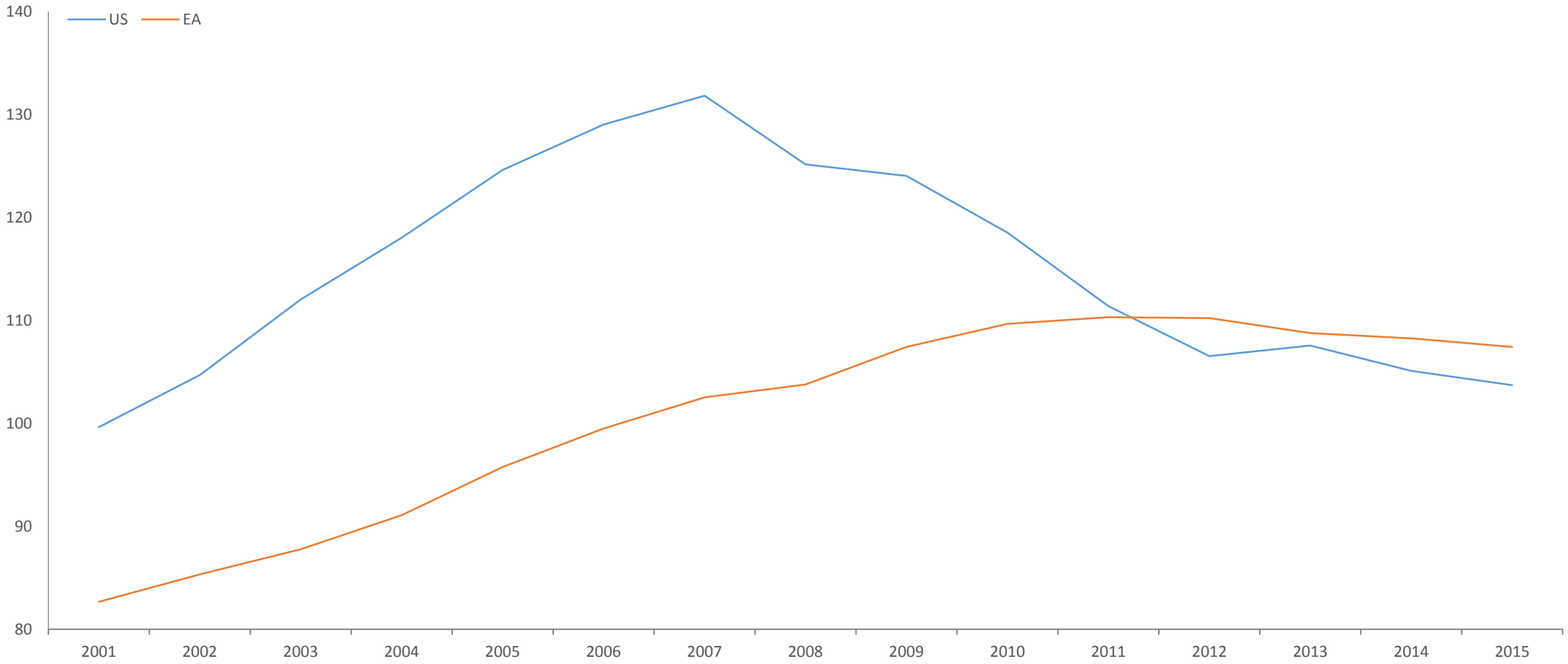
source: FRB, BEA, Eurostat, ECB



Exercise 2: VAR in levels – trends

The VAR:

$$y_t = \gamma + A y_{t-1} + u_t$$

Long term forecast (deterministic component)

