

## **Could Monetary Base Rule Have Achieved Economic Growth? Recent Japanese Case**

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**Abstract:** Japan introduced unprecedented financial policy in April 2013. The Bank of Japan (the Japanese central bank) will double the monetary base to promote economic growth. The effectiveness of this large and unprecedented monetary-base rule, which is effective in recovering the economy, has received much attention not only in Japan but also all over the world. This article empirically examines whether or not this monetary-base rule would have achieved economic growth in Japan if it had been introduced in the past. The article builds a macroeconomic model that keeps the inflation rate at 2% and an empirical analysis is conducted for the past. The results show that there would be no large difference in economic growth would result from the introduction of this new rule; however, stronger monetary easing policy should have been conducted around 2008 and 2011 during the world financial crisis.

**JEL Classifications:** E52, E58

**Keywords:** Abenomics, financial policy, Japan, monetary base, quantitative easing

### **1. Introduction**

#### **1.1 Bank of Japan's New Policy**

Japan enjoyed high economic growth in the 1980s. Since the middle of the 1980s, stock and land prices had risen enormously. The yen appreciated sharply; however, exports did not decline. Consumer prices did not rise strongly. However, the so-called bubble economy burst at the end of the 1980s, and the Japanese economy experienced serious conditions. After that, the Japanese economy recovered gradually. In the 1990s, however, the country suffered a striking recession with very low, sometimes negative growth rates late in the decade and in the beginning of the 2000s. The main reason for the recession was said to be the country's fragile financial system and structural problems such as delays in political and economic systems and reforms of deregulation in many areas. In particular, huge nonperforming loans prohibited Japanese financial institutions from investing and lending sufficient funds. This situation damaged Japanese economy. Since that time, international competitiveness has suffered a significant decline.

The Bank of Japan (BOJ) introduced new financial policy. Japan's experience with this quantitative easing policy dates back to 2001. This approach received much attention from all over the world as it was unprecedented policy at that time. Following a period of zero interest rate policy in 1999-2000, the Bank of Japan introduced the quantitative easing policy in March, 2001. Under this policy, the BOJ employed purchases of Japanese government bonds as the main instrument to reach its operating target of current account balances held by financial institutions at the BOJ. However, the BOJ exited quantitative easing in March, 2006, amid signs that the economy was emerging from deflation and recession. After the subprime problems occurred in 2007 and the Lehman shock in 2008, a huge amount of capital has flowed into the Japanese markets in spite of the fact that the Japanese economy has not been in good condition for more than 20 years. The Japanese yen appreciated greatly against other currencies and this hit Japanese economy's deteriorating export industries. Stock prices decreased greatly. Following the global financial crisis, the BOJ increased the pace of its Japanese government bonds purchases and conducted unconventional measures to promote financial stability. In October, 2010, the BOJ introduced its comprehensive monetary easing policy to respond to the re-emergence of deflation and a slowing recovery. One key measure was an asset purchase program that involved government bonds as well as private assets. After that, the Japanese government changed and more aggressive financial policy was strongly demanded.

In April, 2013, the Policy Board of BOJ decided to introduce the quantitative and qualitative monetary easing. The BOJ decided to achieve the price target of 2% in terms of the year-on-year rate of change in the consumer price index (CPI) at the earliest time, with a time horizon of about two years. It can be said that the BOJ entered a new phase of monetary easing both in terms of quantity and quality. The BOJ will double the monetary base and the amounts outstanding of Japanese government bonds as well as exchange-traded funds (ETFs) in two years and would more than double the average remaining maturity of Japanese government bonds purchases. To achieve quantitative monetary easing, the main target for financial policy instruments was changed from the uncollateralized overnight call (interbank interest) rate to the monetary base.

The Japanese government not only conducted economic policy but also measures to strengthen competitiveness and economic growth. These measures include possible policy actions to reform the economic structure, such as concentrating resources on innovative research and development, strengthening the foundation for innovation, performing regulatory and institutional reforms, and changing the tax system. Moreover, by strengthening coordination between the BOJ and the government, the Japanese government will conduct measures to achieve a new fiscal structure to ensure the credibility of the fiscal condition. This approach is called *Abenomics*. Abe is from the name of the current prime minister.

