

Has Zero Interest Rate Policy of the Bank of Japan Influenced Financial Markets?

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Abstract

This article empirically examines the effect of zero interest rate policy of the Bank of Japan on financial markets. Zero interest rate policy was first introduced in Japan and has been adopted to combat deflation and to promote the economy. This policy was later implemented by other developed countries, including the United States and United Kingdom. Empirical results show that this policy has effectively influenced the expectation of markets, namely, over one-year future interest rates. The zero interest rate policy has been effective in lowering and stabilizing interest rates to boost the economy in Japan.

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1. Introduction

Japan attained high economic growth in the 1980s. Since the middle of the 1980s, stock and land prices have risen enormously. The Japanese yen has appreciated greatly since 1985; however, exports did not decline. Consumer prices, in an overheated economy, did not rise strongly. Daily lives were not damaged badly except those who wished to buy houses or land. However, after the so-called bubble economy burst at the end of the 1980s, the Japanese economy experienced severe conditions. At the beginning of the 1990s, the country suffered a serious recession with very low 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 or deregulation in many areas (see, for example, Quintyn and Taylor, 2004). In particular, huge nonperforming loan problems caused Japanese financial institutions to reduce their level of funds for investing and lending (see, for example, Gomi, 2007). This situation damaged the Japanese economy. The Bank of Japan (BOJ), using more injections of ample funds, made every effort to maintain the stability of the financial markets.

In February 2, 1999, the BOJ adopted the zero interest rate policy, which was unprecedented all over the world, to combat deflationary pressure and to boost the economy. Furthermore, the BOJ announced in April 1999 that it would continue the zero interest rate policy until deflationary concerns were dispelled. Later, the zero interest rate policy was rescinded on August 11, 2000, as the economic situation displayed signs of gradual recovery.

However, the situation has not improved greatly. The BOJ introduced a new monetary policy, the quantitative easing policy, in 2001. Japan's experience with the quantitative easing policy dates back to March 9, 2001. This policy received much attention from all over the world as it was unprecedented. Under this unconventional policy, the BOJ made huge 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. The zero interest rate policy was again introduced.

In March 2006, the BOJ exited quantitative easing amid signs that deflation was ending and the recession had disappeared. On July 14, 2006, the zero interest rate policy, which had been implemented in March 2001, ended.

After the occurrence of the subprime problems in 2007 and the Lehman shock in 2008, a huge amount of capital has flowed into the Japanese financial markets in spite of the fact that the Japanese economy has not been in good condition in about 20 years. Yen-carrying trading occurred as the Japanese interest rate was comparatively low. The Japanese yen appreciated strikingly against other currencies, which hit the Japanese economy by deteriorating exports. Stock prices decreased sharply. Following this global financial crisis, the BOJ increased the pace of its Japanese government bond purchases and undertook unconventional measures to promote the economy and attain financial stability. In 2008, the BOJ judged that additional measures for money market operations were necessary so that the effects of extremely low policy interest rates would prevail in the financial markets.

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 fiscal policy was strongly demanded. The zero interest rate policy was in effect from October 2010 and it is still now. The transmission mechanism of the monetary policy to the financial market and real economy has not been fully analyzed as yet. In particular, the relationship between monetary policy and reactions in financial policy is still unclear and has much room for further analysis.

This article examines the impact of the BOJ's policy as an unconventional monetary policy tool for the zero interest rate policy. A VAR model is employed to examine the policy. Section 2 introduces related studies and shows the relationship to this study. Section 3 shows the empirical analysis and the results are analyzed in section 4. Finally, this article ends with a brief summary.

2. Existing Studies

The zero interest rate policy was first introduced in Japan. Since then, Japanese monetary policy has received much attention from the world as such a policy was unprecedented at that time. However, only a few studies have examined the effects of this policy empirically. One reason is that a short time has passed since the policy was adopted. Much attention has been paid; however, there is not sufficient data and information to analyze the effects of this policy.

Some monetary policy rules have been presented not only by academic fields but also from the real environment. The relationship of recent Japanese monetary policy to the monetary base rule should be examined much more. In April 2013, the BOJ decided to double the monetary base. McCallum (1990) investigated properties of a policy rule that specifies the use of the monetary base as a monetary policy that is designed to keep the nominal GDP growing smoothly at a noninflationary rate. This article has been cited often. Hall (1990) and Razzak (2003) employed McCallum's rule for some countries. Judd and Motley (1992, 1993) presented a feedback rule in which central banks change the interest rate in response to divergence between actual and targeted nominal GDP growth rate. Dueker and Fischer (1998) provided potential effectiveness of the indicator model as a policy indicator for the Swiss monetary base. Many studies have included other

rules for monetary policy in theoretical models or for empirical analysis (see, Ida (2013), for example). One of them, a price-level target model, has been advocated by Barro (1986), Haraf (1986), Clark (1988), and so on. Recently, nominal GDP targeting or inflation targeting rule has been discussed and more than 20 countries have now introduced inflation targeting. The Taylor rule was presented and many articles, including those with modified rules, have been presented for this rule.

