Efficiency of Quantitative Easing in Japan during (2001,2006) through Estimation of Precautionary Money Demand-II

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Abstract

This paper investigates the effect of “quantitative easing monetary policy (QEMP)” which the Bank of Japan (BOJ) adopted from March 2001 through March 2006, by changing operating target for money market from interest rate to the monetary base that is defined as the sum of “Cash” and “Reserve Deposit at the BOJ”. The paper confirms that the monetary policy has contributed to the recovery of the prolonged deflation. First we comparatively investigate economic activities in the usual economy period of (1981,1998) and in the zero interest rate period of (1999,2006), where vector autoregressive (VAR) model of (call rate, exchange rate, stock, nominal GDP, price) is estimated with “call rate” replaced by “Reserve” in the latter period. A monetary easing policy is effective through transmission path of stock market in both periods. Next we decompose money stock into transaction money and precautionary money to evaluate the transmission mechanism of the effect of reserves on the real economy by taking into account the financial anxiety. We have found a quantitative easing shock firstly increase “precautionary money” and secondly raise “Tankan”, which dispel the anxiety, and finally attain to “transaction money” and output.

1 Introduction

In 2001, the Bank of Japan (BOJ) adopted “quantitative monetary easing”. Since short term interest rates became almost zero, the operating target of monetary policy was changed from interest rate to the monetary base that is defined as the sum of “Cash” and “Reserve at the BOJ”. Honda et al[1] showed that “Reserve at the BOJ” in (2001,2006) is effective to the economy through a transmission path in a stock market. Harada et al[2] supported Honda’s result with an additional transmission path of balance sheet of banks, where monetary base is used in monthly data.

“Reserve at the BOJ” was 4000 billion yen in 2001 and 30000 billion yen in 2003. Since interest rates were almost zero in (2001,2006), “Reserve” can be regarded as a control variable in monetary policy. Following Honda and Harada, we can show effectiveness of “Reserve” in a system of (reserve, exchange rate, stock, GDP, price) with quarterly data. However, the real economic activity is directly related to the money “M1” and/or “M2+CD”, where the latter is a representative money before 2007 and is given by $M2 + CD = M1 + quasi money + CD$. Morita and Miyagawa[3] investigated the relation between “Reserve” and “M2 + CD”. Decomposing “M2 + CD” into transaction money demand (for consumption) and precautionary money demand (for saving), we showed the estimation results of two kinds of money demand. In this paper, estimation of precautionary money demand in [3] is extensively improved by assuming precautionary money as a function of “Tankan”, “GDP” and “Reserve”. Strong relationship between “GDP” and estimated transaction money demand is shown by cointegration property.

2 Data Properties

2.1 List of variables

Variables and symbolic notions are given in Table 1, and some of them are depicted in Fig.1. All data except for the core CPI are obtained from Website of Bank of Japan. The core CPI is obtained from Website of Ministry of Internal Affairs and Communications. These data are quarterly with sample period (1981q1,2007q4).

| $call(t)$ | call rate | $bojdep(t)$ | Reserve at BOJ |
| $m2(t)$ | $M2+CD$ | $y(t)$ | ln(nominal GDP) |
| $rgdp(t)$ | nominal GDP | $r_gdp(t)$ | real GDP |
| $lnstk(t)$ | ln(stock) | $ln CPI(t)$ | ln(core CPI) |
| $lnex(t)$ | ln(exchange rate), (yen/dollar) | $tankan(t)$ | business cycle of Tankan Diffusion Index |
| $tankan(t)$ | max($tankan$, 0) | $tankan_{min}(t)$ | min($tankan$, 0) |

Table 1: List of variables

3.1 Basic behavior in (1981q1,1998q4)

Letting $x = (\text{call}, \ln ex, \ln stk, y, \ln cpi)'$, we consider a system described by VAR model of the form:

$$x(t) = A_0 + A_1 x(t-1) + A_2 x(t-2) + \varepsilon(t),$$

where the lag order is determined to be 2 by AIC.