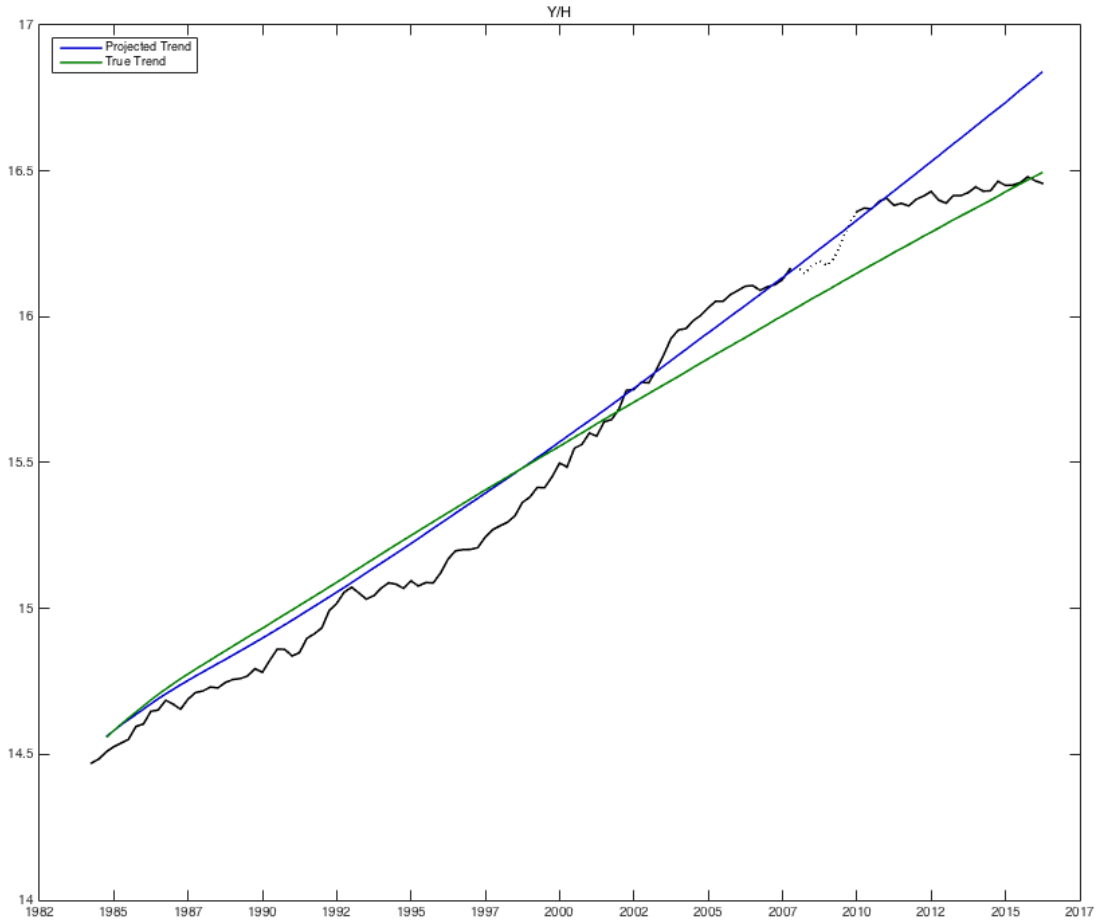
$$d_t = A^{t-1} y_1 + \sum_{j=0}^{t-2} A^j \gamma$$

NB: tendency of over-fitting – prior on sum of coefficients repairs it to some extent

- Compute it for the whole sample (true trend) and pre-crisis
- Compute unconditional projections and plot against these two trends

