Monetary Policy

Monetary policy is the process by which the monetary authority of a country controls the supply of money, often targeting a rate of interest for the purpose of promoting economic growth and stability.[1][2] The official goals usually include relatively stable prices and low unemployment. Monetary economics provides insight into how to craft optimal monetary policy.

Monetary policy is referred to as either being expansionary or contractionary, where an expansionary policy increases the total supply of money in the economy more rapidly than usual, and contractionary policy expands the money supply more slowly than usual or even shrinks it. Expansionary policy is traditionally used to try to combat unemployment in a recession by lowering interest rates in the hope that easy credit will entice businesses into expanding. Contractionary policy is intended to slow inflation in order to avoid the resulting distortions and deterioration of asset values.

Monetary policy differs from fiscal policy, which refers to taxation, government spending, and associated borrowing.[3]

Overview

Monetary policy, to a great extent, is the management of expectations.[4] Monetary policy rests on the relationship between the rates of interest in an economy, that is, the price at which money can be borrowed, and the total supply of money. Monetary policy uses a variety of tools to control one or both of these, to influence outcomes like economic growth, inflation, exchange rates with other currencies and unemployment. Where currency is under a monopoly of issuance, or where there is a regulated system of issuing currency through banks which are tied to a central bank, the monetary authority has the ability to alter the money supply and thus influence the interest rate (to achieve policy goals). The beginning of monetary policy as such comes from the late 19th century, where it was used to maintain the gold standard.

A policy is referred to as contradictory if it reduces the size of the money supply or increases it only slowly, or if it raises the interest rate. An expansionary policy increases the size of the money supply more rapidly, or decreases the interest rate. Furthermore, monetary policies are described as follows: accommodative, if the interest rate set by the central monetary authority is intended to create economic growth; neutral, if it is intended neither to create growth nor combat inflation; or tight if intended to reduce inflation.

There are several monetary policy tools available to achieve these ends: increasing interest rates by fiat; reducing the monetary base; and increasing reserve requirements. All have the effect of contracting the money supply; and, if reversed, expand the money supply. Since the 1970s, monetary policy has generally been formed separately from fiscal policy. Even prior to the 1970s, the Bretton Woods system still ensured that most nations would form the two policies separately.

Within the vast majority modern nations, special institutions (such as the Federal Reserve System in the United States, the Bank of England, the European Central Bank, the People's Bank of China, the Reserve Bank of New Zealand, and the Bank of Japan) exist which have the task of executing the monetary policy and often independently of the executive. In general, these institutions are called central banks and often have other responsibilities such as supervising the smooth operation of the financial system.

The primary tool of monetary policy is open market operations. This entails managing the quantity of money in circulation through the buying and selling of various financial instruments, such as treasury bills, company bonds, or foreign currencies. All of these purchases or sales result in more or less base currency entering or leaving market circulation.

Usually, the short term goal of open market operations is to achieve a specific short term interest rate target. In other instances, monetary policy might instead entail the targeting of a specific exchange rate relative to some foreign currency or else relative to gold. For example, in the case of the USA the Federal Reserve targets the federal funds rate, the rate at which member banks lend to one another overnight; however, the monetary policy of China is to target the exchange rate between the Chinese renminbi and a basket of foreign currencies.

The other primary means of conducting monetary policy include: (i) Discount window lending (lender of last resort); (ii) Fractional deposit lending (changes in the reserve requirement); (iii) Moral suasion (cajoling certain market players to achieve specified outcomes); (iv) "Open Mouth Operations" (talking monetary policy with the market).

Theory

General

Monetary policy is the process by which the government, central bank, or monetary authority of a country controls (i) the supply of money, (ii) availability of money, and (iii) cost of money or rate of interest to attain a set of objectives oriented towards the growth and stability of the economy.[1] Monetary theory provides insight into how to craft optimal monetary policy.

