Lecture notes on risk management, public policy, and the financial system

Central banks and the financial system

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Overview of monetary policy

The framework of monetary policy

Conduct of monetary policy in normal times

Lender of last resort

Overview of monetary policy
- Central banks and monetary policy
- Emergence of central banking

The framework of monetary policy

Conduct of monetary policy in normal times

Lender of last resort

What is monetary policy?

- A set of objectives and tools to carry it out
- Can be carried out by government or central bank
  - Shift in modern era to central banks
  - Independence from political influence and specialization
- Objectives

  Price stability: inflation, exchange rates
  Broader macroeconomic goals: growth, employment
  Financial system: payment systems, financial stability
  Broader political goals intertwined with other goals
- Closely intertwined with regulatory and →**fiscal policy**

Typical powers and functions of a central bank

All shared with government

Issuance of money in different forms

Payment systems: international, interbank, consumer

Interest rate control through market operations, administered rates

- Constrained by fiscal policy

Supervision and regulation of banks, other financial intermediaries

Financial stability: permanent facilities aimed at prevention, emergency measures

The first central banks and what they did

- 16th c. Italian and Dutch merchant cities: semi-public banks facilitate credit and foreign exchange markets
- Earliest nation-state central banks:

  1668 Sverige Riksbank
  1694 Bank of England
  - Semi-public institutions: privately owned, but fiscal obligations
  - Note-issuing privileges, e.g. exclusive rights within City, but not (yet) full monopoly
- Original purpose: support government borrowing
  - Fragmentation reduced, uniform issuance in then-emerging capital markets
  - U.K.: liquid government bond secondary market by mid-18th c. (3 percent consol of 1751)
- Key functions of central banks emerge
  - Bank becomes banker to city banks/merchants during 18th c.→birth of monetary policy
  - Bank plays stabilizing role in financial crises of 1797 and after→**lender of last resort** function

Emergence of monetary policy

- Note-issuance and other privileges→Bank key counterparty for all other banks
  - Supports both major functions of central bank
- 18th c.: discovery of Bank influence over interest rates
  - U.K.: **Bank rate** at which Bank rediscounts commercial bills
  - Country and City banks treat Bank notes as reserves
  - Gold and liquidity reserves centralized at Bank
- Bank rate in turn influences
  - Outstanding volume of banknote issues, money supply, general business conditions and prices
  - Gold flows, international balance and maintenance of reserves under still-informal gold standard
- **Peel's Act** (1844) institutionalizes gold standard, monetary control
  - Bank to be sole issuer of banknotes in fixed volume and backed by gold reserve
  - Institutional separation of note issue from lending to City banks

Federal Reserve: one of the last central banks

Establishment of the Fed in 1913 in response to 1907 financial panic

Gold exchange standard between and after wars: U.S. dollar emerges as international reserve currency

Banking Acts of 1932, 1935 shifts power to Board of Governors, widens lending authority

Fed-Treasury Accord 1951 abandons long-term bond price support since 1942→central bank independence

The (first) Keynesian moment 1960-, emphasis on fiscal policy

Great Stagflation of the 1970's, interest rates always one step behind rise in inflation

Volcker disinflation 1979-1982 demonstrates role of expectations and value of active monetary policy

Financial crisis from 2007: unconventional monetary policy

Central banking without a central bank

- Federal Reserve established only in 1913
  - But private insurance arrangements among private commercial banks throughout 19th century
- Lender of last resort function carried out in part via **private bank clearinghouses**
  - Established to clear, net and settle commercial bank payments
  - Key role esp. during Panic of 1907
- Operations of clearinghouses during crises:
  - Address problem of depletion of reserves
  - Member banks deposit good collateral with clearinghouse
  - Clearinghouse issues certificates (liabilities) that can be used to settle debts between members, circulate as money

Overview of monetary policy

The framework of monetary policy

- The monetary policy framework is focused on market expectations
- How monetary policy impacts and influences the economy

