The effectiveness of Japan's Negative Interest rate policy

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Effectiveness of Japan's Zero and Negative Interest rate Policy

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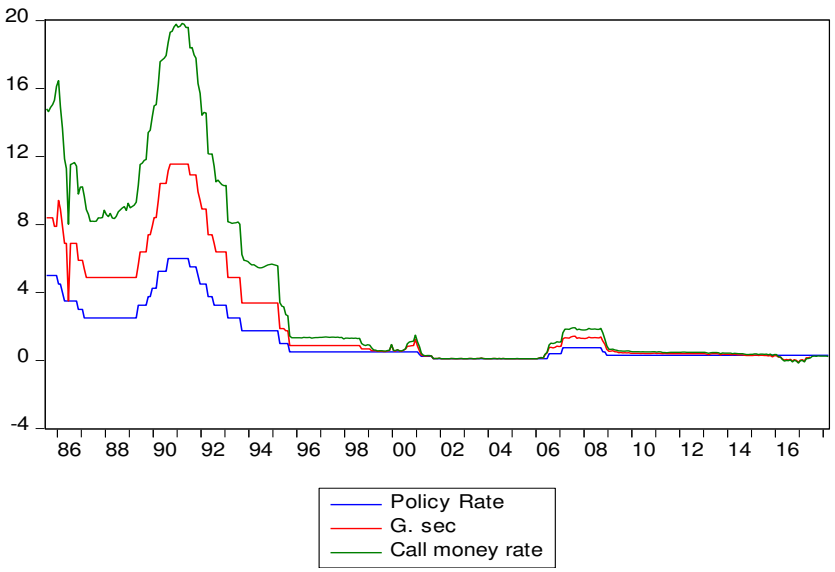
Abstract

This paper investigates the effect of zero and negative interest rate policy of Japan on the inflation rate and the role of exchange rate in conducting the zero and negative interest rate policy. The disappointing economic performance thus seems primarily due to a series of adverse economic shocks rather than an extraordinary policy error. The empirical analysis is based on, primarily, a stylized VAR model of the Japanese economy with the innovation that the interest rate policy, and the exchange rate—two important parameters for assessing the stance of monetary policy—are allowed to vary over time. Secondly, the estimated VAR model investigates whether alternative interest-rate policy approaches proposed in the literature could have improved macroeconomic performance. Though, Granger causality method has been used in the earlier literature to measure the causation of interest rate on inflation rate and it also used to see the block and instantaneous causality between the systems of variables. Next, using an estimated structural model, I identified a number of adverse shocks occurring after the 1990s. It thus follows that int. rate policy was not solely responsible for the stimulation neither in inflation growth performance nor in increasing the output growth. Aiming for a low inflation level and responding to the economy according to a conventional policy rule provided insufficient insurance against the contractionary shocks that occurred over the 1990s.

Introduction

Japan has achieved the high economic growth in the 1980s. By the middle of the 1980s, stock and land prices have grown sharply. The exchange rate of Japan has appreciated greatly since 1985; although, exports did not decline. Whereas, at the end of the 1980s the Japanese economy experienced severe conditions after the so-called bubble economy burst. The country had gone through a serious recession with very low growth rates from 1990-2000 and the main reason for the recession was primarily country's fragile financial system such as delays in reforms or deregulation in many areas. Particularly, increased nonperforming loan problems caused the Japanese financial institutions to reduce their level of funds for investing and it damaged the Japanese economy.

Since the latter half of the 1990s, Japan's economy has been in a state of low inflation rate, in which the year-on-year rate of change in the consumer price index was either zero or slightly negative. A distinctive feature of Japan's deflation is that it was moderate but persistent. The recovery has reported but only for short period of time in some period. The annual average rate of decline in the CPI from fiscal 1998 to fiscal 2012 was a close to minus 0.3 percent, but this decline went on for 15 years. However, major macro incident brought down the inflation and economic growth of the Japan, First, following the burst of the asset bubble at the beginning of the 1990s, firms and financial institutions were forced to repair their impaired balance sheets. The Bank of Japan successively lowered the policy interest rate. The policy rate, which had stood at 6 percent in August 1990, was reduced to the then globally unprecedented level of 0.25 percent in September 1998. As a result, conventional monetary policy tools had been almost exhausted by around 1997-98 when anxiety about the financial system due to the financial crisis reached its peak. As a result of the erosion of banks' intermediation function, Japan's economy fell into a situation in which the effects of monetary policy did not sufficiently feed through to the economy.



The Bank of Japan's Unconventional Monetary Policies

The expressions such as "zero interest rate policy," "quantitative easing," "credit easing," and "forward guidance", These are names of unconventional monetary policy measures introduced by central banks in the United States and Europe after the global financial crisis. In fact, most of these policy measures were originally implemented in one form or another by the Bank of Japan ahead of other central banks in response to the 15 years of deflation since the latter half of the 1990s.

The Bank of Japan had lowered the policy rate to 0.25 percent in September 1998, reaching a situation in which the conventional monetary policy tool of setting the policy interest rate had been almost exhausted. Japan's economy was facing the "zero lower bound on nominal interest rates." However, economic activity and prices did not improve.

Further, Japan's inflation rates continued to slide, despite the various unconventional monetary policies pursued by the Bank. In that sense, the Bank's past policies were not sufficient to lift Japan's economy out of deflation.

There were certain leakages which hindered the inflation to pull out its growth; the first was the lack of a strong enough commitment to price stability. The second was element that had been lacking is policies that have a sufficiently large impact, whereas policies need to have a large impact. Nevertheless, the impact provided by those policies proved insufficient to allow the economy to escape from its deflationary equilibrium.

