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Evaluation of Monetary Easing Policy in Japan:

Integration between the US and Japanese markets

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Abstract

This paper examines the effectiveness of monetary policy on domestic monetary and financial markets and the real economy in Japan, based on the VAR (Vector autoregressive) model from 2001 to 2014, covering the period of the Quantitative Monetary Easing Policy (QE, 2001-2006), Comprehensive Monetary Easing (CME, 2010-2011), as well as the Qualitative and Quantitative Monetary Easing (QQE) Policy (2013～) in Japan.

The result shows that monetary easing policy has become increasingly less effective in controlling the domestic market, and it has become more difficult for BOJ to put postive effect on the real economy in Japan through the current QQE under increasing international capital flows, that have been accerelated under the Federal Reserves' QE2 and QE3. It is clear that the abundant liquidity provided by BOJ is not effectively utilized for productive investment even under the extremely easy monetary policy in Japan. This could be accounted for by the fact that the liquidity has been invested in the monetary and financial markets in the US and Japan, which have become more associated each other recently after the Global Financial Crisis. The analysis based on Granger Causality Test and Impulse Response Functions shows that the base money and money stocks, as well as other variables in Japan have increasingly associated with that of the USA, and both markets have become significantly integrated.

1.Introduction

This paper examines the effectiveness of Bank of Japan (BOJ)'s monetary policy in both the domestic and the US monetary and financial markets as well as the real economy, based on the VAR (Vector autoregressive) model from April 2001 to June 2014, covering the periods of QE (2001-2006), CME (2010-2012) and the QQE(2013-).

Bank of Japan initiated the Quantitative Monetary Easing Policy (QE) in 2001, which was terminated in March 2006, while BOJ continued the 'Zero interest-rate' policy introduced in 1999. BOJ introduced 'Comprehensive Monetary Easing' since October 2010, which is followed by 'Quantitative and Qualitative Monetary Easing (QQE), the program of asset purchase with US$1.4 trillion in two years, initiated in April 2013. The QQE policy pushed up stock prices with depreciation of exchange rate of Yen byMay 2013. However, monetary easing, especially QQE, has not directly increased in bank lending for domestic production. The Federal Reserve (FRB) also introduced monetary easing policy with Large Scale Asset Purchases[LSAPs], and its effects on the markets in the US and Japan have become substantialy large, as shown in this paper. It is widely recognized that

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the Federal Reserve's Quantitative Easing, especially QE2(Nov. 2010 –June 2011) and QE2 (Sept. 2012-), has influenced on the monetary policy in many countries. Such an extremely monetary easing accelerated liquidity supply in the global market though carry trade and other financial transactions. The market in Japan is also considered to be increasingly influenced by the capital flows under the QE2 and QE3.

Extremely easy monetary policy, therefore, may not be directly effective in putting positive impact upon the domestic economy and market in Japan, since cross-border capital flows have significantly increased especially after the Global Financial Crisis (2008/9), when monetary easing policies were adopted by major advanced economies, including Japan and the USA. That could have facilitated capital/ financial investment in the US and other markets[2].

The effects of monetary easing policies on the financial market and the real economy in Japan have been studied by several scholars particularly during the Quantitative Easing period (2001-2006). Although international capital flows have put significant impact upon the domestic market and the real economy, the major past studies have not taken up the aspect of international context, including the effects of capital flows on the domestic monetary policy and financial/ monetarymarkets in Japan[3]. Also, there has not been any study on the effects of monetary easing policyof theUS FRB's extremely monetary easing on the markets in the US and Japan.

This paper examines the effects of BOJ and FRB's monetary easing policy on the US and Japanese markets, based on the analysis of VAR model, including variables such as monetary base(the US/Japan), BOJ Current account (including foreingbanks' excess reserve), as well as money stocks (M2), bond yields, and the stock prices in the US and Japan during April 2001 to June 2014. The major findings of the analysis obtained in this paper include: (i)The BOJ's monetary policy has become increasingly ineffective, in the sense that monetary policy instrument (BOJ Current Account, Base Money) has put insignificant effect on the monetary and financial market as well as the real economy over the whole period[4]; (ii) The monetary easing in both the US and Japan has bidirectional Garnger Causality in money stocks and monetary base and other variables in the market. The impulse response functions of various varibles also indicate that the related variables have influenced on the other markets and real economies bot not positively in both countries. This could be due to capital flows under the BOJ's comparehensive monetary easing and Quantitative and Qualitative monetary easing, as well the monetary easing policy under QE2 as well as QE3.

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[2] The monetary easing policy of FRB's QE2 also has not been proved as directly related to the US real economy. Martin Feldstein argues that QE2 led to a rise in the stock market, which in turn contributed to increasing consumption and the strong performance of the US economy in late 2010 (Statement on 24 February 2011). However, QE2 has put significant effect on the pressure for currency appreciation and inflation, and the higher commodity prices in the global market, while the effects on the domestic economy is not significant. The effect of QE3 is also questioned by Mr. Fischer, Governor of Dallas Reserve Boad (See Bloomberg dated 10th April, 2013)

[3] In this regard, Miyao(2006) shows that monetary policy had become ineffective in the 1990s through the analysis based on VAR model.

[4] Noguchi(2013a) maintais that monetary easing policies in Japan as well as that in the USA have not resulted in positive effect on the real economy.

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2. Research on the Effects of Monetary Policy in Japan

A number of studies have been undertaken on monetary policy and its effects on the monetary/financial market as well as the real economy in Japan, but past studies have focused mostly on the period of Quantitative Monetary Easing Policy [QE] (2001-2006), and almost all the studies have not examined the effects of monetary easing policy after the 'Lehman Shock' (2008), including the BOJ's Comprehensive Monetary Easing (CME) and the current QQE Policy Phase since Spring 2013.

Several studies suggest that QE (2001-2006) in Japan put the bond yield lower and had certain effects on the maturity and yield curve of the bonds, thereby stabilizing the market[5]. However, several studies pointed out that the effect of QE on the real economy was insignificant[6].

Major analyses based on VAR models on the monetary policy in Japan have been initiated in the 2000s, including the work by Teruyama (2001), which shows monetary policy had become ineffective, but the period of the analysis was confined to the analysis in the 1990s. Other studies based on the VAR models are basically analyses on the Quantitative Monetary Easing Policy period (2001-2006), but not covered more recent period until today. Harada and Masujima (2008) pointed out the effectiveness of the Quantitative Monetary Easing(2001-2006) on the real economy through stock market, based on the VAR model. Honda, Kuroki and Tachibana (2010) also show the effectiveness of monetary easing policy during 2001-2006 by adopting variables of CPI, industrial production, call rate, BOJ Current Account, Nikkei stock prices, and industrial production, based the VAR models. The study by Honda and Tachibana (2011) extended the covered period from 1996 to March 2010, including dummy variable for the period of Quantitative Monetary Easing (2001-2006), and claims that monetary policy was effective in increasing industrial production through the route of stock market.[7] However, the significant rise of stock price in Tokyo, reached its highest level in the past few years in Spring 2013, might be the resul of investors' expectation of the Japanese authority's stance in the monetary policy and depreciation of Yen, rather than the actual change in the monetary base, and the effect of monetary easing has already been faded away in the market since the mid-2013 until today.

Therefore, the results of previous studies may not be valid for the discussion on the effectiveness of monetary easing that has significantly increased in the post Global Financial Crisis(2008). Ohta(2013) alreadysuggested that BOJ's monetary easing policy has not provided significant effects on the real economy as well as the domestic financial market, and that could be caused by increase in short-term capital flows. This paper examines not only the effects of increasing monetary base in Japan and shows that

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[5] Okina and Shiratsuka (2004) and Baba et al. (2006) indicated that the monetary easing policy did lower the yield curve of the government bond (JGB) with longer period, but the effects on the price levels and the real economy were limited. Ugai (2006) also suggested that the monetary easing had some effect in terms of lower risk premium during the QE period (2001-2006).