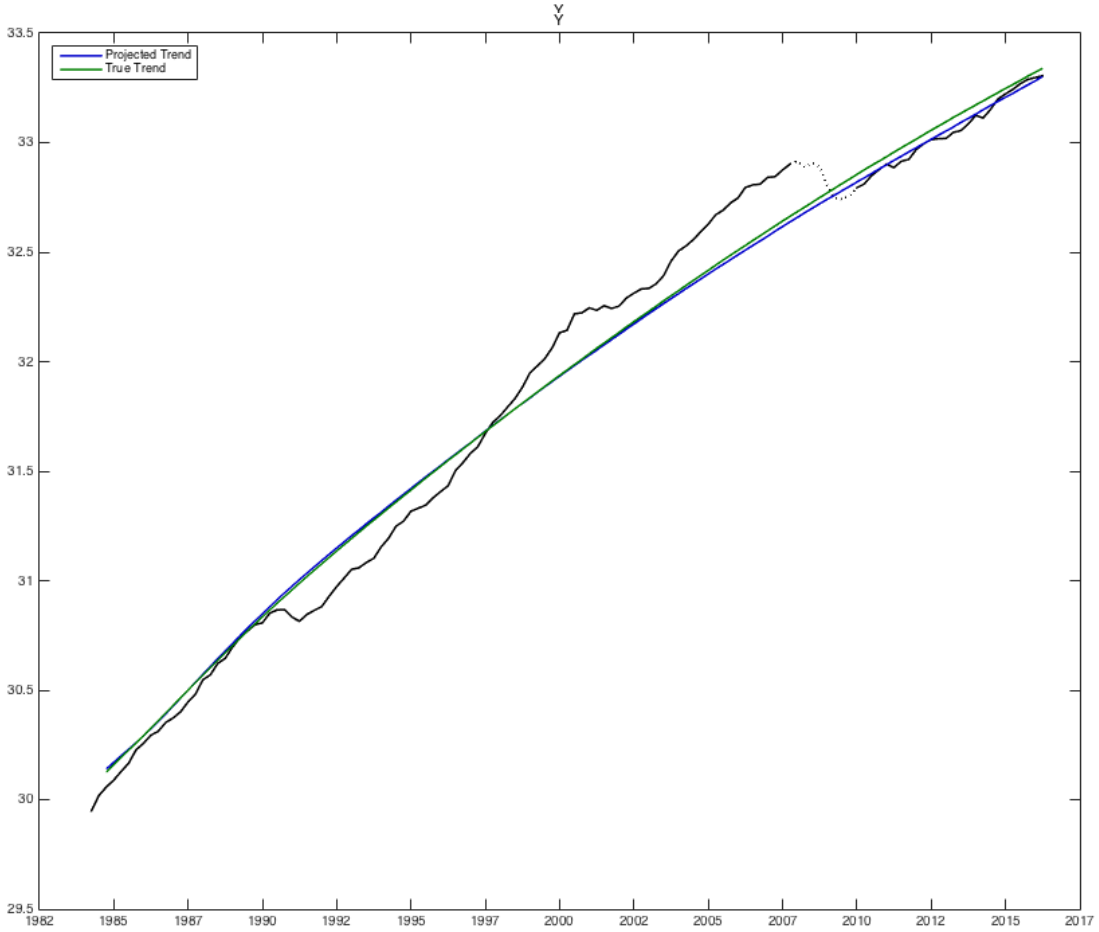
Deterministic Trend: Labor Productivity

Observations since 2010 push down the trend estimate - Persistent slowdown



Deterministic Trend: Real GDP

