# What Is a Central Bank?

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One can state in a few paragraphs the “facts” about central banks. Beyond these few facts, there is endless controversy. In the recent past, a consensus appeared to develop that central banks can control inflation. However, many now question their ability to end deflation. And there is no consensus over how central banks control inflation. So what are the facts?

**I. Is the price level a monetary phenomenon?**

A central bank is the institution with a monopoly on the creation of the monetary base, which is the liability side of its balance sheet. Its liabilities divide between currency held by the public and the reserves that banks hold with it. The monetary base, that is, currency and bank reserves, are the instruments the public uses to effect finality of payment. There is a relationship between money, which includes bank deposits, and the monetary base. Currency is a component of both. Also, banks hold reserves to settle among themselves the payments imbalances that result as their depositors transfer deposits to depositors at other banks. A central bank controls the monetary base through the acquisition of assets, typically, government securities.

The price level is the money price of goods. For example, the CPI measures the amount of dollars required to purchase a standard basket of consumption goods. The monetary base and money then are related to the price level. The fundamental issue in monetary economics is the direction of causation. Intuitively, if the causal relationship goes from prices determined in individual

markets to their average (the price level) and then to money creation, the price level is a nonmonetary phenomenon. In contrast, if the causal relationship goes from the monetary base and money to the price level, the price level is a monetary phenomenon.

When the central bank sets its instrument (the funds rate) at a sustainable value (consistent with no change in inflation), then expected inflation drives the behavior of both the price level and money. The price level is a nonmonetary phenomenon if that expectation is detached from the behavior of the central bank (through a “wage-price spiral,” for example). The price level is a monetary phenomenon if the central bank controls that expectation.

If the price level is a monetary phenomenon, the analytical distinction between nominal and real variables becomes paramount. Economists agree that individuals care only about real variables. That is, only physical quantities and relative prices affect welfare. The dollar values of quantities (nominal variables) do not affect welfare apart from their corresponding real values. If the price level is a monetary phenomenon, then only the central bank can give nominal variables well-defined values.

The central issue in monetary economics is what determines the value possessed by money in exchange for goods. An individual accepts money (an intrinsically worthless piece of paper) because of the belief that another individual in the future will offer goods for money. But what determines that belief? If the price level is a nonmonetary phenomenon, a variety of institutional and

special factors such as union bargaining power and weather determine the value of money.

If the price level is a monetary phenomenon, the price level does not emerge independently of the money creating behavior of the central bank. To give money value in exchange, the central bank must control the quantity of money. A central bank could do so directly through its control over the monetary base. In practice, with the interbank interest rate as the central bank's instrument, a central bank gives money value according to how it shapes the way that the public forms its expectation of the future price level.

Individuals part with goods for money because they believe that money will possess value in a future exchange. In the simplest case, a central bank persuades the public that the price level will fluctuate around a fixed value. In practice, central banks allow inflation (deflation) and drift in the price level. The central bank then shapes how the public forms its expectation of the future price level by the way that it makes money creation depend upon macroeconomic shocks.

Economists borrow language from the world of the gold standard in referring to the need for a "nominal anchor." In the gold standard, the dollar (pound) price of gold set by the central bank was the nominal anchor. The parity price of gold deflated by the price level equaled the real price of gold. An increase, say, in the price level unmatched by the real factors determining the value of gold, would lower the real price of gold. Gold would flow out

of banks into nonmonetary uses, the money stock would fall, and the price level would return to its original value.

In the case of a small country that pegs its currency to that of a larger foreign country, the nominal anchor is the price level of the foreign country. That domestic price level moves proportionately with the foreign price level and with the terms of trade. In the case of a monetary regime with an interest rate instrument and autonomous determination of the domestic price level, the nominal anchor is the public's expectation of the future price level. That expectation is the analogue of the price level of the foreign country while the real interest rate is the analogue of the terms of trade. If the price level is a monetary phenomenon and the public forms its expectations rationally (conformably with the monetary regime), the central bank determines how the public forms that expectation.