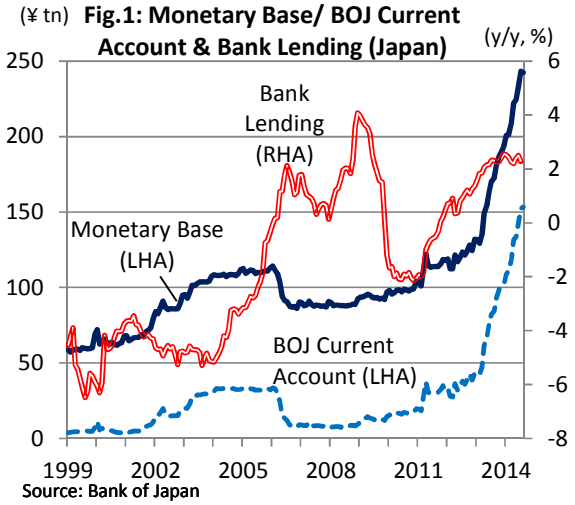
[6] Shiratsuka et al. (2010) also pointed out that QE might put expectation of easing policy to be positive among the private sector, but the effect on the real economy is limited.

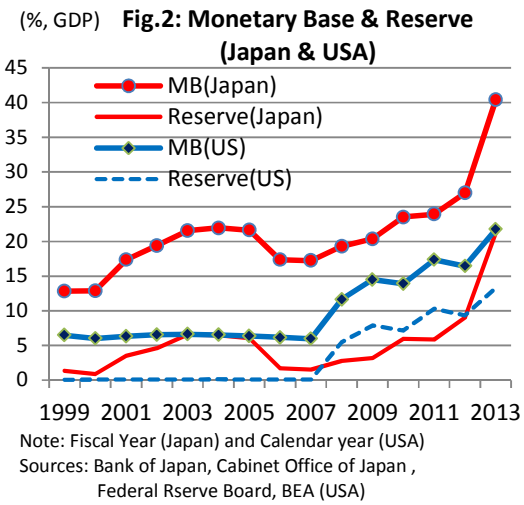
[7] Honda(2014) maintains the effectiveness of asset effect, however, the monetary easing since 2006 has not directly linked to stock prices in Japan, as the anaylisis of this paer shows.

monetary policy has become ineffective in activating the real economy and that no significant influences on the financial and monetary markets. This paper also focuses on the increasing causality between the Japanese and the US markets in terms of foreign banks' BOJ's Current Account, as well as monetary base and money stocks, which have significant inpact upon both markets that have become closely associated recently.

3. Monetary Policy and Financial Market in Japan

Monetary base, including Bank of Japan(BOJ) Current Account, have increased significantly, especially under the current Quantitative and Qualitative Monetary Easing(QQE), and the amount reached to ¥242 trillion and ¥151 trillion, respectively in August 2014 (Fig.1). On the other hand, bank lending has not increased substantially, despite of massively increased monetary base since 2013 (Fig.1). The size of the monetary base and BOJ Current Account in Japan are almost 40% of GDP (estimated by Author) and 21.3%, higher than that of the USA with 21.7% and 13.3%, respectively(Fig.2）.





Even under such a monetary easing policy, industrial production has not increased substantially until today, and monetary base is not associated with the Nikkei stock prices (Fig.3&4). There is no positive correlation and association between the stock prices and industrial production, nor money stocks(M2) and industrial production(Fig.5&6).

Monetary easing policy after the Global Financial Crisis in the US market seems to have achieved better performance in terms of stock prices and production, as compared with that in Japan (Fig.7&8). This could be due to the fact that the US economy is more influenced by asset effects of the stock prices, as compared with Japan. However, its is still not clear that the US monetary easing policy, including QE 2 and 3 has directly put positive impact upon the productive activities, as discussed later.

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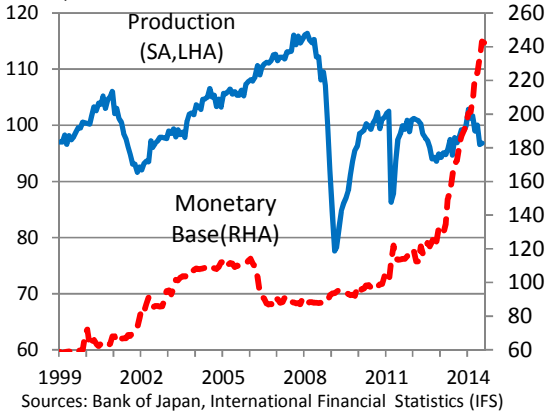
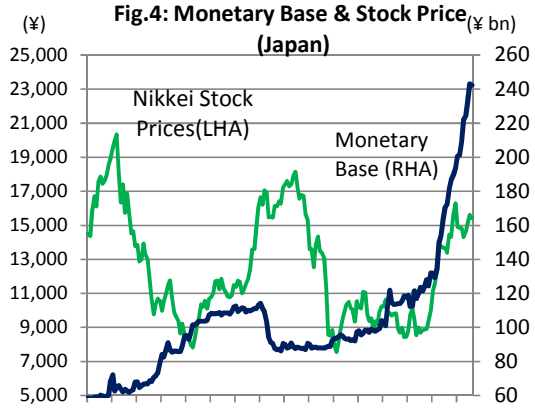
Fig.3: Monetary Base & Industrial Production (Japan)



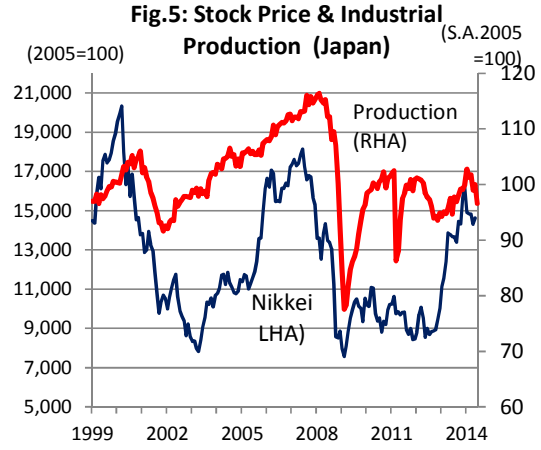
Sources: Bank of Japan, International Financial Statistics (IFS) database (IMF)

Fig.4: Monetary Base & Stock Price (Japan)



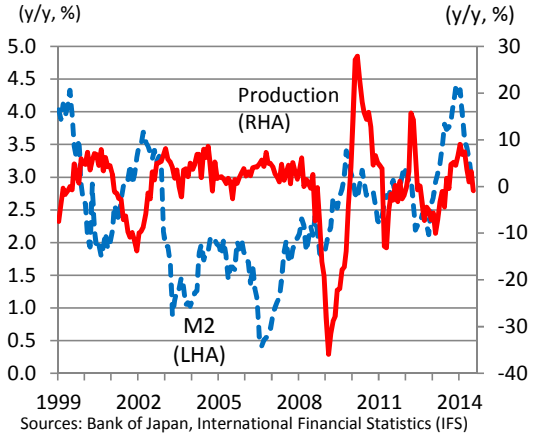
Sources: Bank of Japan, International Financial Statistics (IFS) database (IMF), Nikkei Profile

Fig.5: Stock Price & Industrial Production (Japan)