Introduction of Zero interest rate policy

In February 2, 1999, the BOJ adopted the zero interest rate policy which was prodigious all over the world in order to combat deflationary pressure and to boost the economy. Furthermore, the bank of Japan had again announced in April 1999 that it would continue the zero interest rate policy until deflationary concerns were removed. After that, as the economic situation displayed signs of gradual recovery, the zero interest rate policy was cancelled on August 11, 2000. It considers potential differences between interest rate cuts in positive versus negative territory on deposit and lending rates, as well as banks interest rate margins and profitability, and market functioning. When rates approach the point at which most agents switch into cash, further cuts will become ineffective or counterproductive if they hinder financial intermediation and Pressures could then grow on banks' business models, profits and charter values, with negative consequences for financial stability.

Major central banks cut their policy rates to zero or slightly above the zero during the global financial crisis. As zero was then considered the lower bound for policy rates, further monetary easing was achieved through unconventional measures-such as forward guidance, asset purchase programs, and credit easing-to stimulate growth and stabilize inflation expectations. These

policies led to a substantial decline in nominal and real interest rates, and helped support a slow and uneven recovery in economic activity.

Introduction of QQE

QQE has the following two features. One feature is a strong and clear commitment to achieve price stability. The other feature is large-scale monetary accommodation to underpin the commitment. QQE with a Negative Interest Rate was an extension of the existing policy framework of QQE.

In April 2013, the Bank of Japan introduced an inflation target of 2% with the aim of overcoming deflation and achieving sustainable economic growth. But due to lower international oil prices, it was unable to achieve this target and was forced to take further measures. Hence, in February 2016, the Bank of Japan adopted a negative interest rate policy by massively increasing the money supply through purchasing long-term Japanese government bonds. The Bank of Japan had previously purchased short-term government bonds mainly, a policy that flattened the yield curve of Japanese govt. bonds. On the one hand, banks reduced the numbers of government bonds because short-term bond yields had become negative and even the interest rates of long term government bonds up to 15 years became negative. Even though, bank loans to the corporate sector did not increase due to the Japanese economy's vertical investment-saving.

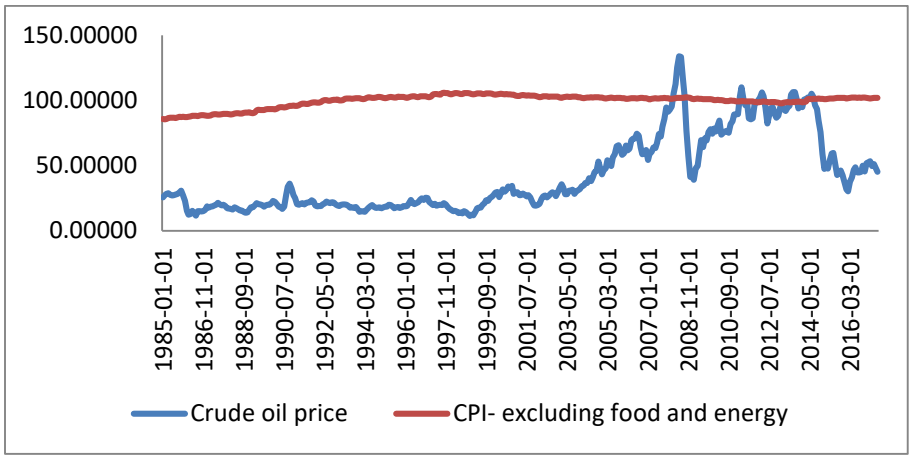
The interest rate channel through exchange rate has helped many countries to achieve their objective; exchange rate aided the monetary mechanism with the negative interest rate policy. For instance, In Switzerland, the monetary authority adopted a negative interest rate policy to ease excessive appreciation pressure on its domestic currency, but the currency appreciated as the authority cut the interest rate further into negative territory. On the other hand, Sweden and countries in the euro area experienced depreciation in their currencies as a result of the adoption of negative interest rate policies. In Denmark, its currency is pegged to the euro, and the monetary authority employed the negative interest rate policy as one of the options for changing.

Decline in Crude Oil Prices Has Been Weighing on Price Increases Exports and production are sluggish at present. However, as the Bank has strengthened QQE, Indeed, prices do not appear to be rising, as the year-on-year rate of change in the CPI -- the price index that the Bank adopts as its price target for the time being -- was only 0 percent for all items less fresh food in February 2016. However, this was caused by a decline in energy prices due to the fall in crude oil prices worldwide, and prices in terms of the CPI for all items less fresh food and energy show a steady increase of 1.1 percent for February 2016. As energy prices will not continue falling forever, the CPI including energy -- that is, CPI for all items less fresh food -- will also start to rise as the effects of the fall in energy prices dissipate. Prices have not risen as much as initially had been expected, but this is due to the fall in crude oil prices. As these prices stabilize, prices will rise. However, I think that QQE would be a serious failure if prices rose without

employment growth. Prices eventually will start rising as the output gap in the overall economy tightens and the unemployment rate declines.

Why Has the Price Stability Target Not Yet Been Achieved?

In order to see the underlying trend in consumer prices, it is necessary to look at the rate of change in the CPI excluding fresh food and energy, since the CPI excluding fresh food but including energy is affected by temporary fluctuations in oil prices. The important thing to note when looking at these indexes is that their underlying trend was negative from the mid-1990s onward, but following the introduction of QQE the rate of change in the CPI excluding fresh food and energy turned positive and since then has continued to be on an uptrend. Immediately after the introduction of QQE in April 2013, the rate of change in the CPI excluding fresh food and energy increased from around minus 0.5 percent to around plus 1 percent. After losing momentum in the start of the consumption tax hike in April 2014, the rate of change moved upward again with the expansion of QQE, but then again started to decline in 2016. Certainly, the 2 percent price stability target has not yet been achieved.