At the most fundamental level, the price level is a monetary phenomenon if changes in the price level function as part of the price system. The market cleared by changes in the price level depends upon central bank arrangements for creating money. For a small open economy with a fixed exchange rate, the price level varies to produce the real terms of trade that clears the market for internationally traded goods (equilibrates the balance of payments). The central bank "ratifies" this price level by creating whatever nominal quantity of money the public demands at the resulting domestic price level. For an economy with autonomous

price level determination, the price level varies to provide the nominal quantity of money with the real purchasing power desired by the public. Price level changes clear the market for money balances. A primary empirical test of the hypothesis that the price level is a monetary phenomenon is whether monetary regimes of fixed and floating exchange rates entail a different equilibrating role for the price level.

A central implication of the assumption that the price level is a monetary phenomenon is that the policy procedures of the central bank possess a characterization in terms of monetary control. That implication is not obvious when a central bank uses the interest rate as its instrument. As explained below, the implication appears clearer along with two additional assumptions. First, the price system works to achieve macroeconomic equilibrium. Second, the public forms its expectation of inflation in a way that conforms to the nature of the monetary regime. (Of course, monetary policy procedures that result in erratic money creation and unpredictable price level changes can make the formation of those expectations extremely difficult.)

**II. Central bank money creation**

The quantity theory gives empirical content to the assumption that the price level is a monetary phenomenon. Specifically, with autonomous price level determination (floating exchange rates), the theory embodies the assumption that the nominal quantity of money can change independently of the real quantity of money. The price

level must then adjust to restore the real quantity of money, that is, the real purchasing power, the public desires.

Before conducting the classic conceptual experiment of the quantity theory where nominal money changes independently of real money demand, consider the public's demand for real purchasing power. One way to measure purchasing power is the fraction of its nominal (dollar) expenditure the public desires to hold in the form money balances (the inverse of the velocity of money). The assumption that this demand for real purchasing power is well-defined gives the central bank a lever to control the public's nominal expenditure through money creation.

The theory of real money demand became part of neoclassical economics when economists began to treat money as one of the assets in the portfolio held by individuals (McCallum and Goodfriend). Consider three assets: money, bonds and capital. For the individual not to want to rearrange his portfolio, equality must hold between the rates of return of these three assets.

Specifically, equation (1), from Friedman (1969), equates the return between money, government bonds, and capital (a proxy for any illiquid real asset). The return to money includes the marginal liquidity (nonpecuniary) services yield of money ( $MNPS_M$ ) minus the cost imposed by expected inflation $\left(\frac{1}{P}\frac{dP}{dt}\right)^*$ (or plus the return due to expected deflation). The return to bonds is the marginal liquidity services yield of bonds ( $MNPS_B$ ) plus the

explicit interest yield ( $r_B$ ) and the negative of expected inflation. The marginal real yield on capital is $MRY$ .

(1) $$MNPS_M - \left(\frac{1}{P}\frac{dP}{dt}\right)^* = MNPS_B + r_B - \left(\frac{1}{P}\frac{dP}{dt}\right)^* = MRY$$

One can use (1) to think about the constraints placed on the central bank's interest rate target. Assume that the price system works well to return real variables to their equilibrium values in response to macroeconomic shocks. Specifically, in the absence of monetary nonneutrality, there is a natural rate of interest that induces individuals to accept the unequal distribution of consumption over time produced by the unequal intertemporal distribution of production. The assumption that the price system works well implies that the central bank must vary the funds rate so that the real funds rate ***tracks*** this natural rate. The central bank cannot "improve" upon the behavior of the economy by improving the working of the price system. Consider again (1) with the real yields across assets set equal to the natural rate.

