Computational Methodds in Macroeconomics

Some Old-Fashioned Macro: Money Matters

Paul McNelis, S.J.

Department of Economics, Boston College

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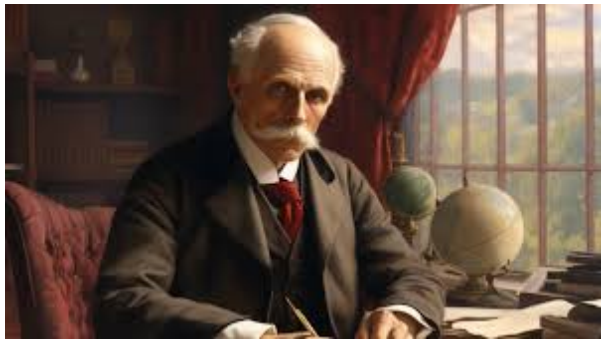
Department of Economics, Boston College,

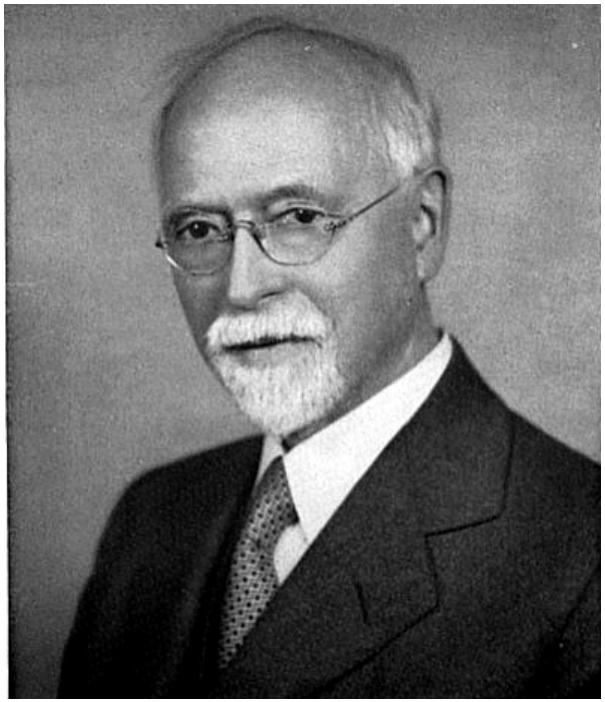
140 Commonwealth Ave, Chestnut Hill, Mass. 02467

Outline

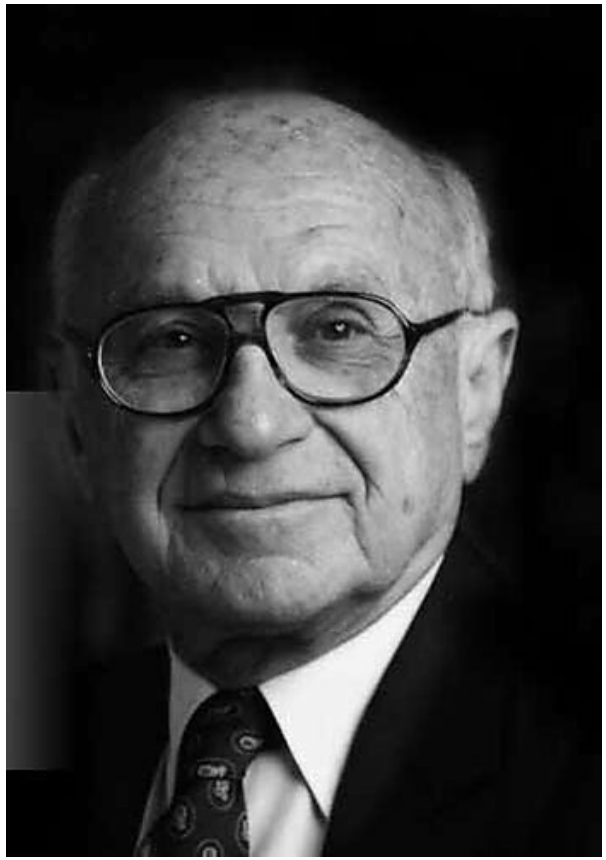
Founders of Monetary Economics



Alfred Marshall
Cambridge School
Money demand approach



Irving Fisher
Yale School
Price level determination



Milton Friedman
Chicago School
Monetarism

The Quantity Theory: Foundation

The Basic Identity

$$MV = PY$$

Where:

- M Money supply
- V Velocity of money (how fast money circulates)
- P Price level
- Y Real output (real GDP)
- PY Nominal income/GDP

Key insight: This starts as an identity (always true by definition), but becomes a theory when we make assumptions about V and Y.