Impulse responses of Eq.(1) are depicted in Fig.2, where an impulse shock is given by one standard deviation with the usage of the inverse of the Cholesky factor of the residual covariance matrix. A solid line implies a calculated impulse response and two dotted lines show 95% confidence intervals given by ±2 s.e., where the response standard errors are analytically computed. At the 1st column of Fig.2, the impulse shock of the call rate is given, that is, the (1,1)-element of $\varepsilon(t)$ takes the value of 1 only at $t = 1$. Then the 1st panel of the 1st column exhibits the call rate behavior after the impulse shock of the corresponding call rate noise. The blue solid line is the calculated response of call rate. Since two dotted red lines show 95% confidence intervals, we can see that the call rate process keeps positive values till 5 periods. The 2nd panel of the 1st column is the behavior of the exchange rate process corresponding to the call rate shock. Although the blue line keeps positive, the lower red line takes negative values after the 3rd period. In this case, we can say that the exchange rate process takes the positive value till the 1st and 2nd period when the call rate shock is given to the system. At the 3rd panel of the 1st column, we can see that the stock process keeps negative when the call rate shock is given to the system, because the upper red line is almost zero. At the 4th panel of the 1st column, we cannot say anything about the nominal GDP, because two dotted lines contain the zero line and hence we cannot judge whether the nominal GDP is increased or decreased corresponding to the call rate shock. At the 5th panel of the 1st column, we cannot say strictly anything about the CPI process, but only tendency such that CPI is increased by the call rate shock. At the 2nd column of Fig.2, the exchange rate shock is given to the system. At the 1st panel of the 2nd column, the behavior of the call rate process is exhibited when the impulse shock of the exchange rate is added. At the 2nd panel of the 2nd column, the exchange rate process behaves, corresponding to the impulse shock of the exchange rate, and so on. Thus, we can see behaviors of the 1st to the 5th column as follows:

1st: $\text{call}(\uparrow) \implies \ln ex(\uparrow), \ln stk(\uparrow)$
2nd: $\ln ex(\uparrow) \implies \text{call}(\uparrow), \ln stk(\downarrow)$
3rd: $\ln stk(\uparrow) \implies \text{call}(\uparrow), \ln ex(\downarrow), y(\uparrow), \ln cpi(\downarrow)$
4th: $y(\uparrow) \implies \ln cpi(\uparrow)$
5th: $\ln cpi(\uparrow) \implies \text{not significant}$

2.2 Unit root test in (1981q1, 2007q4)

Two kinds of tests are carried out. One is DF-GLS (ERS) test with unit root as the null hypothesis and the other is KPSS test with stationarity as the null hypothesis. If unit root of a process is not rejected by ERS test, then we can expect that the process is nonstationary. By combining ERS test with KPSS test, the detecting power of unit root test becomes large. The stationary. By combining ERS test with KPSS test, we can say that the process is stationary. If unit root of a process is not rejected by ERS test, then we can expect that the process is nonstationary.

Letting $\varepsilon(t) = (\text{call}, \ln m2, \ln ngdp, \ln stk, \ln cpi, \ln tankan)'$, we consider a system described by VAR model of the form:

$$x(t) = A_0 + A_1 x(t-1) + A_2 x(t-2) + \varepsilon(t),$$

where the lag order is determined to be 2 by AIC.

