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Comments on "Specification and Analysis of a Monetary Policy Rule for Japan" : A Central Banker's View

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Professor McCallum has written a series of influential papers in which he chooses nominal GNP as the target and monetary base as the policy instrument. Since I believe that it is practically very difficult for a central bank to employ monetary base as the instrument, I was thus very pleased to find that in a new paper he seriously considered the possibility of using the short-term interest rate as the instrument variable. Unfortunately, the paper concluded that monetary base was preferable.

The purpose of this comment is to show why it is difficult to use monetary base as the instrument variable directly controlled by the central bank, and why further research on the subject using the short-term interest rate as the policy instrument is needed.

I. Controllability of Monetary Base

Monetary base consists of currency in circulation and banks' reserves at the central bank. The nature of currency in circulation and that of reserves is quite different. Hence, when we discuss the controllability of "monetary base," it is fruitful to separate the two.

At the end of 1992, outstanding currency in circulation in Japan was ¥39,000 billion and reserves, ¥2,900 billion. Thus, the first question is whether the Bank of Japan is able to control currency in circulation directly.

This is an old question. In 1970, Nicholas Kaldor[1] argued that:

> "Every schoolboy knows that cash in the hands of the public regularly shoots up at Christmas, goes down in January and shoots up again around the summer bank holiday.
>
> Nobody would suggest (not even Professor Friedman, I believe) that the increase in note circulation in December is the cause of the Christmas buying spree. But there is the question that is more relevant to the Friedman thesis:

[1] *See* Kaldor (1970).

> Could the "authorities" prevent the buying spree by refusing to supply additional notes and coins in the Christmas season?
>
> Of course, most people would say that it would be quite impossible to prevent the rise in the note circulation without disastrous consequences: widespread bank failures, or a general closure of the bank, as a precautionary measure."

Indeed, currency in circulation is "supplied" when firms and households withdraw deposits from their bank accounts. Private banks cannot refuse as it could trigger a run. Therefore, currency in circulation is demand determined.

Then, what determines demand for currency? On a weekly or monthly basis, the movement of currency in circulation is quite seasonal and is closely related to nominal consumption, as Kaldor pointed out. Also, in the late 1980s, the volume of stock and real estate transactions had some influence (Figure A-1). This is natural because demand for currency is mainly driven by the transaction motive.

Thus, in the short run, the central bank cannot control currency in circulation unless it drives up short-term interest rates dramatically so as to affect nominal consumption. Otherwise, currency in circulation, which accounts for more than 93% of monetary base, cannot be controlled by the central bank in the short run.

In reality, what usually happens is that the Bank of Japan accommodates demand for currency in circulation, leaving short-term interest rate movements unaffected.

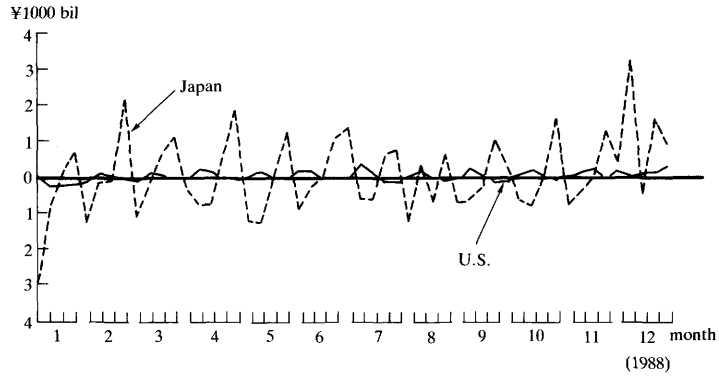
Next, the controllability of reserves. McCallum admits that "reserve requirements could be changed so as to be of the contemporaneous type. And, indeed, such a change would probably be warranted if the BOJ were to adopt a base instrument." However, he argues that "even with a continuation of lagged reserve requirements, it is conceivable that the system could adjust to a regime featuring stringent base control." His reasoning is as follows: "A major reason why excess reserve holdings are currently so small is that the BOJ has routinely supplied or removed reserves at the end of each maintenance period so as to smooth interest rates — *i.e.*, to keep them from rising or falling sharply." Thus, if the Bank of Japan stopped doing this, "one adjustment that would occur naturally, *i.e.*, *via* the self-interested behavior of privately motivated banks, is that higher levels of excess reserves would be held as a matter of course and managed in an interest-elastic fashion."