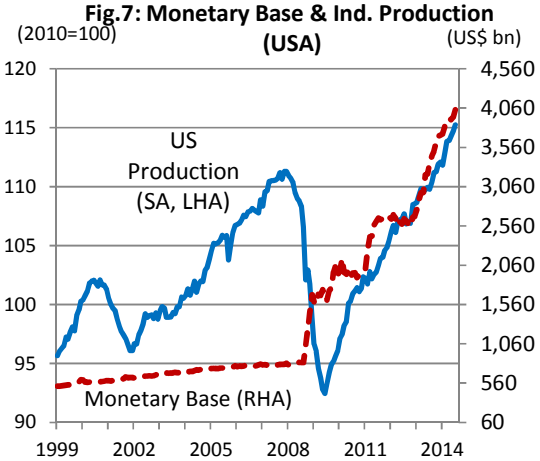
Sources: Bank of Japan, IFS)database (IMF), Nikkei Profile

Fig.6: M2 & Industrial Production (Japan)



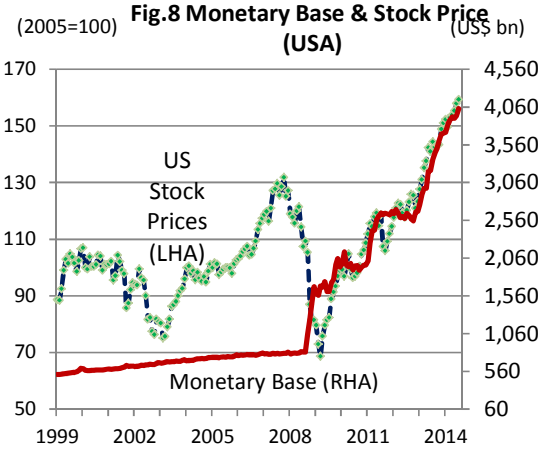
Sources: Bank of Japan, International Financial Statistics (IFS) database (IMF)

Fig.7: Monetary Base & Ind. Production (USA)



Source: International Financial Statistics (IFS) database (IMF)

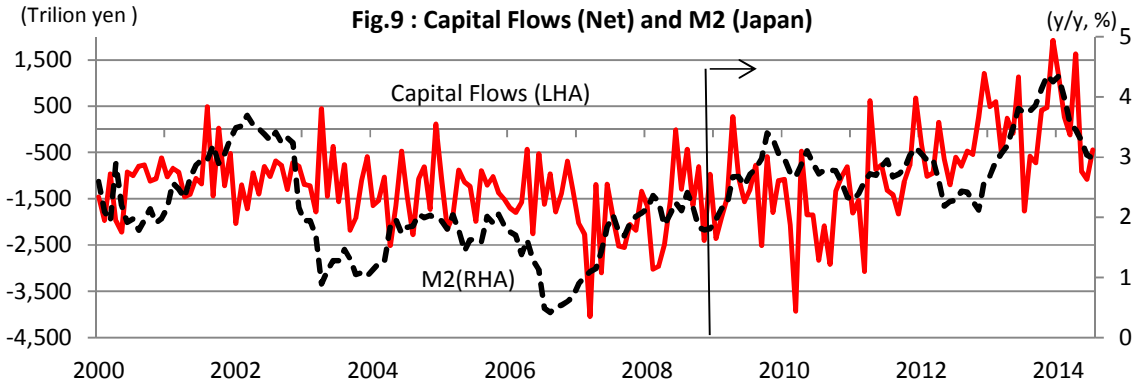
Fig.8 Monetary Base & Stock Price (USA)



Sources: nternational Financial Statistics (IFS) database (IMF)

There are several reasons why the BOJ's monetary easing policy has not been effective in influencing positively on the real economy. This could be partly explained by the fact that bank lending to the productive sector has not increased, irrespective of increase in the banks' BOJ current account. It is also important to note that substantial capital have flown in the domestic market, which increased money stocks, and influenced on the

monetary base provided by the BOJ. The liquidity provided by the BOJ has also been flown out to the international markets. Capital inflows from the external markets should also have influenced in the domestic market in Japan. It is shown by the fact that the changes in M2 have significant correlation with capital flows, especially after September 2008 (Fig.9). This could indicate that money stock held in the domestic financial sector is associalted with the capitalflows that originated from liquidity in the global market,especially the US market. This trend has become significant in recent years after the Global Financial Crisis. Thus, money stock is now closely linked to the overseas market under the current regime of capital market liberalization. As shown in Fig.9, and the coefficient of determination (R^2) and coefficient of the regression of M2 on capitals flows is fairly high (0.369) in recent years. It is necessary, therefore, that Monetary policy should be analysed under the context of capital flows that put significant effects on the domestic market.



Source: Bank of Japan, ternational Financial Statistics (IFS) database (IMF)

(2001.4-2008.8)
CapFlows ⇒ M2
(2001.4-2008.8)
Y = -0.01X + 677.5
(-3.445) (131.8)
R^2= 0.120
(figures in parenthisis are t-value)

(2008.9-2014.7)
CapFlows ⇒ M2
(2008.9-2014.7)
Y = 0.022X + 819.9
(6.346) (170.1)
R^2= 0.369
(figures in parenthisis are t-value)

In order to examine the above mentioned facts, the analysis is made based on Vetororautoregressive (VAR) model, to identify the overall ineffectiveness of recent BOJ's monetary easing policy and increasing association between the Jpanese and the US market in the following sections.

4. Vector Auto regression (VAR) Model and Analysis on Monetary Policy

4.1 General Explanation of the Analysis

This section is devoted to explanation on the VAR (Vector auto regression) model to be used for analysis on the effects of monetary policy on monetary and capital/ financial market, foreign exchange, as well as the real economy in Japan in the next section (Section5) . The effects of US monetary easing on the US domestic and the Japanese market s are also examined in Section 6.

The whole period (2001-2014) is divided into four periods:

(i) Quantitative Monetary Easing Period [April 2001- March 2006]
(ii) Period until 'Lehman Shock' [April 2006 – August 2008]
(iii) Post-Global Financial Crisis Period [September 2008 – February 2011]
(iv) Comprehensive Monetary Easing (CME) and Quantitative and Qualitative Monetary Easing (QQE) by Japan [March 2011 – June 2014] [8]
The sources of variables are shown in the table given below.

Variables	Abbreviation	Sources
Bank of Japan Current Account	BOJ AC	Bank of Japan (major data series)
BOJ Monetary Base	Monetary Base (MB)	Bank of Japan (major data series)
Money Stocks (Japan)	M2	Bank of Japan (major data series)
Government Bond Yields (JPN)	Yield	International inancial Statistics (IFS) database (IMF)
Real Effective Exchange Rate (JPN	REER	BIS effective exchange rate indices
Consumer price index (JPN)	CPI	Statistical Office (Japan), IFS database (IMF)
Nikkei Stock Prices	Stock(Nikkei)	Nikkei Profile database
Bank Lending	Lending(y/y)	Bank of Japan (major data series)
All Industry Activity Indices	Index	Ministry of Economy & Industry, Japan
Industrial Production	Production(Prod)	IFS database (IMF), Ministry of Economy & Industry, Japan
The US Monetary Base	USMB	IFS database (IMF), FRB
The US Money Stock (M2)	USM2	IFS database (IMF), FRB
Real Effective Exchange Rate (US)	USREER	BIS effective exchange rate indices
T-Bill yield (10 years maturity)	TB10Y	Federal Reserve Borad
T-Bill yield (2 years maturity)	TB2Y	Federal Reserve Borad
The US Stock Prices	USShare	IFS database (IMF)
Industrial Production (US)	USProd	IFS database (IMF)

4.2 VAR(Vector autoregressive) Model

The VAR model used in this paper is basically based on the equation given below. The first shock is provided by the monetary policy instruments (variables), including BOJ Current Account (BOJAC), Monetary Base (Japan and the US) , ForeignBanks' excess reserve of BOJ current account (FEXRESV) against other market variables such as money stocks(M2, Japan and the US), average government bond yield (Yield), and Stock Prices(Japan and the US). The variables on the market in Japan include Banks' lending (Lend), Real Effective Exchange Rate (REER), Consumer Price Index (CPI), All Industry Activity Index (Index), and industrial production (Prod) [9]..

$$Y_t = c + A_1 Y_{t-1} + A_2 Y_{t-2} + \ \ldots + A_p Y_{p-1} + B\varepsilon_t$$

Where c is constant vector matrix; A_t ：（n×n） matrix; ε_t ：（n×1） Shock Vector; B ： ε_t （n×l）：matrix for changing the disturbance term vector (u_t) ($u_t = B\varepsilon_t$)

The order of each variables of the VAR model is determined by the shock of the monetary policy and the impact on the market and the real economy. Most of the variables used for the analysis are with first-order difference to have stationality. The lag order is determined by SIC (Schwarz criterion, or Bayesian information criterion, BIC).