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It is important for policymakers to make credible announcements. If private agents (consumers and firms) believe that policymakers are committed to lowering inflation, they will anticipate future prices to be lower than otherwise (how those expectations are formed is an entirely different matter; compare for instance rational expectations with adaptive expectations). If an employee expects prices to be high in the future, he or she will draw up a wage contract with a

high wage to match these prices.[*citation needed*] Hence, the expectation of lower wages is reflected in wage-setting behavior between employees and employers (lower wages since prices are expected to be lower) and since wages are in fact lower there is no demand pull inflation because employees are receiving a smaller wage and there is no cost push inflation because employers are paying out less in wages.

To achieve this low level of inflation, policymakers must have *credible* announcements; that is, private agents must believe that these announcements will reflect actual future policy. If an announcement about low-level inflation targets is made but not believed by private agents, wage-setting will anticipate high-level inflation and so wages will be higher and inflation will rise. A high wage will increase a consumer's demand (demand pull inflation) and a firm's costs (cost push inflation), so inflation rises. Hence, if a policymaker's announcements regarding monetary policy are not credible, policy will not have the desired effect.

If policymakers believe that private agents anticipate low inflation, they have an incentive to adopt an expansionist monetary policy (where the marginal benefit of increasing economic output outweighs the marginal cost of inflation); however, assuming private agents have rational expectations, they know that policymakers have this incentive. Hence, private agents know that if they anticipate low inflation, an expansionist policy will be adopted that causes a rise in inflation. Consequently, (unless policymakers can make their announcement of low inflation *credible*), private agents expect high inflation. This anticipation is fulfilled through adaptive expectation (wage-setting behavior); so, there is higher inflation (without the benefit of increased output). Hence, unless credible announcements can be made, expansionary monetary policy will fail.

Announcements can be made credible in various ways. One is to establish an independent central bank with low inflation targets (but no output targets). Hence, private agents know that inflation will be low because it is set by an independent body. Central banks can be given incentives to meet targets (for example, larger budgets, a wage bonus for the head of the bank) to increase their reputation and signal a strong commitment to a policy goal. Reputation is an important element in monetary policy implementation. But the idea of reputation should not be confused with commitment.

While a central bank might have a favorable reputation due to good performance in conducting monetary policy, the same central bank might not have chosen any particular form of commitment (such as targeting a certain range for inflation). Reputation plays a crucial role in determining how much markets would believe the announcement of a particular commitment to a policy goal but both concepts should not be assimilated. Also, note that under rational expectations, it is not necessary for the policymaker to have established its reputation through past policy actions; as an example, the reputation of the head of the central bank might be derived entirely from his or her ideology, professional background, public statements, etc.

It has been argued[5] that to prevent some pathologies related to the time inconsistency of monetary policy implementation (in particular excessive inflation), the head of a central bank should have a larger distaste for inflation than the rest of the economy on average. Hence the

reputation of a particular central bank is not necessarily tied to past performance, but rather to particular institutional arrangements that the markets can use to form inflation expectations.

Despite the frequent discussion of credibility as it relates to monetary policy, the exact meaning of credibility is rarely defined. Such lack of clarity can serve to lead policy away from what is believed to be the most beneficial. For example, capability to serve the public interest is one definition of credibility often associated with central banks. The reliability with which a central bank keeps its promises is also a common definition. While everyone most likely agrees a central bank should not lie to the public, wide disagreement exists on how a central bank can best serve the public interest. Therefore, lack of definition can lead people to believe they are supporting one particular policy of credibility when they are really supporting another.[6]

International economics

Optimal monetary policy in international economics is concerned with the question of how monetary policy should be conducted in *interdependent* open economies. The classical view holds that international macroeconomic interdependence is only relevant if it affects domestic output gaps and inflation, and monetary policy prescriptions can abstract from openness without harm.[7] As stressed by Corsetti and Pesenti (2005)[8] and Devereux and Engel (2003),[9] this view rests on two implicit assumptions: a high responsiveness of import prices to the exchange rate, i.e. producer currency pricing (PCP), and frictionless international financial markets supporting the efficiency of flexible price allocation. The violation or distortion of these assumptions found in empirical research is the subject of a substantial part of the international optimal monetary policy literature. The policy trade-offs specific to this international perspective are threefold:[10]

First, research, e.g. by Gopinath and Rigobon (2008),[11] however, suggests only a weak reflection of exchange rate movements in import prices, lending credibility to the opposed theory of local currency pricing (LCP). The consequence is a departure from the classical view in the form of a trade-off between output gaps and misalignments in international relative prices, shifting monetary policy to CPI inflation control and real exchange rate stabilization.