Impulse responses of Eq.(1) are depicted in Fig.2, where an impulse shock is given by one standard deviation with the usage of the inverse of the Cholesky factor of the residual covariance matrix. A solid line implies a calculated impulse response and two dotted lines show 95% confidence intervals given by ±2 s.e., where the response standard errors are analytically computed. At the 1st column of Fig.2, the impulse shock of the call rate is given, that is, the (1,1)-element of $\varepsilon(t)$ takes the value of 1 only at $t = 1$. Then the 1st panel of the 1st column exhibits the call rate behavior after the impulse shock of the corresponding call rate noise. The blue solid line is the calculated response of call rate. Since two dotted red lines show 95% confidence intervals, we can see that the call rate process keeps positive values till 5 periods. The 2nd panel of the 1st column is the behavior of the exchange rate process corresponding to the call rate shock. Although the blue line keeps positive, the lower red line takes negative values after the 3rd period. In this case, we can say that the exchange rate process takes the positive value till the 1st and 2nd period when the call rate shock is given to the system. At the 3rd panel of the 1st column, we can see that the stock process keeps negative when the call rate shock is given to the system, because the upper red line is almost zero. At the 4th panel of the 1st column, we cannot say anything about the nominal GDP, because two dotted lines contain the zero line and hence we cannot judge whether the nominal GDP is increased or decreased corresponding to the call rate shock. At the 5th panel of the 1st column, we cannot say strictly anything about the CPI process, but only tendency such that CPI is increased by the call rate shock. At the 2nd column of Fig.2, the exchange rate shock is given to the system. At the 1st panel of the 2nd column, the behavior of the call rate process is exhibited when the impulse shock of the exchange rate is added. At the 2nd panel of the 2nd column, the exchange rate process behaves, corresponding to the impulse shock of the exchange rate, and so on. Thus, we can see behaviors of the 1st to the 5th column as follows:

1st: $\text{call}(\uparrow) \implies \ln ex(\uparrow), \ln stk(\downarrow)$
2nd: $\ln ex(\uparrow) \implies \text{call}(\uparrow), \ln stk(\downarrow)$
3rd: $\ln stk(\uparrow) \implies \text{call}(\uparrow), \ln ex(\downarrow), y(\uparrow), \ln cpi(\downarrow)$
4th: $y(\uparrow) \implies \ln cpi(\uparrow)$
5th: $\ln cpi(\uparrow) \implies \text{not significant}$

Table 2: Unit root test in (1981q1, 2007q4)

<table>
<thead>
<tr>
<th>var.</th>
<th>ERS</th>
<th>lag</th>
<th>KPSS</th>
<th>c+trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>call</td>
<td>0.2594</td>
<td>0</td>
<td>0.7951 ***</td>
<td>c</td>
</tr>
<tr>
<td>ln(bojdpst)</td>
<td>-1.4355</td>
<td>1</td>
<td>0.2627</td>
<td>c</td>
</tr>
<tr>
<td>ln(m2)</td>
<td>0.1121</td>
<td>5</td>
<td>1.102 ***</td>
<td>c</td>
</tr>
<tr>
<td>ln(ngdp)</td>
<td>-0.2859</td>
<td>3</td>
<td>0.2952 ***</td>
<td>c+trend</td>
</tr>
<tr>
<td>lnex</td>
<td>-0.3354</td>
<td>3</td>
<td>0.8101 ***</td>
<td>c</td>
</tr>
<tr>
<td>lnstk</td>
<td>-1.467</td>
<td>1</td>
<td>0.060</td>
<td>c</td>
</tr>
<tr>
<td>lncpi</td>
<td>0.6047</td>
<td>4</td>
<td>0.9974 ***</td>
<td>c</td>
</tr>
<tr>
<td>tankan</td>
<td>-2.618 ***</td>
<td>1</td>
<td>0.2040</td>
<td>c</td>
</tr>
</tbody>
</table>

***, ** and * denote significance levels of 1%, 5% and 10% respectively. call and ln(bojdpst) are tested in (1981q1,1998q4) and (1999q1,2007q4) respectively, while other variables are in (1981q1,2007q4).
Fig. 2: Impulse responses of the system with $x = (\text{call}(t), \lnex(t), \lnstk(t), y(t), \lncri(t))^\prime$ in (1981q1,1998q4)

Fig. 3: Impulse responses of the system with $x = (\ln(baj_{dpst}(t)), \lnex(t), \lnstk(t), y(t), \lncri(t))^\prime$ in (1999q1,2006q1)
where \( \ln ex(\uparrow) \) implies “low appreciation of yen”.