The models used in the following sections are as follows:
(i)Effects of monetary easing on the market and real economy in Japan

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[8] Although Comprehensive Monetary Policy by BOJ was initiated officially inOctober 2010, monetary base had not increased significantly until February 2011, so that the period of expansionally monetary policy is set from March 2011 to date in this paper. The QE2 initiated from November 2010 to June 2011, but in this paper the US monetary market trend during the periods of 2008-2011 and 2011-2014 are similar to that in Japan. Therefore, the same period during March 2011 and 2014 June is used for the analysis on the US market, which covers the whole period of QE2 and QE3..
[9] The variables and their sources are shown in the table at the end of the main text.

Model1(Fig.10-1,2,3): BOJ Current Account (or Monetary Base or Call Rate) ; Real Effective Exchange Rate (REER); Bank Lendig (Lend); Stock Prices (Nikkei); Industrial Production (Prod)

Model2(Fig.11-1,2,3): BOJ Current Account (or Monetary Base or Call Rate); Money Stocks (M2); CPI; average Government Bond Yield (Yield); All Industry Activity Index (Index)

(ii)Effects of BOJ's monetary easing on the US market and the real economy

Model3(Fig.14-1.2): Monetary Base (Japan) (or Foreign Banks' Excess Reserves of BOJ Current Account[FEXRESV]); US Monetary Base (USMB); US Money Stocks(USM2); Trerasury Bill yields of 10 years maturity (TB10y);Treasury Bill yield of 2 years maturity (TB2Y); US stock prices (USShare); US Industrial Production (USProd)

(iii)Effects of the US monetary easing on the market and the economy in theUS and Japan

Model4(Fig.15-1,2): US Monetary Base (USMB) (or US Federal Fund Rate [FF]); US Real effective exchange rate (USREER); US Money Stocks (USM2); Trerasury Bond yields (TB10y); US stock prices (USShare); US Industrial Production (USProd)

Model5(Fig.16,17): US Monetary Base (USMB) (or US Federal Fund Rate [FF]); BOJMonetary Base (JPNMB); Foreign Banks' Excess Reserves of BOJ Current Account(FEXRESV); Call Rate(Japan); M2(Japan); Government BondYield (Japan); Nikkei Stock Prices (Japan)

5. Ineffectiveness of Monetary Pollicy instrumens in Japan

VAR Models are for estimating the impact of monetary easing shocks on the domestic monetary/financial markets and industrial production (for Model 1 [see 4.3]) and that of monetary policy on the foreign exchange, as well as overall production activity via stock markets (for Model 2 [see 4.3]).

5.1 ADF test and Stationarity of variables

Prior to the analysis based on VAR models, stationarity of the variables involved in the regression is tested by ADF (augmented Dickey-Fuller) method for the unit root tests. FDI and Derivatives have unit root without first lag during the covered period. The ADF test results show that unit root is rejected for the first lag of other variables, which is expressed as I (1). The stationarity of each variable is also confirmed by the Johansen test for cointegration that allows for more than one cointegrating relationship.

The variables which are confirmed stationarity with the first lag are as follows: Portfolio; Other Investment; BOJ Current Account; Monetary Base; Real effective exchange rate (REER, US and Japan); Money Stock (M2); Nikkei Average(Nikkei); CPI (y/y); Average Government Bond yield (Yield); Bank Lending (Lend); Industrial Production (Prod); All Industry Activiety indices(Index) in Japan;US monetary Base (USMB); US money stock(USM2); US stock prices (USShare), and US industrial production (USProd). The analyses based on the VAR models used the variables with first order difference, depending on the ADF test results.

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5.2 Granger Causality Test

Granger causality tests are used to verify the effects of changes in monetary policy variable (BOJ Current Account, Monetary Base, and Call Rate) on other variables. The results of Granger Causality test of each variable (the average of F-value of the first, 2nd, 3rd and 4th lags) are summarized in Table1. The Granger Causality in this analysis is based on bi-variate model with pairwise causality test. Therefore, the variable of the leftest row indicate the first causal shock against the variable of each column (Table1).

Table 1: Japan : Granger Causality (2001-2014)

2001-2006	BOJAC	MB	Call Rate	REER	CPI	M2	Nikkei	Lend	Prod	Index
BOJAC		2.829 *	0.648	1.625	0.433	2.247	3.705 **	0.755	0.652	1.634
MB	0.561		3.373 *	1.661	0.574	2.273	0.829	1.372	1.665	3.521 **
Call Rate	1.047	0.613		0.632	0.476	2.710 *	0.918	0.978	1.974	
REER	2.425	1.927	2.405		1.338	0.976	1.904	0.537	0.203	
CPI	0.492	0.398	0.989	1.816		2.491 *	1.355	1.355	0.572	1.970
M2	0.589	0.783	0.723	3.987 **	0.431		0.161	2.907 *	1.429	1.751
Yield	0.421	0.278	2.437	0.608	1.308	1.033	1.695	1.737	2.607 *	
Nikkei	1.967	2.651 *	1.901	1.082	0.208	0.532		1.418	3.317 *	1.993
Lend	2.003	1.330	0.231	0.364	0.514	1.383	0.58		0.089	0.374
Prod	1.364	1.038	0.858	1.701	0.629	1.291	0.258	1.19		1.012
Index	3.038 *	5.208 **	0.585	0.619	0.585	1.577	1.302	3.298 *	0.072	
2006-2008	BOJAC	MB	Call Rate	REER	CPI	M2	Nikkei	Lend	Prod	Index
BOJAC		1.064	0.881	0.117	0.226	3.713 **	0.507	0.365	0.445	0.700
MB	2.070		1.543	0.132	0.580	5.326 **	0.655	0.316	0.699	0.543
Call Rate	0.561	0.496		0.942	0.462	0.344	1.453	1.762	0.312	0.714
REER	2.732 *	1.221	0.429		0.819	0.724	0.877	1.228	0.752	1.056
CPI	0.536	0.331	0.347	0.313		2.285	2.301	1.436	1.782	1.342
M2	1.386	0.628	0.452	1.183	1.519		4.224 **	1.311	0.324	0.368
Yield	0.685	1.593	0.186	1.492	3.135 *	0.704	0.516	0.349	0.235	0.654
Nikkei	0.700	0.263	0.837	2.847 *	0.233	2.532 *		1.226	0.350	0.274
Lend	2.463 *	2.046	0.729	0.813	1.352	1.719	0.455		4.079 **	2.427
Prod	0.461	0.699	2.671 *	2.065	1.193	0.525	0.846	0.892		0.763
Index	1.624	3.648 **	2.463	0.748	1.157	0.410	0.614	0.419	0.601	
2008-2011	BOJAC	MB	Call Rate	REER	CPI	M2	Nikkei	Lend	Prod	Index
BOJAC		0.781	1.027	0.595	0.678	0.113	5.604 **	0.365	0.560	1.088
MB	1.017		0.965	1.656	0.246	0.500	3.614 **	0.359	0.529	1.504
Call Rate	2.690 *	1.180		2.042	0.589	0.891	0.904	0.710	8.146 ***	11.98 ***
REER	2.516 *	1.235	4.516 **		1.719	1.134	1.963	1.828	5.989 ***	7.088 ***
CPI	0.188	0.354	0.415	0.436		2.572 *	0.804	0.559	1.227	1.503
M2	1.248	1.621	0.942	0.286	0.233		0.660	5.590 ***	1.305	0.854
Yield	0.788	0.317	0.730	0.906	0.936	1.018	1.507	0.115	0.288	0.697
Nikkei	2.727 *	2.313	4.614 **	2.038	0.764	0.581		1.734	2.385	6.024 ***
Lend	2.267	0.783	2.895 *	0.701	0.840	0.358	1.291		3.146 *	3.204 **
Prod	6.121 ***	1.888	1.959	2.539	0.757	1.514	0.746	0.567		9.236 ***
Index	7.702 ***	2.563 *	2.67 *	5.15 **	1.67	2.102	0.658	0.309	1.204	
2011-2014	BOJAC	MB	Call Rate	REER	CPI	M2	Nikkei	Lend	Prod	Index
BOJAC		2.106	3.450 *	0.492	0.335	1.634	1.072	2.079	0.666	0.665
MB	1.661		2.584 *	0.363	0.730	1.382	1.083	1.395	0.467	0.701
Call Rate	5.453 **	5.335 **		1.431	0.151	0.953	1.472	0.604	0.675	0.844
REER	0.957	0.670	1.469		0.258	0.950	0.872	2.023	0.451	0.217
CPI	0.242	0.183	0.234	0.156		1.220	0.170	0.540	1.029	1.065
M2	0.777	0.492	0.350	0.641	1.056		1.122	0.271	2.641 *	2.732 *
Yield	0.461	0.791	0.542	0.471	1.211	1.623	2.106	0.492	0.133	0.554
Nikkei	0.973	0.844	0.233	5.698 ***	0.036	1.474		1.940	0.983	0.366
Lend	1.041	1.158	1.718	0.466	1.210	1.525	0.294		3.618 **	3.703 **
Prod	2.635 *	1.972	3.209 *	2.925 *	0.563	0.219	1.131	3.885		1.730
Index	1.372	1.006	1.443	2.395	2.703 *	0.142	0.507	2.978 *	0.829	

