



**TELLUS Something New**

## **How do Central Banks Determine Interest Rates?**

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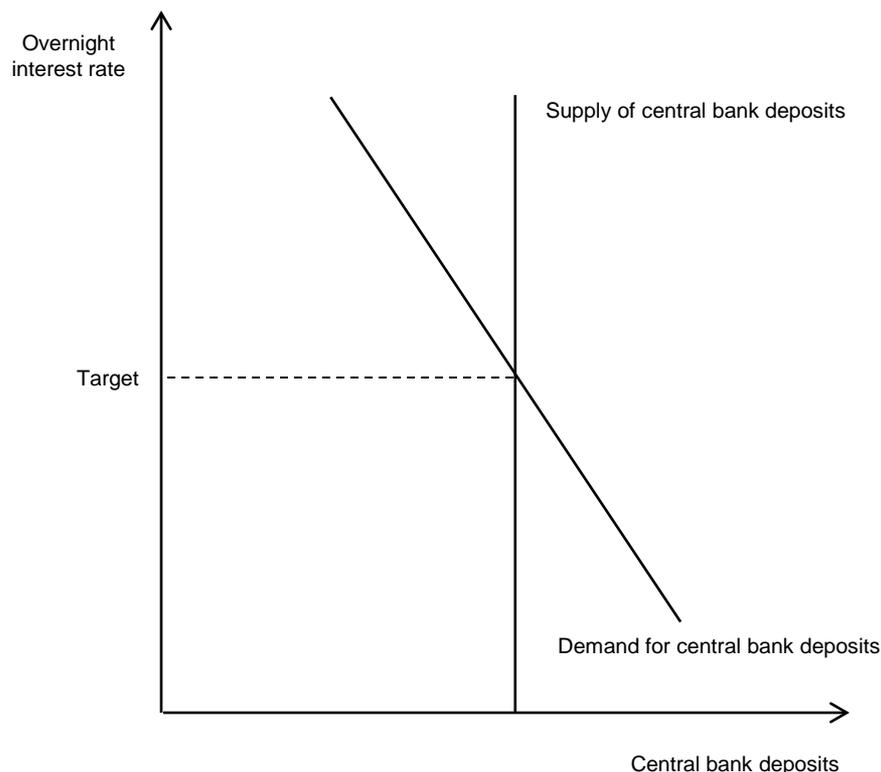
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## Overview

- Central banks try to control inflation by moving a short term interest rate, typically the overnight interest rate in the interbank market. Expectations of future short term interest rates then determine long term interest rates.
- But how, exactly, do central banks determine the short term interest rate, often called the policy rate?
- It has basically nothing to do with the supply of central bank money. A central bank can determine the interest rate in an economy without cash and where interbank claims are not settled in central bank deposits.
- So-called open market operations that alter the quantity of central bank deposits (“reserves”) are just a side show to monetary policy.
- Fundamentally, a central bank controls the interest rate since it is the growth rate of liabilities denominated in its own unit of account. NOK, USD, and EUR, are examples of such units. While central banks issue liabilities denominated in their own unit of account, commercial banks issue liabilities denominated in a central bank’s unit of account. This, essentially, is what gives central banks leverage over interest rates.
- We are of course talking about so-called nominal interests here. Interest rates adjusted for expected inflation are determined by saving and investment. However, it is nominal interest rates that are crucial for inflation.
- A central bank becomes irrelevant with respect to nominal interest rates if its economy no longer use its unit of account. That can happen if it badly mishandles monetary affairs or if superior alternatives to its unit of account develop spontaneously in the economy.
- One such alternative is a resuscitated, market based gold standard. Another is private *fiat* currencies. If such alternatives materialize, central banks can lose some or all of their nominal power.