Second, another specificity of international optimal monetary policy is the issue of strategic interactions and competitive devaluations, which is due to cross-border spillovers in quantities and prices.[12] Therein, the national authorities of different countries face incentives to manipulate the terms of trade to increase national welfare in the absence of international policy coordination. Though research by Corsetti & Penseti (2005)[8] suggests that the gains of international policy coordination might be small, such gains may become very relevant if balanced against incentives for international noncooperation.

Third, open economies face policy trade-offs if asset market distortions prevent global efficient allocation. Even though the real exchange rate absorbs shocks in current and expected fundamentals, its adjustment does not necessarily result in a desirable allocation and may even exacerbate the misallocation of consumption and employment at both the domestic and global level. This is because, relative to the case of complete markets, both the Phillips curve and the loss function include a welfare-relevant measure of cross-country imbalances. Consequently, this results in domestic goals, e.g. output gaps or inflation, being traded-off against the stabilization

of external variables such as the terms of trade or the demand gap. Hence, the optimal monetary policy in this case consists of redressing demand imbalances and/or correcting international relative prices at the cost of some inflation.[13]

Corsetti, Dedola & Leduc (2011)[14] summarize the status quo of research on international monetary policy prescriptions: "Optimal monetary policy thus should target a combination of inward-looking variables such as output gap and inflation, with currency misalignment and cross-country demand misallocation, by leaning against the wind of misaligned exchange rates and international imbalances."

History

Monetary policy is associated with interest rates and availability of credit. Instruments of monetary policy have included short-term interest rates and bank reserves through the monetary base.[15] For many centuries there were only two forms of monetary policy: (i) Decisions about coinage; (ii) Decisions to print paper money to create credit. Interest rates, while now thought of as part of monetary authority, were not generally coordinated with the other forms of monetary policy during this time. Monetary policy was seen as an executive decision, and was generally in the hands of the authority with seigniorage, or the power to coin. With the advent of larger trading networks came the ability to set the price between gold and silver, and the price of the local currency to foreign currencies. This official price could be enforced by law, even if it varied from the market price.

Paper money called "jiaozi" originated from promissory notes in 7th century China. Jiaozi did not replace metallic currency, and were used alongside the copper coins. The successive Yuan Dynasty was the first government to use paper currency as the predominant circulating medium. In the later course of the dynasty, facing massive shortages of specie to fund war and their rule in China, they began printing paper money without restrictions, resulting in hyperinflation.

With the creation of the Bank of England in 1699, which acquired the responsibility to print notes and back them with gold, the idea of monetary policy as independent of executive action began to be established.[16] The goal of monetary policy was to maintain the value of the coinage, print notes which would trade at par to specie, and prevent coins from leaving circulation. The establishment of central banks by industrializing nations was associated then with the desire to maintain the nation's peg to the gold standard, and to trade in a narrow band with other gold-backed currencies. To accomplish this end, central banks as part of the gold standard began setting the interest rates that they charged, both their own borrowers, and other banks who required liquidity. The maintenance of a gold standard required almost monthly adjustments of interest rates.

During the 1870–1920 period, the industrialized nations set up central banking systems, with one of the last being the Federal Reserve in 1913.[17] By this point the role of the central bank as the "lender of last resort" was understood. It was also increasingly understood that interest rates had an effect on the entire economy, in no small part because of the marginal revolution in economics, which demonstrated how people would change a decision based on a change in the economic trade-offs.