Conduct of monetary policy in normal times

Lender of last resort

Monetary policy framework before the crisis

Instruments $\longrightarrow$ Intermediate targets $\longrightarrow$ Objectives

Objectives or **targets:**

- Ultimate goals, infrequently altered and often enshrined in legislation

Intermediate target: prices or quantities central bank ties to influence in pursuit of objectives

- **Effective** (realized) **federal funds rate:** key money market rate
- Money stock rarely an intermediate target

Monetary policy tools

- Most tools operate via central bank balance sheet
  - Vary **balances:** banks' deposits at central bank
  - Reserves have liquidity value to banks and may also pay interest
  - Reserve balances controlled through central bank purchases and sales of securities
- Reserves added or drained from the money market through

  Open market operations (OMOs) in bond markets at market prices

  Standing facilities transacting at **administered rate** set by central bank
- **Communication and signaling:** tools to achieve consistency of public's expectations with policy intentions
- Distinct from emergency liquidity programs ($\rightarrow$)LOLR

Money supply definitions

- **Monetary base** or **high-powered money** is issued by public authorities:

  Cash issued by government or central bank
  Reserve balances: banks' deposits at central bank

- By scope:

  Narrow money (M1 in the U.S.): cash and most of the public's deposits in commercial banks
  Broad money (M2 in the U.S.) includes forms of money less easy to use in transactions or clear slowly: some savings deposits, MMMF shares

- By issuer:

  Outside money is issued by public sector, largely coterminous with base money
  Inside money is issued privately, largely as commercial bank deposit liabilities

A simple model of the economy

- Key variables

  Nominal interest rate or money-market rate i.
  Inflation π
  Real interest rate: difference $i - \mathbf{E}[\pi]$ between nominal and *expected* inflation
  Output x: GDP growth or employment, measured relative to full-employment or potential or natural-rate

- Two key relationships describe the economy

  Aggregate demand or "IS" curve: an increase in real interest rate depresses output
  Aggregate supply or *short run* **Phillips curve**:
  - Inflation rises with output and expected inflation
  - $\Rightarrow$ Tradeoff lower inflation for higher unemployment

- Price/wage rigidity plays a key role

Key characteristics and results of the model

- Current values of each variable—i.e. state of the economy—depend on entire expected future path of each variable
- Gradual adjustment over time to shocks/surprises/news/data
- But can monetary policy influence real variables?
  - Short-term trade-off between output and inflation (and their volatilities)
  - Long term **neutrality of money**
- Near-complete absence from model of financial system: leverage, credit conditions, etc.
- Centrality of expectations in executing strategy
  - $\rightarrow$ importance of **communication**
  - Past performance and track record also crucial to expectation formation
- **Rules** ($\leftrightarrow$**discretion**) as commitment mechanism
- $\rightarrow$Strategy for carrying out monetary policy

Strategy execution via an interest-rate rule

- Central bank sets short-term nominal interest rate i
  - Closes up model, i.e. determines—together with key relationships—paths of inflation and growth
  - Thus an **intermediate target**
  - In U.S., **federal funds rate** at which banks lend to one another
- Conceptually: set target rate to adjust market interest rates to unobservable long term **natural** or **equilibrium real interest rate**