Note: 1 The period is from April 2001 to March 2006; April 2006 to August 2008; September 2008 to Feburary 2011, and March 2011 to June 2014.
2 Calculation based on the average of 1st to 4th lags of the variables
3 Figures are F-value. ***, **, * denote significance at 1%, 5%, and 10%.
Sources: Author's calculation based on IFS database (IMF), Bank of Japan

BOJ Current Account(hereafter BOJAC) Granger causes Nikkei stock prices (Nikkei), and Nikkei has Granger Causes industrial production (Prod), which indicates that there was

causality route from BOJAC to industrial production through the stock market during the period 2001-2006. However, causality from BOJAC to Nikkei and from Nikkei to industrial production became insignificant since 2006[10]. In this regard, the period 2008-2011 was some special period when the Global Financial Crisis hit the global market, so that the significant causality from BOJAC to Nikkei was not positive but negative one, as it is shown in the next section of impulse response functions. This could be accounted for by the fact that BOJAC and Monetary Base have no significant causality with domestic monetary market variables, and this could be caused by global monetary flows including between the Japanese and US markets after the Lehman shock.

Bank lending Granger causes industrial and overall production in a limited scale during 2006-2014 ; however, Monetary base (or BOJ Current Account) itself has no causal rlationaship with the Bank lending. Also, REER has no causality with BOJ Current Account (BOJAC) during the same period, which is examined in the impulse response functions.

5.3 Impulse Response Functions: Effects on theMarket and Real Economy

The order of the variable in the Model 1 and 2 is determined by the first shock of monetary easing, followed by the spread route which is theoretically assumed, as fllows:
For Model 1, expansion of monetary base will put some pressure on the exchange rate(REER), and the increase in base money (or BOJ's current account) should influence on banks' lending activities, which may induce productive activities that would put positive effects on expectation of rising stock prices. As a result, production may expand, induced by some asset effects. Model 2 assumes that monetary easing will result in expansion of overall money stocks, and the liquidity increase will have influence on the price levels, as well as the market indices, including JGB yield and stock prices. The change in the order of each variable does not change the overall results of the impulse response functions of each variable.

The actual results of the impulse response functions are quite different from that of theoretical assumptions given above. Over the period 2001-2014, the response functions of industrial production and all industry activities to BOJ Current Account(BOJAC) and Monetary Base (MB) are not positive but rather negative, though statistically insignificant (Fig.10-1, 10-2, 11-1, 11-2)[11]. The monetary easing had not put real effective exchange depreciated significantly except the perid of QE(2001-2006), and the result is contrary to the theoretically expected results since 2008 as shown in Fig.10-1and Fig.10-2. Although massive propaganda of 'Qualitative and Quantitative Monetary Easing (QQE)' policy since 2013 might have induced currency depreciation, that could be caused by interntional capital flows, determined by foreing investors at that period mainly. The monetary expansion of the BOJAC and MB put rather negative response to stock prices since 2006, which is different from the positive response of stock prices during 2001-2006 (Fig.10-1, 10-2).

[10] The impulse response of stock prices to monetary base and BOJ current account also has become insignificant since 2006 until today, which is not shown in Fig.10- and 10-2 (see Ohta 2013).
[11] The circle indicated in each graph shows statistically significant response to the shock of each variable.

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Fig.10-1: BOJ Current Account, REER, Lend, Nikkei, Prod