- Trend of GDP less sensitive to inclusion of 2010-2016 data



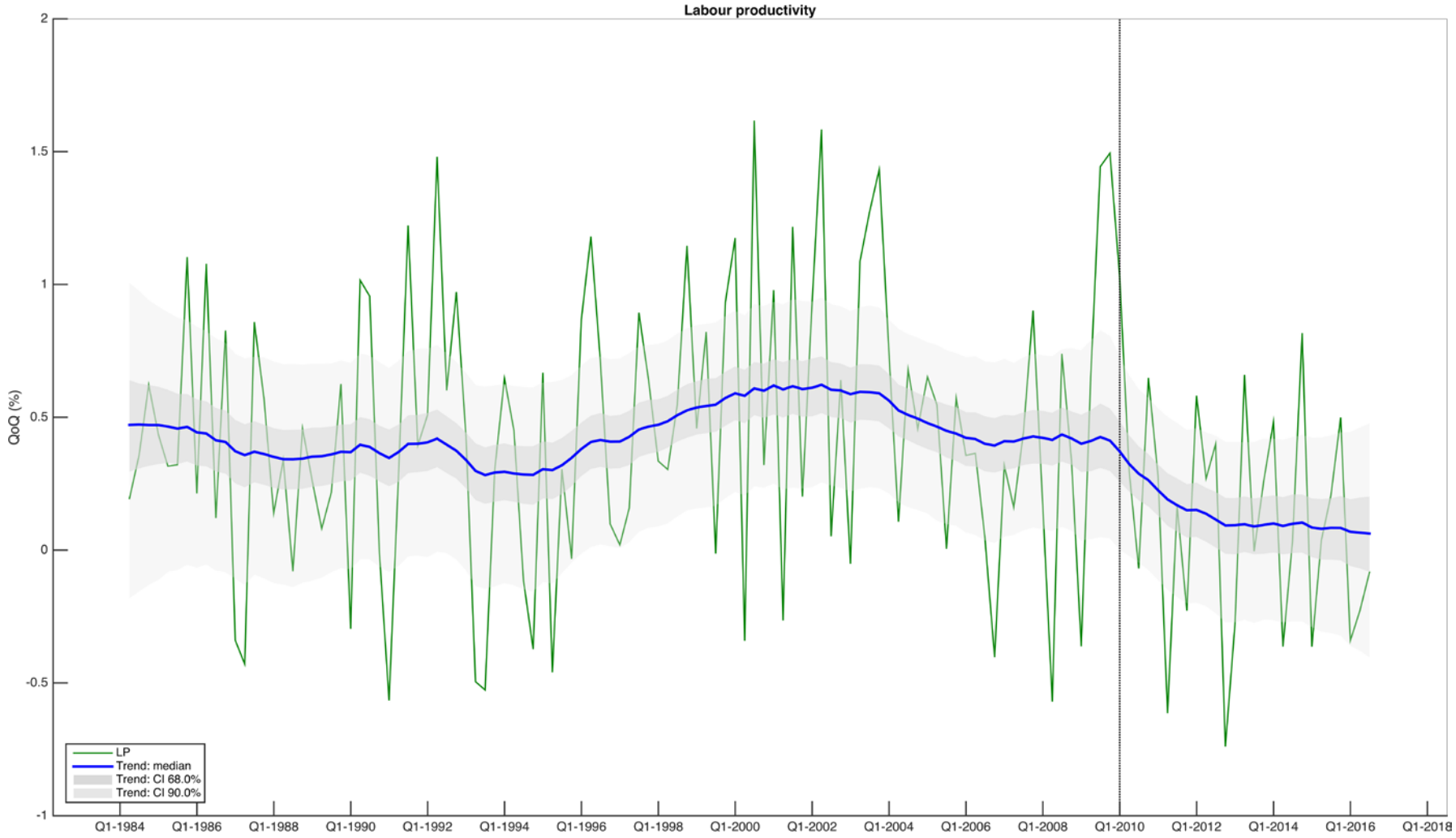
Exercise 3: Bayesian factor model with random walk trend in the rate of growth