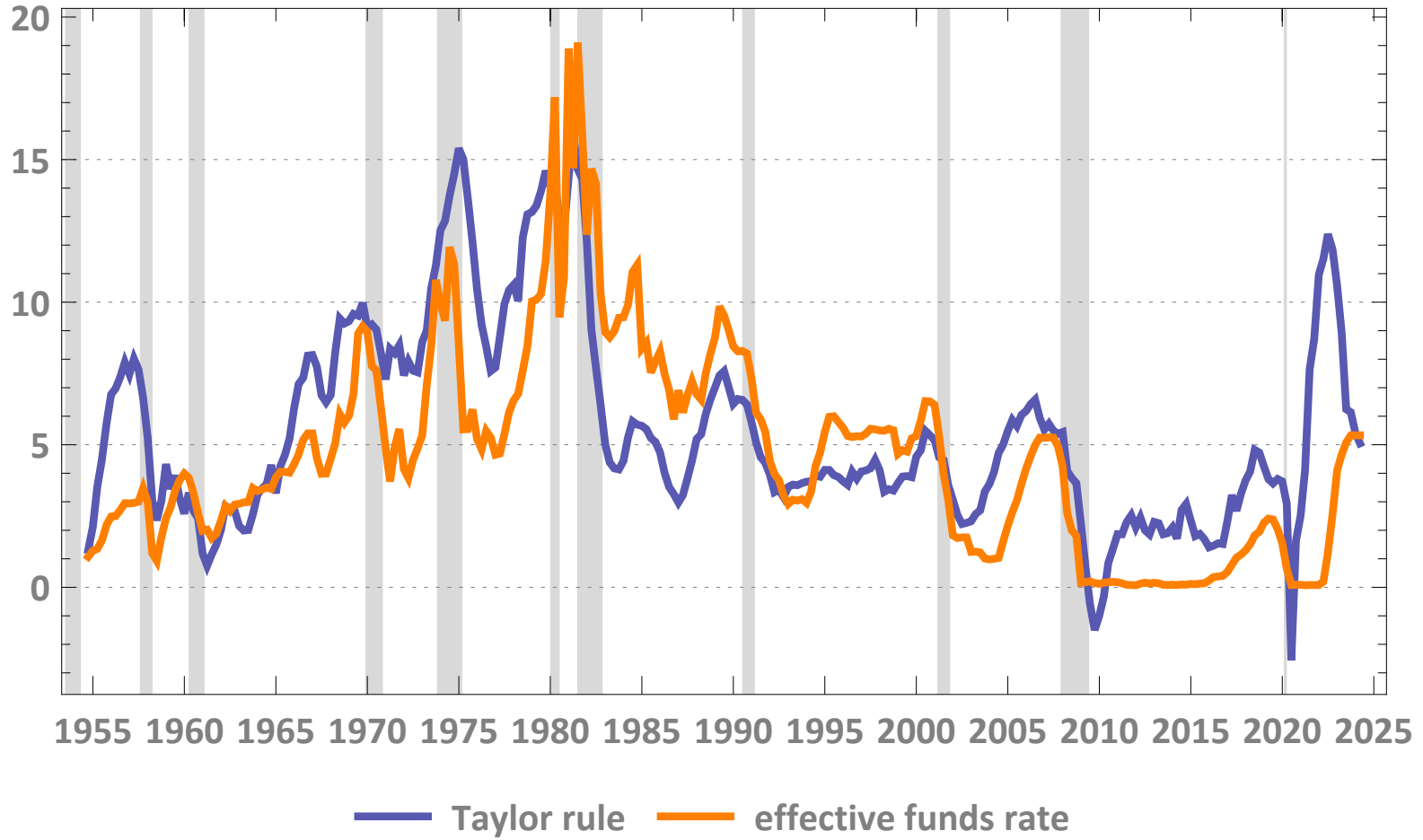
Taylor rules

- **Taylor rule**: raise policy rate if inflation or growth>goal

$$i = \underbrace{0.02}_{\text{natural rate}} + \underbrace{0.02}_{\text{target } \pi} + 1.5 \cdot (\pi - \underbrace{0.02}_{\text{target } \pi}) + 0.5 \cdot x$$

- Symmetric rule: "lean against the wind"
  - Coefficient on actual vs. target inflation $> 1 \rightarrow$ raise interest rates above long-term equilibrium if inflation above target
- Not official **policy rule**, but *looks* like one
  - Advanced market economy central bank actions from 1980's on resemble the rule
  - Hence also called **reaction function**
- **Inertial Taylor rule**: place some weight on prevailing policy rate
  - Potential benefit: avoid disruptive sudden change in policy, even to sudden change in inflation or output gap
  - More closely tracks central bank behavior

Actual and Taylor-rule Fed funds rate 1970–2024



Taylor-rule prescription (black plot): $0.04 + 1.5 \cdot (\pi - 0.02) + 0.5 \cdot x$, with π the year-over-year log change in the PCE deflator and x the log difference between actual GDP and the Congressional Budget Office estimate of potential GDP, quarterly. Actual (purple plot): effective fed funds rate, quarter-end, Q1 1970 to Q1 2024.