We can conclude that there is a transmission path such that \( \text{call}(\downarrow) \rightarrow \ln stk(\uparrow) \rightarrow y(\uparrow) \), and there is a sub-transmission path such that \( \text{call}(\downarrow) \rightarrow \ln ex(\downarrow) \rightarrow \ln stk(\uparrow) \rightarrow y(\uparrow) \).

### 3.2 Basic behavior in (1999q1, 2006q1)

With \( \text{call} \) replaced by \( \ln(\text{boj}_\text{dpst}) \), we define \( x = (\ln(\text{boj}_\text{dpst}), \ln ex, \ln stk, y, \ln cpi)^\top \) in the zero interest rate period (1999q1, 2006q1). We consider a system described by VAR model of the form:

\[
x(t) = A_0 + A_1 x(t-1) + \varepsilon(t),
\]

where the lag order is determined to be 1 by AIC.

Impulse responses of Eq.(2) are depicted in Fig.3. We can see behaviors of the 1st to the 5th column as follows:

1st: \( \ln(\text{boj}_\text{dpst})(\uparrow) \Rightarrow \ln ex(\downarrow) \ln stk(\uparrow) y(\upsilon) \)

2nd: \( \ln ex(\uparrow) \Rightarrow y(\uparrow) \)

3rd: \( \ln stk(\uparrow) \Rightarrow \ln(\text{boj}_\text{dpst})(\downarrow) \ln ex(\downarrow), y(\upsilon), \ln cpi(\uparrow) \)

4th: \( y(\uparrow) \Rightarrow \ln ex(\uparrow) \)

5th: \( \ln cpi(\uparrow) \Rightarrow \ln(\text{boj}_\text{dpst})(\downarrow) \ln ex(\downarrow) \ln stk(\uparrow) y(\upsilon) \)

We can conclude that there is a transmission path such that \( \ln(\text{boj}_\text{dpst})(\uparrow) \rightarrow \ln stk(\uparrow) \rightarrow y(\uparrow) \). The effect of \( \ln stk \) influences to \( \ln cpi \) as well as \( y \), and the change of \( \ln cpi \) improves the deflation in the 5th column. Exchange rate does not seem to be effective in this QE period.

### 4 Decomposition of \( m2 \) into Transaction and Precautionary Money Demands in (1981q1, 2007q4)

In this section, we statistically quantify how much money contributed to the recovery of the economy when the BOJ increased reserves. We would decompose the money stock into the transaction money and the precautionary money.

### 4.1 Estimation of precautionary demand

Precautionary demand will increase when the liquidity concern among the private sector intensify in the depression, while its demand will decrease when the concern dispels in the boom. We use here the Corporate Financial Position Diffusion Index issued quarterly by Bank of Japan known as TANKAN in order to qualify the unobservable variable, which would affect the precautionary demand. Properties of precautionary demand can be listed as follows:

- **GDP(↑) \Rightarrow prec.demand(↑)** as Keynes said.
- **prec.demand(↑) for future anxiety when economy is in depression.**

#### [Assumption of prec. demand]

\[
\begin{align*}
\text{prec.demand}(t) & = c_1 * \text{ngdp}(t) \\
& + (c_2 * \text{tankan}_n(t) + c_3 * \text{tankan}_p(t)) * \frac{\text{m}2(t)}{100} \\
& + c_4 * \text{boj}_\text{dpst}(t-1) * \text{dummy}_\text{dpst}(t-1)
\end{align*}
\]