It is very difficult to judge what kind of relations should exist between the central bank and the government. This problem has been discussed for a long time and no conclusions have been reached. The BOJ changed the law and strengthened independence from the government, as in most foreign developed countries in 1997. Many countries have employed independence of the central bank from government. This idea has generally had good results and performance; however, in 2013, the Japanese government and central bank decided to cooperate strongly to combat serious economic

conditions. Also in recent years, some central bankers have seemed to be the main advocates of extending the scope of government interventions into the economy as the financial policy's instrument is very limited under the low interest rates in most developed countries.

After these policies were announced by the BOJ and the Japanese government, the stock prices rose greatly and the yen depreciated largely. As of now, these policies appear to have been evaluated highly; however, there seems to be opposing views from the academic field.

This article focuses on this unprecedented financial policy and monetary-base rule and examines whether or not the monetary-base rule achieved economic growth in Japan. Many studies have analyzed quantitative easing policies, as with the case of the United States. It is not surprising that there are few existing studies, as this policy started only recently, in April, 2013; however, few studies have examined the case of Japanese financial policy and its impact on Japanese financial markets in spite of the fact that Japan has experienced serious deflation and has employed nontraditional financial policies not experienced in other countries. It seems important to examine this policy not only for Japan but also for other countries with low interest rates where the effects of traditional financial policies seem to be strictly limited.

## 1.2 Related Studies

In Japan, a zero or low interest rate policy was enacted in the beginning of the 2000s to combat recession and deflation. Since then, Japanese financial policy received much attention from the world as such a policy was unprecedented at that time. However, only a few studies have examined this policy. Kurihara (2010) examined the effectiveness of BOJ intraday financial policies. Kurihara (2012a) used daily data to examine the impact of BOJ news announcements on interest rates. Honda *et al.* (2013) and Kurihara (2013) examined recent Japanese financial policy. On the other hand, there are some so-called rules for financial policy in theoretical model analysis. One of them, a price-level target model, has been advocated by Barro (1986), Clark (1988), Haraf (1986), and so on.<sup>1</sup>

However, few studies have introduced a monetary-base rule for financial policy. Only McCallum (1990) investigated properties of a policy rule that specifies the use of the monetary base as a financial policy that is designed to keep the nominal GDP growing smoothly at a noninflationary rate. In April, 2013, the BOJ decided to double the monetary base. This article examines empirically whether this rule could have been effective now, when monetary expansion has been effective.

Hall (1990) employed McCallum's rule for some countries, including Japan, and found that the rule would have increased nominal GDP variability. Judd and Motley (1992, 1993) provided an alternative feedback rule in which the central bank changes the interest rate in response to divergence between actual and targeted nominal GDP growth rate. Dueker and Fischer (1998) showed potential effectiveness of the indicator model as a policy indicator for the Swiss monetary base. Stark and Croushore (1998) examined McCallum's rule and showed that although the rule causes lower inflation, the rule should be modified to feed back on the GDP growth rate rather than the level. Nelson (2002) showed that growth of the monetary base might be valuable as an indicator of the rate of a monetary transmission mechanism. Eggertsson *et al.* (2003) showed that the possibility of

expanding the monetary base by using central bank purchases of assets does little if anything to expand the set of feasible paths for inflation and real activity.

Khakimov *et al.* (2010) and Razzak (2003) examined performance of McCallum's and the Taylor rule. Razzak showed that the two rules are cointegrated and stabilization policies are similar. Esanov *et al.* (2004) examined McCallum, Taylor, and hybrid rules for Russia and showed that monetary aggregates can be used and compared McCallum's and Taylor rule for Turkey.

However, few studies on the introduction of a monetary-base rule have been performed recently. McCallum's rule has not been paid much attention since then. One reason may be that there are only a few countries that have introduced monetary policy rule. For many countries, the operating target for financial policy is the interest rate.

This article is structured as follows. Section 2 provides a new model that revises McCallum's model. This keeps the targeted monetary base instead of GDP rate. Section 3 examines this model empirically to check whether this rule could have achieved economic growth if it had been introduced. Simulation results are shown. Finally, this article ends with a summary.