Central bank objectives and rules

- Fed legislative authority: Federal Reserve Act, sec. 2A, as amended 1977
  - **Dual mandate** (actually triple): "...maximum employment, stable prices, and moderate long-term interest rates."
  - Taylor rule contains inflation- and employment-targeting component
- Since 2012 inflation target a Fed "goal", rather than formal target
  - Set to 2 percent over the longer run
  - Measured by PCE price index excl. food and energy
- Low positive number intended to accommodate some **downward price rigidity**, esp. of wages
  - Targeting zero inflation with price rigidity→risk of deflationary spiral
- Symmetry: ambiguity about whether
  - Meant to be an upper limit or longer-term average
  - Deviations in either direction equally to be avoided
- **European Central Bank**: single mandate of price stability
  - But similar Taylor-rule policy behavior to Fed

Alternative monetary-policy rules

Gold standard and its **rules of the game** 1870–1914:

- Raise (lower) rates in response to gold outflow (inflow)
- Asymmetric in practice
- Controversies: macroeconomic track record, impact on central bank credibility

Interest-rate rule such as Taylor rule

- Employed 1982–2008
- Target i rather than money supply

Monetarism: money-supply targets

- Employed 1979–82
- Difficulties: choice of aggregate in innovated financial system, estimating money demand function

Inflation targeting: differs from dual mandate in two respects

- Firm target rather than goal/benchmark/aspiration
- Central bank not officially concerned with growth

Nominal GDP targeting: transitory above-target inflation in slump

Transmission channels of monetary policy

- How does policy effect on the economy and on the goals of policy, prices and growth?
- Within the framework, transmission "channels" must connect i to x and π
- Transmission channels interact with one another: only conceptually distinct

Transmission channels in normal times

Interest rates influence investment, residential house purchase, and other consumption decisions

Asset values are influenced by interest rates via the impact of discounting on present values

- **Wealth effects:** As interest rates drop, for example, equity values may rise, inducing higher consumption
- **Financial accelerator:** As asset prices change, business and household balance-sheet strength, value of borrowers' collateral influence creditworthiness

Bank lending channel: changes in reserves affect banks' desired loan volume; many borrowers lack direct access to capital markets

Exchange rates also influenced by interest rates. As interest rates drop, U.S. dollar may weaken, inducing higher net exports

Overview of monetary policy

The framework of monetary policy

Conduct of monetary policy in normal times
- Normal operating framework of monetary policy
- Institutions
- Central banks and governments

Lender of last resort

Framework for normal monetary operations

- Operations vary supply of **reserve balances** with Federal Reserve banks
  - Deposits at (loans to) Federal Reserve of **depository institutions** (DIs, mainly commercial banks)
  - Paid no interest pre-crisis ($\rightarrow$IOR, IOER)
- Federal Reserve targets short-term interest rates
  - Via transactions with commercial banks
  - Fed sets ("targets") **federal funds rate**—interest rate on **federal funds transactions** ("**fed funds**")
- **Liquidity effect:** banks' demand for reserves decreases as federal funds rate rises
  - Reserves desired to meet reserve requirements, liquidity, withdrawals, currency demand, facilitate clearing and payments
  - But banks reluctant to pay opportunity cost—foregoing higher-interest money market instruments

Tools of normal monetary operations

Target federal funds rate: where Fed aims to set overnight rate

- Realized or **effective fed funds rate** the **intermediate target** of policy

Discount window: Short-term collateralized loans by Fed to depository institutions (DI)