(2) $$MNPS_M - \left(\frac{1}{P}\frac{dP}{dt}\right)^* = MNPS_B + r_B - \left(\frac{1}{P}\frac{dP}{dt}\right)^* = MRY = \mathbf{NR}$$

The real world counterpart to the quantity theory conceptual experiment of an exogenous increase in money is a failure by the central bank to move the funds rate in a way that tracks the natural rate. This failure leads to money creation or destruction that forces a change in prices. For example, if the central bank fails to raise the funds rate in line with the natural rate, it

creates money. With no change in the price level, real money increases. The public will then rebalance its portfolio by attempting to move out of money into bonds and stocks. In doing so, it increases the prices of these other assets and lowers their yield. Those price and yield changes induce the public to hold larger money balances. At the same time, they also stimulate the nominal expenditure of the public.

However, the assumption that the price level is a monetary phenomenon means that this situation cannot persist. The increase in nominal money that produced the increase in real money provides no additional resources to alter the intertemporal distribution of resources and the natural rate of interest. Ultimately, the additional money creation will raise the price level and the central bank will have to allow the funds rate to rise fully to reflect the rise in the natural rate.

The foundation of this quantity theory view is the assumption that there is a well-defined demand for real purchasing power on the part of the public. Money creation by the central bank endows it with control over the nominal (dollar) expenditure of the public.

**III. Indicators and growth gaps**

To think about the procedures that the central bank uses to track the natural rate and, in the process, to control money creation, one needs to think about gaps between the real rate of interest and the natural rate of interest. The assumption that the price level is a monetary phenomenon implies that such gaps are

"transitory." Changes in the price level will undo the changes in real money that create the gaps. At the same time, the assumption that a gap can exist at all requires some power by the central bank to alter real money and force portfolio rebalancing by the public. One needs a theory of monetary nonneutrality to explain this power and to give content to the characterization "transitory." A final section discusses monetary nonneutrality.

Corresponding to the real rate-natural rate interest gap is a growth gap. Failure of the central bank to align the real rate that corresponds to its interest rate peg with the natural rate allows a growth gap to emerge. That is, a difference emerges between the actual rate of growth of output and the trend rate of growth of output. Again, divergences between the real rate and the natural rate and between actual and trend real output growth depend upon the hypothesis of monetary nonneutrality. Prices do not adjust instantaneously to deprive the central bank of all ability to influence the real quantity of money and real variables.

To proceed further, one needs to identify the consistencies in the policy procedures that policymakers follow (the policy rule). In principle, the central bank could solve a model of the economy with a real business cycle core to determine the natural rate that would exist with complete price flexibility. It could then set its interest rate peg to yield a real interest rate equal to the natural rate. In practice, the central bank must fall back on some indicator as a guide. Over some time period that varies positively

with the degree of instability in money demand, monetary policymakers could look for changes in the trend rate of growth of money. However, noise in money demand and also the interest sensitivity of money demand has meant in practice that central banks do not use money as a guide.

In practice, the FOMC uses a growth-gap indicator—the difference between actual "underlying" real growth and trend real growth. ("Underlying" growth abstracts from transitory influences on real growth such as weather and strikes.) The FOMC assesses the reliability of its estimate of the growth gap by observing measures of change in excess capacity, especially, the unemployment rate. The FOMC moves the funds rate above its prevailing value in response to a positive growth gap, and conversely. The FOMC uses this pragmatic search procedure to discover the natural rate.

Figure 1 depicts a negative growth gap where the growth of actual output falls short of trend output. Operating procedures that entail a reduction in the funds rate in response to a negative growth gap may appear counterintuitive. Movement from the growth path $y^A$ to the more steeply-inclined growth path $y^T$ should in itself require a higher real interest rate. However, what is relevant is the existence of the negative growth gap. Actual real growth is below trend because the real rate exceeds the natural rate. The resulting reduction in nominal money growth relative to real money growth consistent with the path $y^T$ depresses real growth.

