Quantity Theory of Money Around the Globe

Money Growth, Money Velocity and Inflation Subject to Different Monetary Policies

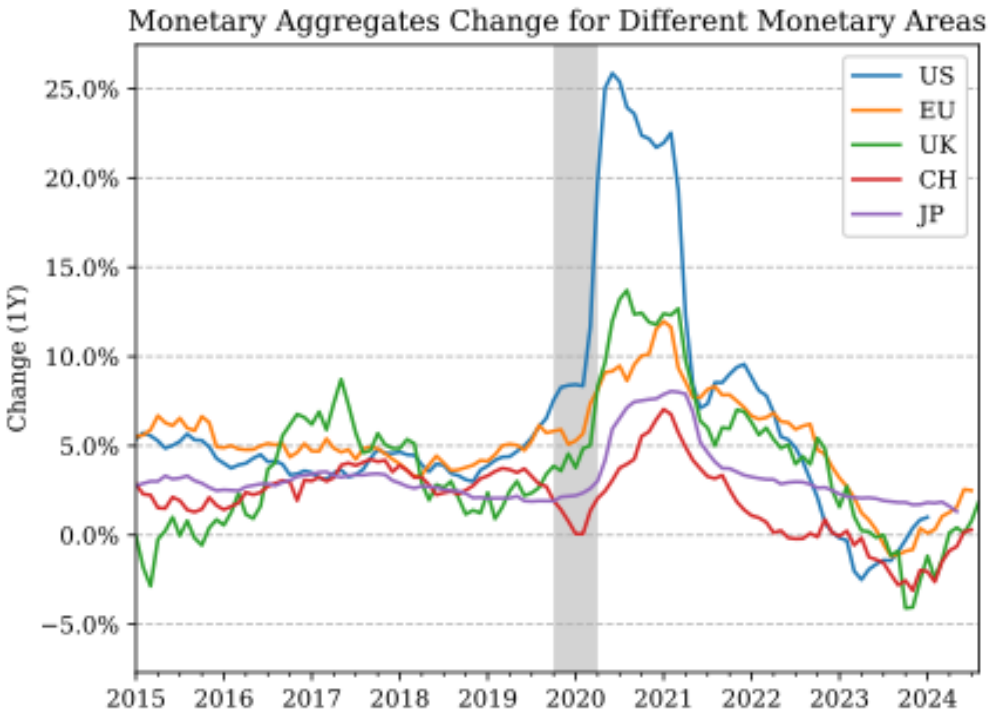
Miguel González Calvo, 14.12.2024

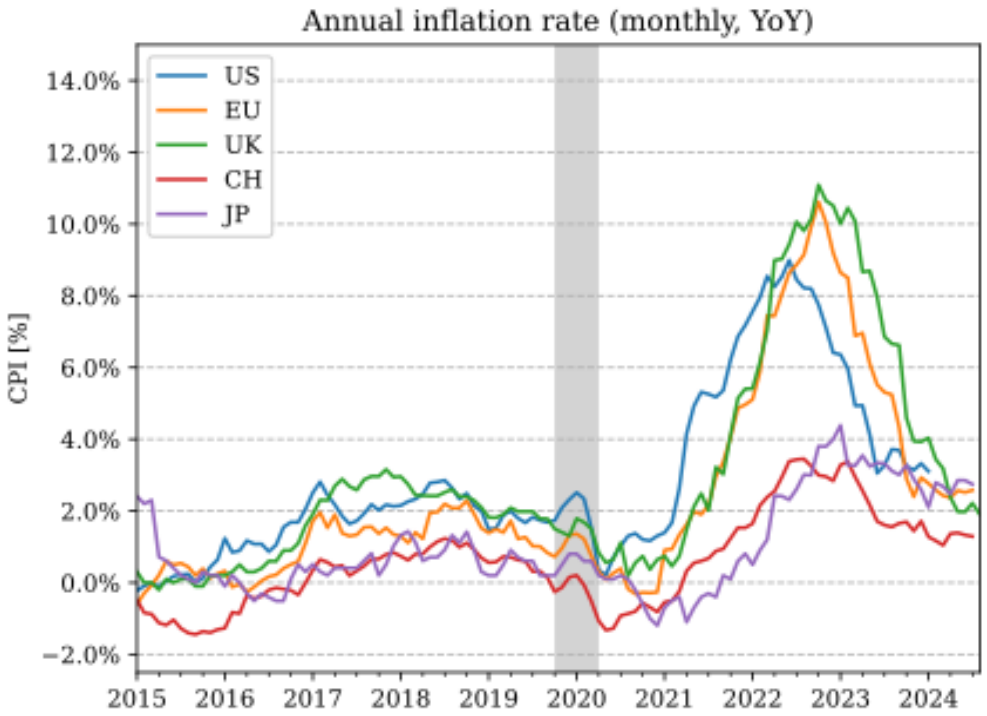
Agenda

- Introduction
- Influence on academia
- Central bank aims
- Empirical analysis
- Conclusions