$$\Delta y_{i,t} = \underbrace{\Lambda_i T_t + \Psi_i C_t}_{Common} + \underbrace{e_{i,t}^T + e_{i,t}^C}_{Idio}$$

$$\mathrm{T}_t = c + T_{t-1} + u_t$$
$$\mathrm{C}_t = A_1 C_{t-1} + A_2 C_{t-2} + v_t$$
$$e_{i,t}^T = d + e_{i,t-1}^T + \epsilon_{i,t}$$
$$e_{i,t}^C = B_1 e_{i,t-1}^C + B_2 e_{i,t-2}^C + \varepsilon_{i,t}$$
$$u_t \sim N(0, Q_T)$$
$$v_t \sim N(0, Q_C)$$
$$\epsilon_{i,t} \sim N(0, R_{i,T})$$
$$\varepsilon_{i,t} \sim N(0, R_{i,C})$$

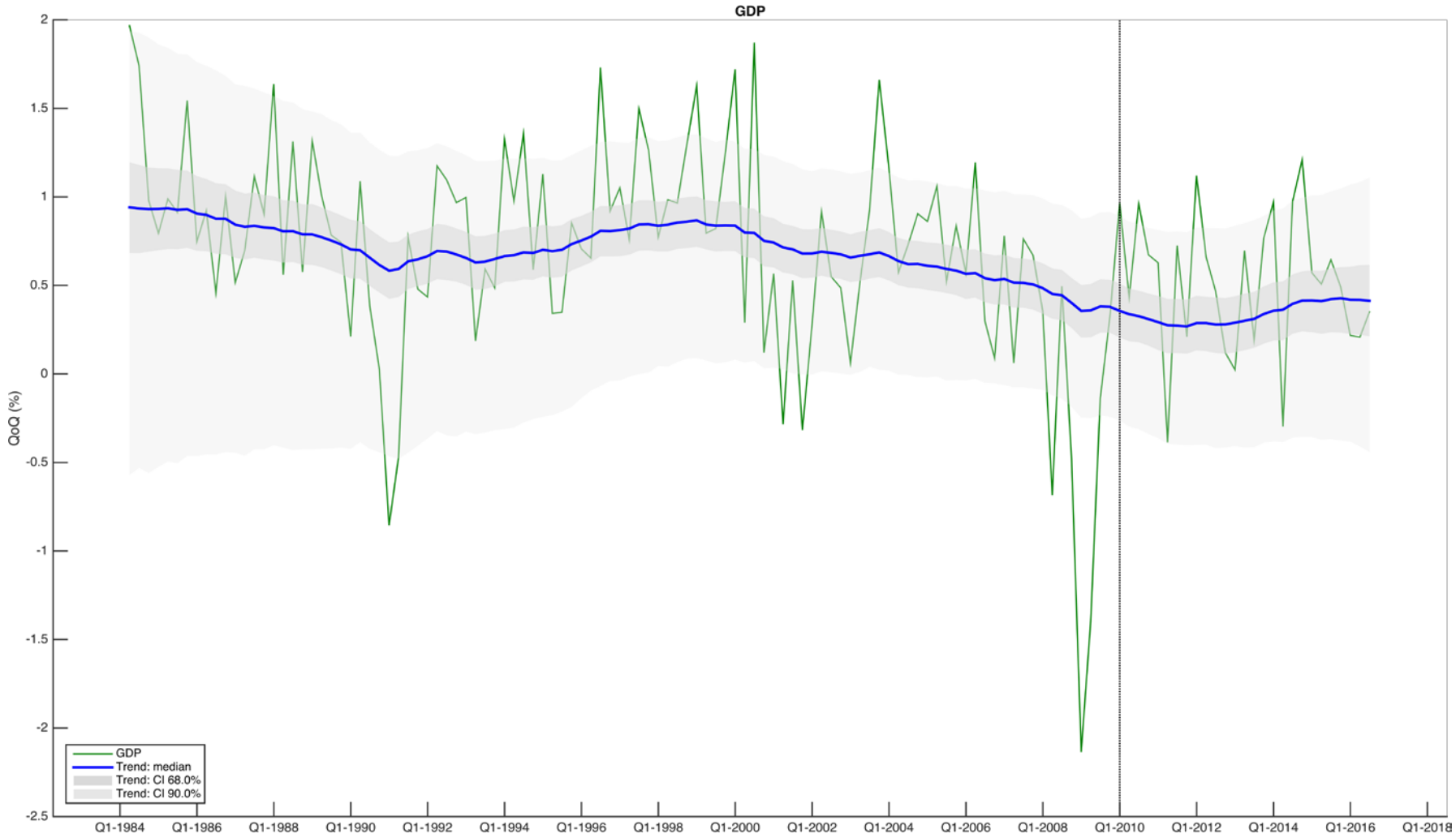
Labour productivity and its variable trend

the statistical model detects a slowly declining trend since early 2000 and an acceleration of decline since 2010– coherent with VAR result