Figure 2 shows positive and negative output gaps. Prior to Paul Volcker's chairmanship of the FOMC, the FOMC used output gaps as the indicator for setting the funds rate. It benchmarked the level of the trend line for real output using a year in which full-employment prevailed, in practice, 4 percent. In particular, the FOMC became willing to raise the funds rate when a negative output gap approached zero. However, the FOMC could not determine the appropriate level of the trend line for real output. Subsequently, it has been better able to estimate a growth gap checked for reliability by observing changes in the unemployment rate.

The next step in understanding central bank procedures is to relax the assumption of a fixed expectation of inflation. A major innovation of the Volcker operating procedures was to move the funds rate in response to sharp movements in bond rates construed as indicating a rise in inflationary expectations beyond the level consistent with the FOMC's implicit inflation target. Goodfriend (1993) documents these episodes of "inflation scares." Note that the FOMC does not target directly a discrepancy between actual and targeted inflation, but rather between expected and targeted inflation. Actual inflation reflects past actions of the FOMC. What is relevant for current price-setting behavior is what individuals believe the price level will be in the future. Although the central bank can influence the public's expectations of inflation through its "brute force" ability to create a negative

output gap through monetary contraction, credibility allows that control without output loss.

**IV. Central banks as creators of money**

Historically, misconceptions about the nature of central banks have derived from misleading analogies with commercial banks. The classic misconception remains the real bills doctrine. When a commercial bank purchases an asset, it loses reserves. A commercial bank could maintain the liquidity necessary to meet unanticipated deposit withdrawals if it held only real bills—self-liquidating IOUs issued to finance the movement of goods from producers to the market. After a short interval such as ninety days, the maturation of a real bill would automatically replace the reserves lost in its acquisition.

By analogy, according to the real bills doctrine, a central bank should hold only real bills. Central bank "credit" would then expand and contract with ("accommodate to") the needs of commerce. If a central bank "forced" credit on the market by acquiring illiquid assets, that credit would spill over into speculation. The guide for the central bank was to limit the speculative extension of credit that creates assets bubbles with the inevitable market collapse and deflation (Hetzel ??).

Modern-day proponents of real bills contend that because of the use of an interest-rate instrument, the market controls the central bank's asset portfolio. The central bank supplies the amount of liquidity that commercial banks demand. Independent

money creation by the central bank does not determine the price level. Consequently, the central bank exercises its influence over the economy through its influence over financial intermediation. For example, in Japan, the argument is common that the bad debts of banks have broken the monetary transmission mechanism. The central bank can acquire assets to increase the reserves of commercial banks, but the weak capital position of banks limits their willingness to engage in additional lending. As in the real bills world, the marketplace controls the ability of the central bank to create independent changes in money that change prices.

According to the quantity theory as opposed to the real bills view, a central bank exercises its control over the public's nominal expenditure through money (monetary base) creation. That control does not derive from the central bank's influence over financial intermediation. A commercial bank acquires assets by making its liabilities attractive to individuals who forego consumption to hold them. In contrast, a central bank acquires assets through the ability to impose a tax (seigniorage) that comes from money creation. It imposes the tax directly on holders of cash and indirectly on holders of bank deposits to the extent that banks hold reserves against deposits.[1]

One way to understand that the central bank exercises control over the price level through money creation rather than through influence over financial intermediation is to consider the change from an interest rate to a reserves instrument. Reserves creation

is not a part of redistributing control over productive assets from savers to investors.

Consider first an interest rate instrument. There is a natural rate of interest that varies positively with the trend rate of growth of real output. The nominal natural rate is the natural rate plus the central bank's inflation target. As described above, the FOMC stabilizes the public's expectation of inflation at a value equal to its implicit inflation target. It then discovers the level of the funds rate that sets the real rate equal to the natural rate by using a growth gap indicator to move the funds rate away from its prevailing value.

Consider now the analogue for a reserves instrument. There is a trend rate of growth of reserves that varies positively with the trend rate of output growth. There is a nominal natural rate of reserves growth that equals this natural rate of reserves growth plus the targeted inflation rate. Analogously with the interest rate case, the FOMC could vary reserves growth to establish credibility for its inflation target. The FOMC could then use the growth gap indicator to adjust judgmentally reserves growth up or down from its prevailing value to keep the growth gap equal to zero on average over time. In this way, the FOMC would maintain over time reserves growth equal to reserves demand consistent with trend real growth and targeted inflation.