Introduction

Different policies, different results





Something to unlearn

«Well, when you and I studied economics a million years ago, M2 and monetary aggregates generally seemed to have a relationship to economic growth… that classic relationship between monetary aggregates and economic growth and the size of the economy, it just no longer holds… **so something we have to unlearn, I guess**.» **(Powell 2021a)**

«**Inflation is always and everywhere a monetary phenomenon**, in the sense that it is and can be produced only by a more rapid increase in the quantity of money than in output.» **(Friedman 1970)**

Influence on academia

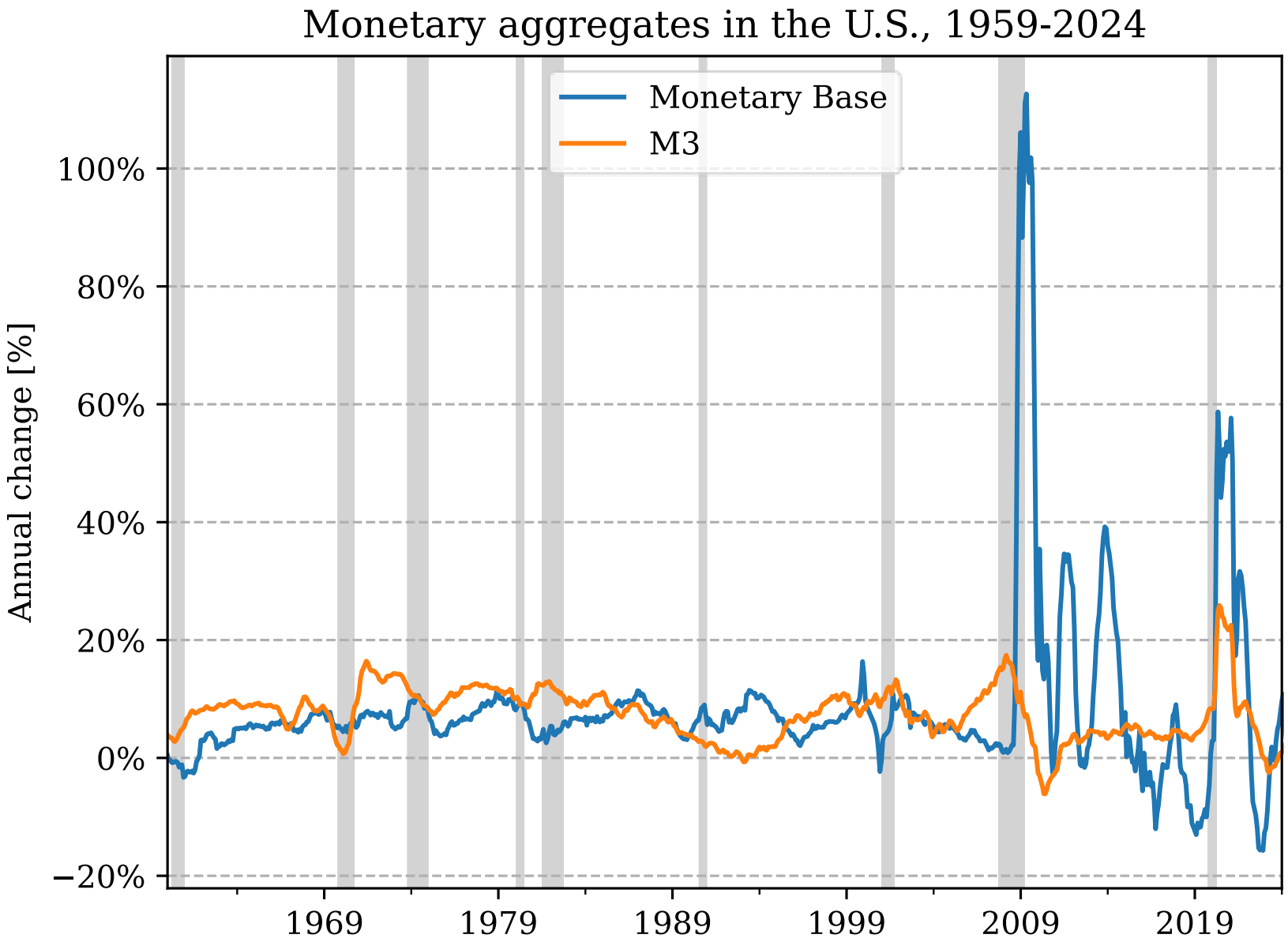
- Potential inflation alert **(Castañeda and Congdon 2020), (Congdon 2020)**
- Monetary explainations vs. ad-hoc explainations **(Greenwood and Hanke 2001)**
- Fiscal deficits and inflation relationship **(Bordo and Levy, 2021)**
- Central banks balance sheets and inflation relationship **(Reynard 2023)**
- Monetary growth and inflation: Markov **(Amisan and Fagan 2012)**
  - US: broad money demand **(Anderson, Bordo and Duca 2017)**
  - US: money velocity and inflation **(Castañeda and Cendejas 2023)**