Two Classical Interpretations

Cambridge Approach (Marshall)

Money demand theory:

$$\frac{M}{P} = VY$$

Real money balances proportional to real income.
Assumes: $V = \bar{V}$ (constant)

Fisher's Approach (Yale)

Price level theory:

$$P = \frac{MV}{Y}$$

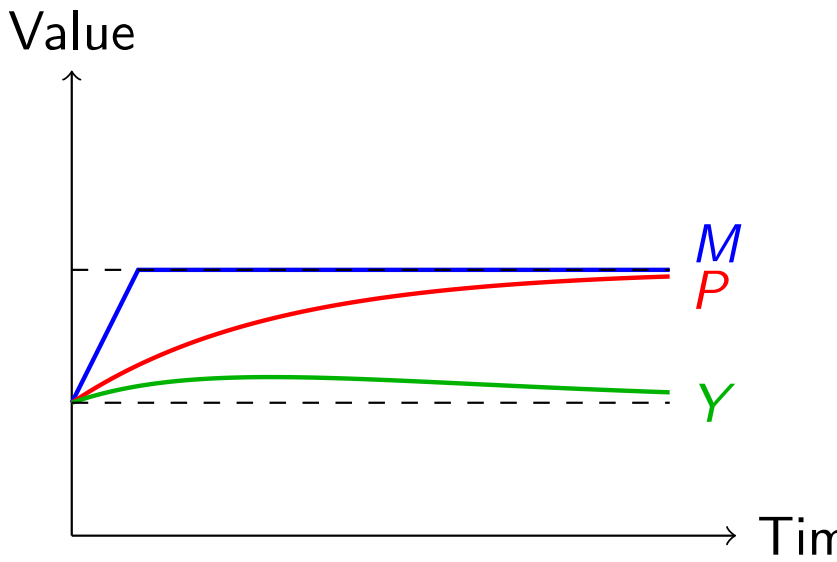
Prices determined by money and velocity.
Assumes: $V = \bar{V}$ and $Y = \bar{Y}$

Long-run implication: $P = kM$ where $k = \frac{\bar{V}}{\bar{Y}}$
In growth rates: $\pi = \Delta m$ (inflation equals money growth)

Neutrality of Money

Long-run neutrality:

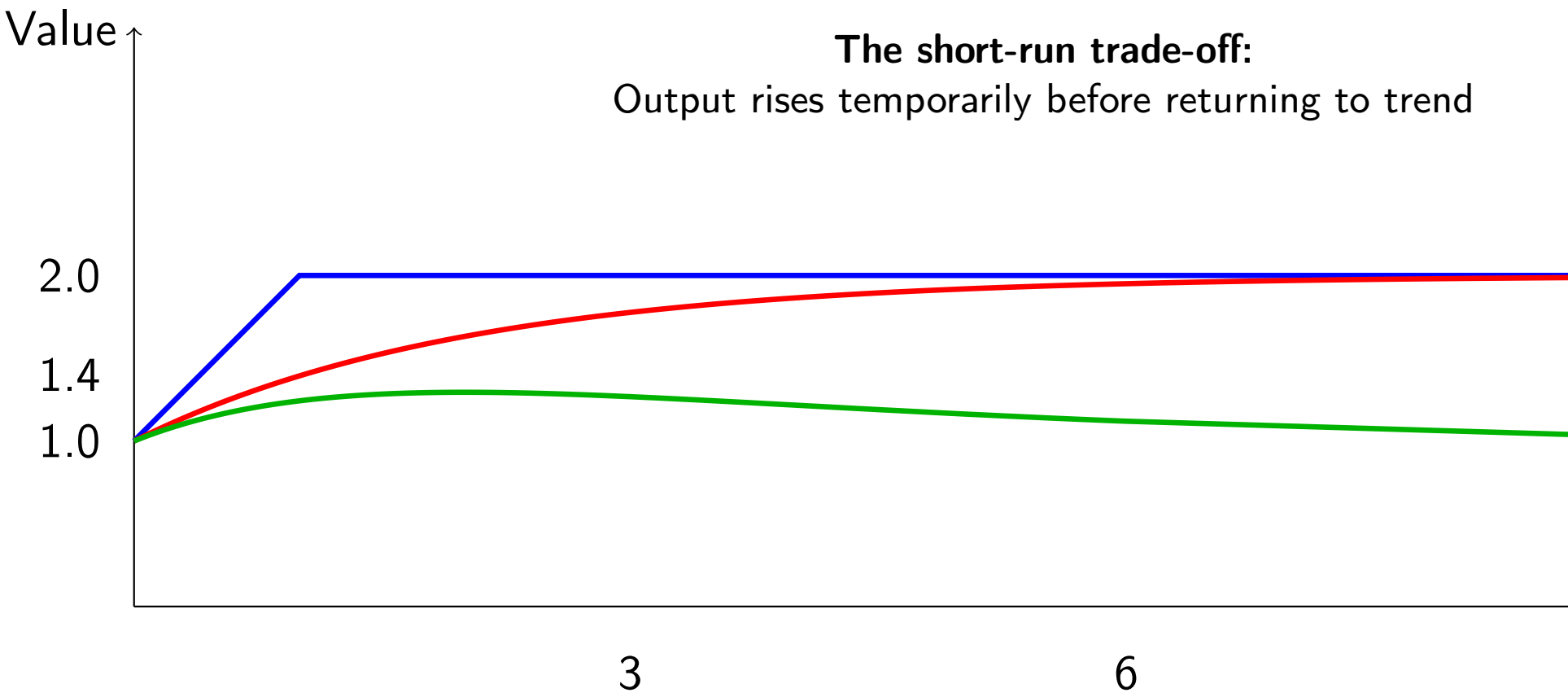
- Changes in money supply only affect prices
- Real variables (Y, employment) unchanged
- This is a *classical* result



But what about the short run?

- Prices are sticky
- Firms don't adjust instantly
- Money can affect real output temporarily

Short-Run Dynamics: The Adjustment Process



Fisher's Nuanced View

"What I affirm in the long run, I deny in the short run."

Fisher's insights:

- Long run: Money growth $\rightarrow$ Inflation (quantity theory holds)
- Short run: Prices are sticky and adjust slowly
- Therefore: Monetary changes can have real effects temporarily

The critical question: Are these real effects small and fleeting like a ripple, or large and persistent like a tidal wave?

Three Schools of Thought

Keynesian View

Fine-tuning works

- Large, persistent effects
- Use monetary policy actively
- Stabilize output during recessions

Friedman (Monetarist)

Rules over discretion

- Effects exist but uncertain
- "Long and variable lags"
- Tie policymakers' hands
- Use money growth rules

Lucas (New Classical)

Rational expectations

- Expected changes are neutral
- "Super-neutrality"
- Only surprises matter
- Policy is irrelevant

Core disagreement: Role of government intervention in the economy

Why Can't They All Be Right?

- **Friedman:** Correct about long-run neutrality
- **Keynesians:** Correct about short-run effects
- **Lucas:** Correct about expected vs. unexpected policy

Different time horizons, but...

Free Market View

Markets deliver optimal outcomes.
Friedman: Fed creates instability *("Tie their hands")*
Lucas: Fed is powerless *("They're irrelevant")*

Interventionist View

Markets need stabilization.
Keynesians: Fed should actively manage demand
Active policy can improve welfare

It's fundamentally about philosophy, not just economics.

The Enduring Relevance of Simple Ideas

Simple $\neq$ Trivial

Politicians repeatedly forget: Sustained inflation requires sustained money growth.

1970s Ford: "WIN" buttons (Whip Inflation Now) — *didn't work*

1970s Carter: COWPS "voluntary" wage-price guidelines — *didn't work*

1979: Carter appoints **Paul Volcker** to the Fed

1979-1982: Volcker implements monetary targeting

Result: Inflation fell from 12% to 4% in two years

What is Money?