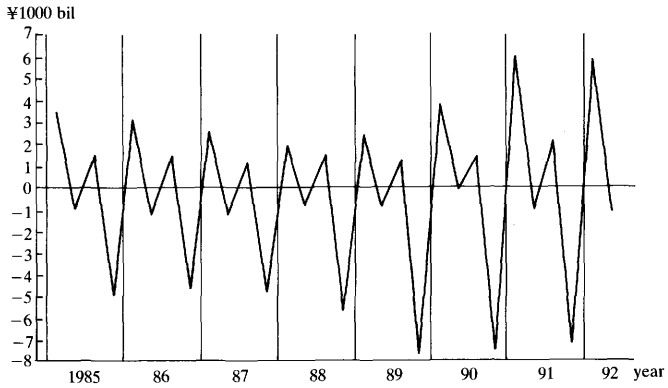
Then, "accurate attainment of the base values stipulated by rule (1) could be combined with some interest rate smoothing on a daily basis. One possibility is that an interest rate could be adopted as the variable manipulated on a day-to-day basis but with target values set according to another rule designed to yield quarterly-average values of the base that conform to rule (1)."

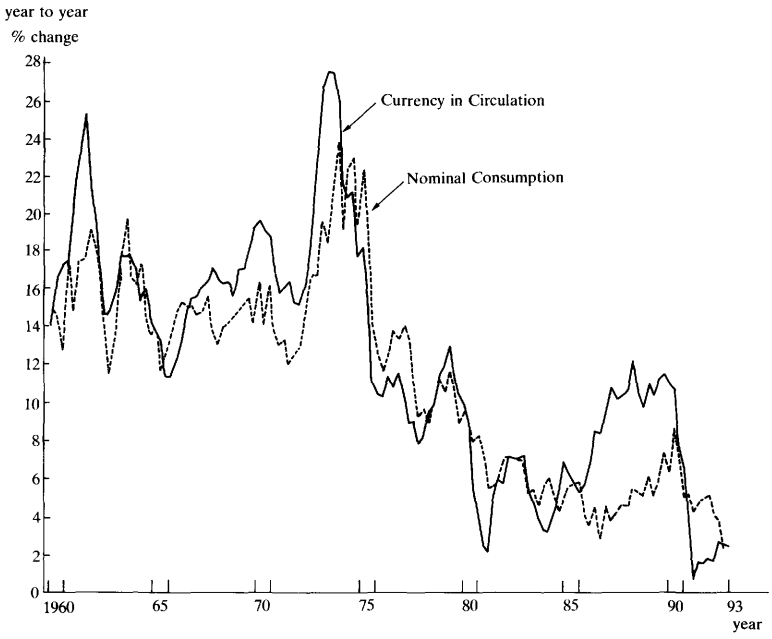
I am somewhat skeptical of this line of reasoning regarding the controllability of monetary base. I believe that the essential motive for private banks to hold excess reserves lies in the uncertainty concerning the necessary level of reserves for fulfilling

Figure A-1

Currency in Circulation







their settlement obligations or legal requirement. But in Japan, this uncertainty is quite small. Moreover, since there exists an intra-day call market, banks can easily obtain funds from the market should the need arise. Thus, there is no incentive for them to hold excess reserves.

Of course, the central bank could create uncertainty intentionally. However, creating settlement uncertainty is quite undesirable from the viewpoint of the central bank as protector of the payment system.[2]

Suppose nevertheless, that the Bank of Japan does create uncertainty and private banks begin to hold excess reserves. Would such excess reserves be enough to control monetary base? McCallum argues that, "with excess reserves of 2 – 3% of required reserves — still only a *tiny* fraction of deposits — banks would be able to avoid violation of the legal requirements except in highly unusual circumstances."

Remember that at the end of 1992, more than 93% of monetary base was currency in circulation. Thus, 2% of reserves is only 0.2% of monetary base. Given the demand-determined nature and considerably lagged response of currency in circulation to short-term interest rates, excess reserves of this level are hardly a sufficient buffer. Stringent control of monetary base would require creation of a much more substantial amount of positive or negative excess reserves.