Kurihara (2010) examined the effectiveness of BOJ intraday financial policies. Ueda (2011) examined the nontraditional monetary policy adopted by the Bank of Japan 1998-2006. Fukuda (2011) showed that zero interest rate policy by the BOJ caused the short-term interest rate to fall to zero and was somewhat effective at reducing the size of the spread in the call market. Hanabusa (2010) showed that the zero interest rate policy stabilized the long-term interest rates in Japan. Kurihara (2012) used daily data to examine the impact of BOJ news announcements on interest rates. Honda, Kuroki, and Tachibana (2013) and Kurihara (2013) examined recent Japanese monetary policy. Schenelberg and Watzka (2013) showed that Japanese quantitative easing shock leads to a significant decrease in long-term interest rates and increases output and the price level; however, the effects were only transitory. Takahashi (2013) showed that although no clear conclusion can be drawn thus far as to the effectiveness in terms of boosting business activities, the zero interest rate policy and quantitative easing policy had clear effects in terms of stabilizing the financial system.

This article focuses on interest rate paths. Formation of expectations can matter greatly in the real world. Jones and Kulish (2013) showed that announcements from central banks about the future path of the short-term rate can lower long-term interest rates because of their impact both on expectations and on the risk premium. The authors indicated that long-term interest rate rules perform better than the Taylor rule. Kurmann and Otrok (2013) showed that one shock can explain the majority of unpredictable changes in the slope of the term structure of interest rates. McKinnon and Liu (2013) showed that the zero interest rate policy did not stimulate the U.S. economy as domestic financial intermediation by financial institutions and money market mutual funds (MMFs) is undermined. Wright (2012) also showed that simulated monetary policy shocks could lower Treasury and corporate bond yields; however, the effects disappear quickly. Ziaei (2014) showed that interest rates in Gulf Corporation Council (GCC) countries change positively in response to unpredictable increases in monetary aggregates.

This paper also examines the relationship between monetary policy and asset prices. Eggertsson, Woodford, Friedman, and Gertler (2003) showed that the possibility of increasing the monetary base by central bank's purchases of assets does little if anything to expand the set of paths for inflation and real economic activity. Blinder, Ehrmann, Fratzscher, De Haan, and Jansen (2008) and Knütter, Mohr, and Wagner (2011) provided a survey on the effects of central bank announcements on financial asset prices. Woodford (2012) and Moessner (2013) showed empirical evidence that focused on the effects of the Federal Open Market Committee (FOMC) policy guidance. Kontonikas, MacDonald, and Saggiu (2013) showed that unexpected federal fund rate cuts promote stock prices. The Bank of England's quantitative easing (QE) program was in effect from March 2009 to January 2010 for the UK government bond market. Joyce and Tong (2012) indicated that QE announcements took different lengths of time to become incorporated into market prices and had significant effects on the shape of the term structure. Allowing for fiscal news and the changing macroeconomic outlook, QE appears to have had persistent effects on gilt yields.

To the best of my knowledge, there are no studies of the Japanese cases; moreover, there has been little study that has examined the effects of the zero interest rate policy by the BOJ on stock prices and on exchange rates. In conducting monetary policy, the BOJ, like other central banks in other countries, by means of its operational instruments, influences the formation of interest rates for the purpose of monetary control. As with these, both stock price and exchange rate are not

intended to control. However, these two variables are important in the economy, so they are included in this study for analysis.

3. Empirical Analysis

To examine the effects of the zero interest rate policy on the Japanese economy empirically, three dependent variables, namely, future interest rates, stock prices and exchange rates, are used for the regression equation. More concretely, in the regression equation, INTEREST means daily changes in three-month and m-year-ahead futures rates ($m = 1, 2, 3, 4, 5,$ and 10 year; in percentage points) in the Tokyo interbank market; STOCK means daily stock price (Nikkei average 225; the most representative Japanese stock price index); and EXCHANGE means daily exchange rate (against the U.S. dollar). All of these are regressed by a dummy variable, where the dummy takes the value of 1 on days when the BOJ provided new information about the policy change and zero otherwise.

$$INTEREST_t - INTEREST_{(t-1)} = \alpha + \beta dummy_t + \varepsilon_t \quad (1)$$

$$STOCK_t - STOCK_{(t-1)} = \alpha + \beta dummy_t + \varepsilon_t \quad (2)$$

$$EXCHANGE_t - EXCHANGE_{(t-1)} = \alpha + \beta dummy_t + \varepsilon_t \quad (3)$$

ε is an error term.

