Monetary Policy

Part II: Central Banking

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Agenda

• Monetary policy
  – long run vs. short run
  – monetary policy goals
  – fed funds market
  – understanding monetary policy decisions: the ‘Taylor rule’

• Monetary policy transmission mechanism and related topics
  – monetary policy surprises
  – changes in the term structure
  – rules vs. discretion and the time inconsistency problem
  – talking points: independence, transparency, communication etc
Goals

• What can monetary policy do?
  – keep inflation low?
  – keep unemployment low?
  – eliminate business cycles?
Long run vs. short run

- In long run (at trend frequencies) growth of ‘real’ economy determined by real factors
  - total factor productivity
  - physical and human capital accumulation
  - employment and demographics

- But in short run (at business cycle frequencies) growth of economy can be affected by monetary policy
  - can stimulate economy if below trend
  - can dampen economy if above trend
  - but only if trend inflation is low

- And of course monetary policy can control trend inflation itself
  - with help from sensible fiscal policy
Why only if trend inflation is low?

• If inflation is low, economy typically has many ‘nominal rigidities’
  – nominal wages and prices do not move one-for-one with inflation
  – inflation expectations are low and stable

• If inflation expectations stable, say at $\bar{\pi}$, and

  $r_t = i_t - \bar{\pi}$

  – then cut in nominal rate also reduces real rate and stimulates economy
  – how?
Can policy stimulate the economy indefinitely?

• If monetary policy tries to keep real rate low to stimulate economy
  – inflation begins to build up
  – inflation expectations rise (the ‘Fisher effect’ works in the long run)
  – wages and other contracts indexed to inflation

• In short
  – monetary policy can only stimulate if inflation expectations ‘anchored’
  – but inflation expectations will ‘drift up’ if policy is too stimulatory
Federal reserve

- Board of Governors
  - 7 members appointed by President for 14-year terms
  - chair has 4-year term as chair
- 12 regional banks
  - presidents appointed locally
- Federal Open Market Committee (FOMC)
  - board + president of NY regional bank (FRBNY) + rotating panel of 4 other regional presidents
  - makes monetary policy decisions
Goals

• Federal Reserve Act (1913)

  The Board of Governors of the Federal Reserve System and the Federal Open Market Committee shall maintain long run growth of the monetary and credit aggregates commensurate with the economy’s long run potential to increase production, so as to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates.

• Three goals
  – maximum employment
  – stable prices
  – moderate long-term interest rates

• Are these goals in conflict? Are there policy tradeoffs?
Instruments

• How does a central bank pursue its goals?
  – by controlling a monetary ‘instrument’

• Candidate instruments include
  – narrow measures of the money supply (e.g., currency)
  – overnight interest rates

• Most central banks (now) prefer to use interest rates. Why?
Fed funds market

- Banks required to hold overnight deposits as (non-interest bearing) reserves with Fed
- At end of day, banks may have excess or shortfall of funds needed to meet their reserve requirement
- Interbank ‘fed funds’ market: banks with excess lend to banks with shortfall
  - turnover $2.3 trillion per day
  - but only $17.3 billion reserves held by financial system
  - so circulates with huge velocity

\[
\text{velocity} = \frac{\text{$2.300$ trillion}}{\text{$0.017$ trillion}} \approx 135 \text{ per day}
\]

(by contrast, M2 velocity is about 2 per year!)

- Interest rate on these transactions is the ‘effective fed funds rate’
- Discount window open (at +100 bp) if shortfall
Trading in the fed funds market

Ashcraft and Duffie, 2007
Fed funds target

• FOMC sets a target fed funds rate

• Engages in ‘open market operations’ to try and hit target
  – purchases or sales of Treasury securities
  – example: buy Treasuries $\rightarrow \uparrow$ bank reserves $\rightarrow \downarrow$ funds rate

• Other interest rates affected through term structure etc (more on this next class)

• Special interventions
  – stock market crash, 1987
  – September 11, 2001
  – others?
Fed funds rate