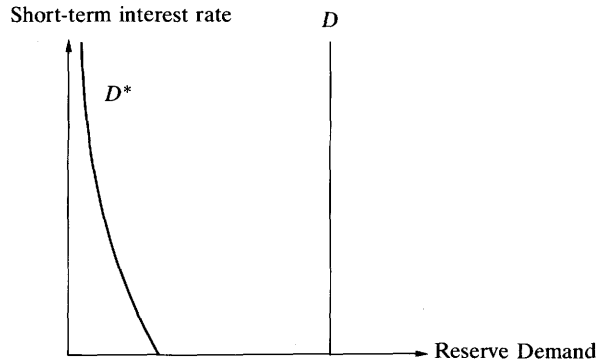
Then, suppose that the central bank tried to maintain stringent control of monetary base through reserve control. What would happen? For simplicity, let us assume a pure lagged reserve requirement system, and further that reserve requirement is binding in the sense that required reserves exceed private bank transaction demand for reserves, which may be interest elastic, as shown in Figure A-2.

Now, when the central bank tries to enforce stringent control of monetary base, there would be two possible scenarios: one where the target reserve level would be below the required reserve; and the other where the target reserve level would be above.

If the central bank's target reserve level were below the reserve requirement, the central bank could supply a reserve smaller than the reserve requirement. This implies that the central bank virtually ignores the reserve requirement obligation. Thus, as pointed out in footnote 15 of McCallum's paper, non-pecuniary costs might diminish and only the explicit cost (official discount rate plus 3.75% per annum in Japan) might matter. One problem associated with this case is that as long as the supply of reserve exceeds settlement demand, the equilibrium overnight interest rate would inevitably become the same as the official discount rate plus 3.75% per annum. The reason is simple. If the market rate were higher, private banks would not attempt to accumulate

[2]In Canada, for example, there is no same-day settlement system and private banks have to hold excess reserves to avoid relying on costly borrowing from the Bank of Canada. The Canadian Payment Association plans to introduce a same-day settlement system which will eliminate settlement uncertainty and the need for private banks to hold excess reserves. Thus, the Bank of Canada staff are discussing new operating procedures which do not rely on excess reserves as in Japan. *See* Longworth and Muller (1991).

Figure A-2
Private Banks Reserve Demand Schedule



D^* : Pure transaction demand

D : Average reserve demand under lagged reserve system per day

reserves. If the market rate were lower, private banks would try to accumulate reserves by borrowing from the market and thus drive up market interest rates. Such a situation might be very uncomfortable for the Bank of Japan. Thus, even in this case, some change in the reserve requirement system would be inevitable. While this is a technical and minor problem, a more fundamental one would arise if currency in circulation exceeded the target level of monetary base, because the central bank cannot set a negative reserve level.

In the second scenario, in which the central bank's target reserve level exceeds the reserve requirement, another serious problem might occur. Suppose the central bank announced a base control rule as in equation (1), or private banks realized, from experience, that it was the central bank's intention to create excess reserves. There would be no need for them to hold costly excess reserves since they know that the central bank would ultimately supply excess reserves. Thus private banks would try to minimize reserves by keeping them at a level just necessary for fulfilling settlement needs. In order to avoid interest rates from becoming too low, the central bank has to limit its supply of reserve funds to a small amount, far below its target (recall Figure A-2). Then, as the final day of the maintenance period approached, the central bank would try to lend, or purchase securities, to create excess reserves but which no private bank wanted to hold. The result would be that interest rates fall to zero. "An accurate attainment of the base values combined with some interest smoothing on a daily basis" does logically imply this kind of quite unrealistic movement of reserves.

In order to clarify this point, let me give a numerical example. Suppose that, to achieve a target, the Bank of Japan has to increase monetary base 1% during a month. Also, for simplicity, let us ignore seasonality. Now, 1% of monetary base was approx-

imately ¥400 billion in 1993. Since cash in circulation is very difficult to control in the short run, the Bank of Japan has to create excess reserves to increase monetary base. Suppose that the average required reserve in any month is ¥3,000 billion, then the Bank of Japan has to supply ¥3,400 billion reserves to meet the base money target. Also assume that average transaction demand is ¥1,500 billion when the inter-bank rate is close to zero.