The methods of empirical analysis are LS (least squared) and robust estimation. Robust estimation is a robust estimator, unlike maximum likelihood estimation.

4. Results Analysis

The results are shown in Tables 1 and 2. Monetary policy, namely, zero interest rate policy announcements, has influenced long-term future interest rates.

Table 1. Empirical result: LS

	C (Prob.)	Dummy (Prob.)	Adj.R2	F-statistic (Prob.)	D.W.
3 month	0.9951 (0.0000)	0.0016 (0.046)	0.022	3.972 (0.046)	0.0064
1 year	0.5794 (0.0000)	-0.1575 (0.0468)	0.0026	3.9587 (0.0468)	0.0064
2 year	0.6140 (0.0000)	-0.2095 (0.0346)	0.0255	4.4729 (0.0348)	0.0080
3 year	0.6761 (0.0000)	-0.2648 (0.0241)	0.0029	5.0960 (0.0241)	0.0090
4 year	0.7512 (0.0000)	-0.3129 (0.0170)	0.0033	5.7062 (0.0190)	0.0100
5 year	0.8346 (0.0000)	-0.3492 (0.0125)	0.0037	6.2524 (0.0125)	0.0031
10 year	1.3424 (0.0000)	-0.3477 (0.0011)	0.0037	6.4584 (0.0011)	0.0013
STOCK	11613.37 (0.0000)	2129.432 (0.0615)	0.0020	3.5008 (0.0615)	0.0079
EXCHANGE	94.6887 (0.0000)	12.3866 (0.0146)	0.0034	5.9798 (0.0146)	0.0096

Table 2. Empirical result: Robust estimation

	C (t-value)	Dummy (t-value)	Adj.R2	Rn-statistic (probability)	Deviance
3 month	0.9953 (0.0000)	0.0015 (0.1214)	0.0019	2.3987 (0.1214)	0.0076
1 year	0.5680 (0.0000)	-0.1461 (0.0955)	0.0021	2.7791 (0.0955)	70.0531
2 year	0.5848 (0.0000)	-0.1799 (0.1012)	0.0021	2.6869 (0.1012)	102.7498
3 year	0.6449 (0.0000)	-0.2332 (0.0717)	0.0025	3.2431 (0.0717)	145.8620
4 year	0.7240 (0.0000)	-0.2854 (0.0477)	0.0029	3.9194 (0.0477)	185.9301
5 year	0.8152 (0.0000)	-0.3277 (0.0312)	0.0033	4.6416 (0.0312)	215.6219
10 year	1.3386 (0.0000)	-0.3430 (0.0189)	0.0037	5.5113 (0.0019)	213.0669
STOCK	10231.30 (0.0000)	2011.183 (0.0702)	0.0016	3.3298 (0.07301)	163.027
EXCHANGE	90.5718 (0.0000)	11.2155 (0.0158)	0.0035	5.9001 (0.0139)	150.1263

Monetary policy announcements could significantly lower middle- and long-term future interest rates. The policies as a whole succeeded in terms of future interest rate stabilization and reduction.

On the other hand, the short-term interest rate, namely, the 3-month future interest rate, was not influenced by this policy. Also, the exchange rate responded to the expected direction (depreciation); however, stock price did not move in the expected direction (increasing). However, the two variables are not intended to be managed by the BOJ.