Analyses by the Bank suggest that a major causes for the situation is the decline in inflation expectations, and that the following two factors responsible for the decline in inflation expectations. First, (1) the decline in crude oil prices, (2) the weakness in demand following the consumption tax hike in April 2014, and (3) the slowdown in emerging economies and volatile global financial markets, have lowered the inflation rate. Although in 2018, Long-term interest rates have risen, mainly reflecting concern over an expected increase in the issuance of U.S. Treasuries under the country's expansionary fiscal policy, and higher inflation expectations due to rises in crude oil prices and hence inflation rate. Even in February 2018, when the volatility of stock prices increased, the volatility of U.S. Treasury futures remained stable at a low level.

Literature Review

The zero interest rate policy was first introduced in Japan. Since then, Japanese monetary policy has received much attention from the world. However, only a few studies have examined the effects of this policy empirically. The relationship of recent Japanese monetary policy to the monetary base rule should be examined much more in detail so that policy implication should reflects in other macro variables also.

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.

Kurihara (2010) examined the effectiveness of Bank of Japan 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 bank of Japan 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 bank of Japan 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.

S. Pelin Berkmen (2012) uses the structural VAR model to analyze the effect of Bank of Japan's Quantitative and Credit Easing.

Data and Methodology

In this paper I've analyzed the effectiveness of zero and negative int. rate policy of Japan. Policy in an economy with zero & negative nominal interest rates as experienced in Japan since the mid-1990s. In this paper, I attempted to provide a quantitative evaluation of the importance of the zero interest rate bound and the likelihood of a liquidity trap in Japan. This paper explores the implications of interest rate policies for monetary policy transmission and effect on inflation.

This paper extends the analysis basic VAR by explicitly using the BOJ's monetary easing measures in quantity terms. The regressions trace the impact of interest rate policy measures on inflation activity directly, and therefore, shocks to spreads are not interpreted as monetary policy actions. This paper relies on following sets of variables:

Crude oil prices

Exchange rate

Long run interest rate

Short run interest rate

CPI- all items

Share price index

The VAR regressions are done for the period of 1985-07-01 to 2017-10-30, which covers three distinct episodes of BOJ's monetary policy: i) the zero interest rate policy from 1999 to 2000 and the quantitative easing period between 2001 and 2006; ii) Post-Lehman policy measures, including JGB and CP purchases and fund supplying operations; and iii) the CME, starting in 2010. While policy instruments differ in each period, they all affect the current account balance at the BOJ through changes in liquidity.

To study the effectiveness of Interest rates, I employed the VAR model. To analyzed the effect of the shock of short and long run interest rate on inflation and other variable by using orthogonalised impulse response, forecast error variance decomposition and generalized impulse response. The model is essential for the analysis of effectiveness of interest rate and how the change in int. rate affects the inflation rate and other macro components. I tried to finds some evidence that Bank of Japan's Int. rate policy during 1990-2018 have had an impact on economic activity as well as on inflation. However, Impulse response assumes shock occur only once in variable at a time. On the other hand, correlation of the error term may indicate that the shock in one variable is likely to be accompanied by a shock from other variable. Hence, there will be some shocks which may have occurred more than once; therefore a better alternative is to use "Orthogonalized Impulse Response". Alternative method that provides the another information about the dynamic linkages between the inflation and interest rate are granger causality and instantaneous causality, however both underpin the causality between the variables

Granger causality shows whether a scalar variable "y" can help forecast another scalar variable "x". If it is not does, then we say "y" does not granger "x"

The major difference between orthogonalized and generalized impulse response is that, both differ in terms of ordering of varaibles, orthogonalised impulse decomospotistion is sensitive to

ordering of the variable while generalized impulse response is not. The forecast error variance decomposition gives us extra information about the VAR matrix.

VAR (2)