In our earlier paper [3], the 1st term on the RHS of Eq.(3) was given as a stochastic trend which takes a constant value in every year. In this paper, we changed a stochastic trend into \( \text{ngdp}(t) \) and succeeded in good estimation of prec.demand. The 2nd term on the RHS means that the precautionary money demand is a function of tankan, because people try to hold more money when financial anxiety rises, and that the demand may depend on the level of \( m2 \). It should be noted that, in the estimation, \( \text{tankan} \) itself becomes significant. However, when we decompose \( \text{tankan} \) into \( \text{tankan}_n \) and \( \text{tankan}_p \) in the above assumption form, the coefficient \( c_2 \) of \( \text{tankan}_n \) becomes significant, while \( c_3 \) of \( \text{tankan}_p \) is not significant. So, we delete \( \text{tankan}_p \) in the estimation of prec.demand. The 3rd term represents effect of the BOJ’s monetary policies with operational lags \( (t-1) \). This lag was determined so as to maximize the log-likelihood function stated below. We take into consideration the policy change by adding the dummy variable. The BOJ adopts the zero interest rate policy in February 1999 and temporarily lifts its policy in August 2000. It implements the QEMP from March 2001 through March 2006. We have set both of \( \text{call} \) and \( \text{boj}_\text{dpst} \) as monetary policies, but \( \text{call} \) does not become significant so as to be deleted here in Eq.(3).

#### [Log-likelihood function]

The growth rate model of nominal output is taken into consideration, and the log-likelihood function of Delta \( \ln(\text{ngdp}) \) should be maximized with respect to every parameter containing prec. demand:

\[
\Delta \ln(\text{ngdp}(t)) = d_1 * \Delta \ln(\text{ngdp}(t-2)) + d_2 * \Delta \ln(m2(t-1) - \text{prec.demand}(t-1)) + d_3 * \Delta \ln(m2(t-2) - \text{prec.demand}(t-2)),
\]

where, on the RHS of Eq.(4), a constant term \( d_0 \) has been deleted because the change of \( \text{ngdp}(t) \) should be explained by that of “trans. demand(t)”, and where
$\Delta \ln(n_gdp(t - 1))$ has been deleted because the estimated coefficient was not significant.

Estimation results in Eqs.(3) and (4) are shown in Table 3.

Table 3: Estimation result of Eqs.(3) and (4) in (1981q1, 2007q4)

<table>
<thead>
<tr>
<th>coefficients</th>
<th>std.error</th>
<th>z-statistics</th>
<th>prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$c_1$</td>
<td>12.78</td>
<td>10.01</td>
<td>1.276</td>
</tr>
<tr>
<td>$c_2$</td>
<td>-0.0975</td>
<td>0.0340</td>
<td>-2.862</td>
</tr>
<tr>
<td>$c_3$</td>
<td>1.217</td>
<td>1.193</td>
<td>1.019</td>
</tr>
<tr>
<td>$d_1$</td>
<td>0.180</td>
<td>0.108</td>
<td>1.673</td>
</tr>
<tr>
<td>$d_2$</td>
<td>0.2219</td>
<td>0.1212</td>
<td>1.8307</td>
</tr>
<tr>
<td>$d_3$</td>
<td>0.1726</td>
<td>0.0769</td>
<td>2.244</td>
</tr>
</tbody>
</table>

In (2001q1, 2006q1) during QEMP period, the actual developments of the trans. demand (left axis) and prec. demand (right axis) are shown in Figure 5. In this figure during the QEMP period, prec. demand rapidly increases, while trans. demand gradually increases. In the zero interest rates period, there may exist the phenomena of “Liquidity trap” such that easing money by the central bank is only saved without consumption. However, in our estimation, prec. demand increases while trans. demand is also increasing gradually. We may insist that the “Liquidity trap” does not exist in QEMP period (2001q1,2006q1). The conclusion for “Liquidity trap” is shown in the following subsection 4.2.

### 4.2 The role of tankan in transmission mechanism of QEMP during (2001q1,2006q1)

We estimate VAR model of ($\ln(boj_{dpst}(t))$, $tankan(t)$, $\ln(trans.demand(t))$, $\ln(prec.demand(t))$). We focus on the role of tankan in the transmission mechanism of easing monetary policy.

