Michelson-Morley, Occam, and Fisher: The Radical Implications of Stable, Quiet Inflation at the Zero Bound

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Michelson-Morley; The long quiet ZLB

What happens at the ZLB? *Nothing.*
Core Monetary Doctrines / ZLB predictions

What happens at ZLB?

- Old K / adaptive E: ZLB $\rightarrow$ *Deflation spiral.*
  - (Friedman 68) $i$ peg, or ZLB, or passive, is *unstable.*
    
    \[
    \pi_{t+1} = (\lambda > 1)\pi_t + \text{shocks}.
    \]
  - Taylor $\phi > 1$ stabilizes. No Taylor, $\rightarrow$ spiral.

- NK/Rational E: ZLB $\rightarrow \pi$ is *volatile;* “Self-confirming fluctuations,” “sunspots.”
  - ZLB, peg, passive is *stable* but *indeterminate.*
    
    \[
    E_t\pi_{t+1} = (\lambda \leq 1)\pi_t; \quad \pi_{t+1} = E_t\pi_{t+1} + \delta_{t+1}.
    \]
  - Taylor $\phi > 1$ makes unstable, hence determinate.
  - $\phi < 1$ volatility a core prediction.

- MV=PY: ZLB, $i \approx 0$ is irrelevant. M $50b \rightarrow$ $3,000b$ means *hyperinflation.* Velocity is “stable.” QE “injects liquidity.”
\[
\chi_t = -\sigma(i_t - \pi_{t-1} - \nu^r_t);
\pi_t = \pi_{t-1} + \kappa \chi_t;
i_t = \max[i^* + \phi(\pi_t - \pi^*), 0]
\]
Core Monetary Doctrines / ZLB predictions

▶ Old K / adaptive E: ZLB → Deflation spiral.
  ▶ (Friedman 68) $i$ peg, or ZLB, or passive is unstable.

$$\pi_{t+1} = (\lambda > 1)\pi_t + \text{shocks}.$$  

▶ Taylor $\phi > 1$ stabilizes.

▶ NK/Rational Ex.:
  ▶ ZLB → $\pi$ is stable, but indeterminate hence volatile;

$$E_t\pi_{t+1} = (\lambda \leq 1)\pi_t; \quad \pi_{t+1} = E_t\pi_{t+1} + \delta_{t+1}.$$  

▶ At ZLB, model only pins down expected $\pi$. Unexpected $\pi$ can be anything. “Sunspots.”

▶ $\phi > 1$ makes $\pi$ unstable, hence determinate.
▶ $\phi < 1$ volatility a core prediction.

▶ MV=PY: ZLB, $i \approx 0$ is irrelevant. M $50b \rightarrow$ $3,000b$ means hyperinflation. $V$ is “stable.”
Quiet, stable $\pi$ at long period of $i \approx 0$, $\phi \ll 1$, huge $M$.
No deflation spiral. No M/QE inflation. No sunspot volatility. No change in $\pi$ dynamics. $\sigma(\pi)$ lower?
Larger shock but same dynamics. Faster decline in $u$, lower $\sigma(\Delta Y)$? $E(\Delta Y)$ is too low, but is that monetary policy?
20+ years at $i \approx 0$ with no spiral, sunspot $\sigma(\pi)$.
Europe

Lower rates ↔ lower inflation.
Michelson-Morley

Michelson-Morley. Experiment:

- Inflation can be stable, quiet, at ZLB, $\phi < 1$. Even a peg.
- Huge excess reserves paying market interest are not inflationary.
- $\phi > 1$ vs. $\phi < 1$, ZLB, is not a key state variable for $\sigma(\pi)$, dynamics.

Implications

- Old-Keynesian. No spiral.
- New-Keynesian. No sunspots.
- $MV=PY$. No hyperinflation.

Next theory? New Keynesian + Fiscal Theory. ...
\[ \frac{B_{t-1}}{P_t} = E_t \sum_{j=0}^{\infty} \beta^j s_{t+j} \]

Real value of gov’t debt = PV of primary surpluses

\[ \frac{B_t}{P_t} (E_{t+1} - E_t) \left( \frac{P_t}{P_{t+1}} \right) = (E_{t+1} - E_t) \sum_{j=0}^{\infty} \beta^j s_{t+1+j}. \] (1)

Unexpected inflation = news about pv of surpluses / debt

- Unexpected deflation ↔ debt worth more ↔ raise tax/cut spending.
- (1) solves spiral, indeterminacy/sunspots.

\[ \delta_{t+1} = \pi_{t+1} - E_t \pi_{t+1} \leftrightarrow \text{fiscal policy.} \]

- \( i \) peg or \( \phi < 1 \) can be stable (NK) and (now) determinate and quiet.
- NK + FTPL is the only remaining pre-existing, simple, economic, theory consistent with stable, quiet inflation at ZLB, huge reserves.
Occam: The (Long) Paper

What about...