Model 1: $Y_t = \Phi_1 Y_t + \cdots + \Phi_p Y_{t-p} + \omega X_t + e_t$

Model 2: $Y_t = \Phi_1 Y_t + \cdots + \Phi_p Y_{t-p} + e_t$

Where, Y represents endogenous variable

X Represent exogenous variable- Crude oil Price

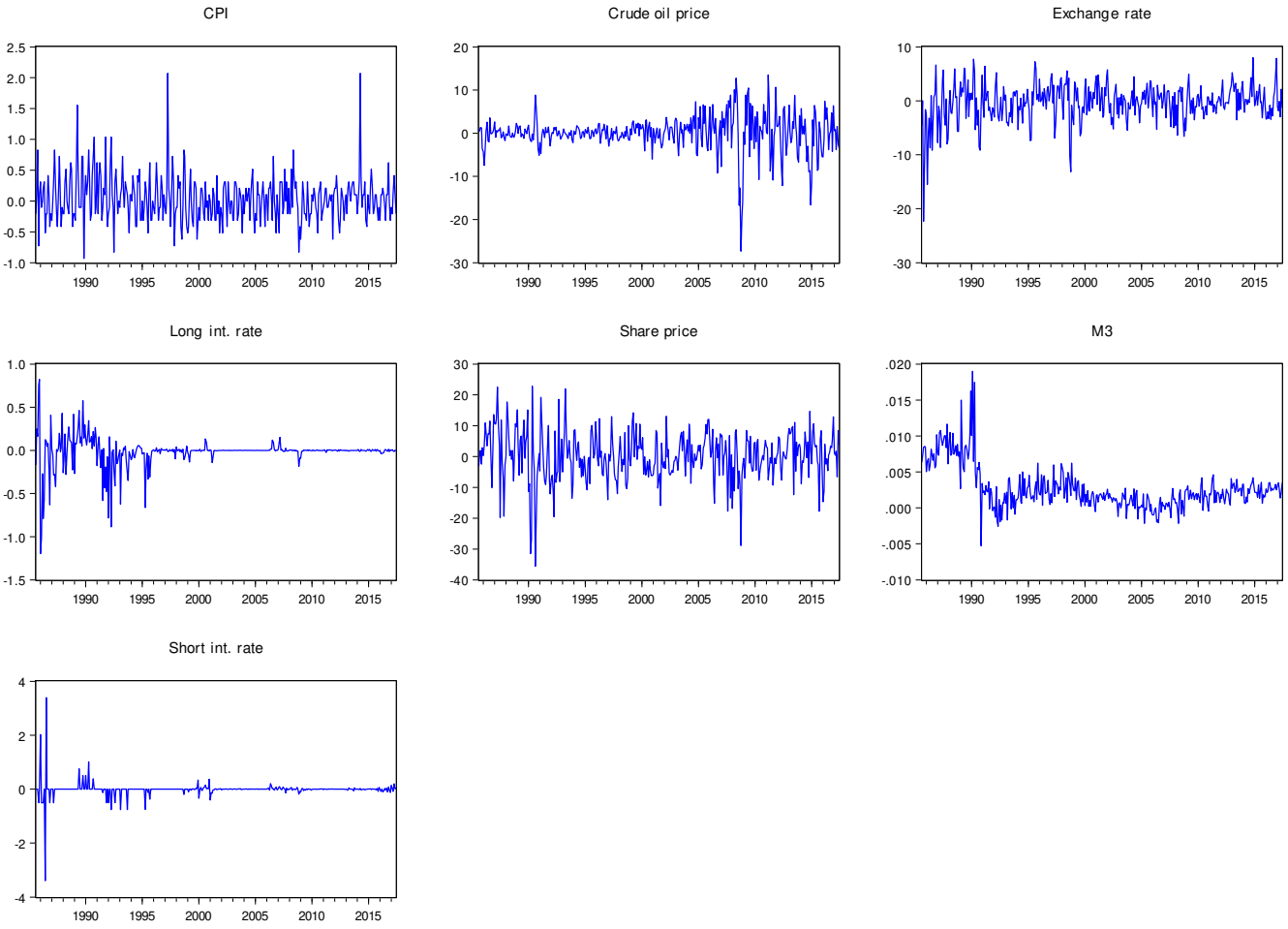
Intermediate ADF test results UNTITLED

Series	Prob.	Lag	Max Lag	Obs
CPI	0.0216787...	11	16	371
CRUDE_OIL_P...	9.3331665...	0	16	382
EXCHANGE_RATE	1.8410537...	0	16	382
M3	0.0253189...	3	16	379
LONG_INT__RATE	3.5705101...	5	16	377
SHARE_PRICE	1.1302845...	0	16	382
SHORT_INT__...	1.5320309...	4	16	378

The above table shows the unit roost test result and values are significant calculate from p values. Before modeling the VAR model, I used the selection criteria which have followed by normality test, box-Q test and ARCH effect. Results provide significant outcome that aided to model VAR process.

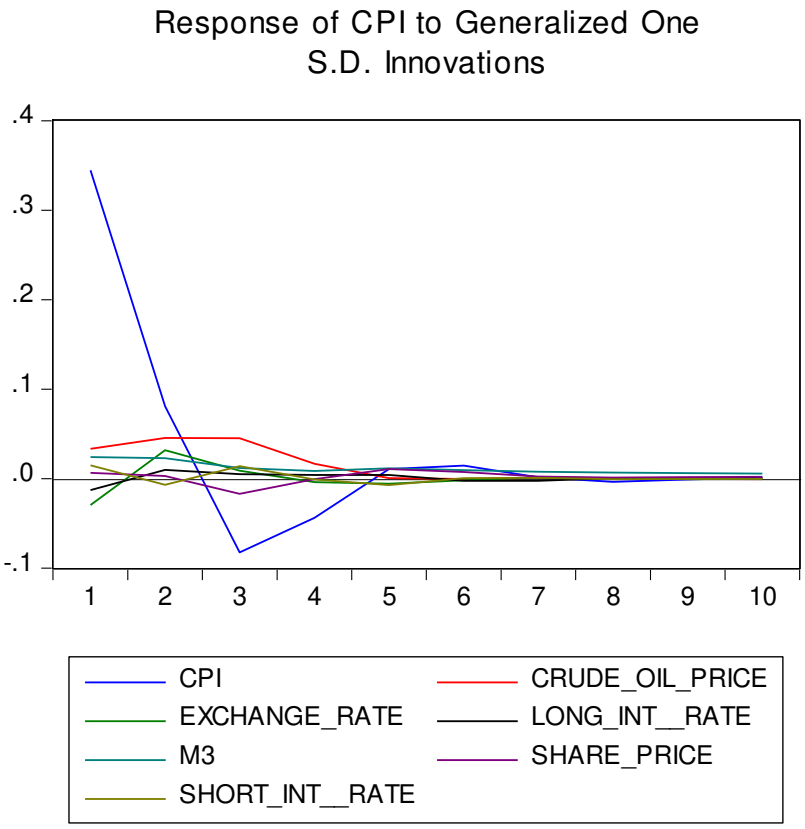
Consequently, VAR (2) model has provided by AIC criterion. I built two separate models, in order to see the oil price interaction on inflation rate, I use crude oil as an exogenous variable in first model and later it excluded in model B.

Since, The R package doesn't provide generalized impulse response certainly, to compensate this result I used Eviews to calculate the generalized impulse response and compare it to orthogonalised impulse response. Further, I use the causality test to check the granger and instantaneous causality. Result shows that CPI granger cause to other variables in when crude oil prices have taken into account but results alter when crude oil excludes from the model. It gave us analysis that crude oil has significant impact to inflation rate as well on exchange rate.