Figure 6 shows impulse responses to a one standard deviation shock to four variables.

1st: $\ln(boj_{dpst}(\uparrow)) \Rightarrow \ln(tankan(\uparrow))$
2nd: $\ln(tankan(\uparrow)) \Rightarrow \ln(boj_{dpst}(\downarrow))$
3rd: $\ln(trans.demand(\uparrow)) \Rightarrow \ln(prec.demand(\downarrow))$
4th: $\ln(prec.demand(\uparrow)) \Rightarrow$ not significant

The estimation results are summarized as follows.

A quantitative monetary easing has a positive effect on Japan’s prolonged deflation. In the 1st column of Fig.6, an increase of reserves makes prec. demand increased first. Secondly, tankan rises, which means dispel of the anxiety in the future. Thirdly, trans. demand rises, which implies that reserves arrive to the final goal of “GDP”. Furthermore, rises of both prec. demand and trans. demand indicate that a liquidity trap in the period of the QEMP does not exist.

In the 2nd column of Fig.6, an increase of tankan also raises trans. demand and at the same time decreases prec. demand. The rise of tankan makes people’s mind changed from negative to positive one. The BOJ decreases reserves when tankan and GDP through trans. demand are improved.

In the 3rd column of Fig.6, an increase of trans. demand also exhibits that of prec. demand, which is due to the property such that an increase of GDP causes that of trans. demand as well as prec. demand.

Figure 4 shows the nominal money stock $m_2$ and the trans. money demand. The difference “$m_2 - trans.demand$” measures the prec. demand. We find that the difference begins to expand rapidly around 1990 when the bubble economy busted and once again expand around 2001 when the QEMP has been introduced.

Figure 5: Estimation results of $trans.demand$ (left axis) and $prec. demand$ (right axis) in QEMP period of (2001q1, 2006q1)
4.3 Cointegration property between $\ln(ngdp)$ and $\ln(\text{trans.demand})$ in (1981q1, 2007q4)

For simplicity, we shall consider VAR model of $x(t) = (x_1(t), x_2(t))'$ described by

$$x(t) = \sum_{i=1}^{k} A_i x(t-i) + \Phi D(t) + \varepsilon,$$

(5)

where the deterministic terms $D(t)$ can contain a constant, a linear term of $t$ or other regressors that we consider non-stochastic. We assume that $x_i(t)$ ($i = 1, 2$) is nonstationary and that $\Delta x_i(t) = x_i(t) - x_i(t-1)$ is stationary. Equation (5) can be written by the following form:

$$\Delta x(t) = \sum_{i=1}^{k} B_i \Delta x(t-i) + B_k x(t-k) + \Phi D(t) + \varepsilon(t),$$

(6)

where $B_i$ is defined by

$$B_i = -(I - \sum_{j=1}^{i} A_j).$$

(7)

Cointegration property is given by the condition $0 < \text{rank}(B_k) < \text{full rank}$. Notice that a linear combination of nonstationary variables $x_1(t)$ and $x_2(t)$ becomes stationary. We call such a linear combination as “cointegrating equation”:

$$x_1(t) + \beta x_2(t) + c_0 + c_1 t = \varepsilon(t),$$

(8)

where $\varepsilon(t)$ is an independent identically distributed error process. A cointegrating equation can be classified to several cases, depending on whether the equation contains a constant term or a linear term of $t$. In this paper, we set a cointegrating equation in a form of Eq.(8). For more detail, see Johansen[4].