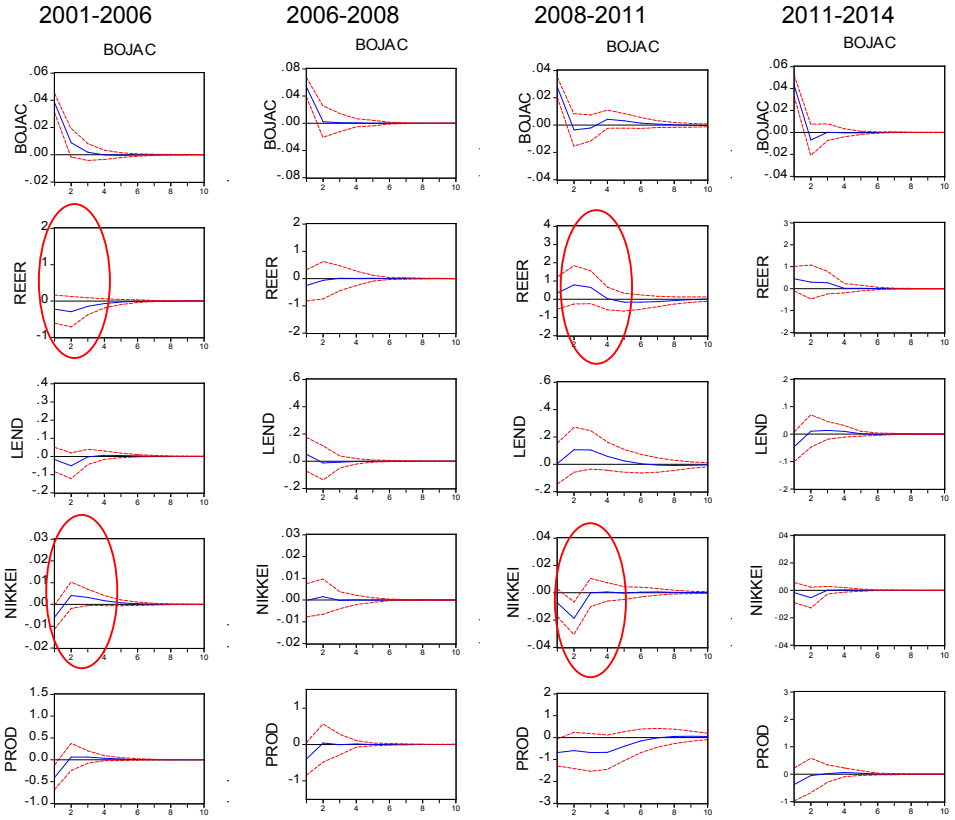

Fig.10-2: Monetary Base, REER, Lend, Nikkei, Production

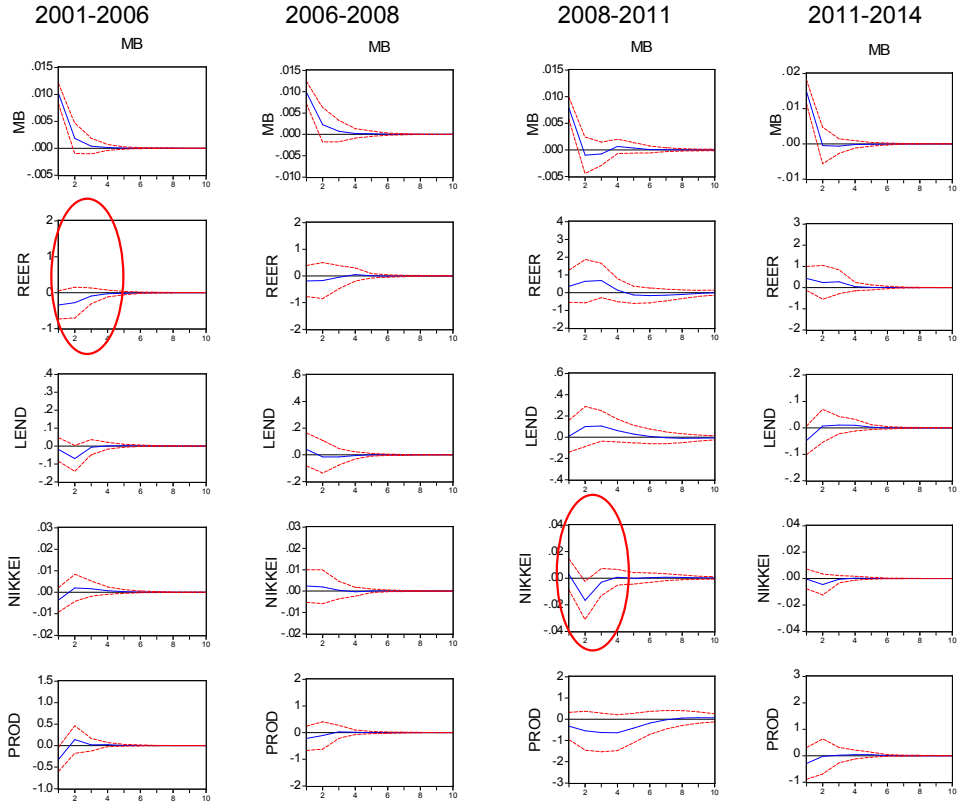

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Fig.10-3: Call Rate, REER, Lend, CPI, Yield, Production

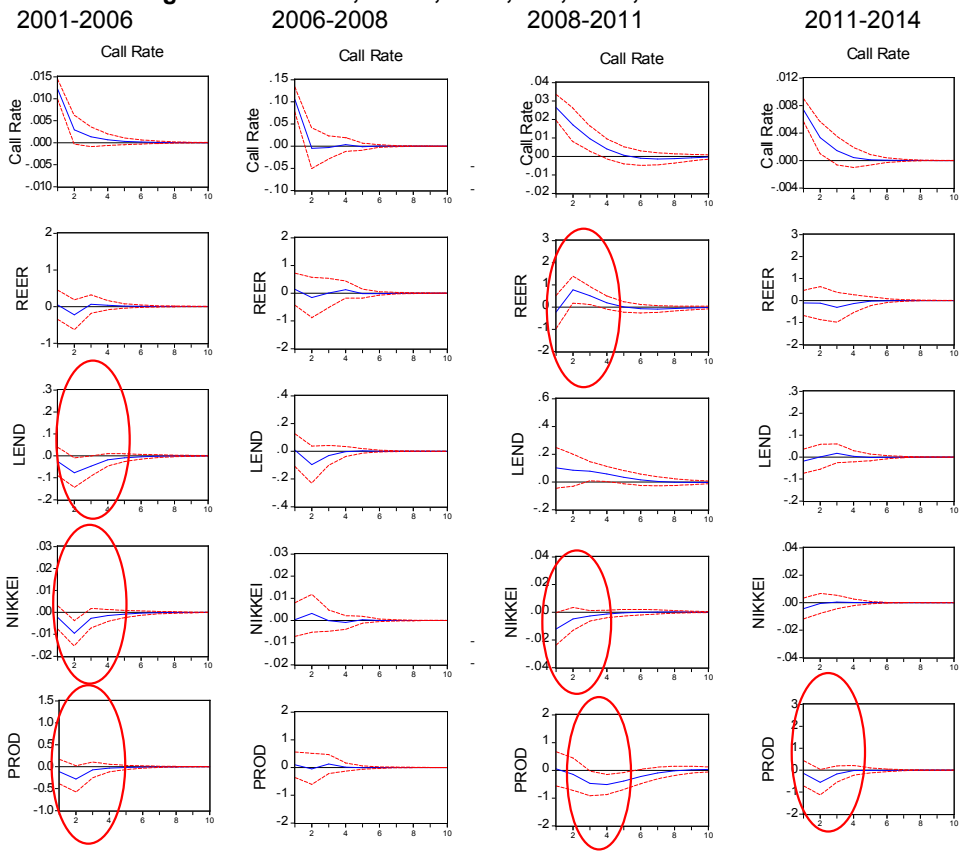

Fig.11-1: BOJAC, M2, CPI, Yield, All Industrial Activity Indices

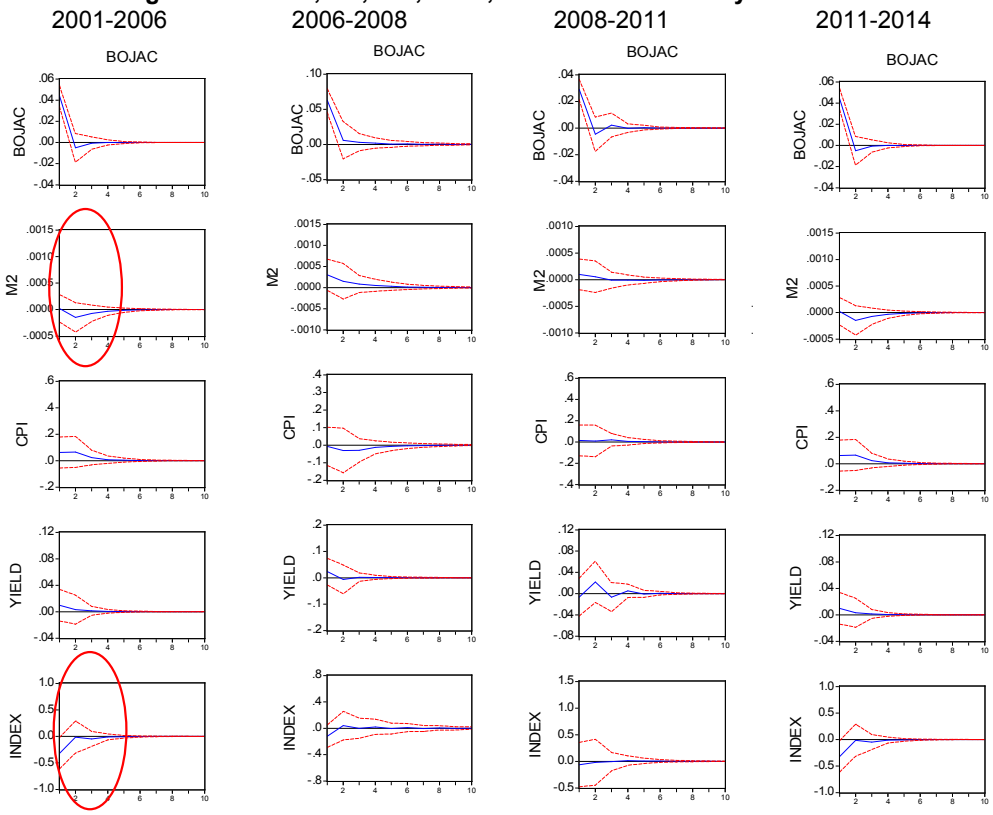

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Fig11-2: Monetary Base,M2, CPI, Yield, All Industrial Activity Indices