Monetarist economists long contended that the money-supply growth could affect the macroeconomy. These included Milton Friedman who early in his career advocated that government budget deficits during recessions be financed in equal amount by money creation to help to stimulate aggregate demand for output.[18] Later he advocated simply increasing the monetary supply at a low, constant rate, as the best way of maintaining low inflation and stable output growth.[19] However, when U.S. Federal Reserve Chairman Paul Volcker tried this policy, starting in October 1979, it was found to be impractical, because of the highly unstable relationship between monetary aggregates and other macroeconomic variables.[20] Even Milton Friedman acknowledged that money supply targeting was less successful than he had hoped, in an interview with the Financial Times on June 7, 2003.[21][22][23]

Therefore, monetary decisions today take into account a wider range of factors, such as:

- short term interest rates;
- long term interest rates;
- velocity of money through the economy;
- exchange rates;
- credit quality;
- bonds and equities (corporate ownership and debt);
- government versus private sector spending/savings;
- international capital flows of money on large scales;
- financial derivatives such as options, swaps, futures contracts, etc.

Trends in central banking

The central bank influences interest rates by expanding or contracting the monetary base, which consists of currency in circulation and banks' reserves on deposit at the central bank. The primary way that the central bank can affect the monetary base is by open market operations or sales and purchases of second hand government debt, or by changing the reserve requirements. If the central bank wishes to lower interest rates, it purchases government debt, thereby increasing the amount of cash in circulation or crediting banks' reserve accounts. Alternatively, it can lower the interest rate on discounts or overdrafts (loans to banks secured by suitable collateral, specified by the central bank). If the interest rate on such transactions is sufficiently low, commercial banks can borrow from the central bank to meet reserve requirements and use the additional liquidity to expand their balance sheets, increasing the credit available to the economy. Lowering reserve requirements has a similar effect, freeing up funds for banks to increase loans or buy other profitable assets.

A central bank can only operate a truly independent monetary policy when the exchange rate is floating.[24] If the exchange rate is pegged or managed in any way, the central bank will have to purchase or sell foreign exchange. These transactions in foreign exchange will have an effect on the monetary base analogous to open market purchases and sales of government debt; if the central bank buys foreign exchange, the monetary base expands, and vice versa. But even in the case of a pure floating exchange rate, central banks and monetary authorities can at best "lean against the wind" in a world where capital is mobile.

Accordingly, the management of the exchange rate will influence domestic monetary conditions. To maintain its monetary policy target, the central bank will have to sterilize or offset its foreign exchange operations. For example, if a central bank buys foreign exchange (to counteract appreciation of the exchange rate), base money will increase. Therefore, to sterilize that increase, the central bank must also sell government debt to contract the monetary base by an equal amount. It follows that turbulent activity in foreign exchange markets can cause a central bank to lose control of domestic monetary policy when it is also managing the exchange rate.

In the 1980s, many economists began to believe that making a nation's central bank independent of the rest of executive government is the best way to ensure an optimal monetary policy, and those central banks which did not have independence began to gain it. This is to avoid overt manipulation of the tools of monetary policies to effect political goals, such as re-electing the current government. Independence typically means that the members of the committee which conducts monetary policy have long, fixed terms. Obviously, this is a somewhat limited independence.

In the 1990s, central banks began adopting formal, public inflation targets with the goal of making the outcomes, if not the process, of monetary policy more transparent. In other words, a central bank may have an inflation target of 2% for a given year, and if inflation turns out to be 5%, then the central bank will typically have to submit an explanation. The Bank of England exemplifies both these trends. It became independent of government through the Bank of England Act 1998 and adopted an inflation target of 2.5% RPI (now 2% of CPI).

The debate rages on about whether monetary policy can smooth business cycles or not. A central conjecture of Keynesian economics is that the central bank can stimulate aggregate demand in the short run, because a significant number of prices in the economy are fixed in the short run and firms will produce as many goods and services as are demanded (in the long run, however, money is neutral, as in the neoclassical model). There is also the Austrian school of economics, which includes Friedrich von Hayek and Ludwig von Mises's arguments,[25] which argues that central bank monetary policy aggravates the business cycle, creating malinvestment and maladjustments in the economy which then cause down cycle corrections, but most economists fall into either the Keynesian or neoclassical camps on this issue.

Developing countries

Developing countries may have problems establishing an effective operating monetary policy. The primary difficulty is that few developing countries have deep markets in government debt. The matter is further complicated by the difficulties in forecasting money demand and fiscal pressure to levy the inflation tax by expanding the monetary base rapidly. In general, the central banks in many developing countries have poor records in managing monetary policy. This is often because the monetary authority in a developing country is not independent of government, so good monetary policy takes a backseat to the political desires of the government or are used to pursue other non-monetary goals. For this and other reasons, developing countries that want to establish credible monetary policy may institute a currency board or adopt dollarization. Such forms of monetary institutions thus essentially tie the hands of the government from interference and, it is hoped, that such policies will import the monetary policy of the anchor nation.