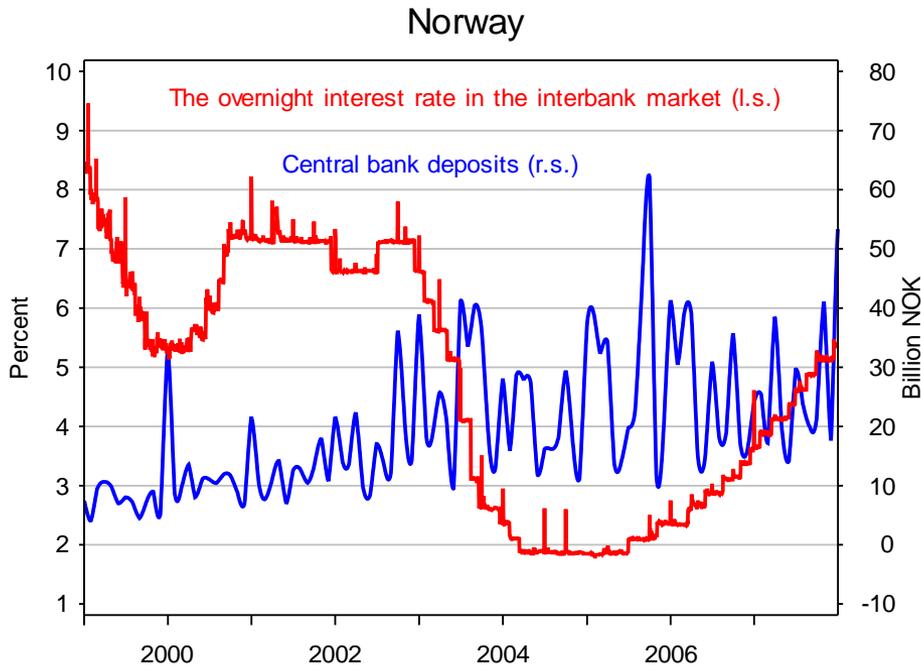
## The traditional view of interest determination

Like this?



- How do central banks control the short term interest rate?
- The typical answer focuses on the supply of central bank deposits (“reserves”). It is held that a central bank determines the interest rate by adjusting the quantity of deposits:
  - If it wants to decrease the interest rate, it buys securities, say Treasury bills, and increases the amount of central bank deposits. (“Open market purchases”).
  - If it wants to increase the interest rate, it sells securities and reduces the quantity of central bank deposits. (“Open market sales”).
- The figure illustrates this view. Central banks are thought to adjust the short term interest rate by moving the supply of central bank deposits along a stable demand curve.

## The traditional view does not seem to fit the facts



Source: Reuters EcoWin

- There is no stable relation between central bank deposits and the short interest rate in Norway. Norges Bank steers the overnight rate without having to adjust the supply of deposits.
- The same pattern is evident in other economies. Open market operations do not seem to be the key to monetary policy.

## Imagine an economy without central bank money – it's easy...

- To understand how central banks in fact determine the overnight interest rate, it might be useful to think of an economy, say a future Norway, where the private sector has stopped using central bank money.\*
- Central bank money takes two forms: cash (notes and coins) and central bank deposits (“reserves”). Note that these are central bank liabilities. Central banks issue cash and deposits to purchase assets, say Treasuries.
- Imagine that households and firms have dropped cash in favor of making payments by debit cards, electronic purses, and other forms of transferring bank deposits. All notes and coins, therefore, have been deposited in banks. The banks redeposit the cash with the central bank who credits the banks' accounts.
- Assume also that a private firm comes up with a new technique for managing interbank payments. In order to profit from this technology, banks use liabilities issued by this private firm to settle interbank claims. This erodes the demand for central bank deposits, and banks can then swap their deposits for Treasuries. (We assume that there are no reserve requirements, as is typical in many developed economies, such as Norway. The reason banks in these economies currently hold central bank deposits is to settle interbank claims and to accommodate their customers' demand for cash. Also, when applied, as in the US, reserve requirements are seldom binding in advanced economies).
- If so, the private sector – households, firms and banks – no longer hold central bank money. Instead they use private sector liabilities, e.g. bank deposits, as media of exchange.
- But assume the central bank continues to offer an overnight deposit facility that banks can use as an investment vehicle. That is, banks can hold central bank deposits in their short term portfolio, along with Treasury bills and short term private sector liabilities, such as interbank overnight debt. Crucially, we also assume that the central bank still defines the economy's unit of account. Hence, throughout the Norwegian economy, for example, prices and contracts are denominated in NOK.