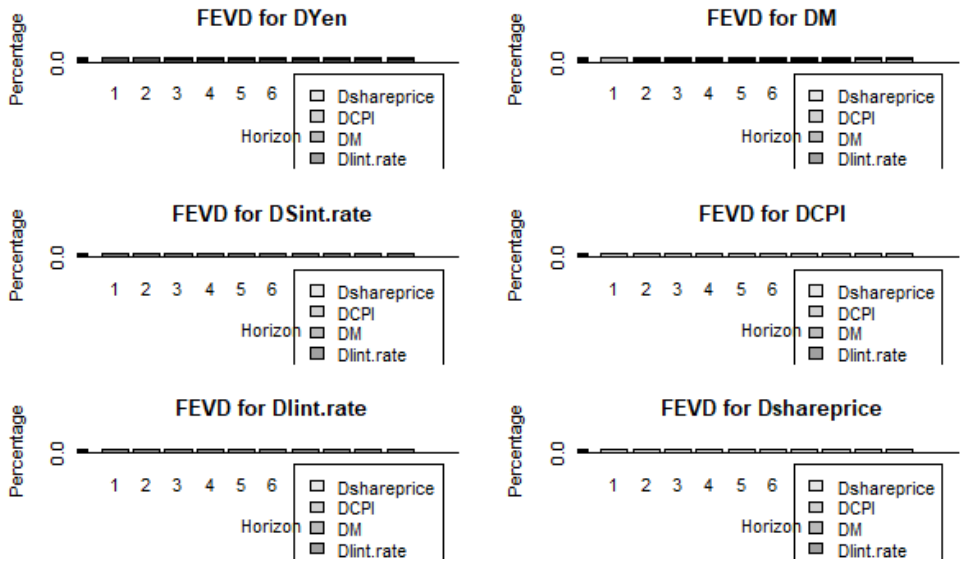


Finally, Impulse responses are calculated from the VAR model representing insignificant values of the coefficients of the lags, even, short run and long run interest doesn't have any impact on CPI. Figure below presents the generalized impulse responses, shock of all variables except exchange rate and crude oil prices doesn't have any effect on CPI, even though crude oil price and exchange rate have very small effect close to zero. The impact on inflation becomes visible, but still not statistically significant in the VAR model.

Quantitative and monetary easing appear to have no effect on the exchange rate, as we do not detect statistically significant systematic impact of the monetary policy variable on the exchange rate across the equations. This result is also consistent with recent studies



Alternative method, FEVD, which also provides extra information on error structures, shows that, factors contributing to forecast CPI are insignificant or close to zero.



Finally I forecasted the CPI for 10 periods ahead to look the, forecast decomposition also suggests that inflation rate wouldn't pull out in foreseeable time.

Concluding Remarks

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 was not effective to influence the inflation rate for long term. The zero interest rate policy has been effective in terms of lowering and stabilizing interest rates. The paper finds some evidence that recent monetary easing by the BoJ have supported economic activity, although the statistical significance varies in different estimates. Using different measures for economic activity, ranging from inflation to exchange rate, the VAR regressions pick up some impact on economic activity. While the evidence is still weak, these results are still an improvement over earlier findings looking at previous QE periods. The results from this paper suggest that the monetary policy transmission mechanism may have strengthened, while the impact of quantitative and other monetary easing on inflation, however, is weaker. This might reflect Japan's stable inflation expectations and relatively flat Phillips curve, which requires large changes in output to move inflation. Similarly, Lam (2011) finds that recent monetary easing measures have had no statistically significant impact on inflation expectations the paper did not find evidence that BOJ's monetary policy measures have had an effect on the exchange rate. Therefore, any impact on economic activity is likely to work through other channels, which could include portfolio rebalancing, commitment effects, expectations, or Reduction in liquidity, risk premium rather than the exchange rate channel. Therefore, this paper is a first step in assessing quantitatively the effectiveness of policies introduced by bank of japan.

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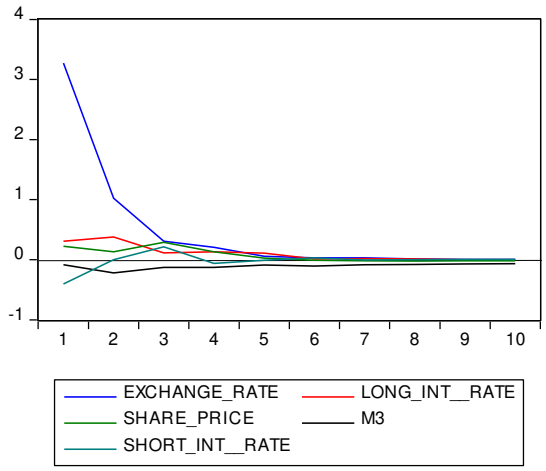
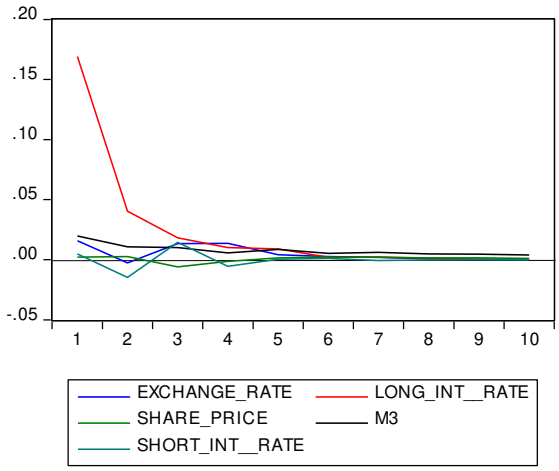
Pairwise Granger Causality Tests
Date: 05/16/18 Time: 22:34
Sample: 1985M08 2017M06
Lags: 12