Recent attempts at liberalizing and reforming financial markets (particularly the recapitalization of banks and other financial institutions in Nigeria and elsewhere) are gradually providing the latitude required to implement monetary policy frameworks by the relevant central banks.

Types

In practice, to implement any type of monetary policy the main tool used is modifying the amount of base money in circulation. The monetary authority does this by buying or selling financial assets (usually government obligations). These open market operations change either the amount of money or its liquidity (if less liquid forms of money are bought or sold). The multiplier effect of fractional reserve banking amplifies the effects of these actions.

Constant market transactions by the monetary authority modify the supply of currency and this impacts other market variables such as short term interest rates and the exchange rate.

The distinction between the various types of monetary policy lies primarily with the set of instruments and target variables that are used by the monetary authority to achieve their goals.

Monetary Policy:	Target Market Variable:	Long Term Objective:
Inflation Targeting	Interest rate on overnight debt	A given rate of change in the CPI
Price Level Targeting	Interest rate on overnight debt	A specific CPI number
Monetary Aggregates	The growth in money supply	A given rate of change in the CPI
Fixed Exchange Rate	The spot price of the currency	The spot price of the currency
Gold Standard	The spot price of gold	Low inflation as measured by the gold price
Mixed Policy	Usually interest rates	Usually unemployment + CPI change

The different types of policy are also called **monetary regimes**, in parallel to exchange-rate regimes. A fixed exchange rate is also an exchange-rate regime; The Gold standard results in a relatively fixed regime towards the currency of other countries on the gold standard and a floating regime towards those that are not. Targeting inflation, the price level or other monetary aggregates implies floating exchange rate unless the management of the relevant foreign currencies is tracking exactly the same variables (such as a harmonized consumer price index).

In economics, an expansionary fiscal policy includes higher spending and tax cuts, that encourage economic growth.[26] In turn, an expansionary monetary policy is one that seeks to increase the size of the money supply. As usual, inciting of money supply is aimed at lowering the interest rates on purpose to achieve economic growth by increase of economic activity.[27] Conversely, contractionary monetary policy seeks to reduce the size of the money supply. In most nations, monetary policy is controlled by either a central bank or a finance ministry.

Neoclassical and Keynesian economics significantly differ on the effects and effectiveness of monetary policy on influencing the **real** economy; there is no clear consensus on how monetary policy affects real economic variables (aggregate output or income, employment). Both economic schools accept that monetary policy affects monetary variables (price levels, interest rates).

Inflation targeting

Under this policy approach the target is to keep inflation, under a particular definition such as Consumer Price Index, within a desired range.

The inflation target is achieved through periodic adjustments to the Central Bank interest rate target. The interest rate used is generally the overnight rate at which banks lend to each other overnight for cash flow purposes. Depending on the country this particular interest rate might be called the cash rate or something similar.

The interest rate target is maintained for a specific duration using open market operations. Typically the duration that the interest rate target is kept constant will vary between months and years. This interest rate target is usually reviewed on a monthly or quarterly basis by a policy committee.

Changes to the interest rate target are made in response to various market indicators in an attempt to forecast economic trends and in so doing keep the market on track towards achieving the defined inflation target. For example, one simple method of inflation targeting called the Taylor rule adjusts the interest rate in response to changes in the inflation rate and the output gap. The rule was proposed by John B. Taylor of Stanford University.[28]

The inflation targeting approach to monetary policy approach was pioneered in New Zealand. It has been used in Australia, Brazil, Canada, Chile, Colombia, the Czech Republic, Hungary, New Zealand, Norway, Iceland, India, Philippines, Poland, Sweden, South Africa, Turkey, and the United Kingdom.