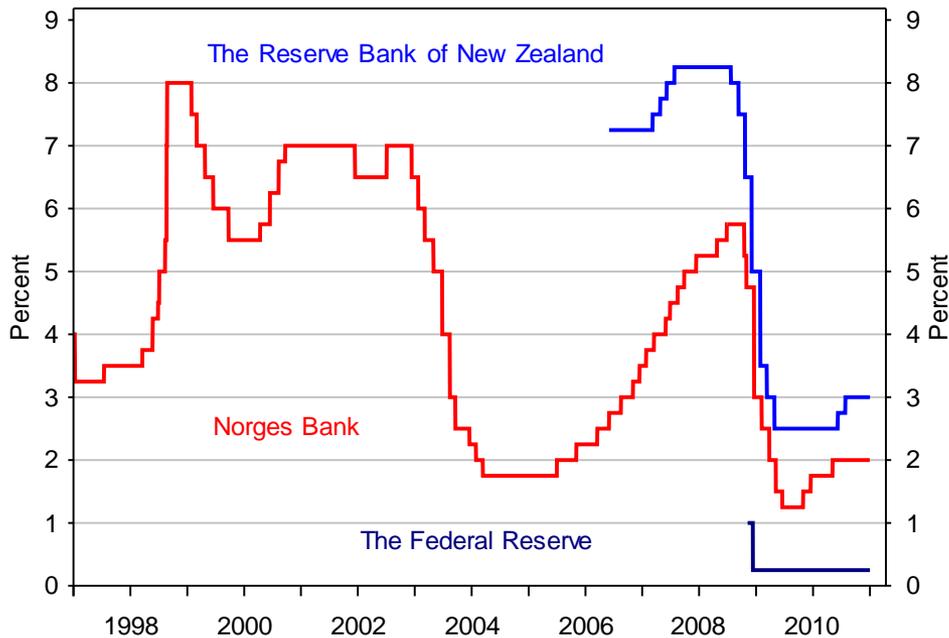
\* Michael Woodford's "Interest and Prices" (Princeton University Press, 2003) first explained interest determination in a cashless economy.

## Nominal power

- During certain historic periods, currencies were weights of gold. When currencies decoupled from gold, they became *fiat* money. That is, they morphed into abstract units of accounts defined in terms of central bank liabilities. As a result, central banks can tinker with currency units at will, by arbitrarily deciding how their own liabilities are denominated and remunerated. This, basically, is the key to central banks' nominal power.
- To illustrate, imagine a currency reform: Assume that Norges Bank on February 1<sup>st</sup> announces that 1 NOK henceforth is equal to 1.05 "New NOK". An annoyance, for sure, but if everybody change prices and contracts, the effects are small. In particular, deposits in commercial banks will change to "New NOK" at a rate of 1 NOK to 1.05 "New NOK". What happens if a commercial bank strays from the "party line" and offers to exchange 1 NOK for 1.04 "New NOK"? Then its depositors flee to other banks. What if it offers to exchange 1 NOK for 1.06 "New NOK"? Then it depletes its capital, since it gives away money to its depositors.
- Now, consider interest rates: Suppose that initially the overnight interest rate paid on deposits in Norges Bank is zero. Then it announces that 1 NOK on deposits will grow by an annual factor of 1.05. Functionally this is equivalent to a redenomination of its liabilities. Instead of declaring that 1 NOK equals 1.05 "New NOK" now or at a future date, Norges Bank decides to multiply each unit of its liabilities by an annual factor of 1.05. In this case too, commercial banks have nothing to gain from not following Norges Bank's move. Creditors flee, or banks give money to their creditors, if they charge a different rate than Norges Bank. Hence the overnight interest rate in the interbank market moves from 0 to 5 percent. On private liabilities there might be a risk premium, of course, but that does not affect the base change in interest rates, which is 5 percentage points.
- Note that quantitative adjustments of central bank liabilities are unnecessary in both cases. Norges Bank can hike the short interest rate without first decreasing the supply of deposits, just as it can implement a currency reform without first changing the amount of liabilities. Instead, Norges Bank rules the roost since it defines the economy's unit of account. That is, it is the sole issuer of "brand name" NOK liabilities.