Null Hypothesis:	Obs	F-Statistic	Prob.
CRUDE_OIL_PRICE does not Granger Cause CPI	371	3.30766...	0.0001...
CPI does not Granger Cause CRUDE_OIL_PRICE		1.87500...	0.0362...
EXCHANGE_RATE does not Granger Cause CPI	371	0.45942...	0.9371...
CPI does not Granger Cause EXCHANGE_RATE		1.17877...	0.2967...
LONG_INT__RATE does not Granger Cause CPI	371	2.38675...	0.0057...
CPI does not Granger Cause LONG_INT__RATE		1.19303...	0.2862...
SHARE_PRICE does not Granger Cause CPI	371	1.14223...	0.3246...
CPI does not Granger Cause SHARE_PRICE		1.34811...	0.1895...
M3 does not Granger Cause CPI	371	1.75035...	0.0552...
CPI does not Granger Cause M3		1.90483...	0.0327...
SHORT_INT__RATE does not Granger Cause CPI	371	1.14981...	0.3186...
CPI does not Granger Cause SHORT_INT__RATE		0.92877...	0.5180...
EXCHANGE_RATE does not Granger Cause CRUDE_OIL_PRICE	371	0.75724...	0.6944...
CRUDE_OIL_PRICE does not Granger Cause EXCHANGE_RATE		0.68143...	0.7694...
LONG_INT__RATE does not Granger Cause CRUDE_OIL_PRICE	371	0.12241...	0.9998...
CRUDE_OIL_PRICE does not Granger Cause LONG_INT__RATE		0.43476...	0.9489...
SHARE_PRICE does not Granger Cause CRUDE_OIL_PRICE	371	0.96880...	0.4784...
CRUDE_OIL_PRICE does not Granger Cause SHARE_PRICE		0.49921...	0.9148...
M3 does not Granger Cause CRUDE_OIL_PRICE	371	0.96927...	0.4779...
CRUDE_OIL_PRICE does not Granger Cause M3		0.46003...	0.9368...
SHORT_INT__RATE does not Granger Cause CRUDE_OIL_PRICE	371	0.14492...	0.9996...
CRUDE_OIL_PRICE does not Granger Cause SHORT_INT__RATE		0.41740...	0.9564...
LONG_INT__RATE does not Granger Cause EXCHANGE_RATE	371	1.63120...	0.0812...
EXCHANGE_RATE does not Granger Cause LONG_INT__RATE		1.23270...	0.2586...
SHARE_PRICE does not Granger Cause EXCHANGE_RATE	371	1.34150...	0.1930...
EXCHANGE_RATE does not Granger Cause SHARE_PRICE		0.83356...	0.6157...
M3 does not Granger Cause EXCHANGE_RATE	371	1.30599...	0.2128...
EXCHANGE_RATE does not Granger Cause M3		1.87948...	0.0357...
SHORT_INT__RATE does not Granger Cause EXCHANGE_RATE	371	1.67753...	0.0700...
EXCHANGE_RATE does not Granger Cause SHORT_INT__RATE		1.78714...	0.0488...
SHARE_PRICE does not Granger Cause LONG_INT__RATE	371	1.59580...	0.0908...
LONG_INT__RATE does not Granger Cause SHARE_PRICE		2.18330...	0.0121...
M3 does not Granger Cause LONG_INT__RATE	371	1.32677...	0.2010...
LONG_INT__RATE does not Granger Cause M3		0.99261...	0.4554...
SHORT_INT__RATE does not Granger Cause LONG_INT__RATE	371	5.72299...	5.0802...
LONG_INT__RATE does not Granger Cause SHORT_INT__RATE		5.96085...	1.8252...
M3 does not Granger Cause SHARE_PRICE	371	1.40955...	0.1592...
SHARE_PRICE does not Granger Cause M3		1.97567...	0.0256...
SHORT_INT__RATE does not Granger Cause SHARE_PRICE	371	1.45839...	0.1380...
SHARE_PRICE does not Granger Cause SHORT_INT__RATE		1.67553...	0.0704...
SHORT_INT__RATE does not Granger Cause M3	371	1.50894...	0.1186...
M3 does not Granger Cause SHORT_INT__RATE		1.69633...	0.0658...

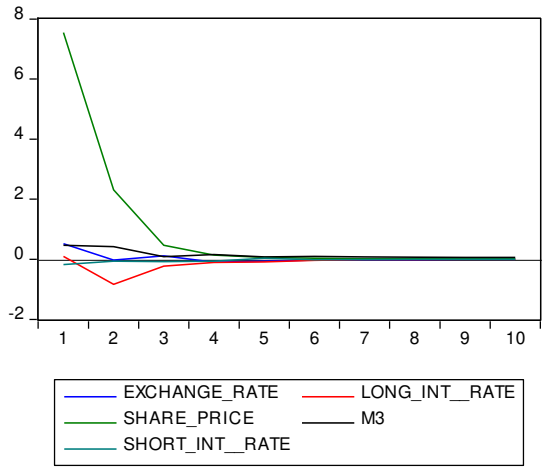
Response of EXCHANGE_RATE to Generalized One S.D. Innovations



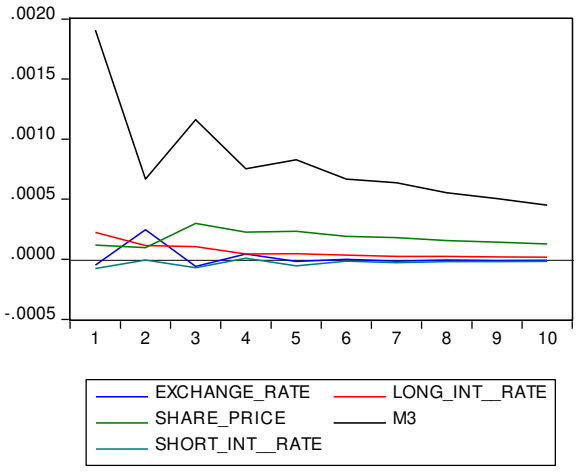
Response of LONG_INT__RATE to Generalized One S.D. Innovations



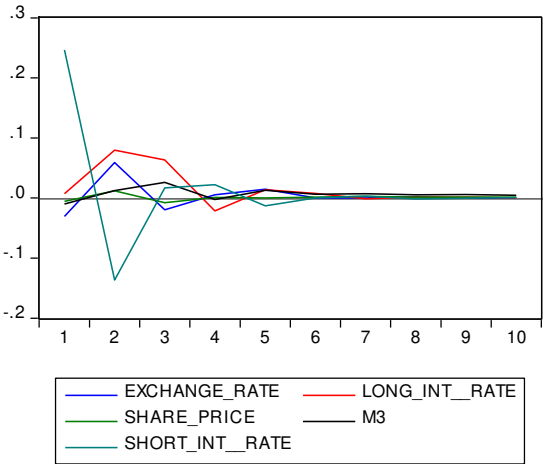
Response of SHARE_PRICE to Generalized One S.D. Innovations