Which monetary aggregate?

- Different possibilities: MB, M1, M2, M3, M4, M4x
- Monetary multiplier (in)stability **(Bordo and Levy 2021)**
- M4x implications for Quantitative Easing **(Smith 2020)**
- «Broad money» vs. «Narrow Money» **(Congdon 2024)**
- Clearing: the case of IOFC **(Congdon 2024)**

Thence:

- M3 for U.S., euro area, Switzerland and Japan
- M4x for the United Kingdom


Monetary aggregates in the U.S., 1959-2024
Monetary Base
M3
Annual change [%]
100%
80%
60%
40%
20%
0%
−20%
1969
1979
1989
1999
2009
2019

Why these monetary areas?

- US, EU, UK: high inflation **and** high broad money supply increase
- CH, JP: low inflation **and** low broad money supply increase
- ”Relatively” controlled experiment
- But: correlation ≠ causality

Why these periods?

- Available data for inflation, GDP and money supply

Central bank aims

Price stability and limits to debt:

- US: «maximum employment, stable prices, and moderate long-term interest rates»
- EU: «price stability is best maintained by aiming for 2% inflation over the medium term»
- UK: «set monetary policy to achieve low and stable inflation»
- CH: «ensuring price stability, while taking due account of economic developments»
- JP: «price stability target at 2 percent in terms of the year-on-year rate of change in the consumer price index»

Empirical analysis

$$M_t v_t = P_t Y_t$$

$$\Delta \log v_t = \Delta \log(\mathrm{P_t Y_t}) - \Delta \log M_t$$

$$\log \pi_\mathrm{t} = \Delta \log \mathrm{P_t} = \log \mathrm{P_t} - \log \mathrm{P_{t-1}}$$

- Regression to the mean of $\Delta \log v_t$
- Markov regime-switching model

Stationarity analysis

Critic to monetarists: v is not stationary, but:

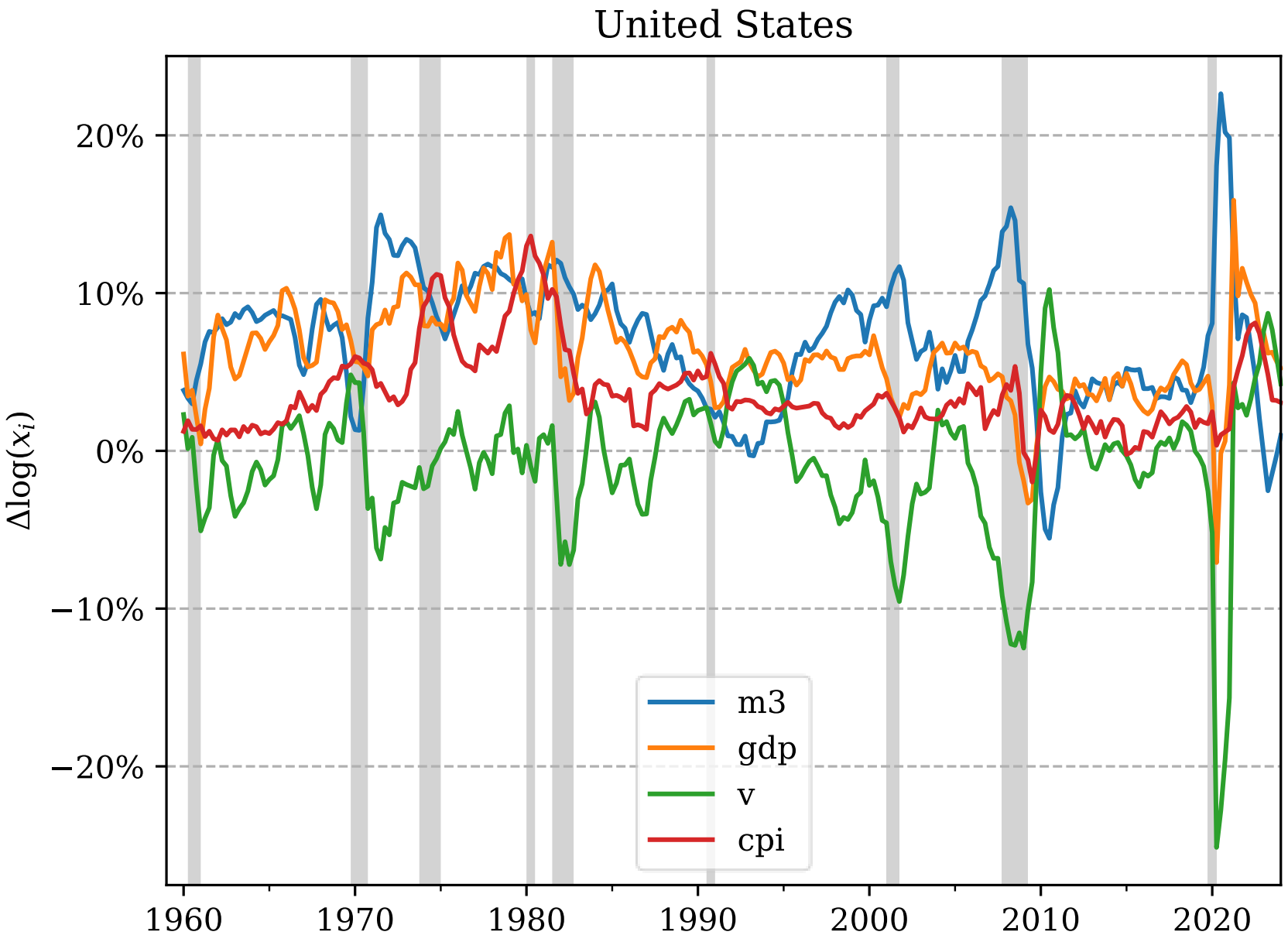
> "The values of $\Delta \log P_t Y_t$ and $\Delta \log M_t$ do not follow divergent paths for excessively long periods of time" (Castañeda and Cendejas 2023)

Is it true for the rest of monetary areas?

Stationarity analysis

$\Delta \log v_t$ behavior:

- Non-zero mean (p-value< 0.002)
- **Regression to the mean**
- Mean value depending on monetary area (intrinsic qualities)
- Uniform deviation among monetary areas
- Stationary time series ($\nexists$ unit roots, ADF)


United States
20%
10%
0%
−10%
−20%
Δlog(x_i)
1960
1970
1980
1990
2000
2010
2020
m3
gdp
v
cpi