Since private banks know that the Bank of Japan will on average supply ¥3,400 billion reserves, and that therefore the inter-bank rate has to fall close to zero at some point during the maintenance period, there should be no incentive for banks to hold reserves above the transaction demand level, as long as the interest rate is positive. To keep the inter-bank interest rate at a reasonably positive level, say 2%, the Bank of Japan has to limit its supply of reserves to below ¥1,500 billion — say ¥1,200 billion. Thus, the Bank of Japan's "smoothing operation" in a reserve maintenance period should be something like the following:

	Reserve Level	Interest Rate
From day 1 to day 29	¥ 1,200 billion	2%
End of maintenance period (day 30)	¥67,200 billion	0%
Average	¥ 3,400 billion	1.93%

One possible response to this argument might be that the lower interest rates in the earlier part of the reserve maintenance period tend to increase the level of required reserves in the later part of the period, and that therefore the smoothing operation by the Bank of Japan should not be as drastic as illustrated here. In Japan, private banks' required reserves are calculated as the product of the reserve ratio and average deposits outstanding in a calendar month, with the reserve "maintenance period" beginning on the sixteenth day of that month and ending on the fifteenth day of the following month. Therefore, the Japanese reserve requirement system is a mixture of a "lagged reserve system" and a "contemporaneous reserve system." Thus, a decline in the short-term rate in the first half of the reserve maintenance period could, in theory, increase reserve demand in the second half of the period.

However, anecdotal evidence suggests that we cannot rely much on this type of short-term interest rate flexibility of required reserve demand. The Bank of Japan collects expected required reserve levels data from banks around the middle of a calendar month. Thus, if the required reserve level is flexible to the interest rate level in the short run, the actual reserve requirement should exceed the expected figure, if interest rates fall conspicuously in the second half of a month: however, no such tendency can be observed systematically.

To sum up, it is almost impossible to realize stringent control of monetary base, partly due to the fact that currency in circulation is demand determined, and also partly due to the fact that the share of reserves in monetary base is so small that creating excess

reserves for the stringent control of monetary base is impossible under a lagged reserve system.[3]

II. Controllability of Nominal GNP and Stability of Short-term Interest Rates

There are two seemingly "striking" conclusions in McCallum's paper.

The first is that simulations with quarterly data for the period 1972-92 end up with the conclusion that the control of monetary base would successfully realize smooth non-inflationary nominal GNP growth.

As I pointed out earlier, monetary base mainly reflects movements in nominal consumption. In other words, monetary base can be interpreted as a proxy of nominal consumption. Thus, if we estimate a simultaneous equation system incorporating monetary base and nominal GNP, and assume monetary base is controllable, it would seem we could control nominal GNP, since, if we can directly control nominal consumption as the instrument, it would be easy to control nominal GNP. Thus, the implicit assumption behind this simulation seems to be that strict control of monetary base is achieved mainly through controlling nominal consumption by short-term interest rates.

But the second striking conclusion of the paper is derived from Figure 13. The author argues that "here the striking — and surprising — feature of the comparison is the similarity between simulated and actual time paths," and concludes that "this similarity suggests that, in terms of quarterly averages, variability of short-term interest rates would not be greatly increased by adoption of a policy rule like equation (2)." Is this true? If it is, then how does the central bank control demand-determined monetary base? Or, how does the central bank control nominal consumption?

My interpretation of Figure 13 is as follows. Since the volume of currency in circulation plays only a small role in determining short-term interest rates,[4] the observed movement of a change in monetary base does not contain much information about short-term interest rates, and neither does the observed consumption path. Thus, if we estimate a model using actual data, the impact of monetary base on short-term interest rates should be small. Hence, the result is not at all striking. But, if we really want to try to control monetary base, we must control short-term interest rates quite differently from the way we did in the data period, because to control monetary base stringently, we must control nominal consumption by interest rates.

All in all, my conclusion is as follows. There is the possibility that the seemingly

[3]Introducing a contemporaneous reserve system is not a sufficient condition for the stringent control of monetary base. Part of the reason is the fact that it takes considerable time for private banks to respond to changes in short-term interest rates. I do not argue this point further here, but the fact that the Fed abandoned non-borrowed reserve targeting in the early 1980s is suggestive.

[4]*See* Okina (1993).

good performance of the monetary base control rule is superficial. Thus, though the performance of interest rate rule simulation, an innovation of the paper, was not favorable, further exploration along this line is necessary.

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