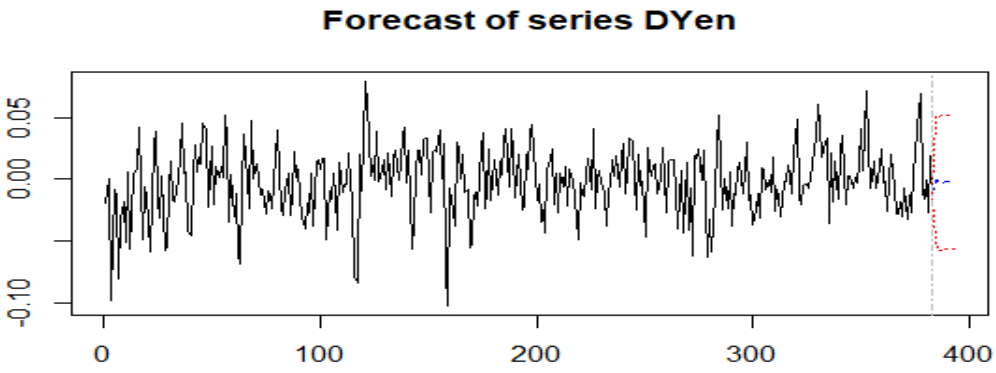


Response of M3 to Generalized One S.D. Innovations



Response of SHORT_INT__RATE to Generalized One S.D. Innovations




Forecast of series DYen
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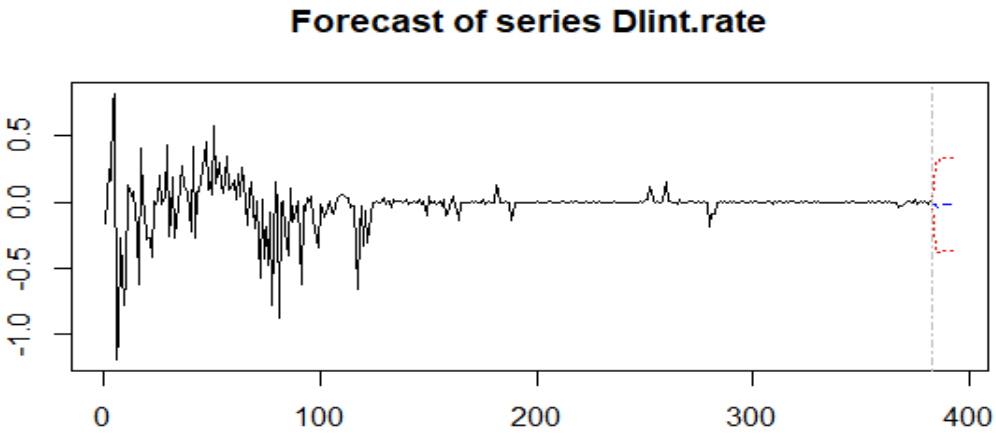
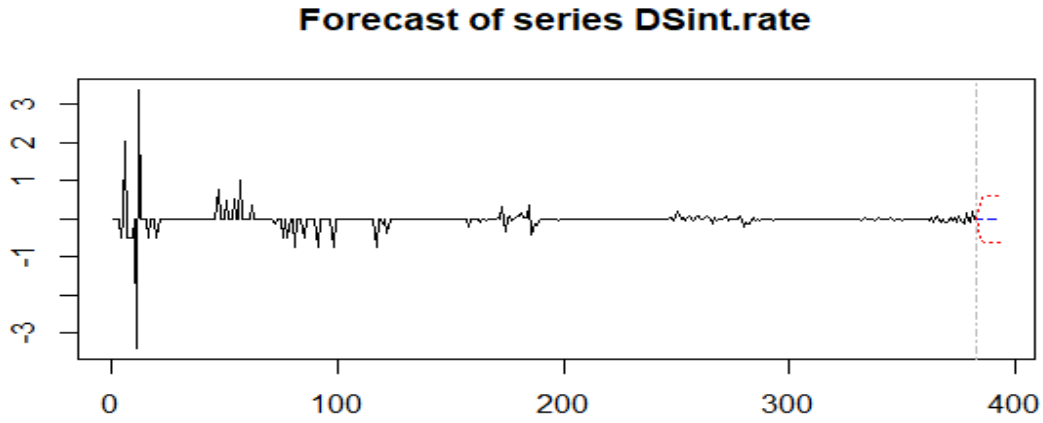
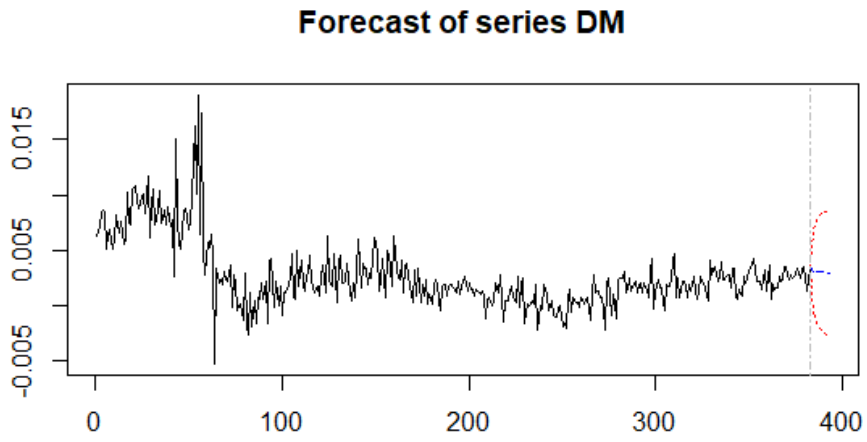
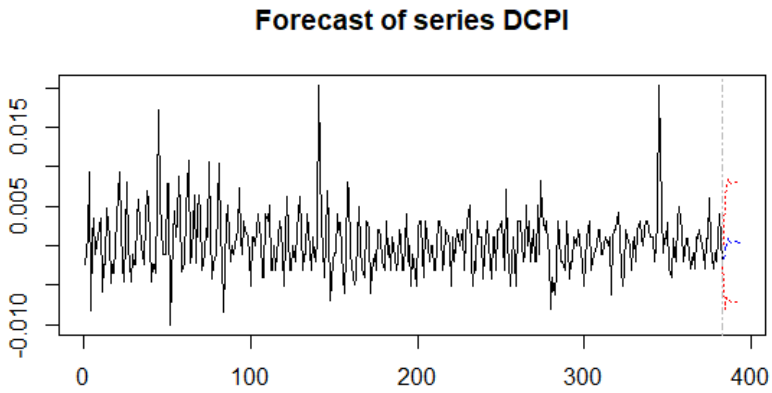
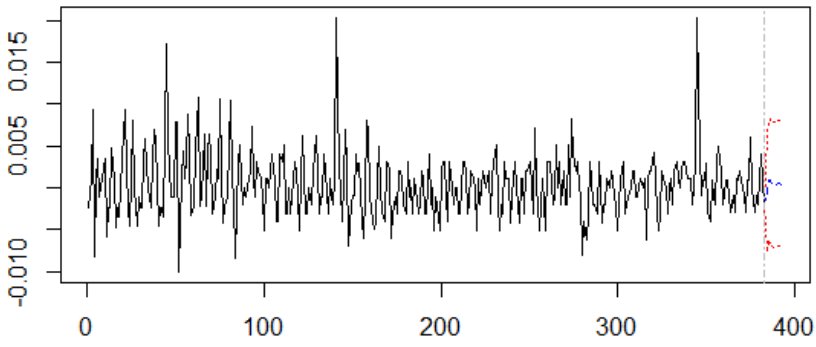
0.05
0
100
200
300
400