## 2. Theoretical Model

McCallum's rule is summarized as follows. The monetary authority would have attempted to keep GDP close to the GDP target (GDP\*) by focusing adjustments on the growth rate of the monetary base.<sup>2</sup> MB means the log of the monetary base then the rule is set as follows:

$$\Delta MB_t = \alpha_0 - \alpha_1(GDP_{t-1} - MB_{t-1} - GDP_{t-2} - MB_{t-2}) + \lambda(GDP^*_{t-1} - GDP_{t-1}) \quad (1)$$

Where GDP means the logarithm of nominal GDP and  $\lambda$  is a positive feedback coefficient. The first term denotes the growth rate expressed in logarithmic units. The second term subtracts the average growth of base velocity over the previous term (years). Finally, the third term is a feedback adjustment in response to departures of GDP from the target.

The log of GDP is written as:

$$\Delta GDP_t = \beta_0 + \beta_1 \Delta GDP_{t-1} + \beta_2 \Delta GDP_{t-2} + \beta_3 \Delta GDP_{t-3} + \beta_4 \Delta MS_{t-1} \quad (2)$$

where MS is the log of the money stock. Not only lagged money stock ( $\Delta MS$ ) but also three lagged  $\Delta GDP$  are included in the model.

Finally, the relationship between monetary base and money stock is as follows:

$$\Delta MS_t - \Delta MB_t = \gamma_0 - \gamma_1 \Delta RESERVE_t - \gamma_2 \Delta DEPOSIT_t + \gamma_3 DUMMY + \gamma_4 (\Delta MS_{t-1} - \Delta MB_{t-1}) \quad (3)$$

Where RESERVE is the log of the required reserve ratio and DEPOSIT is the ratio of deposits in suspended banks to deposits of all banks ( $\Delta MS_t - \Delta MB_t$ ).

This article modifies this model for the recent Japanese case by considering the monetary-base rule and using inflation target instead of GDP target.

The policy rule under consideration now would have attempted to keep inflation rate  $p$  close to the  $p^*$  target path by means of adjustments in the growth rate of the monetary base, a policy instrument that can be controlled by the BOJ.<sup>3</sup> MS denotes the log of the monetary base at time  $t$ . The rule can be formulated as:

$$\Delta MB_t = \alpha_0 + \alpha_1 \Delta MB_{t-1} + \alpha_2 \Delta GDP_{t-1} + \alpha_3 (P^*_t - P_{t-1}) \quad (4)$$

Where  $P^*$  means target rate (2%, logarithm). The third term is an automatic feedback that is adjusted in response to departures of price (CPI) from the target path. As explained above, the BOJ decided to achieve the price stability target of 2%.

The equation is based on McCallum's model. Instead this model (4), the simplified model also is employed.

$$\Delta MB_t = \alpha_0 + \alpha_1 \Delta GDP_{t-1} + \alpha_2 (P^*_t - P_{t-1}) \quad (5)$$

According to the McCallum's model, the GDP is related to  $\Delta MS_{t-1}$ .

$$\Delta GDP_t = \beta_0 + \beta_1 \Delta GDP_{t-1} + \beta_2 \Delta MS_{t-1} \quad (6)$$

This equation (6) also is modified to become equation (7):

$$\Delta GDP_t = \beta_0 + \beta_1 \Delta MS_{t-1} \quad (7)$$

Finally,  $\Delta MS$  can be written as follows according to the McCallum's model:

$$\Delta MS_t - \Delta MB_t = \gamma_0 + \gamma_1 (\Delta MS_{t-1} - \Delta MB_{t-1}) + \gamma_2 \Delta INT_{t-1} + \gamma_3 \Delta RESERVE_{t-1} \quad (8)$$

Where INT denotes interbank call (interest) rate, which had been used for policy target. This equation also is modified as follows:

$$\Delta MS_t - \Delta MB_t = \gamma_0 + \gamma_1 \Delta INT_{t-1} + \gamma_2 \Delta RESERVE_{t-1} \quad (9)$$

In the next section, both McCallum's model [(4), (6), and (8)] and the modified model [(5), (7), and (9)] are examined empirically.