# Nominal power in practice

Policy rates in Norway, New Zealand and the US



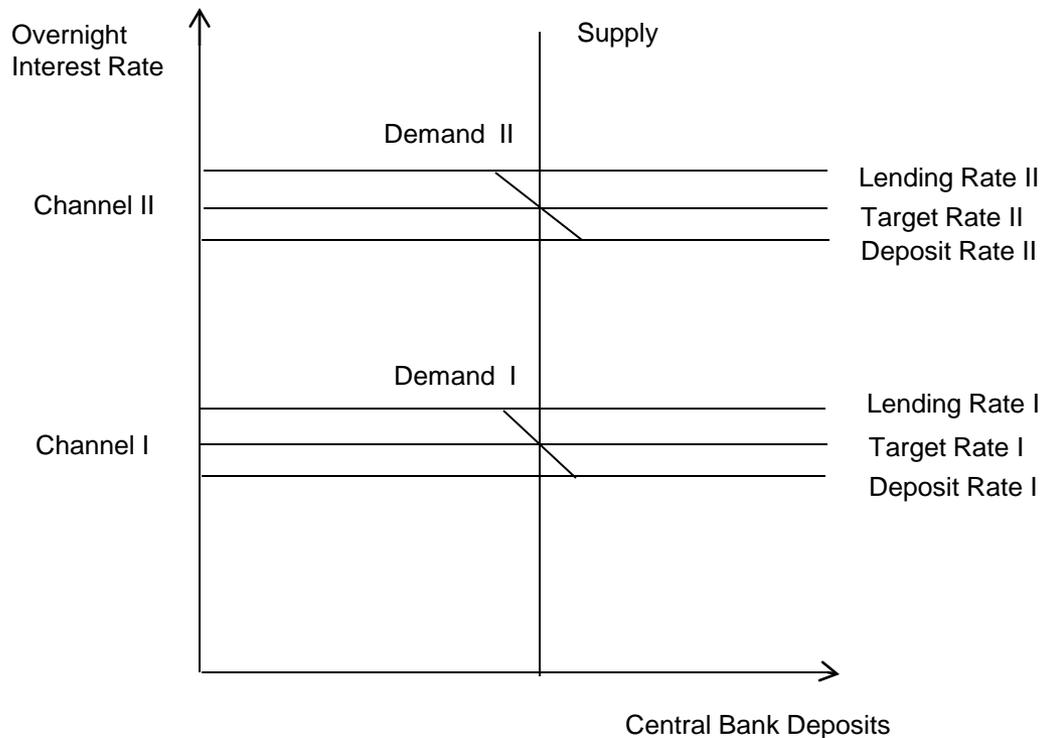
Source: Reuters EcoWin

- No countries yet operate without central bank money. But some central banks implement interest policy almost as if the economy did not use central bank money as media of exchange.
- Norges Bank pays interest on central bank deposits. Since 1997 this deposit rate has also been the policy rate. The overnight interest rate in the interbank market is always close to the deposit rate. Typically there is a risk premium of 10bps on overnight loans between large banks.
- The Reserve Bank of New Zealand adopted the same system in 2006.
- The Federal Reserve has paid interest on deposits (“reserves”) since late 2008. But not all banks are eligible for interest, and due to limited arbitrage the effective federal funds rate is a bit lower than the Federal Reserve’s deposit rate.

## Onward to reality

- Since banks do hold central bank deposits for settlement purposes, such deposits offer banks services beyond their pecuniary yield. That is, they provide banks with utility in addition to interest income. Hence central banks that use the deposit rate as their target rate, supply the banking system with enough deposits to drive their non-pecuniary yield to zero on the margin. Then the interbank overnight interest rate is equal to the central bank's deposit rate plus a small risk premium.
- Other central banks prefer the interest rate in the interbank market to be somewhat higher than the rate paid on deposits. They therefore reduce the supply of deposits until their marginal non-pecuniary yield is positive. This pushes the interbank rate above the deposit rate. Banks, who are uncertain about end of day net settlement needs, then make a trade-off between lending out funds in the interbank market or precautiously deposit funds in the central bank. Hence banks' demand for central bank deposits is sensitive to the interbank rate; the lower the market rate, the higher is the demand for deposits, and *vice versa*.
- These central banks typically control the interbank overnight interest rate by having two facilities: a deposit rate that puts a floor under the interbank overnight interest rate and a lending rate that sets a roof for the rate paid on interbank loans. These two rates define a channel within which the interbank market rate is determined by supply and demand. By fine-tuning the supply of deposits, central banks then steer the overnight rate toward the target, typically in the middle of the channel.
- So there is a place for open market operations after all as long as banks use central bank money.
- However, note that most open market operations are necessitated by daily fluctuations in the demand for central bank deposits due to the changes in the demand for cash and payments between the private and the public sector. Also, while open market operations are necessary to keep the overnight rate at the target within the channel, the channel itself is shifted without open market operations. Instead, the target rate is changed by announcements, just as in an economy that does not use central bank liabilities as money.