- **Primary Credit Facility**: standing facility, no formal limit on borrowing by DIs, though generally low
- **Discount rate** set higher than target fed funds $\rightarrow$ *ceiling* on fed funds rate
- Discount rate an administered rate

Reserve requirements: minimum ratio of reserves to loan assets; contribute to demand for reserves on part of banks

- Formerly $\approx$ 10 percent of demand deposits over 2-week **maintenance period**
- Eliminated 2020

Open market operations adding or draining reserves

Open market operations

- OMOs as well as discount window borrowing vary balance sheet—assets and liabilities of central bank
  - Fed assets pre-crisis consisted almost entirely of U.S. Treasury bills and bonds, held outright, small volume of Treasury repo
  - Funded primarily currency issuance and by varying small volume of reserve balances, central bank liabilities
- **Nonborrowed reserves:** reserve balances acquired by banks through OMOs rather than discount window or other borrowing at administered rates
- Conducted via **primary dealers**, including some non-banks

Types of open market operations

Outright operations via *secondary market* purchases (adding) and sales (draining) of bonds:

- Medium-term growth of reserves, e.g. demand for currency as economy grows

Temporary operations via

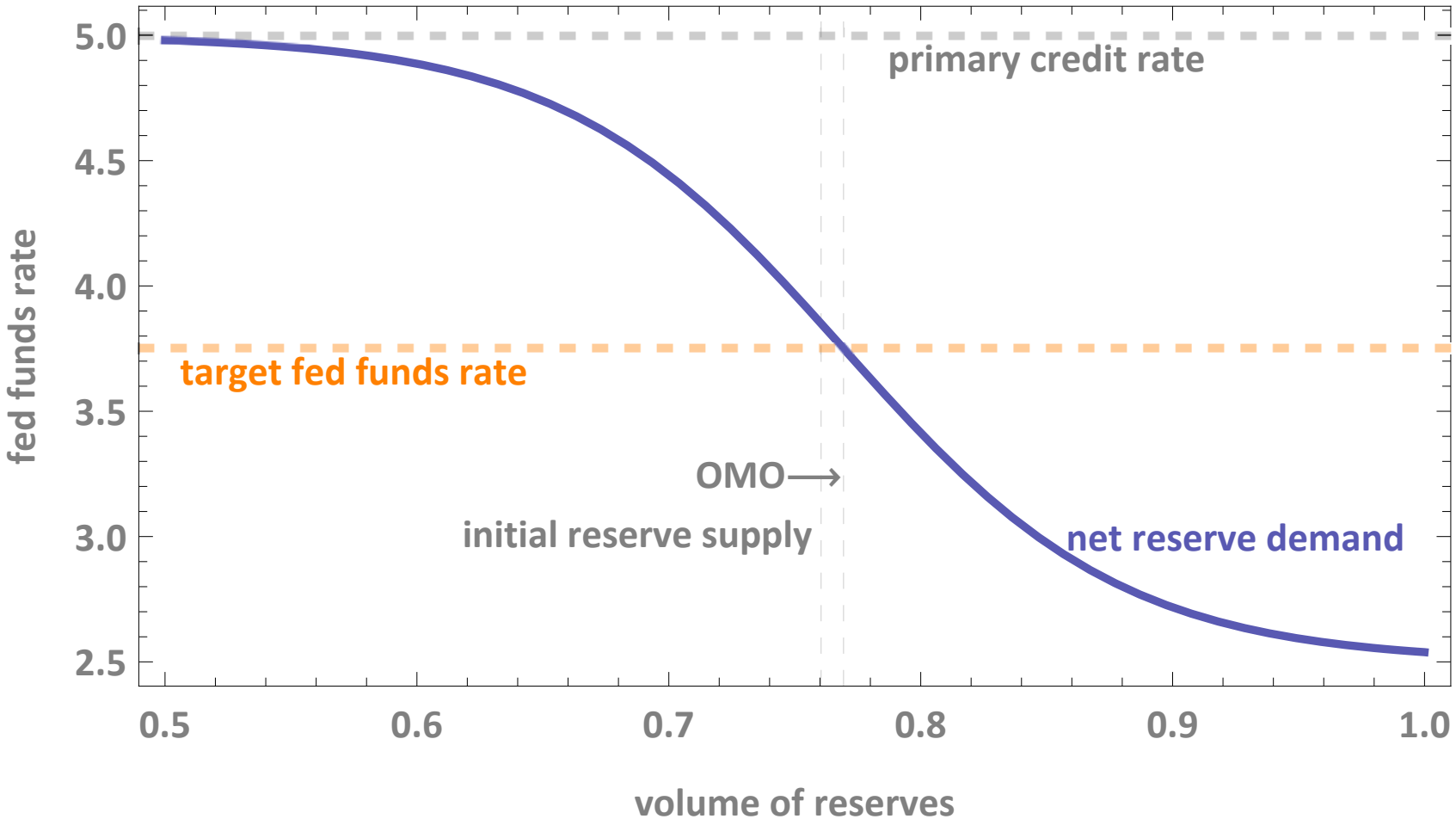
- **Repurchase** (adding) and **reverse repurchase agreements** (draining)
- Terminology from point of view of primary dealers
- Address shorter-term fluctuations in liquidity demand