We set $x_1(t) = \ln(ngdp(t))$ and $x_2(t) = \ln(\text{trans.demand}(t))$. Furthermore the lag order in Eq.(5) is set to be $k = 2$ by AIC. Cointegration test by Johansen[4] is carried out. We can show the existence of one cointegrating vector in (1981q1, 2007q4). Table 4 is a result of cointegration test which exhibits the existence of one cointegrating vector in (1981q1, 2007q4). Equation(8) becomes

Table 4: Cointegration Test of $\ln(ngdp)$ and $\ln(\text{trans.demand})$ in (1981q1, 2007q4)

<table>
<thead>
<tr>
<th>Test for the number $r_c$ of cointegrating vectors</th>
<th>Eigenvalues</th>
<th>$\alpha$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypo.</td>
<td>$r_c = 0$</td>
<td>0.066</td>
</tr>
<tr>
<td>$\Delta \ln(ngdp)$</td>
<td>-0.082</td>
<td>(0.015)</td>
</tr>
<tr>
<td>$\Delta \ln(\text{trans})$</td>
<td>0.003</td>
<td>(0.021)</td>
</tr>
<tr>
<td>Cointegrating coefficients $\beta, c_0, c_1$</td>
<td>$\ln(ngdp)$</td>
<td>$\ln(\text{trans})$</td>
</tr>
<tr>
<td>$\text{coint}$</td>
<td>1.00</td>
<td>-0.872</td>
</tr>
<tr>
<td></td>
<td>(0.074)</td>
<td>(0.001)</td>
</tr>
</tbody>
</table>

* denotes rejection of hypothesis at 5 % significance level. $p(\text{trace.stat.})$ is $p$-value of $\text{trace.stat.}$ and $p(\lambda_{max})$ is that of $\lambda_{max}$. A lagged difference is set to be 1. Adjustment coefficients $\alpha$ and cointegrating coefficients $\beta'$ are shown with standard error denoted by (· · ·).
\[
\ln(ngdp(t)) - 0.872 \ln(\text{trans.demand}(t)) \\
+1.12 + 0.0069 \times t = \epsilon(t).
\]

(9)

In the above cointegrating equation, we introduced a trend term. Unfortunately without this term, a cointegrating relationship does not hold. Notice that in the derivation of prec.demand in Eqs.(3) and (4) we did not use the trend term at all. We guess that parameters in Eqs.(3) and (4) as well as the parameter 0.872 in Eq.(9) may change during (1981q1,2007q4) and that the existence of the trend term may explain the variation of such parameters.

5 Conclusions

Many macroeconomists and policy makers have discussed on the effectiveness of non-traditional monetary easing which the BOJ adopted at the zero lower bound on interest rate. Some blamed the BOJ by arguing the prolonged deflation of Japan’s economy attributed to the Bank of Japan’s past monetary policies. The other defend the BOJ’s policy by insisting that expanding unlimitedly the assets of the BOJ’s balance sheet without any favorable effect on the economy would risk the financial position of the Bank.

The paper challenged the policy issues by quantifying statistically the effect of the monetary easing, during the period of QEMP. We have found monetary easing has a positive effect on the output through stock prices by estimating VAR model five variables; reserves, exchange rate, stock, nominal GDP and price.

Next we have estimated the transmission mechanism of the effect of monetary easing by decomposing money stock into transaction money and precautionary money by maximum likelihood estimation. Some argued that Japan’s economy already fall into a liquidity trap. They insisted that additional money would be absorbed as a precautionary demand even if central bank increased the base money.

By combining prec.money and trans.money with \( boj_{dpst} \) and tankan, we quantified statistically how much money was absorbed into precautionary money through the concept of expectation variable (tankan). People tend to increase the precautionary demand if the deflation is expected to continue. We found that the precautionary money increases rapidly after the \( boj_{dpst} \) was suddenly increased as the QEMP in 2001. However, at the same time, tankan also began to increase and through the improvement of tankan, transaction money firmly increased to recover the economy. The new policy seems to mitigate the cash-flow constrain of firms and households. Thus, we conclude that the QEMP has the positive effect on the economy by dispelling future deflationary concerns. We also confirm the non-existence of a liquidity trap in the QEMP period.

References