Price level targeting

Price level targeting is a monetary policy that is similar to inflation targeting except that CPI growth in one year over or under the long term price level target is offset in subsequent years such that a targeted price-level is reached over time, e.g. five years, giving more certainty about future price increases to consumers. Under inflation targeting what happened in the immediate past years is not taken into account or adjusted for in the current and future years.

Uncertainty in price levels can create uncertainty around price and wage setting activity for firms and workers, and undermines any information that can be gained from relative prices, as it is more difficult for firms to determine if a change in the price of a good or service is because of inflation or other factors, such as an increase in the efficiency of factors of production, if inflation is high and volatile. An increase in inflation also leads to a decrease in the demand for

money, as it reduces the incentive to hold money and increases transaction costs and shoe leather costs.

Monetary age

In the 1980s, several countries used an approach based on a constant growth in the money supply. This approach was refined to include different classes of money and credit (M0, M1 etc.). In the USA this approach to monetary policy was discontinued with the selection of Alan Greenspan as Fed Chairman.

This approach is also sometimes called monetarism.

While most monetary policy focuses on a price signal of one form or another, this approach is focused on monetary quantities. As these quantities could have a role on the economy and business cycles depending on the households' risk aversion level, money is sometimes explicitly added in the central bank's reaction function.[29]

Fixed exchange rate

This policy is based on maintaining a fixed exchange rate with a foreign currency. There are varying degrees of fixed exchange rates, which can be ranked in relation to how rigid the fixed exchange rate is with the anchor nation.

Under a system of fiat fixed rates, the local government or monetary authority declares a fixed exchange rate but does not actively buy or sell currency to maintain the rate. Instead, the rate is enforced by non-convertibility measures (e.g. capital controls, import/export licenses, etc.). In this case there is a black market exchange rate where the currency trades at its market/unofficial rate.

Under a system of fixed-convertibility, currency is bought and sold by the central bank or monetary authority on a daily basis to achieve the target exchange rate. This target rate may be a fixed level or a fixed band within which the exchange rate may fluctuate until the monetary authority intervenes to buy or sell as necessary to maintain the exchange rate within the band. (In this case, the fixed exchange rate with a fixed level can be seen as a special case of the fixed exchange rate with bands where the bands are set to zero.)

Under a system of fixed exchange rates maintained by a currency board every unit of local currency must be backed by a unit of foreign currency (correcting for the exchange rate). This ensures that the local monetary base does not inflate without being backed by hard currency and eliminates any worries about a run on the local currency by those wishing to convert the local currency to the hard (anchor) currency.

Under dollarization, foreign currency (usually the US dollar, hence the term "dollarization") is used freely as the medium of exchange either exclusively or in parallel with local currency. This outcome can come about because the local population has lost all faith in the local currency, or it

may also be a policy of the government (usually to rein in inflation and import credible monetary policy).

These policies often abdicate monetary policy to the foreign monetary authority or government as monetary policy in the pegging nation must align with monetary policy in the anchor nation to maintain the exchange rate. The degree to which local monetary policy becomes dependent on the anchor nation depends on factors such as capital mobility, openness, credit channels and other economic factors.

Gold standard

The gold standard is a system under which the price of the national currency is measured in units of gold bars and is kept constant by the government's promise to buy or sell gold at a fixed price in terms of the base currency. The gold standard might be regarded as a special case of "fixed exchange rate" policy, or as a special type of commodity price level targeting.

Today this type of monetary policy is no longer used by any country, although the gold standard was widely used across the world between the mid-19th century through 1971.[30] Its major advantages were simplicity and transparency. The gold standard was abandoned during the Great Depression, as countries sought to reinvigorate their economies by increasing their money supply.[31] The Bretton Woods system, which was a modified gold standard, replaced it in the aftermath of World War II. However, this system too broke down during the Nixon shock of 1971.