In the first case, the central bank has privatized reserves provision by turning the decision on the quantity of reserves over

to banks. It has nationalized the setting of the interest rate. In the second case, the central bank has turned (real) interest rate determination over to the private market while taking direct control over reserves provision. It is hard to see any economic reason for preferring one instrument to the other (an interest rate or a reserves aggregate). However, the case of the reserves instrument makes clear that the central bank exercises its control over the price level through the way that it creates reserves creation rather than through its influence over financial intermediation.

**V. Monetary nonneutrality**

Monetary nonneutrality arises from a coordination failure. When the central bank creates and destroys money in an erratic way that forces unpredictable changes in the price level, individual price setters lack a coordinated way to move their dollar prices to maintain the real purchasing power desired by the public while preserving relative prices. Because individual price setters do not capture the externalities from being the first to change their dollar prices to discover the new sustainable price level, they make quantity adjustments initially.

As explained by Friedrich von Hayek (1945), the price system works well to allow individual price setters to discover relative prices. The reason is that the price system economizes on the information any one entity needs to set a price for its product. The firm can act on the basis of the market-determined price for

its product and the prices of its labor and capital inputs. The price system fails to provide any comparable coordinating mechanism for moving individual dollar prices to the level appropriate for providing the real purchasing power the public desires.

When a firm (with some market power) sets the dollar price of its product, it is solely concerned with the relationship of its dollar price to other dollar prices. That is, it only cares about relative prices—the rate of exchange of its product with other products. However, there is another dimension to its dollar price. The average of the dollar prices set by firms must be at the level that gives the public the real purchasing power it desires. How do firms set their dollar prices in a way that both gives the public the real purchasing power it desires and delivers equilibrium relative prices?

The coordinating mechanism that maintains the average of individual dollar prices at the level that delivers the public's desired purchasing power is a common expectation of the future price level. Of course, the central bank must validate those expectations by pursuing a monetary policy that results in a consistent rate of money creation. The main responsibility of a central bank is to provide this coordination for the setting of absolute dollar prices (providing maximum latitude for the market to set relative prices). The more explicit the central bank is about its inflation objective, the better it fulfills its primary responsibility as a central bank.

What happens when erratic money creation by the central bank forces unpredictable changes in the sustainable price level? For example, assume that the central bank attempts to lower equity prices through a “high” real interest rate made possible by money destruction. The central bank provides no guide for the duration of the policy or the required fall in asset prices. A specific example would be the Fed in 1928 and 1929 or the Bank of Japan in 1990. The ongoing monetary contraction will require a lower price level, but the nature of the policy renders the ultimate price level unpredictable. Associated changes in real money demand produced by interest rate and real output changes and financial market instability will render money an unreliable guide to the appropriate price level.

Consider an individual firm. Assume that its customers face search costs so that the firm possesses some short-term, but no long-term, market power. If the firm lowers its price in the absence of an aggregate shock, it will expect initially only a small increase in demand. Profits will fall because the firm sells about the same amount, but at a lower price. However, over time, demand will increase. If the firm’s price was appropriate before, it will then sell too much. Its sales might increase significantly, but it is selling each unit of output at a loss.

With the monetary contraction described above, all firms should lower their dollar prices in tandem to maintain aggregate real sales. However, there is nothing to coordinate a common fall

in dollar prices that preserves relative prices. Each individual firm faces the prospect of lowering its price in an isolated fashion and incurring the losses described above. Another way to make this point is to note that the firm that lowers its price first confers a positive externality on society by increasing the purchasing power of money. However, the individual firm does not capture that externality.