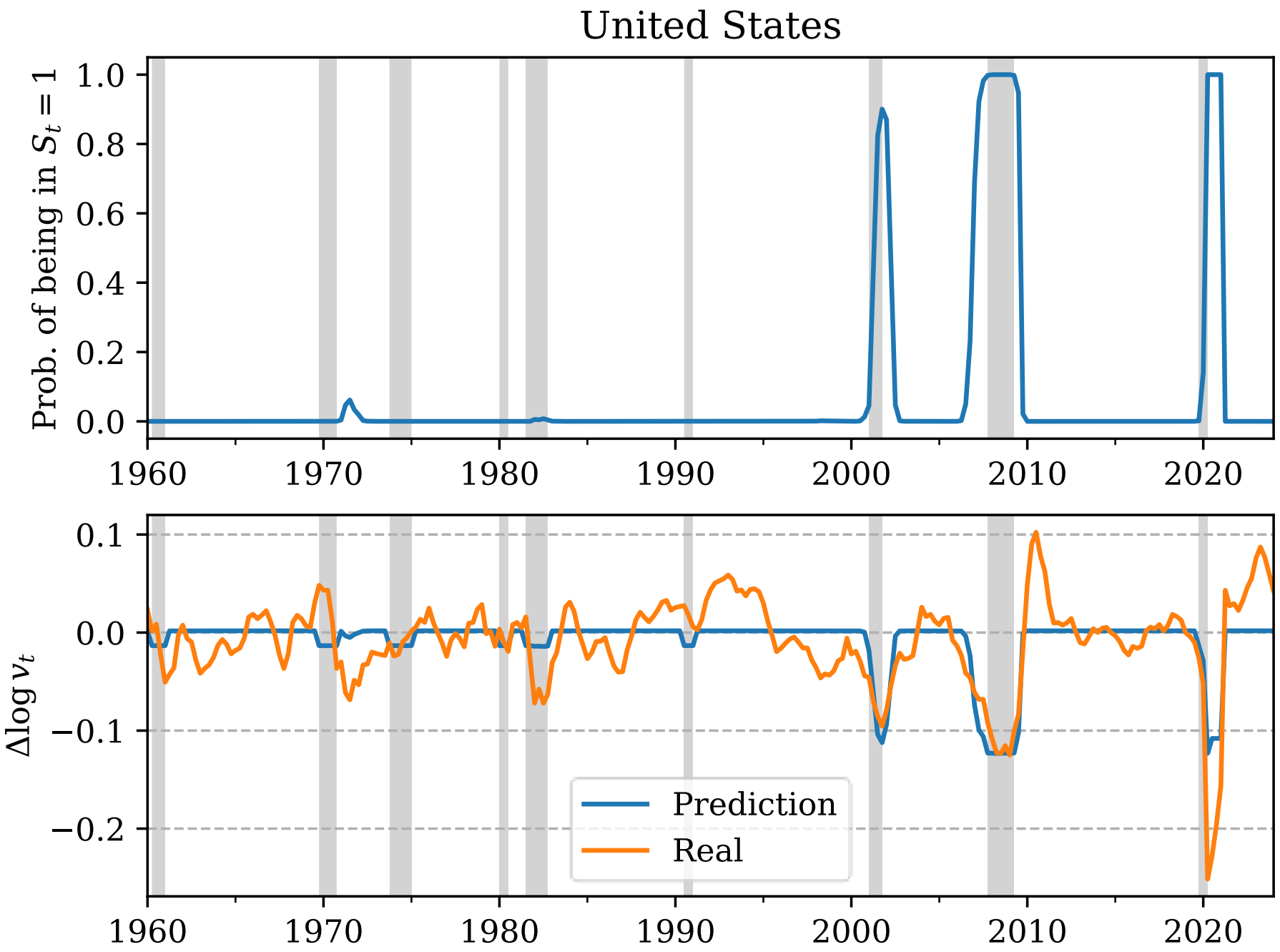
Money velocity changes

$$\Delta \log v_t = \beta_{recession} d_{recession,t} + \alpha_{S_1} S_t + \alpha_{S_2}(1 - S_t) + \varepsilon_t$$
$$\varepsilon_t \sim N(0, \sigma^2)$$

Two regimes: high /low changes in money velocity variation

Exogenous variable: recessions (yes/no)

Recessions: NBER 2023


United States
Prob. of being in $S_t = 1$
1.0
0.8
0.6
0.4
0.2
0.0
1960
1970
1980
1990
2000
2010
2020
$\Delta \log v_t$
0.1
0.0
−0.1
−0.2
Prediction
Real

Inflation

$$\Delta \log P_t = \alpha_{S_1}(L)\Delta \log M_t\,(1 - S_t) + \alpha_{S_2}(L)\Delta \log M_t\, S_t + \gamma(L)\Delta \log v_t + \varepsilon_t$$