The gold standard induces deflation, as the economy usually grows faster than the supply of gold. When an economy grows faster than its money supply, the same amount of money is used to execute a larger number of transactions. The only way to make this possible is to lower the nominal cost of each transaction, which means that prices of goods and services fall, and each unit of money increases in value. Absent precautionary measures, deflation would tend to increase the ratio of the real value of nominal debts to physical assets over time. For example, during deflation, nominal debt and the monthly nominal cost of a fixed-rate home mortgage stays the same, even while the dollar value of the house falls, and the value of the dollars required to pay the mortgage goes up. Economists generally consider such deflation to be a major disadvantage of the gold standard. Unsustainable (i.e. excessive) deflation can cause problems during recessions and financial crisis lengthening the amount of time an economy spends in recession. William Jennings Bryan rose to national prominence when he built his historic (though unsuccessful) 1896 presidential campaign around the argument that deflation caused by the gold standard made it harder for everyday citizens to start new businesses, expand their farms, or build new homes.[32]

Policy tools

Monetary policy uses three main tactical approaches to maintain monetary stability:

The first tactic manages the money supply. This mainly involves buying government bonds (expanding the money supply) or selling them (contracting the money supply). In the Federal

Reserve System, these are known as open market operations, because the central bank buys and sells government bonds in public markets. Most of the government bonds bought and sold through open market operations are short-term government bonds bought and sold from Federal Reserve System member banks and from large financial institutions.[33][34] When the central bank disburses or collects payment for these bonds, it alters the amount of money in the economy while simultaneously affecting the price (and thereby the yield) of short-term government bonds. The change in the amount of money in the economy in turn affects interbank interest rates.[35][36]

The second tactic manages money demand. Demand for money, like demand for most things, is sensitive to price. For money, the price is the interest rates charged to borrowers. Setting banking-system lending or interest rates (such as the US overnight bank lending rate, the federal funds discount Rate, and the London Interbank Offer Rate, or Libor) in order to manage money demand is a major tool used by central banks. Ordinarily, a central bank conducts monetary policy by raising or lowering its interest rate target for the interbank interest rate. If the nominal interest rate is at or very near zero, the central bank cannot lower it further. Such a situation, called a liquidity trap,[37] can occur, for example, during deflation or when inflation is very low.[38]

The third tactic involves managing risk within the banking system. Banking systems use fractional reserve banking[39] to encourage the use of money for investment and expanding economic activity. Banks must keep banking reserves[40][41] on hand to handle actual cash needs, but they can lend an amount equal to several times their actual reserves. The money lent out by banks increases the money supply, and too much money (whether lent or printed) will lead to inflation. Central banks manage systemic risks by maintaining a balance between expansionary economic activity through bank lending and control of inflation through reserve requirements.[42]

Open-market activities, setting banking-system lending or interest rates, and setting banking-system reserve requirements to manage systemic risk are the "normal" methods used by central banks to ensure an adequate money supply to sustain and expand an economy and to manage or limit the effects of recessions and inflation. These "standard" supply, demand, and risk management tools keep market interest rates and inflation at specified target values by balancing the banking system's supply of money against the demands of the aggregate market.

Monetary base

Monetary policy can be implemented by changing the size of the monetary base. Central banks use open market operations to change the monetary base. The central bank buys or sells reserve assets (usually financial instruments such as bonds) in exchange for money on deposit at the central bank. Those deposits are convertible to currency. Together such currency and deposits constitute the monetary base which is the general liabilities of the central bank in its own monetary unit. Usually other banks can use base money as a fractional reserve and expand the circulating money supply by a larger amount.

Reserve requirements

The monetary authority exerts regulatory control over banks. Monetary policy can be implemented by changing the proportion of total assets that banks must hold in reserve with the central bank. Banks only maintain a small portion of their assets as cash available for immediate withdrawal; the rest is invested in illiquid assets like mortgages and loans. By changing the proportion of total assets to be held as liquid cash, the Federal Reserve changes the availability of loanable funds. This acts as a change in the money supply. Central banks typically do not change the reserve requirements often as it can create volatile changes in the money supply and may disrupt the banking system.

Discount window lending

Central banks normally offer a discount window, where commercial banks and other depository institutions are able to borrow reserves from the Central Bank to meet temporary shortages of liquidity caused by internal or external disruptions. This creates a stable financial environment where savings and investment can occur, allowing for the growth of the economy as a whole.

The interest rate charged (called the 'discount rate') is usually set below short term interbank market rates. Accessing the discount window allows institutions to vary credit conditions (i.e., the amount of money they have to loan out), thereby affecting the money supply. Through the discount window, the central bank can affect the economic environment, and thus unemployment and economic growth.