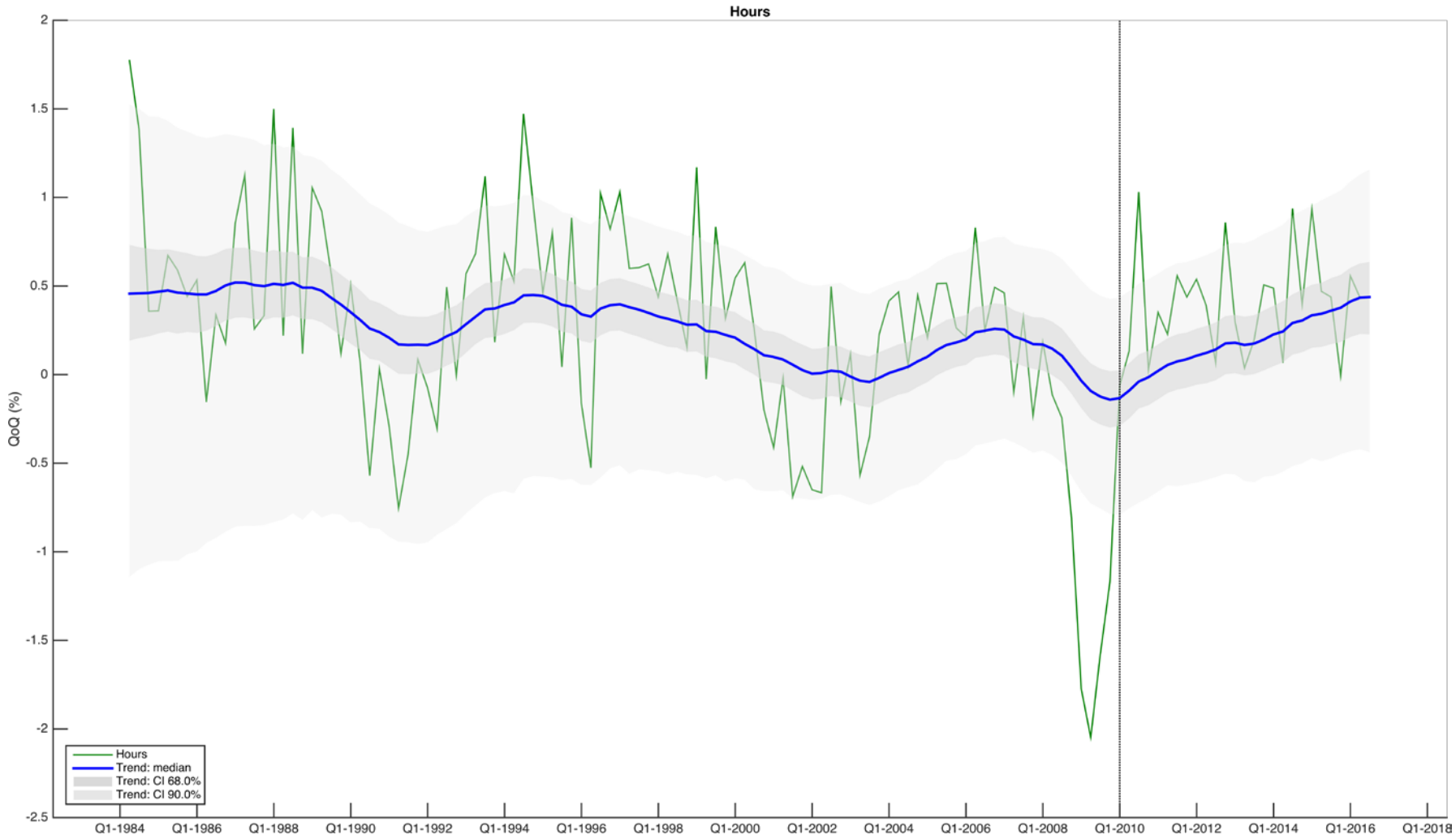


GDP and its variable trend

the statistical model detects a slowly declining trend since early 2000 and a flat trend since 2010– coherent with VAR result