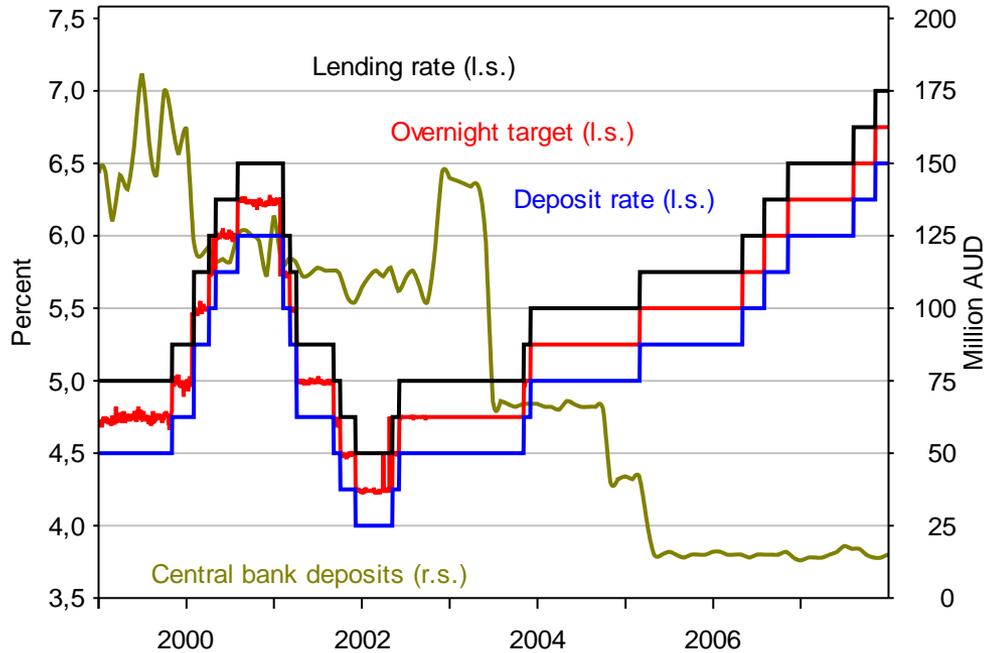
# The channel system



- Given the spread between the central bank's deposit and lending rates, a decision on the target rate is a decision on where to place the channel.
- Within the channel the demand for central bank deposits is a decreasing function of the overnight interest rate in the interbank market.
- The central bank hits the target by adjusting supply such that demand equals supply at the target.
- The central bank changes the policy rate by moving the channel, as from Channel I to II in the figure.
- While the demand for deposits is a decreasing function of the interbank rate, it is relative to channel. Hence, there are as many demand curves as there are potential channels.
- In Norway and New Zealand, and now also in the US, the supply curve is always to the right of where demand curves hit the deposit rate, since that rate is the target rate.