Monetary operations in normal times

Funds rate → Money markets → Long-term rates → State of economy

- **Federal funds market**: secondary market in reserve balances
- Bank demand for reserve balances
  - Meet end-of-day payment obligations and minimum reserve requirements
  - Minimum reserve requirements
- Vary reserve supply to bring effective close to target funds rate
  - Keep fed funds market a bit tight (**structural deficiency** of reserves) and supply reserves day-to-day to hit target
  - Structural deficiency→banks borrow funds from one another, active funds market
- Type of operating framework called **corridor system**
  - Shift vertical supply curve to remain close to target as demand shifts
  - Discount window puts **ceiling** on rates in case of transitory liquidity shortage
  - Fed reserve balances paid no interest prior to 2008 crisis, so **floor** equal to zero

Normal monetary operations



Purple plot shows the net demand of all depository institutions for reserves. The initial reserve supply permits the funds market to clear above the target rate of 3.75 percent. Following an expansionary OMO, the funds rate falls to 3.75 percent.

Why target interest rates, not money supply?

- Biggest puzzle of all: interest rates rather than money as intermediate target
  - Predominant practice among central banks past 30 years
  - Partial exception: **nonborrowed reserves** (NBR) targeting 1979-82, but discount window open
- Can influence, not control, yield curve
  - Weaker influence over long- than short-term rates
- Weak relationship between money stock and price level
  - Uncertain short-term lags, tight long-term relationship
- Can central bank set any other rate than natural rate?
  - Only in the short term
  - In the long term, would result is unlimited inflation or price level collapse

Money supply control

- Central bank has less control over money supply than over reserves
  - Direct control only over reserves, other components (e.g. currency) of **monetary base** or **high-powered money**
  - $\leftrightsquigarrow$**Money stock**, e.g. **monetary aggregates** M1, M2
  - Money stock depends also on behavior of households (demand for currency) and banks (reserve ratios)
- Weak relationship between monetary base and money stock
  - Financial innovation, substitution among money-like assets

Institutional setup of Federal Reserve

Legal authorization via Acts of Congress

- **Federal Reserve Act** 1913
- **Federal Reserve Reform Act** 1977
- **Humphrey-Hawkins Full Employment Act** 1978
- **Monetary Control Act** 1980
- **Dodd-Frank Act** 2010: restricts lender of last resort powers

Federal Open Market Committee (FOMC)

- 8 meetings annually
- 12 members:
  - All 7 members of the Board of Governors
  - President of the New York Fed
  - 4 of the 11 non-N.Y. Reserve Bank presidents, serving 1 year in rotation
  - Remaining Reserve Bank presidents attend FOMC meetings, referred to as "participants"