Interest rates

The contraction of the monetary supply can be achieved *indirectly* by increasing the nominal interest rates. Monetary authorities in different nations have differing levels of control of economy-wide interest rates. In the United States, the Federal Reserve can set the discount rate, as well as achieve the desired Federal funds rate by open market operations. This rate has significant effect on other market interest rates, but there is no perfect relationship. In the United States open market operations are a relatively small part of the total volume in the bond market. One cannot set independent targets for both the monetary base and the interest rate because they are both modified by a single tool — open market operations; one must choose which one to control. A meta-analysis of 70 empirical studies on monetary transmission finds that a one-percentage-point increase in the interest rate typically leads to a 0.3% decrease in prices with the maximum effect occurring between 6 and 12 months.[43]

In other nations, the monetary authority may be able to mandate specific interest rates on loans, savings accounts or other financial assets. By raising the interest rate(s) under its control, a monetary authority can contract the money supply, because higher interest rates encourage savings and discourage borrowing. Both of these effects reduce the size of the money supply.

Currency board

A currency board is a monetary arrangement that pegs the monetary base of one country to another, the anchor nation. As such, it essentially operates as a hard fixed exchange rate, whereby local currency in circulation is backed by foreign currency from the anchor nation at a

fixed rate. Thus, to grow the local monetary base an equivalent amount of foreign currency must be held in reserves with the currency board. This limits the possibility for the local monetary authority to inflate or pursue other objectives. The principal rationales behind a currency board are threefold:

1. To import monetary credibility of the anchor nation;
2. To maintain a fixed exchange rate with the anchor nation;
3. To establish credibility with the exchange rate (the currency board arrangement is the hardest form of fixed exchange rates outside of dollarization).

In theory, it is possible that a country may peg the local currency to more than one foreign currency; although, in practice this has never happened (and it would be a more complicated to run than a simple single-currency currency board). A gold standard is a special case of a currency board where the value of the national currency is linked to the value of gold instead of a foreign currency.

The currency board in question will no longer issue fiat money but instead will only issue a set number of units of local currency for each unit of foreign currency it has in its vault. The surplus on the balance of payments of that country is reflected by higher deposits local banks hold at the central bank as well as (initially) higher deposits of the (net) exporting firms at their local banks. The growth of the domestic money supply can now be coupled to the additional deposits of the banks at the central bank that equals additional hard foreign exchange reserves in the hands of the central bank. The virtue of this system is that questions of currency stability no longer apply. The drawbacks are that the country no longer has the ability to set monetary policy according to other domestic considerations, and that the fixed exchange rate will, to a large extent, also fix a country's terms of trade, irrespective of economic differences between it and its trading partners.

Hong Kong operates a currency board, as does Bulgaria. Estonia established a currency board pegged to the Deutschmark in 1992 after gaining independence, and this policy is seen as a mainstay of that country's subsequent economic success (see Economy of Estonia for a detailed description of the Estonian currency board). Argentina abandoned its currency board in January 2002 after a severe recession. This emphasized the fact that currency boards are not irrevocable, and hence may be abandoned in the face of speculation by foreign exchange traders. Following the signing of the Dayton Peace Agreement in 1995, Bosnia and Herzegovina established a currency board pegged to the Deutschmark (since 2002 replaced by the Euro).

Currency boards have advantages for *small*, *open* economies that would find independent monetary policy difficult to sustain. They can also form a credible commitment to low inflation.

Unconventional monetary policy at the zero bound

Other forms of monetary policy, particularly used when interest rates are at or near 0% and there are concerns about deflation or deflation is occurring, are referred to as **unconventional monetary policy**. These include credit easing, quantitative easing, and signaling. In credit easing, a central bank purchases private sector assets to improve liquidity and improve access to credit. Signaling can be used to lower market expectations for lower interest rates in the future.

For example, during the credit crisis of 2008, the US Federal Reserve indicated rates would be low for an “extended period”, and the Bank of Canada made a “conditional commitment” to keep rates at the lower bound of 25 basis points (0.25%) until the end of the second quarter of 2010.

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