# The channel system in practice

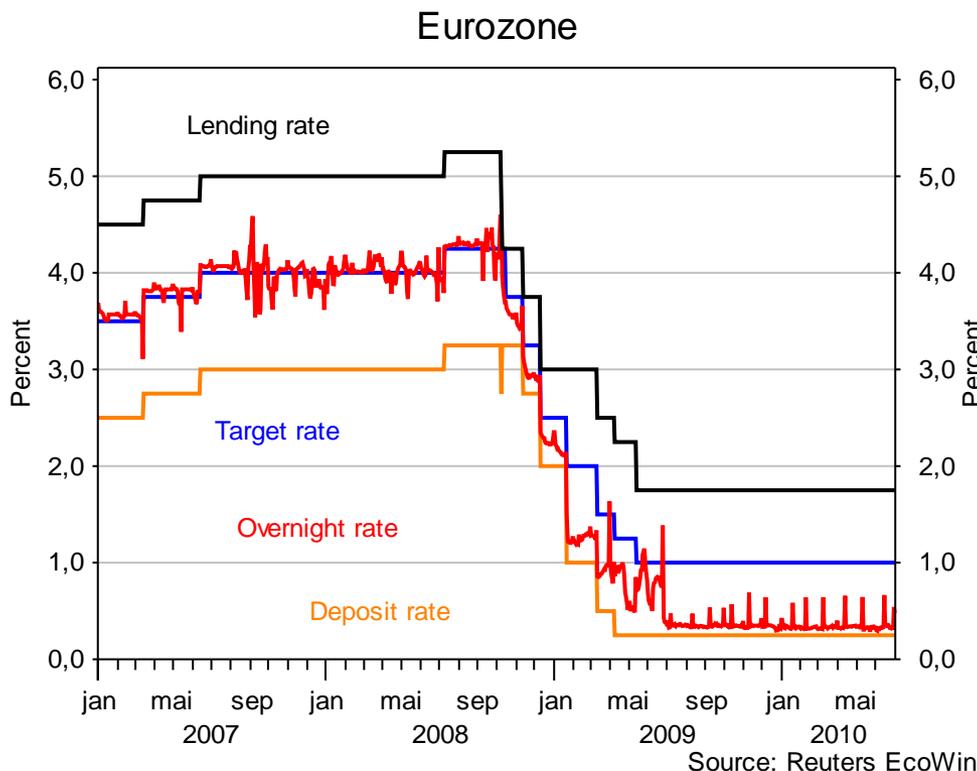
## The Australian Channel



Source: Reuters EcoWin

- The Reserve Bank of Australia has practiced a channel system since the late '90s. The deposit rate is 25bp below the target rate and the lending rate is 25bp above the target.
- Since the central bank intervenes when there is a shortage or an excess of deposits, banks trade at the target by mutual agreement.

## Central banking during the financial crises



- During the financial crisis, parts of the interbank market was frozen. Banks with surplus funds were reluctant to lend to banks with a shortage of funds.
- Central banks then intervened, borrowing funds from banks with surpluses and lending to banks with shortages. Some central banks intervened more broadly, borrowing funds from the banking system and purchasing domestic and/or foreign assets. This increased their' balance sheets and typically the amount of central bank deposits.
- Where the deposit rate was the target rate, such interventions did not affect monetary policy. For central banks with a channel system, however, balance sheet policies often increased deposits beyond where their marginal non-pecuniary yield was zero. Hence, the deposit rate then became the effective policy rate, as in the Eurozone.

## Could central banks become irrelevant?

- Can central banks lose control over interest rates? This is not likely in advanced economies, but it can happen if monetary policy is badly mismanaged or if new technology makes private *fiat* money viable.
- During rapid inflation the private sector often shifts to a foreign country's central bank's unit of account, i.e. the economy "dollarizes". But what if inflation becomes virulent in many large economies simultaneously? Then the private sector might resurrect gold as money, with, say, a gram of fine gold as the unit of account. Importantly, since gold is not *fiat* money, no one determines the overnight interest rate. Instead, all interest rates, as well as inflation, are determined by market forces.
- Can central banks become irrelevant because banks issue their own *fiat* currencies? In "The Denationalization of Money" (2. ed., 1978), F.A. Hayek suggested that banks might begin issuing liabilities denominated in their own units of accounts. For example: instead of using the Swiss National Bank's unit of account and issue "generic" CHF liabilities, Swiss banks could market liabilities denominated in "brand name" units of accounts. Hayek thought that while such units initially would be linked to existing currencies, say the CHF, they could eventually become *fiat* currencies, i.e. abstract denominations of the issuing banks' liabilities. Hayek thought that competition would force banks to keep their units stable as measured in real terms. That is, rivalry should keep "their" price level stable.
- Could this happen? Legally there are few obstacles to currency competition as envisioned by Hayek. Also, many countries allow citizens to use foreign currencies. Yet most people stick to their central bank's unit of account. However, advances in information processing and payment technology might one day make Hayek's idea more likely to materialize. Should that happen, central banks could be marginalized in the sense that prices no longer typically refer to their units of accounts. Then central banks' interest steering truly becomes pushing on a string. But Hayek was wrong to think that in a world of private *fiat* currencies, there is no need for interest rate policy. On the contrary, since *fiat* currencies, whether public or private, are abstract denominations of bank liabilities, issuing banks would have to set an interest rate on their own liabilities. Hence monetary policy would not disappear; it would just be privatized. In fact, price stability would necessitate prudent interest rate "policy" by commercial *fiat* money issuers.