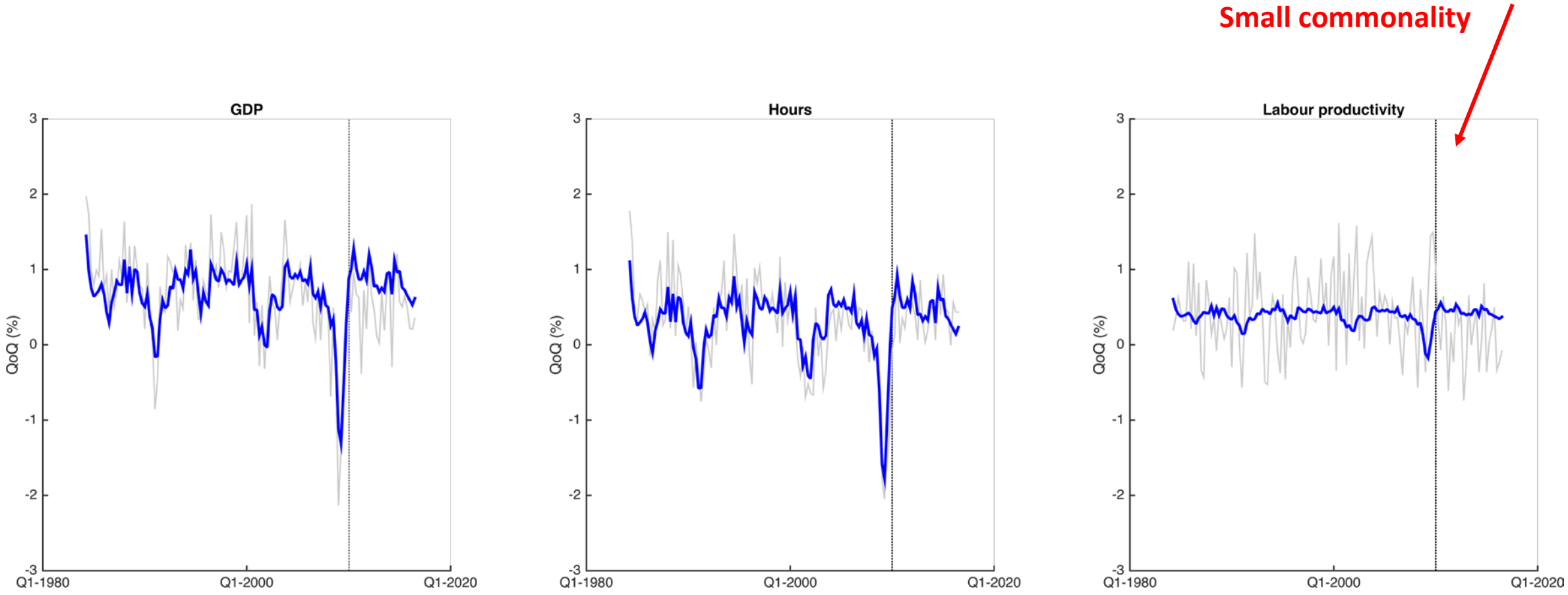


Discrepancy explained by slow upward trend in hours worked since 2010



GDP, hours and labour productivity with their common cycle

cyclical productivity difficult to capure – very little commonality



Tentative conclusions

- The slow recovery in GDP is mostly due to the cycle associated to fiscal contraction and household deleveraging
- Slow productivity is explained by a persistent component (trend)
- Trends: both GDP and labor productivity show a declining trend since 2001-02 but for productivity there is a further deceleration since 2010 associated to an upward trend in hours

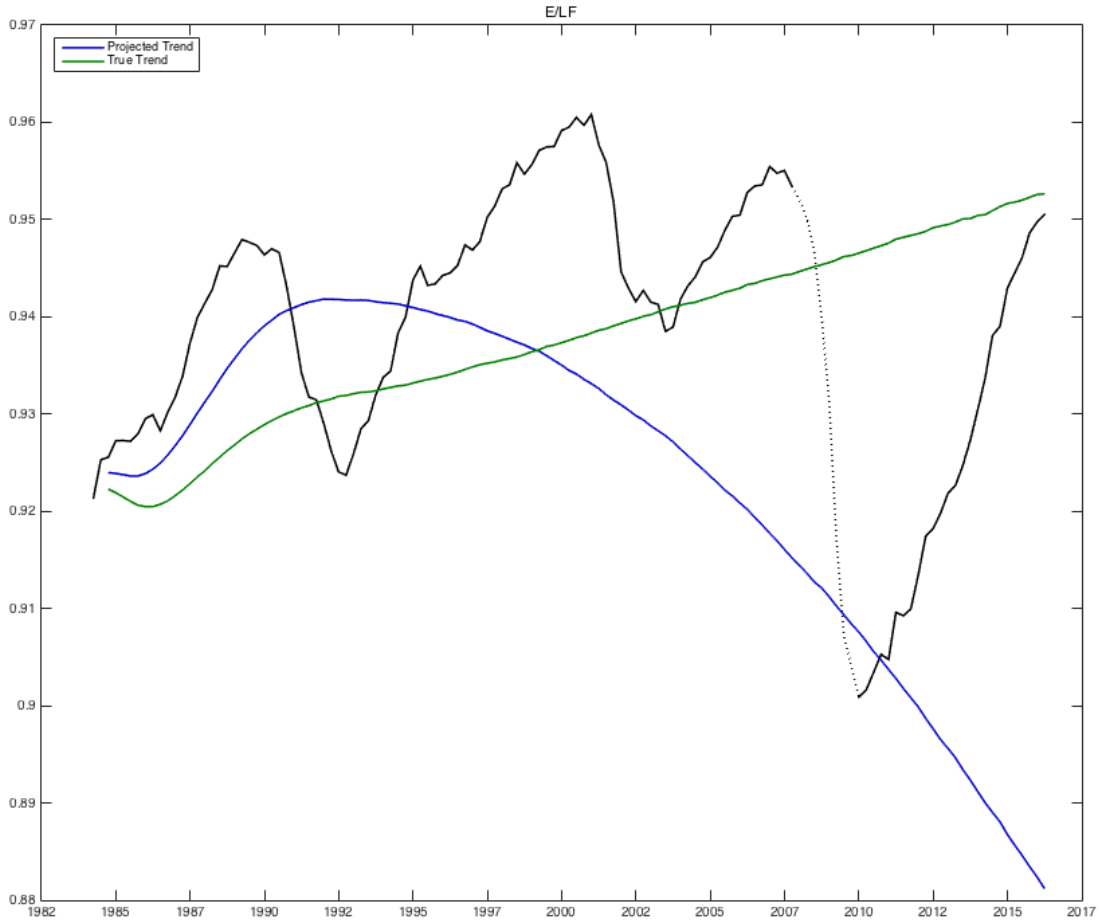
Thank you!