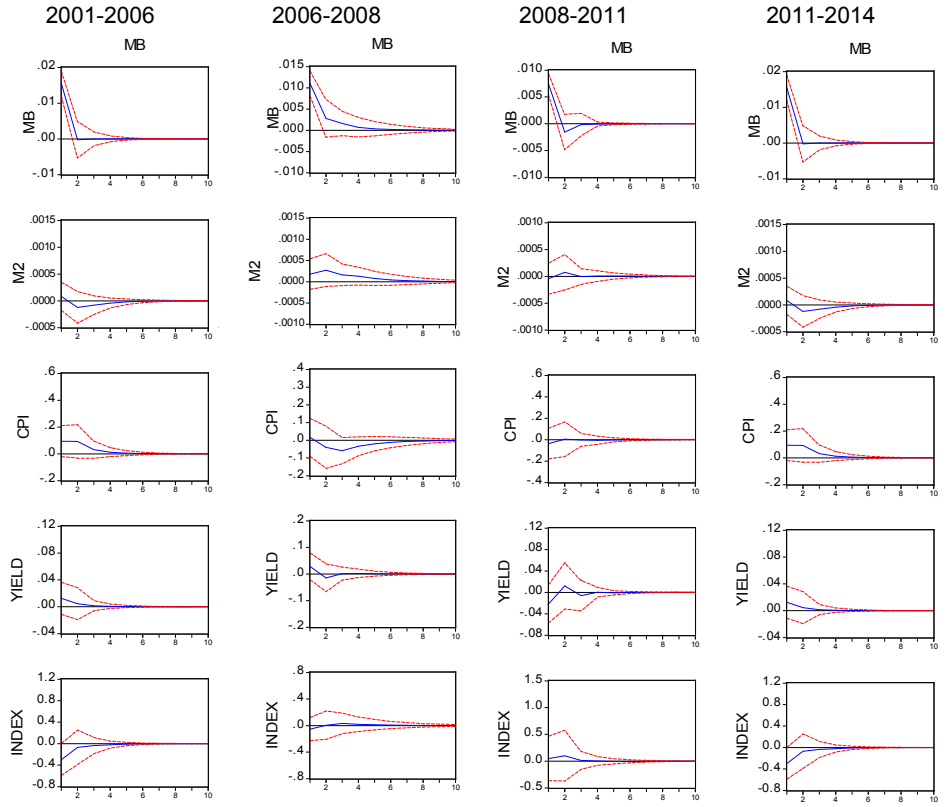
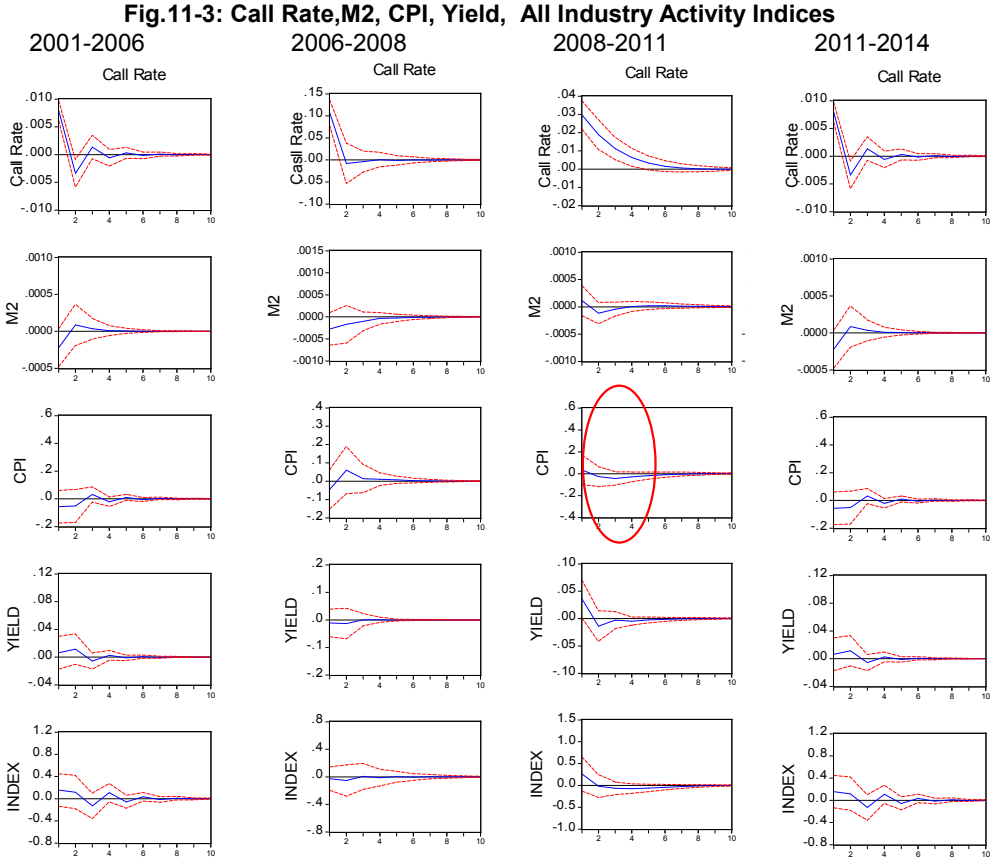


Fig.11-3: Call Rate,M2, CPI, Yield, All Industry Activity Indices



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On the other hand, the reponse function of industrial prodiction to call rate is generally significant during 2008-2014, and it is in line with the theoretical assumptions(Fig.10-3). This result implies that *interest rate policy could be more effective* than that of quantitative monetary easing even under the 'zero interest' policy in Japan.

The impulse response functions of money stocks (M2) and Government Bond Yileds to monetary easing (BOJ Current Account and Monetary Base) indicate no significant effects during the whole period of 2001-2014 (Fig.11-1, 11-2). The response of CPI to BOJAC and MB also had no significant effect on the price levels.

Likewise, the monetary expansion of the BOJAC and MB has no significant effect upon the all industry activity index during the overed period(2001-2014), as seen in the case of industrial production.

As shown in Table 2, the results of inpulse response functions indicate that the quantitative montreary easing generally has not influenced on the real economy, nor financial markets significantly, while interest rate (Call Rate) had put some effective impact upon the real economy in accordance with theoretical assumptions.

Table2: Effects of Monetary Policy

(a)Shock	(b)Variables	Original	2001-06	2006-08	2008-11	2011-14
BOJAC	M2	+	—	—	—	—
MB		+	▲	—	—	—
Call Rate		▲	—	—	—	—
BOJAC	Yield	▲	—	—	—	—
MB		▲	—	—	—	—
Call Rate		+	—	—	—	—
BOJAC	Lend	+	—	—	—	—
MB		+	—	—	—	—
Call Rate		▲	▲	▲	—	—
BOJAC	REER	▲	▲	—	—	—
MB		▲	—	—	—	—
Call Rate		+	—	—	+	—
BOJAC	CPI	+	—	—	—	—
MB		+	—	—	—	—
Call Rate		▲	—	—	▲	—
BOJAC	Stock	+	+	—	▲	▲
MB	(Nikkei)	+	—	—	▲	▲
Call Rate		▲	▲	—	▲	—
BOJAC	Prod	+	—	—	—	—
MB		+	—	—	—	—
Call Rate		▲	▲	—	▲	▲
BOJAC	Index	+	▲	—	—	—
MB		+	—	—	—	—
Call Rate		▲	—	—	▲	—

Notes 1 'Original' denotes originally expected effects.
2 ＋denotes increase or appreciation; ▲ denotes minus effects or decrease; - denotes insignificance in the impulse responses.