Board of Governors, 2007
John Taylor

• Professor of Economics, Stanford, and former Treasury official

• Simple way to interpret FOMC decisions

\[ i_t = \bar{r} + \pi_t + a_1(\pi_t - \bar{\pi}) + a_2(y_t - \bar{y}_t) \]

where

\[ i_t = \text{short term interest rate (fed funds rate)} \]
\[ \bar{r} = \text{long run or ‘neutral’ real interest rate} \]
\[ \pi_t = \text{inflation rate} \]
\[ \bar{\pi} = \text{inflation target} \]
\[ y_t = \text{log of real GDP} \]
\[ \bar{y}_t = \text{log of trend real GDP} \]

with policy parameters \( a_1, a_2 \)
Taylor rule 1993

• Simple example (follows Taylor’s 1993 paper)

\[ i_t = 0.02 + \pi_t + \frac{1}{2}(\pi_t - 0.02) + \frac{1}{2}(y_t - \bar{y}_t) \]
Taylor rule 1993

Taylor 1993
Taylor rule 2007

percent
actual fed funds rate
‘Taylor rule’
Problems?

- Parameter instability
  - changes in policy regime cause $a_1, a_2$ etc to ‘drift’
  - changes in structure of economy changes trend $\bar{y}_t$

- Omitted variables?
‘Taylor principle’

- Taylor rule

\[ i_t = \bar{r} + \pi_t + a_1(\pi_t - \bar{\pi}) + a_2(y_t - \bar{y}_t) \]

- Taylor principle: the policy parameter \( a_1 \) should be positive
  
  - this means FOMC increases nominal rates more than one-for-one with inflation

\[ \frac{di_t}{d\pi_t} = 1 + a_1 \]

- this means real interest rates \( r_t = i_t - \pi_t \) increase

\[ \frac{dr_t}{d\pi_t} = \frac{di_t}{d\pi_t} - 1 = a_1 \]
Inflation in the 1970s

percent

fed funds rate

inflation

Policy accommodates rising inflation \((a_1 < 0)\)
Policy becomes more aggressive \((a_1 > 0)\)
Inflation brought under control

percent
fed funds rate
real rate
What have we learned so far?

• Primary goal of monetary policy
  – price stability

• Instrument of monetary policy
  – short term interest rates
  – specifically, open market operations in fed funds market
  – attempt to hit target fed funds rate

• Taylor rule
  – simple device for understanding FOMC decisions
  – key principle: increase nominal rates more than one-for-one with inflation
Rest of this class
• The monetary policy transmission mechanism and related topics
  – monetary policy surprises
  – changes in the term structure
  – rules vs. discretion and the time inconsistency problem
  – talking points: independence, transparency, communication etc
Monetary policy surprises

• Do financial markets price in Fed decisions?
  – sometimes yes, sometimes no

• Easy to see what financial markets are forecasting at any point in time
  – Eurodollar market
    * dollar-denominated assets at non-US banks
    * liquid, near perfect substitute for fed funds
    * so overnight Eurodollar rates line up with fed funds
  – also, fed funds futures (more recently)

• Easy to spot surprises after the fact!
Eurodollar and fed funds rates

Source: Cochrane and Piazzesi, 2002
Monetary policy surprises?

Source: Cochrane and Piazzesi, 2002
Anticipated changes

Source: Cochrane and Piazzesi, 2002
What are these?

Source: Cochrane and Piazzesi, 2002
Term structure of interest rates

- Interest rates on treasury securities of different maturities
- Monetary policy affects overnight interest rates at the very short end of the yield curve
- How does this spill over to other interest rates?
  - longer maturity treasuries are weighted average of expected future short rates plus term risk
  - mortgage rates and corporate bond rates (etc) are long treasury rates plus credit risk
Movements in the whole term structure

Source: Cochrane and Piazzesi, 2002
Monetary policy surprises

Source: Cochrane and Piazzesi, 2002
Changes in the term structure

• Change in policy affects both ‘slope’ and ‘level’ of yield curve
  – long rates weighted average of expected future short rates
  – changes in term and credit risk spreads
Changes in the term structure

inverted (or flat) yield curve going into recession
Policy response

short rates fall ('slope effect')

yield

maturity
Slope and level effects

- Long rates fall ('level effect')
- Short rates continue to fall
Term spread widens
Term structure through two recessions