Functions of money:

1. Medium of exchange (most important)
2. Store of value
3. Unit of account

Monetary aggregates:

Base	Currency + Reserves
M1	Currency + Demand Deposits
M2	M1 + Savings Deposits

Key Issues

Money as store of value: Not optimal for wealth transfer across generations

Velocity (V): Is it really constant?

- Financial innovation
- Digital currencies
- Measurement challenges

Challenge: Harder to measure "M" in $MV = PY$ with modern finance

The Fed's Policy Toolkit

1. **Reserve requirements** on bank deposits
2. **Discount window** lending to banks
3. **Federal Funds rate** targeting (primary tool)
4. **Forward guidance** about future policy
5. **Large-Scale Asset Purchases** (LSAP / "QE")
6. **Capital requirements** (Basel III)

The Fed's toolkit has expanded dramatically since 2008, moving beyond traditional interest rate policy.

How Banks Work: The Balance Sheet

Assets	Liabilities & Equity
Loans	Deposits
Reserves	Bonds
Securities	Equity (Shares)
Fixed Assets	Retained Earnings

Key constraint: Assets = Liabilities + Equity

Defining Hyperinflation

Technical Definition

Hyperinflation: Monthly inflation $\geq 50\%$ for three consecutive months or more

Two case studies:

Israel

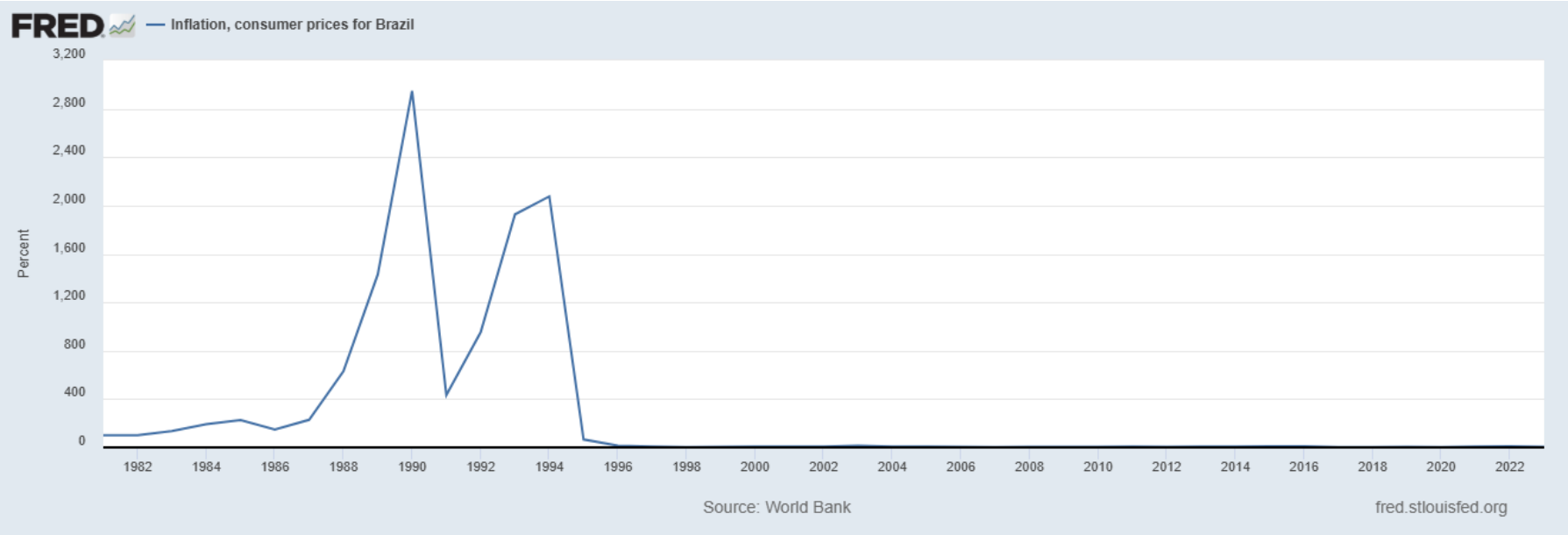
- Qualified as hyperinflation
- Developed indexation systems
- "PATAM" accounts