Medium terms cycles for output and productivity – large var of productivity

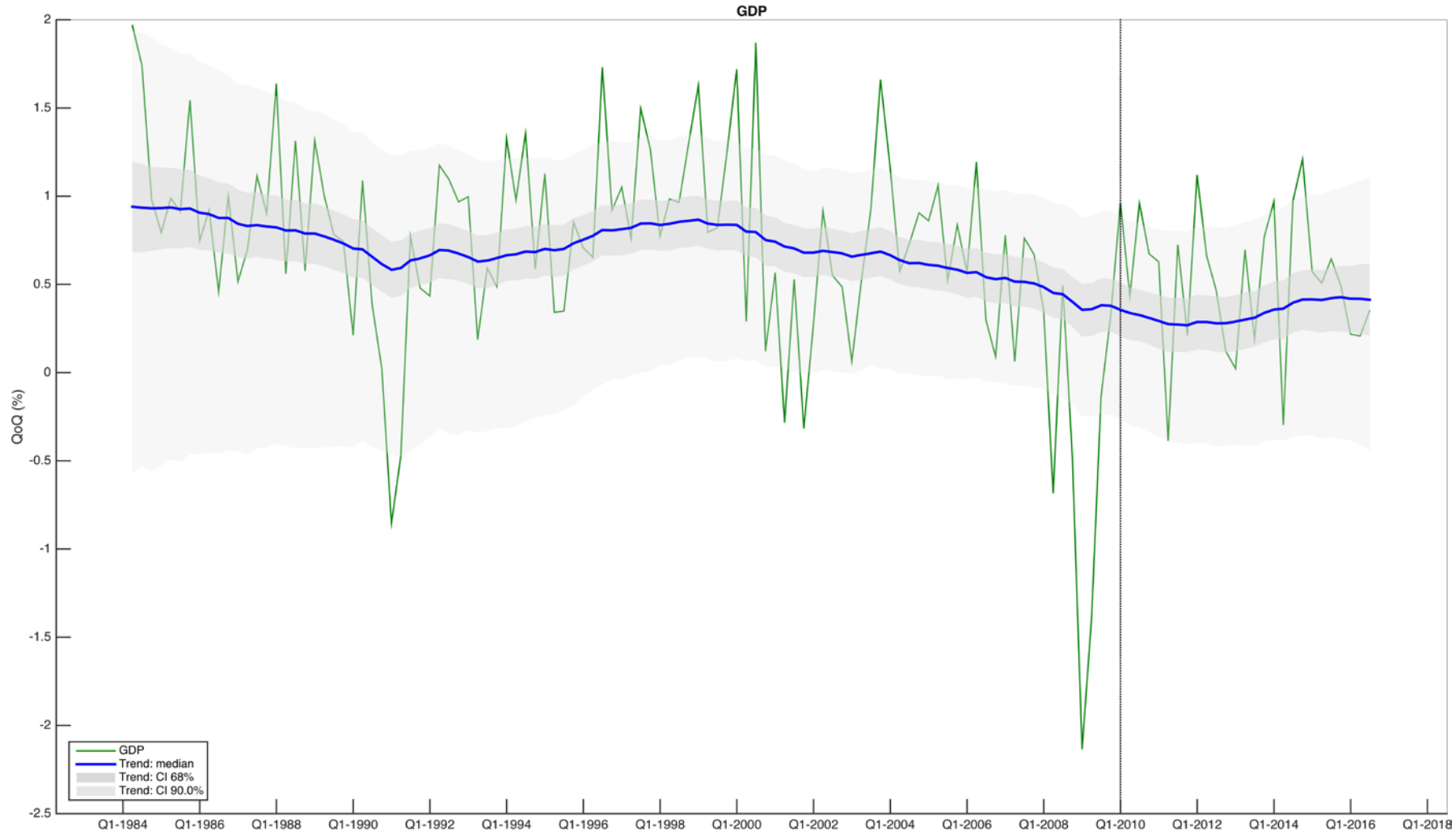
Comin and Gertler:

“The medium term cycle features significant procyclical movements in both embodied and disembodied technological change. These facts, among others, motivated us to approach modeling the medium term cycle by modifying a reasonably conventional business cycle framework to allow for R&D, technology adoption, and variation in markups”

Deterministic Component: Employment over LF



GDP and its variable trend
the statistical model detects a slowly declining trend



Hours and its variable trend
the statistical model detects a slowly declining trend