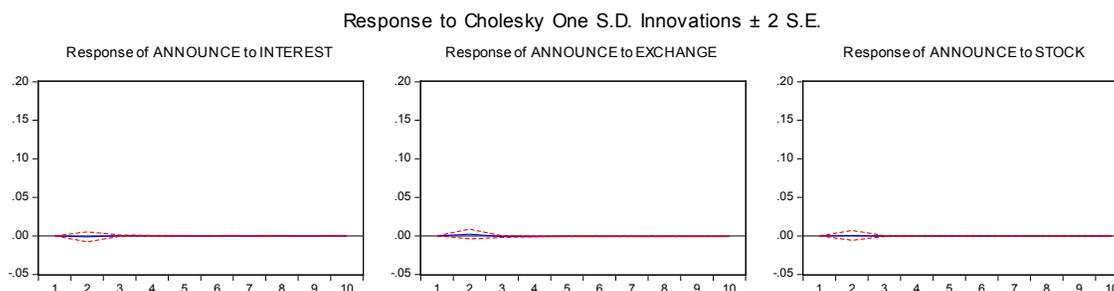
Moreover, VARs (vector autoregressions) are employed for further analysis. The method employed here is mainly used to forecast systems of interrelated time series and to analyze the dynamic impact of random disturbances on the employed variables. Empirical estimation and interface are complicated by the fact that endogenous variables may appear on both the left and right sides of equations. The simultaneous use of VAR means can avoid this issue. The macroeconomic variables are structurally correlated, with different possible lags. Therefore, a VAR model is used to examine the data to avoid this issue. The variables are the long-term yield spread, short-term spread, and economic growth. The time lag sets 2. The time lag selected was from Akaike Information Criteria (AIC) and Schwarz Criterion (SC). The results are shown in Table 3 and Figure 1. Only the cases of the responses of monetary policy announcements to interest rate, exchange rate, and stock price are listed in Figure 1.

The results are clear. The announcements, which appear to have boosted the economy, functioned well. They promoted depreciation of the yen and increases in stock prices.

Interest rates have been quite low. Thus it is very important to analyze the shaping and management of market expectations as the effect of the zero interest rate policy on the real economy in Japan did not meet expectations. Whether or not monetary policy alone changes the situation of the liquidity trap has been left for further study. It is possible that other policies, such as fiscal and cooperation with government, may be necessary. Additional study may reveal whether or not expectations can remove the liquidity trap.

Table 3. Emprical result: VAR.

	INTEREST	EXCHANGE	STOCK
ANNOUNCE(-1)	-0.0006 (0.0012)	0.0139 (0.0666)	45.7580 (15.8044)
ANNOUNCE(-2)	-0.0004 (-0.3485)	0.0109 (0.1635)	-13.0182 (-0.8226)
INTEREST(-1)	0.9569 (54.6346)	0.8654 (0.9213)	-406.3257 (-1.8236)
INTEREST(-2)	0.0408 (2.3347)	-0.7591 (-0.8083)	425.9993 (1.9125)
EXCHANGE(-1)	0.0006 (1.7400)	0.9510 (52.6857)	23.3817 (5.4606)
EXCHNAGE(-2)	-0.0005 (-1.7066)	0.0467 (2.5936)	-23.4646 (-5.4826)
STOCK(-1)	-1.67E-6 (-1.1676)	-0.0002 (-2.9825)	1.0323 (56.8518)
STOCK(-2)	1.42E-6 (0.9922)	0.0002 (3.0807)	-0.0337 (-1.8575)
C	0.2137 (2.1199)	-10.4756 (-1.9374)	-1938.062 (-1.5111)
Adj.R2	0.9970	0.9977	0.9969
F-statistic	1411632.1	185942.7	135252.9
Akaike Information Criterion	8.7817		
Schwartz criterion	8.8482		

**Figure 1.** Impulse response function

The possible measures to adopt are limited. Some monetary policies and fiscal policy are in general effective in the short-run; however, budget deficits in many countries, including Japan, are serious. Consideration of the long-term interest rate is important in spite of the fact that BOJ does not manage the long-term interest rate. Whether the zero interest rate policy can cause the long-term interest rate to fall is uncertain. The effective use of market expectations enables policymakers to influence markets in a more desirable direction. So it is very important analyze the shaping and management of market expectations. In this case, it is possible to conclude that the zero interest rate policy have been effective.

5. Conclusions

This article examined the effect of the zero interest rate policy of the BOJ in financial markets during the period when the policy was in force. The empirical results show that this policy influenced financial markets effectively by influencing market expectations, namely, regarding one-year future interest rates. The zero interest rate policy has been effective in terms of lowering and stabilizing interest rates to stabilize and boost the economy.

In Japan, a drastic new policy, called *Abenomics* (for Abe, the prime minister), was adopted in 2013 as mentioned above. Kurihara (2013) showed that Abenomics seem to be effective at present; however, the effects will be limited. Most people consider that the recent good performance of the economy actually is mainly a result of Abenomics rather than the zero interest rate policy. However, this study shows that the zero interest rate policy has influenced activity for the long-term periods. Thus there is some possibility that the zero interest rate policy has caused the present good situation. It seems necessary to distinguish between the effect of the zero interest rate policy and those of Abenomics. However, some time would need to pass to enable examination of the relationship between this zero interest rate policy and Abenomics. Further study is necessary to address this matter.

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