Brazil

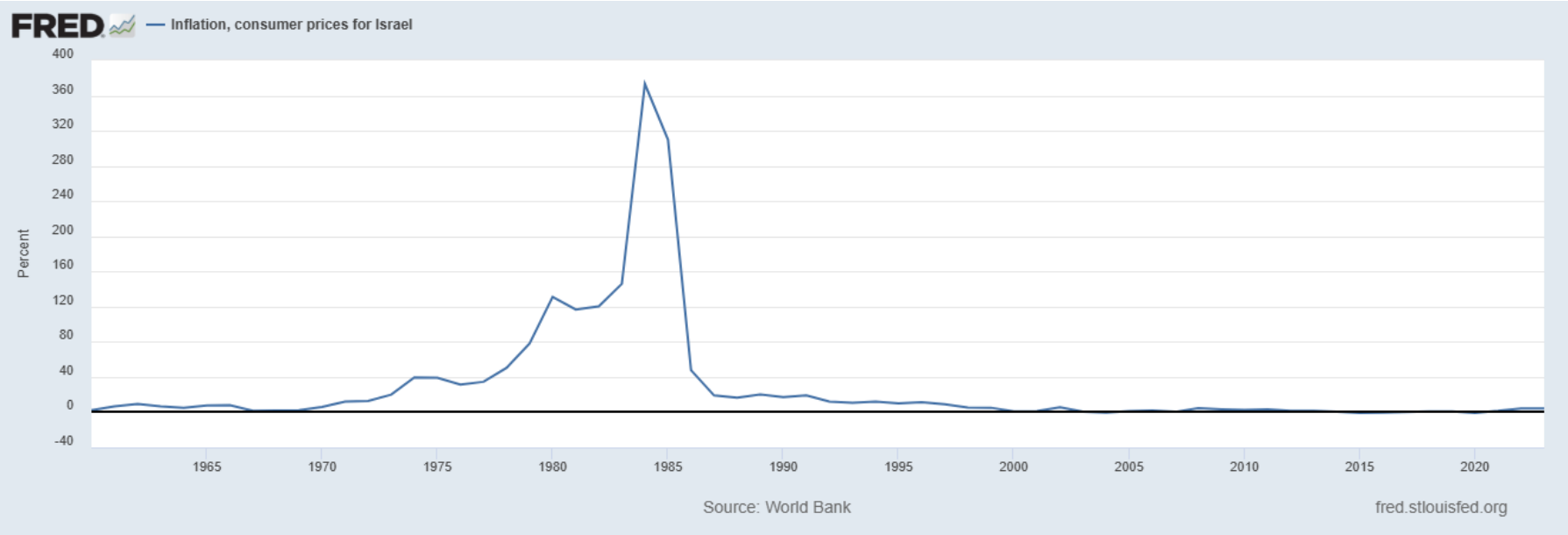
- Never quite hyperinflation
- $\sim$30% monthly inflation
- "Overnight" deposits
- Crawling peg exchange rate

Common feature: Comprehensive indexation of wages, prices, and financial contracts

Brazilian Inflation History



Israeli Inflation History



Living with High Inflation: Brazil

Adaptive mechanisms:

- **Overnight accounts (ON):** Money automatically invested daily
- **Monetary correction:** Automatic indexation of contracts
- **No traditional credit:** Mortgages and credit cards disappeared
- **Post-dated checks:** Used as credit instruments

Daily Life Example

At the "barzinho" (local bar): Better order your second *chopp* (beer) when you order the first — prices might rise before your second round!

Currency markets:

- Parallel (black) markets for dollars
- Travel agencies as de facto currency exchanges
- Large black-market premiums

Modeling Price Stickiness

Setup:

- Assume $V = 1$ (normalized), so in logs: $m - p = y$
- Initial equilibrium: $m = p = y = 0$ (equivalently $M = P = Y = 1$)
- At $t = 1$: Money supply increases by 1%: $m_1 = \ln(1.01) \approx 0.01$

Price adjustment mechanism:

$$p_t = p_{t-1} + \gamma(p^* - p_{t-1})$$

where $p^* = m_t$ is the long-run equilibrium price.