This story of price stickiness captures the spirit of the Friedman-Lucas critique of the Phillips curve. Unanticipated changes in aggregate nominal demand created by the central bank affect output while anticipated changes do not. Anticipated changes are those associated with a common expectation of inflation consistent with central bank policy. For example, inflation consistent with an announced, credible inflation target will not affect output. The common expectations set up by the central bank guide firms in setting their dollar prices in a coordinated way to preserve real purchasing power while allowing freedom to set relative prices by moving dollar prices relative to the common expectation of inflation.

**VI. Concluding comment**

If the price level is a monetary phenomenon, then central bank operating procedures possess a characterization in terms of monetary control. Central banks exercise their control over inflation through money creation not financial intermediation. Whether the price level is a monetary phenomenon is an empirical

proposition. The empirical test is whether the monetary arrangements of a country determine inflation or whether a diverse collection of real factors and nonmonetary institutional arrangements determine inflation. How does one explain the historical behavior of inflation? Surely the diverse monetary experiments of the twentieth century provide the answer. To explain inflation, “Cherchez la banque centrale.” Look for the central bank.

[1] The central bank only turns seigniorage over to the holders of money if it freezes the monetary base while growth of output produces deflation. As the rate of growth of the monetary base become positive, the central bank shares seigniorage with holders of money. With price stability, all seigniorage goes to the central bank. Positive inflation increases seigniorage until the point where reductions in the real monetary base outweigh the increase in inflation.

Figure 1

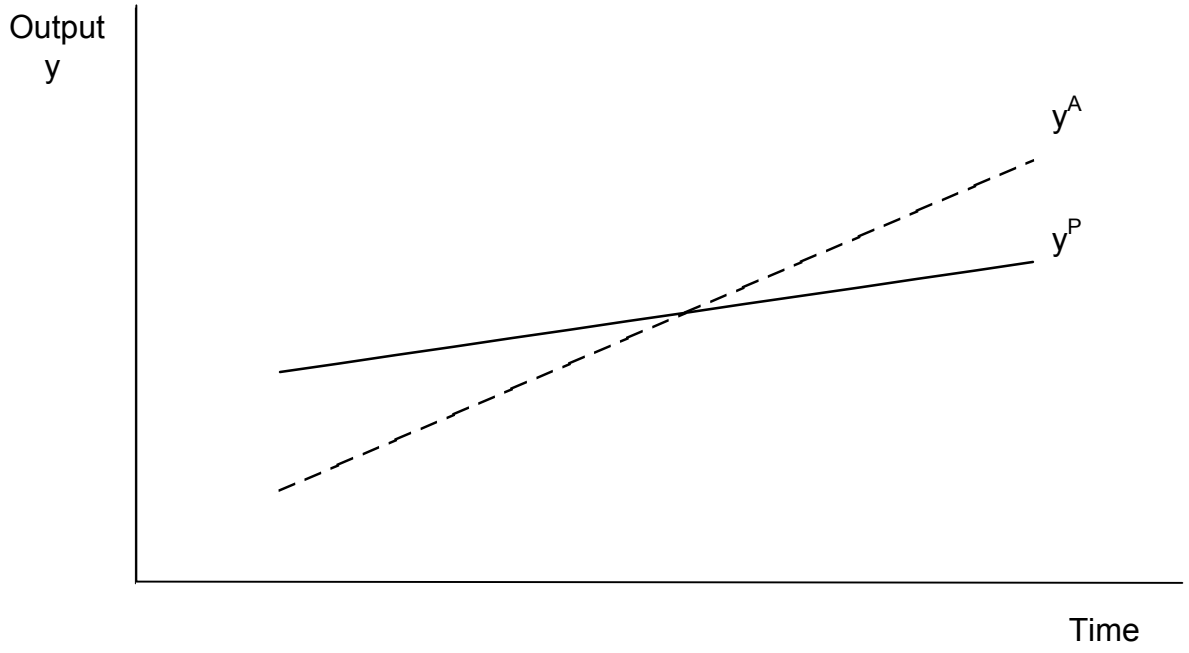


Figure 2