Pre-crisis communication

FOMC meeting decisions publicized via

- **Statements** including target fed funds rate published immediately after meetings from 04Feb1994
- **Minutes** released after 3 weeks
- **Transcripts** released after 5 years

Monetary Policy Report to the Congress in form of semi-annual written report and oral testimony

Speeches by FOMC members

Data in regular and ad hoc forms

- **Monetary aggregates** via H.4.1, as well as other statistical releases
- **Freedom of Information Act** and other legally-mandated releases

Implicit Federal Reserve inflation targeting

- Closely related to developments in communication
- Publication of medium-term forecasts
- 24Jan2012 principles (long-term goal)
- "Constrained discretion"
- But no primacy of price stability within dual mandate

Central bank credibility and independence

- Historically, central banks private-sector entities, but some form of government control
- Dependence of current state on future and on expectations $\rightarrow$ Utility of **credibility** and **commitment**
- **Time consistency** problem
  - Surprise inflation boosts output in short term
  - Detracts from credibility of central bank commitment to low inflation, raises expected inflation
  - Time inconsistency raises long-term inflation (**discretionary inflation bias**)
- $\Rightarrow$ Preference for policy rules over discretion
- Effectiveness of rules enhanced by transparency, communication
- **Independence**: imperviousness to political influence
  - Rules and independence are mechanism to commit central bank to optimal lower-inflation policy

Accommodation of expansionary fiscal policy

- Accommodation by central bank
  - Expansionary monetary policy to offset upward pressure on interest rates
  - Amplifies upward pressure on prices
- **Examples**:
  - Federal Reserve maintenance of near-zero rates to accomodate WWII-era budget deficits, ended by **Fed-Treasury accord** (1951)
  - Fed maintenance of near-zero rates during fiscal expansion 2020–22 (disputed!)
- **Fiscal theory of price level**: expectation of future budget deficits→immediate increase in inflation expectations
  - Anticipation of limit on debt capacity
  - Sovereign will inflate rather than default
- Accommodation by finance ministry
  - **Financial repression**: government policy measures to lower interest rates, diverts investment to lower its own cost of borrowing or reduce debt burden
  - Shift to short term issuance if yield curve steepens in response to higher debt

Possible examples of financial repression

- Motivation of policies unobservable and often disputed
- Shift to short term issuance if yield curve steepens in response to higher debt
- **Activist Treasury issuance** (ATI): U.S. Treasury shift from regular relation between long- and short-term to higher bill issuance
  - U.S. Treasury shift from regular relation between long- and short-term to higher bill issuance
  - Intended to lower long-term rates via portfolio balance channel?
- Preferential regulatory treatment
  - Low or zero risk weights on highly indebted European countries' government debt low or zero risk weights
  - Stable NAV for MMMFs investing in T-bills, ON RRP, Treasury repo
- Motivation of policies unobservable and often disputed

Impact of fiscal policy

- **Expansionary fiscal policy**: increase in government spending via
  - Increase in expenditures on goods and services
  - Increase in **transfers** to households, firms
- If not accompanied by equal rise in tax revenue, results in higher government budget deficit, debt
- If monetary policy unchanged⇒
  - Expansion of economic activity
  - Upward pressure on price level, inflation expectations
  - Upward pressure on interest rates, especially long term
    - Higher demand for credit (**loanable funds**)
    - Portfolio balance effect if more bonds issued
    - ⇒Long-term interest rates rise, influence investment, residential house purchase decisions
  - Exchange rate devaluation pressure
- **Credit policy** and credit allocation: subsidized lending to firms or sectors
  - Difficult to distinguish from expansionary fiscal policy