- Equations? A very simple transparent model.
- Variations to rescue instability, indeterminacy, M? (A: epicycles.)
  - Really unstable but QE offset deflation spiral?
  - NK Equilibrium selection from post-bound actions, not current $\phi \pi_t$?
  - Really active NK, no one expected it to last? (A: Japan?)
  - Peg still unstable/indeterminate?
  - Really unstable but slow to emerge (sticky wages, velocity)?
  - Reserves didn’t leak to M1, M2. (A: My point.)
  - More general models? (A: don’t change stability, determinacy.)
- Fiscal theory objections?
  - Large deficits, debt, Japan? (A: Low $r$. Not deficits, debt $\leftrightarrow \pi$.)
  - Previous pegs, 1970/1980, other episodes?
    (A: Fiscal problems. “A peg can be stable.”)
  - Why is $\sigma(\pi) = \sigma$(E fiscal policy) low? (“A peg can be quiet”)
  - “Budget constraint,” debt repayment means passive fiscal?
    (A: No; off equilibrium modeling just like NK.)
  - “Exogenous” surpluses? $s = \tau y$? $s(P)$? (A: No. Like dividends.)
  - Test FTPL? (A: Test $MV = PY$? $P = EPV(D)$?)
- A: Today: I only claim NK+FTPL is possible, survives quiet ZLB test. I do not claim it proved, explains all tests, all history.
Fisher

Implication of stability. Theory?

Minimum necessary assumptions? Evidence? Policy implications?

Interest rate

Inflation rate
Frictionless model

- Model

\[ i_t = r + E_t \pi_{t+1}, \]

\[ \pi_{t+1} - E_t \pi_{t+1} = (E_{t+1} - E_t) \sum \beta^j s_{t+j} / (B/P) \]

- “Monetary policy” changes \( i \) with no change in fiscal \( \{s\} \).
- Higher \( i_t \) raises \( \pi_{t+1} \), immediately.
- Joint fiscal-monetary tightening can give a temporary \( \pi \) decline.

Pricing frictions give a temporary negative \( \pi \)? …
Effects of rate rise – Standard NK model with $\phi = 0$

\[
\begin{align*}
\chi_t &= E_t \chi_{t+1} - \sigma (i_t - E_t \pi_{t+1}); \quad \pi_t = \beta E_t \pi_{t+1} + \kappa \chi_t. \\
\text{Pricing frictions do not produce } \pi \text{ decline.}
\end{align*}
\]
Long term debt, fiscal theory, works

Simple frictionless example.

\[ \sum_{j=0}^{\infty} \frac{Q_t^{(j)} B_t^{(j)}}{P_t} = E_t \sum_{j=0}^{\infty} \beta^j s_{t+j} \]

- Higher (future) \( i \) → lower \( Q \). \( P \) level must fall.
- Just like a fiscal shock.
- Then \( i = r + E \pi \) inflation rises.
- Paper: Merge with sticky prices → smooth temporary negative \( \pi \) response.
The Answer for negative sign?

\[
\sum_{j=0}^{\infty} \frac{Q_t^{(j)} B_t^{(j)}}{P_t} \approx E_t \sum_{j=0}^{\infty} \beta^j s_{t+j}
\]

Points in favor:
- → QE (twist), forward guidance, and \( i \) policy are the same thing.
- Works in totally frictionless model (money, prices). (+ frictions for realistic dynamics.)

Warnings:
- Only works for unexpected changes. Hard to justify systematic policy, “fine tuning.”
- Positive in long run. Produces 1970 failed stabilizations, not standard 1980s story. (Without a fiscal change too.)
- \textit{Nothing} like any story told to undergraduates, FOMC.
- → The answer is yes, but not for every question.

Other approaches?...
(Long) Paper: What about...

Variations that don’t work:

▶ Sticky prices
▶ Money $U(c, M/P)$
  ▶ Only expected $\Delta i$ works. Won’t help VARs. Won’t work in IOER. Sign helps, but off by $\times 10$ in size.
▶ Temporary rates.
▶ Backward-looking Phillips, or static IS.
▶ Multiple equilibria, coincident or “passive” fiscal shocks.
▶ Active money/passive fiscal.
  ▶ Same result with $\phi > 1$. Solution conditional on $i$ path (Werning). If $i_t = i_t^* + \phi(\pi_t - \pi_t^*) = \hat{i}_t + \phi \pi_t$ produce this equilibrium observed $i_t$, this is $\pi_t, x_t$.
▶ Standard solution of 3 equation model.
Paper: What about..