Forecast of series Dlint.rate
-1.0
-0.5
0.0
0.5
0
100
200
300
400

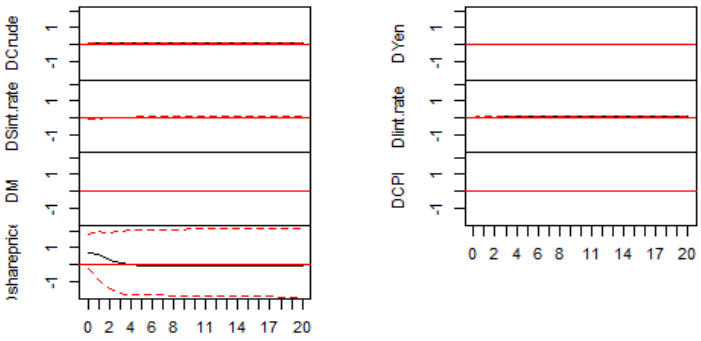

Forecast of series DSint.rate
-3
-1
1
2
3
0
100
200
300
400


Forecast of series DM
-0.005
0.005
0.015
0
100
200
300
400


Forecast of series DCPI
-0.010
0.005
0.015
0
100
200
300
400

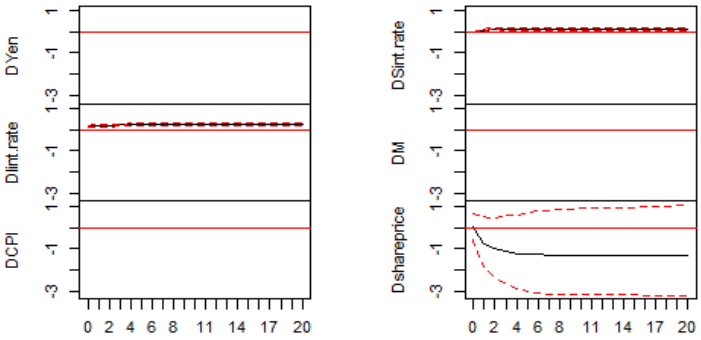

Forecast of series DCPI
-0.010
0.005
0.015
0
100
200
300
400

Orthogonal Impulse Response from DCrude (cumulative)



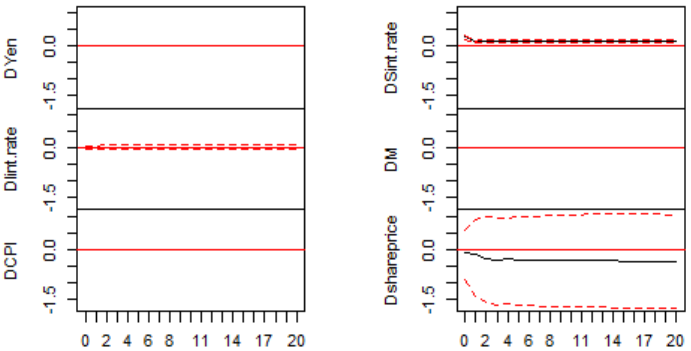
95 % Bootstrap CI, 100 runs

Orthogonal Impulse Response from Dlint.rate (cumulative)



95 % Bootstrap CI, 100 runs

Orthogonal Impulse Response from DSint.rate (cumulative)



95 % Bootstrap CI, 100 runs

	Granger	Instantaneous
Exogenous -Crude oil prices- VAR(2)		
CPI	Yes	Yes
Call money rate	No	No
Exchange rate	Yes	Yes
Share price	No	No
M1	No	No
Policy rate	No	No
Without Exogenous -Crude oil prices- VAR(2)		
CPI	No	No
Call money rate	Yes	Yes
Exchange rate	Yes	Yes
Share price	No	No
M1	No	No
Policy rate	No	No