### 3. Empirical Results

#### 3.1 The Results

This article examines whether the new rule that were introduced in April, 2013, would have been effective if they had been put in force during the 2000s. The estimated results of (4), (6), and (8), based on McCallum's model, are as follows.

$$\Delta MB_t = 0.001 + 0.009\Delta MB_{t-1} + 0.780\Delta GDP_{t-1} - 1.791(P^*_t - P_{t-1})$$

$$(0.3194) \quad (0.0617) \quad (0.8893) \quad (-1.2306)$$

$$\text{Adj.R2: } -0.029 \quad \text{F-statistic: } 0.604 \quad \text{D.W.: } 1.584$$

In McCallum's model, the results, including  $\lambda$ , policy coefficient have not yielded good results in this analysis.

$$\Delta GDP_t = -0.0002 + 0.1623\Delta GDP_{t-1} + 0.8111\Delta MSt_{t-1} \quad (11)$$

$$(-1.371) \quad (1.030) \quad (1.222)$$

$$\text{Adj.R2: } 0.005 \quad \text{F-statistic: } 1.152 \quad \text{D.W.: } 1.957$$

There is a stable relationship between the money stock and GDP at the 10% level. However, the results are not confirmative.<sup>4</sup> Other results are as follows:

$$\Delta MSt - \Delta MB_t = -0.001 + 0.305(\Delta MSt_{t-1} - \Delta MB_{t-1}) - 0.023\Delta INT_{t-1} + 0.097\Delta RESERVE_{t-1} \quad (12)$$

$$(-0.296) \quad (1.339) \quad (-0.358) \quad (0.061)$$

$$\text{Adj.R2: } 0.030 \quad \text{F-statistic: } 1.433 \quad \text{D.W.: } 1.755$$

$$\Delta MSt - \Delta MB_t = -0.001 + 0.303(\Delta MSt_{t-1} - \Delta MB_{t-1}) + 0.100\Delta RESERVE_{t-1} \quad (13)$$

$$(-0.322) \quad (1.346) \quad (2.041)$$

$$\text{Adj.R2: } 0.0523 \quad \text{F-statistic: } 2.1333 \quad \text{D.W.: } 1.7864$$

The results of (4), (6), and (8), based on McCallum's model, are not as good for almost all of the cases. Instead, the empirical results of the simplified [(5), (7), and (9)] are as follows:

$$\Delta MB_t = 5.299 + 1.214\Delta GDP_{t-1} + 5.720(P^*_t - P_{t-1}) \quad (14)$$

(3.990) (2.462) (2.598)

Adj.R2: 0.306    F-statistic: 10.259    D.W.: 1.697

The results are as expected.

$$\Delta GDP_t = 3.726 + 0.361\Delta MSt_{t-1} \quad (15)$$

(24.515) (6.797)

Adj.R2: 0.518    F-statistic: 46.206    D.W.: 1.304

$$\Delta MSt - \Delta MB_t = 1.084 + 0.007\Delta INT_{t-1} - 0.185\Delta RESERVE_{t-1} \quad (16)$$

(39.524) (1.338) (-9.702)

Adj.R2: 0.815    F-statistic: 94.040    D.W.: 1.896

The term of the interest rate (INT) is not significant at the 5% level. Japanese interest rates have been quite low or near zero, so they might have not shown significant effects on money. This variable is therefore omitted from the estimation.

$$\Delta MSt - \Delta MB_t = 1.088 - 0.187\Delta RESERVE_{t-1} \quad (17)$$

(60.256) (-13.951)

Adj.R2: 0.818    F-statistic: 194.648

Use of equations (14), (15), and (17) enables performance of a simulation analysis for GDP. Next, simulation results are shown.

### 3.2 Simulations

The simulated GDP from the models is shown in Table 1 and Figure 1. Both actual and simulated GDP are shown.

The results show that a stronger easing policy should have been conducted in 2008 and 2011. In 2008, the world financial crisis occurred, which hit not only Japan but also other countries. However, It is difficult to judge whether or not the new monetary-base rule instead of the past monetary-base rule should have been introduced as drastic and unprecedented financial policy.

This article also examines responses to shock for each variable. First, each variable (monetary base, money stock, consumer price index, GDP, and interest rate) correlations are show in Table 2.