Set $\gamma = 0.2$:

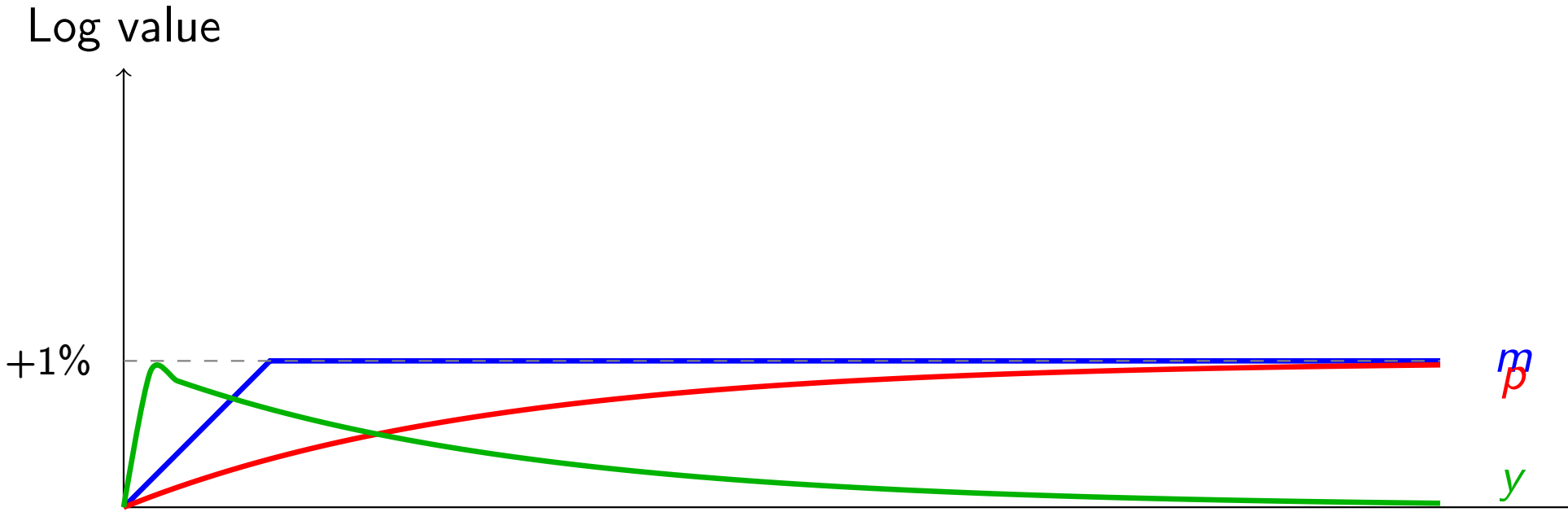
- Slow adjustment
- Prices sticky
- Creates output effects

Output determined by:

$$y_t = m_t - p_t$$

Real effects arise because $p_t < m_t$ during adjustment

The Role of Price Stickiness



Key parameter: γ (degree of price stickiness)

- If $\gamma = 1$: $p_t = m_t$ always $\Rightarrow$ no real effects
- If $\gamma < 1$: Price adjustment is gradual $\Rightarrow$ temporary output effects

Exercise: Disinflation is Costly

Try This

Model a **decrease** in money supply from $M = 1$ to $M = 0.99$

What you'll observe:

1. Money supply falls by 1%
2. Prices adjust slowly downward ($\gamma = 0.2$)
3. Output falls below trend during adjustment
4. Eventually: p and m both at -1%, output returns to $y = 0$

Policy implication: Disinflation (reducing inflation) causes temporary real output losses due to price stickiness. This is the "sacrifice ratio" in action.

Key Takeaways

1. The **Quantity Theory** is simple but powerful:
   - Long run: $\pi = \Delta m$ (money growth causes inflation)
   - Short run: Sticky prices create real effects
2. **Policy debates** reflect deeper philosophical differences:
   - Role of government vs. markets
   - Rules vs. discretion
   - Time horizons matter
3. **Historical evidence** confirms the theory:
   - Brazil, Israel: Inflation driven by money growth
   - Volcker disinflation: Monetary restraint works
4. **Price stickiness parameter** γ is crucial:
   - Determines size of real effects
   - Makes disinflation costly

Questions?

Paul McNelis, S.J.
mcnelis@bc.edu