$$L^m x_t = x_{t-m}$$

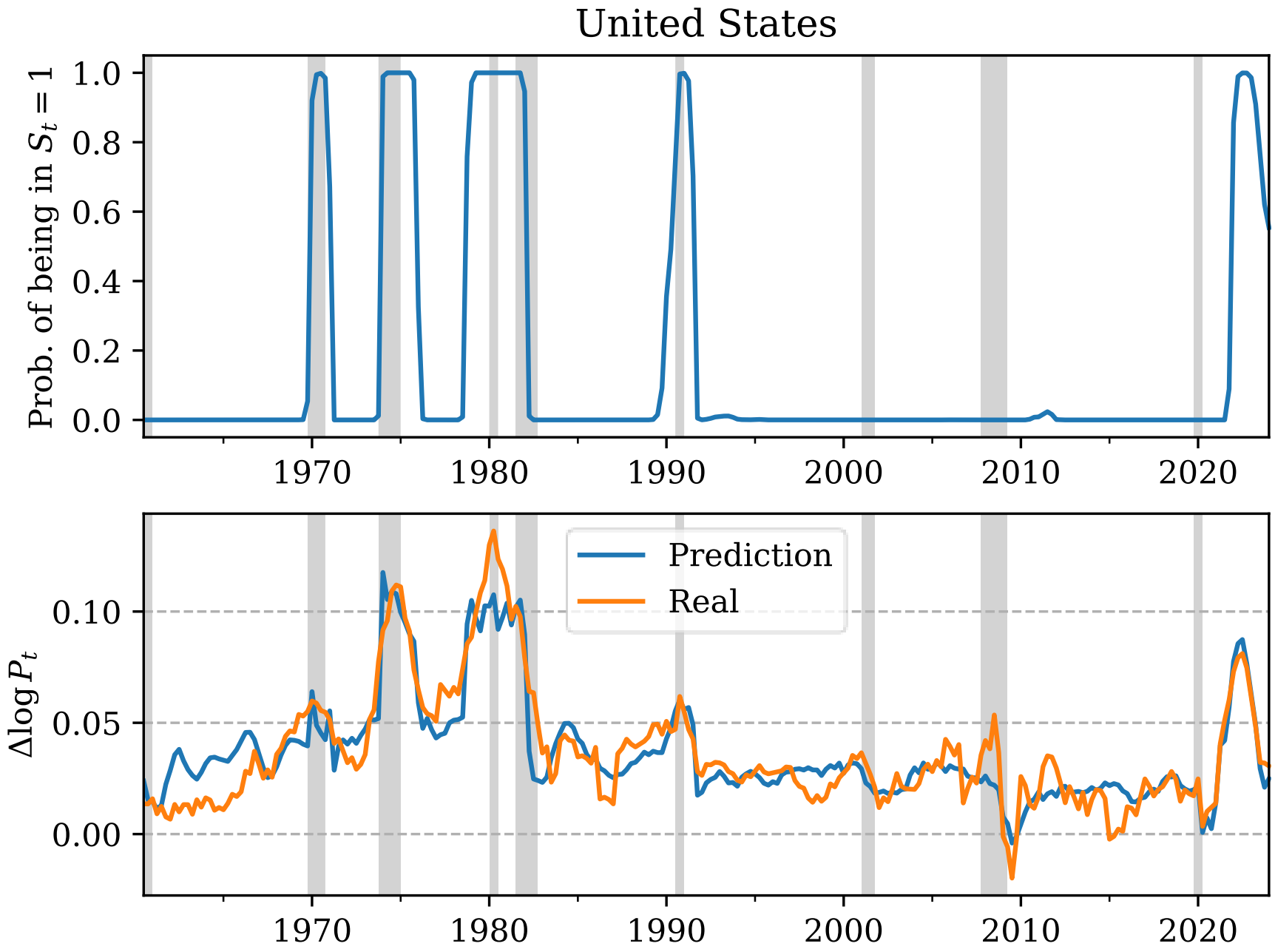
$$\gamma(L) = \gamma_0 + \gamma_1 L + \gamma_2 L^2 + \cdots = \sum \gamma_k L^k$$

$$\alpha_{S_k}(L) = \alpha_{0,S_k} + \alpha_{1,S_k} L + \alpha_{2,S_k} L^2 + \cdots$$

Exogenous variables:

- Money supply changes
- Nominal GDP variation
- Money velocity changes

...and past values


United States
Prob. of being in $S_t = 1$
1.0
0.8
0.6
0.4
0.2
0.0
1970
1980
1990
2000
2010
2020
$\Delta \log P_t$
0.10
0.05
0.00
Prediction
Real
1970
1980
1990
2000
2010
2020

Conclusions

- A relationship between broad monetary aggregates and inflation has been shown for several monetary areas

Policy implications:

~~Something to unlearn~~ **Something to learn**

- There's room for improvement by including purely **monetary elements** into **central banks'** theoretical **framework**
- **«Broad» money supply shall be considered** by central banks when implementing monetary policy