**Table 1.** Simulated results of GDP

	Actual	Simulated	Difference
2002Q1	499069	500829.5	-1760.48
2002Q2	498462	500554.1	-2092.14
2002Q3	499681	499821.5	-140.524
2002Q4	500054	500728.6	-674.557
2003Q1	494125	500928.6	-6803.65
2003Q2	500479	495781.2	4697.837
2003Q3	500309	501220.8	-911.84
2003Q4	501519	500889.7	629.281
2004Q1	505649	501878.2	3770.75
2004Q2	503548	505271.1	-1723.1
2004Q3	503549	503294.8	254.248
2004Q4	502627	503103.1	-476.112
2005Q1	501100	502238.4	-1138.39
2005Q2	505346	500805.1	4540.855
2005Q3	505084	504345.4	738.6328
2005Q4	504508	503889.7	618.2879
2006Q1	505372	503263.8	2108.155
2006Q2	505925	503974.8	1950.219
2006Q3	504624	504436.6	187.4193
2006Q4	510914	503343.4	7570.562
2007Q1	513823	508553.2	5269.801
2007Q2	515245	510900.3	4344.686
2007Q3	510608	511962.6	-1354.58
2007Q4	512043	507893.7	4149.339
2008Q1	513256	508895.3	4360.651
2008Q2	506487	509712.7	-3225.71
2008Q3	496916	503839.6	-6923.61
2008Q4	487806	495483.7	-7677.68
2009Q1	468069	487584.3	-19515.3
2009Q2	472955	470375.5	2579.506
2009Q3	469426	474334.1	-4908.1
2009Q4	473831	471065.9	2765.054
2010Q1	479533	474581.9	4951.063
2010Q2	482553	479252.2	3300.75
2010Q3	486422	481592.1	4829.899
2010Q4	481147	484698.6	-3551.62
2011Q1	470786	479989.1	-9203.07
2011Q2	464113	470939.7	-6826.71
2011Q3	474782	464908	9874.012
2011Q4	473442	473801.8	-359.82
2012Q1	480432	472379	8052.957
2012Q2	478230	478156.4	73.63477
2012Q3	473827	476177.6	-2350.64



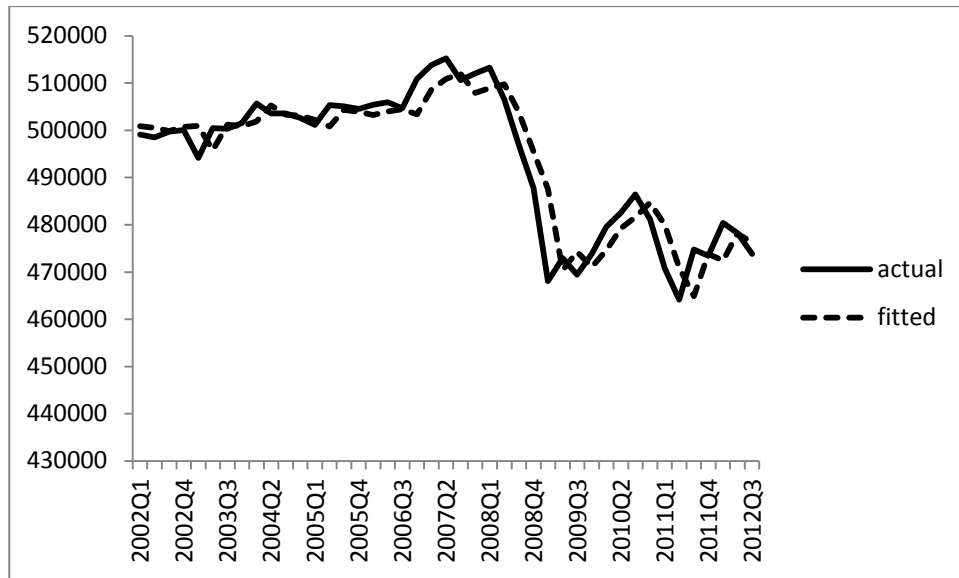


Figure 1. Actual and simulated GDP

Table 2. Correlation of each variable

	MB	MS	CPI	GDP	INT
MB	1.000				
MS	0.471	1.000			
CPI	-0.642	-0.473	1.000		
GDP	0.475	0.727	0.409	1.000	
INT	-0.499	0.185	0.450	0.292	1.000