- More ingredients?
  - Borrowing or collateral constraints, hand-to-mouth consumers, bounded rationality or irrational behavior, a lending channel; habits, labor/leisure, production, capital, variable capital utilization, adjustment costs, alternative models of price stickiness; informational, payments, monetary, financial, frictions; pricing or timing lags, alternatives to rational expectations ("reflective," "k-step" expectations); non-Walrasian equilibrium, game theory, ...
  - A: Necessary as well as sufficient. The sign (and stability?) of M policy depends on soup, not simple economics. There is no honest simple story to tell undergrads, FOMC.
  - Yes to frictions etc.! To understand size and dynamics on top of a simple model that gets sign and stability right.

- VAR evidence? (A: price puzzle, includes fiscal shocks; long term debt effect.)

Bottom line:

- There is no other simple, modern (rational expectations) theory, that delivers the traditional view that higher interest rates lower inflation, even temporarily.
Summary: Evidence suggests, and NK+FTPL theory digests:

- ZLB is stable, quiet. No deflation spiral, sunspots.
- Peg or passive $\phi < 1$ too.
- Large interest-paying reserves do not cause inflation.
- Contrary classic doctrines were wrong.

Summary: Implication

- Higher $i$ can lead to higher $\pi$ in the long run. (Neutrality.)
- Negative short run effect? No simple economic model for standard beliefs. (Only a fiscal / long-term debt channel.)

Policy: (Consequence of stability, quiet)

- Do not fear the ZLB, balance sheet!
- We *can* live the Friedman rule; Huge reserves paying market interest.
- Or, better, the Treasury can issue reserves to the rest of us. No need to keep “bonds” illiquid for price level control.
Optimal quantity of money/Balance sheet
Policy

Policy: (Consequence of stability, quiet)

- The Fed *can* keep a low peg. (Inflation then varies as $r$, $r^*$ vary.)
- (Wild) The Fed *can* target the spread between indexed and non-indexed debt, thus target expected inflation, and let the level of the real rate free to respond to market forces. (Expected CPI standard.)

$$i_t = r_t + E_t \pi_{t+1} \rightarrow E_t \pi_{t+1} = i_t - r_t$$

- The Fed can guess $r$, $r^*$, vary interest rates $i$. $\rightarrow$ More stable inflation, output. Observe a Taylor-like rule.
- The Fed can (try to) offset lots of shocks with time-varying rates/spread; fine-tune inflation / output path with complex DSGE.
- Vs. leave it alone, like hot/cold shower. Old “fine tuning,” “rules vs. discretion,” planning vs. market debate continues.
Policy


- Observed policy may not change much – Taylorish responses to output and inflation + temporary responses to shocks.
- Foundations / strategy may change a lot. No more $\phi > 1$ equilibrium selection. Fiscal anchoring. Balance sheet.
- Monetary economics is now like regular economics! A simple S&D benchmark, then add frictions to taste.
Warnings

Extrapolation warning:

▶ NOT “lower rates to lower inflation” (Turkey, Brazil).
▶ Must be ver persistent, credible, and with fiscal backing. (Our flight to quality came first.)

FTPL warning:

\[ \frac{B_{t-1}}{P_t} = E_t \sum_{j=0}^{\infty} \frac{1}{R_{t,t+j}} s_{t+j} \]

value of gov’t debt = pv of primary surpluses

▶ Fiscal policy “anchoring” comes from expectations of eventual primary surpluses, and low real rates for government debt.
▶ Low \( R \), flight to quality, \( \rightarrow \) low \( P \).
▶ Discount rates dominate valuation everywhere.
▶ Low discount rates could evaporate quickly. (Greece, but ends in inflation.)
The End
Standard NK model with $\phi > 1$ (Woodford)

\[ i_t = \phi \pi_t + v_t^i; \quad v_t^i = \rho v_{t-1}^i + \varepsilon_t^i; \quad \phi = 1.5 \]

- Standard $\phi > 1$ model is even more Fisherian!
Long term debt + fiscal theory + sticky prices

\[
\frac{\sum_{j=0}^{\infty} Q_t^{(j)} B_t^{(j)}}{P_t} \approx E_t \sum_{j=0}^{\infty} \left( \prod_{k=1}^{j} \frac{1}{1 + r_{t+k}} \right) s_{t+j}; \quad r_t = i_t - E_t \pi_{t+1}
\]

- Calibrated to 2014 US maturity structure.
- More sticky → \( r \) rises, → PV declines → less effect.