Relationship between Federal Reserve and Treasury

- Federal Reserve district bank stock owned by member banks, but public has power to appoint boards, senior management
- Federal Reserve's net earnings generally positive: liabilities (reserves) earn zero or low interest relative to assets (securities and loan portfolio)
  - Maintains **surplus capital** account
  - Surplus size had been discretionary but held equal to member banks' capital
  - Now limited to \$10 bill. by **Fixing America's Surface Transportation Act** (FAST)
- Net earnings not a goal of policy, but a byproduct
- Net earnings not paid into surplus remitted to Treasury, reduce amount of debt it must raise from public
  - Negative net earnings→remittances cease, **deferred asset** booked
  - When net earnings turn positive, deferred asset drawn down before remittances resume

Overview of monetary policy

The framework of monetary policy

Conduct of monetary policy in normal times

Lender of last resort

Overview of crisis policy

Crises and the lender of last resort function

Types of emergency policy

"Bailouts" include a broad range of public-sector actions

Debt guarantees Government guarantee of bank debt (all or new liabilities)

Recapitalization Capital injection into banks, generally in exchange for preferred equity (TARP) or subordinated debt)

Asset purchases Purchase of toxic assets or purchase of assets from toxic banks

Liquidity support Longer funding terms, more auctions and/or higher credit lines; domestic system lender of last resort: wider collateral rule; other liquidity support (e.g., support of money market funds); foreign exchange lender of last resort: forex swap lines

Deposit insurance Enhancement of deposit protection in commercial banks, e.g. higher limits, additional types of accounts, ad hoc extensions (Continental Illinois)

Key policy makers in crises

Governments: capital support, management of failed firms, regulatory relief via finance ministries administrative agencies

Central banks: provision of liquidity, maintenance of payment systems

International organizations: coordination, funding of sovereigns

The Bank of England as lender of last resort

- Formulation of "Bagehot's Rule" assigning special role in crises to Bank of England
  - Bank failures and financial panics: 1825, 1836, 1866 (Overend Gurney)
  - Peel's Act viewed as limiting Bank's proper role in panic→**Responsibility Doctrine**
- Distinction between appropriate Bank response to presentation of banknotes for gold under

  Internal drain or increased desire for liquidity associated with panic: lend freely

  External drain or gold flows out of U.K. to foreign countries: increase Bank rate
- If both internal and external drain, lend freely at penalty rate

Bagehot's Rule for a lender of last resort

- Liquidity support only (but can it involve credit support?)
- To specific institutions (or just, or in addition, markets?)
- Lend against "good collateral" (but can't be too selective in crisis)
- To solvent firms only (if you can clearly and quickly distinguish them)
- On a large scale
- But at penalty rate (but there is stigma problem)
- In a systemic risk event (or for efficiency, or to avert a possible systemic risk event?)
- By the "holder of the reserve" (central bank? private clearinghouse?)
- With rules set out in advance (though it's hard to plan for the unforeseeable)

Lender of last resort: institutional framework

- Role of central banks
  - Generally exclusive responsibility for monetary policy
  - Often shared responsibility for financial-sector regulation
  - Provide emergency liquidity to financial sector
- Role of Treasury/finance ministry
  - Shared responsibility for financial-sector regulation
  - Recapitalization of banks if deemed necessary
- Credit policy vs. monetary policy
  - Dilemma of implementing large-scale liquidity support without supporting specific firms or sectors
  - Example of support for housing market through LSAPs
- Cross-border lender of last resort:
  - Foreign entities large participants in USD financial markets as borrowers and lenders
  - **Foreign bank offices** (FBOs): high use of Fed facilities, e.g. Term Asset Facility
  - Issues: lending with less supervisory focus, home-country responsibility

Lender of last resort and market intermediation

- Traditional central bank tools: standing lending facilities
  - Involve lending to banks, which in turn lend—or don't cease lending—to nonfinancial sector
  - E.g. Fed discount window, ECB marginal lending facility
- Considered drastically insufficient during global financial and Covid crises
  - Intermediation via banks less effective in increasingly capital-market intermediated system
- The doctrine updated: **market maker of last resort**
  - Support specific markets in market-intermediated system
  - Responds to withdrawal of market makers, impairment of market functioning
  - Too-big-to-fail and "sins of the past"