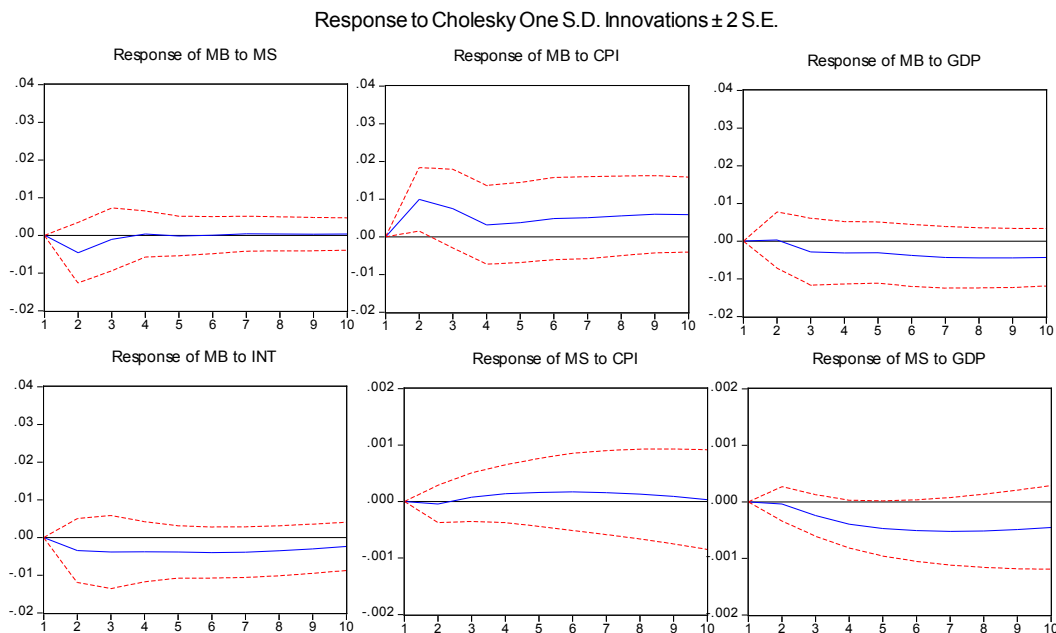


Figure 2. Response to shock

Prices have been quite low or sometimes at negative rates under deflation, which is reflected in this analysis.

Finally, this article employs a structural vector autoregression (SVAR) to investigate the dynamic interactions. The time lag is set to 2. The results are shown in Figure 2.

The monetary base influences CPI, interest rate, and GDP. However, it can be understood that the effects on money stock are important to promote the economy. The effect continues for some time.

#### 4. Conclusions

This article examined whether or not the monetary-base rule could have achieved economic growth in Japan. The results show that the introduction of this rule would have obtained no large differences; however, a stronger monetary easing policy should have been conducted in 2008 during the world financial crisis. Also, it should have been conducted around 2011.

The results are not conclusive; however, it should be understood that the monetary base has some effect on economic growth. On the other hand, to place too much expectation on monetary-base rule is dangerous. Monetary-base rule could not have caused large economic growth if the rule had been in effect starting in the early 2000s. Other policies, such as adequate fiscal policy, along with financial policy, should be implemented to promote growth. For fiscal policy, public investments have continued to increase and housing investments have generally increased. Some bright signs have appeared in Japan with the conduct of fiscal expansion. Comprehensive policies and evaluations are necessary. Not only dramatic financial policy but also other policies intended to promote economic recovery should be implemented at the same time.<sup>5</sup>

The so-called *Abenomics* have been highly evaluated in Japan. Asset prices, especially stock prices, have risen sharply since the beginning of 2013. Export industries, including Toyota (automobile company), have announced record high profits as the yen has depreciated against other currencies. However, it is dangerous to be too optimistic. The Japanese economy still remains weak. Exports and industrial production have decreased, reflecting worse overseas economies. Fixed investments also have shown some weakness. Consumption has remained resilient. The year-on-year rate of change in the CPI is still about 0%. On the other hand, suppose that the BOJ succeeds in achieving a 2% inflation rate. Without income growth in excess of that goal, stagflation will replace deflation. Japan's crushing debt explains why Abe has so far relied on the central bank. It is bad enough to develop the world's biggest public debt. The side effect may be too large to solve. It would be impossible to rely too much on economic policies. Economic agents should exert concerted efforts to improve themselves. Too much dependence on economic policy would be impossible.

Some economists say demographics have more to do with Japan's deflation and economic inertia than a lack of central bank liquidity. People aged 65 or older account for about 22% of the population, which is the highest ratio in the world. There are many serious problems in Japan to be solved. Further study is needed.

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### Notes

1. Kurihara (2010, 2012b) examined pros and cons of inflation targeting.
2. GDP is used instead of GNP in MacCallum (1990).
3. In McCallum's model, the monetary base also is accurately controlled by the Federal Reserve.
4. The results are similar to McCallum (1990).
5. Re-regulation should be conducted much more in Japan in general; however, during the recent crisis, re-regulation sometimes has seemed preferable in some cases for international financial markets.