Source: Cochrane and Piazzesi, 2006
Summary

• Initially
  – short rates decline
  – spreads widen, highest in depths of recession
  – term risk premium is high when investors don’t want risk of any kind

• Over time
  – spreads tighten again
  – as recession ends, enter period of growth and rising interest rates
  – no longer a premium for holding risk
Rules vs. discretion

- Should monetary policy follow a ‘rule’ or be at FOMC’s discretion?

- Rule
  - goals and instruments announced in advance
  - central bank commits to a ‘contingent plan’
  - ‘once and for all time’ optimization

- Discretion
  - policy makers evaluate events in real time
  - ‘sequential’ optimization

- What could be wrong with sequential optimization?
  - temptation: the ‘time inconsistency’ problem
Time inconsistency

- Example
  - hostage negotiation
  - government would like to commit credibly to ‘no negotiation’ stance
  - why?
Time inconsistency: Simple model

- Fed likes to keep inflation $\pi$ and unemployment $u$ low. Minimizes loss
  \[ L(u, \pi) = u + \theta \pi^2, \quad \theta > 0 \]

- Policy tradeoff (‘Phillips curve’)
  \[ u - \bar{u} = -\alpha(\pi - \pi^e), \quad \alpha > 0 \]

- Study this as a game

- Two scenarios
  - fixed rule (policy-maker moves first, ‘commits’)
  - discretion (policy-maker reacts to private agents)
Rule (Fed moves first)

- Fed chooses a single inflation rate $\pi$
- Private agents respond by choosing inflation expectations optimally
- Result
  - Fed chooses zero inflation
    $$\pi = 0$$
  - Private agents believe Fed
    $$\pi^e = \pi = 0$$
  - Unemployment is at steady state
    $$u = \bar{u} - \alpha(\pi - \pi^e) = \bar{u} - 0 = \bar{u}$$
- Good outcome!
Discretion (Fed reacts)

- Private agents choose inflation expectations optimally.
- Fed chooses inflation rate as a function of inflation expectations:
  \[ L(\pi) = \bar{u} - \alpha(\pi - \pi^e) + \theta\pi^2 \]

  - First order condition for Fed’s choice of inflation:
    \[ \frac{dL(\pi)}{d\pi} - \alpha + 2\theta\pi = 0 \Rightarrow \pi = \frac{\alpha}{2\theta} > 0 \]

  - So private agents expect:
    \[ \pi^e = \pi = \frac{\alpha}{2\theta} > 0 \]

- Bad outcome!
- Compared with rule, discretion produces same unemployment rate, but higher inflation.
Implications

- Fed cannot *make* private agents believe it will do the right thing
- There may be advantages to denying taking options off the table
  - a key difference between a single-agent optimization problem and a game
- But absolute commitment to a rule difficult to achieve in practice
  - how can approximate rule-like outcomes be achieved?
Talking points

• Central bank governance
  – independence
  – communication
  – transparency and predictability
**Independence**

- Should central banks be independent from political process?
  - goal independence?
  - instrument independence?
Communication

• Greenspan

\textit{If I seem unduly clear to you, you must have misunderstood what I said}

– why did he think it was useful to be unclear?
– how does Bernanke compare?

• How should Fed communicate its intentions and/or deliberations?

– to financial markets?
– to the general public?
Transparency and predictability

- What aspects of FOMC decision making should be transparent?
  - committee votes?
  - briefing papers?
  - staff forecasts?
  - technical papers?
What have we learned today?

• Primary goal of monetary policy
  – price stability

• Instrument of monetary policy
  – short term interest rates
  – transmission from short rates to long rates and riskier assets
  – Taylor rule: simple device for understanding FOMC decisions

• FOMC decisions are often but not always anticipated by financial markets

• Monetary policy rules may be superior to discretion

• Central bank independence, transparency & predictability all (probably) good things