6. Association and integration of monetary markets between the USA and Japan

The analysis conducted in the previous sections suggest that BOJ's monetary easing policy instruments have not given positive effect on the real economy, and had very limited impact upon the domestic market during the whole period (2001-2014). It could be caused mainly by capital flows that affect the money stocks and monetary base in Japan and the USA, especially after the Global Financial Crisis. Therefore, this section will discuss on increasing integration of the markets between the US and Japan in terms of money flows that have significantly influenced on the both markets in recent years.

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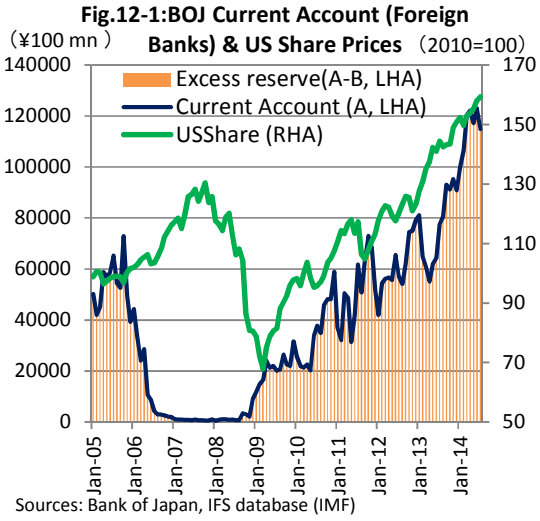
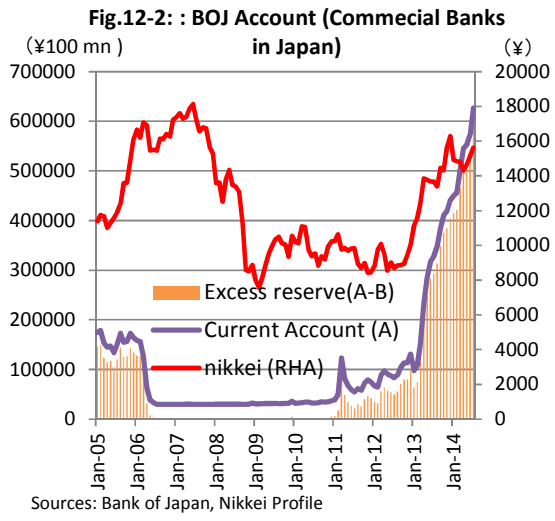
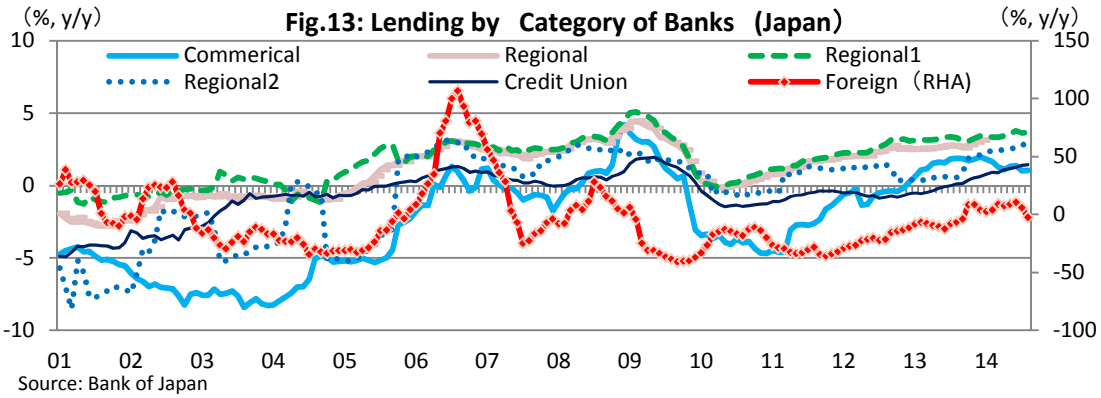
6.1 BOJ Current Account and ForeignBanks' reserves

The BOJ's monetary policy has been associated with the global markets, especially the US market, as shown in Fig.12-1. It indicates that excess reserves of BOJ Current Account are possibly utilized for financial investment globally, including the US market[12]. The BOJ Current Account put substantial impact upon the US market since 2008.

On the other hand, foreign banks have not increased lending substantially in Japan, which could indicate that foreign banks' reserves have not been utilized for productive activities in Japan (Fig.13). Thus, the foreign banks's execess reserves might have utilized for financial investment in the the US and global market. These aspects are analyased by Granger Causality and Impulse Response Functions in 6.2 , 6.3 and 6.4.







[12]Fukuda(2011) suggests that foreign banks in Japan may utilize the excess reserve of the BOJ Current Acount and call market for short-term investment in the monetary/ financial market, not in lending to manufacturing industry. Kikuchi (2013) suggested that under the excessive monetary easing, liquidity could be used for 'speculative' investment. He also maintained that monetary easing in fact has provided 'Hedge Funds' with imporatant resources for financial investment. Foreign banks may mobilize the resources delivered in the Japanese market, and they transfer the money to the Headquarters to be lend to 'Hedge Funds' that trade stocks in the Tokyo market, which accelerated the exchange of yen to dollars. Depreciation of yen would cause the stock prices higher in recent years, since it would enlarge the yen denominated corporate profit. Kikuchi(2014) claims that tapering of the QE3 would require further continuation of BOJ's QQE policy.

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6.2 Causality between the US and Japanese Markets.

BOJ Current Account (BOJAC) and Foreign Banks' excess reserves (heareafter FEXRESV) have significant causality with the US share prices as shown in Table3. Also, causality from the US monetary base and M2 to FEXRESV has become significant, especially after the Global Financial Crisis in 2008[13]. The foreign banks' excess reserve influenced on the US market, and it has causality to the US share prices during 2011-2014. The causality from the US monetary base and money stocks(M2) to BOJAC and FEXRESV is clearly indicated during the post-Global Financial Crisis period (2008-2011), while the direction of causality from the US monetary base and M2 to money stock(M2) in Japan has become significant since 2011. This could be accounted by the fact that the US monetary easing has been strengthend with the introduction of QE2, and as a result, liquidity though private banks have increased for financial investment in the maket in Japan[14]. Therefore, the results are consistent with the general trend described above (6.1).

Table 3: Japan/ US: Granger Causality (2001-2014)

2001-2008	BOJAC	FExRes.	MB	M2	JGBYield	JPNNikkei	US MB	USM2	US Share	US Prod
BOJAC		1.415	1.536	2.236	0.530	2.814 *	1.032	0.550	1.434	1.062
BOJFExRes.	0.248		0.167	1.573	0.639	3.115 *	0.803	0.182	1.472	0.641
JPNMB	2.963 *	1.564		3.431 *	0.412	1.173	0.933	0.268	0.631	0.919
JPNM2	3.360 *	4.045 **	1.399		0.505	1.132	0.581	0.226	1.210	1.048
JGBYield	0.755	1.485	1.296	0.907		1.657	0.479	2.496	0.887	0.543
JPN_Nikkei	1.315	0.463	1.046	1.327	1.894		0.240	5.436 **	2.954 *	2.563 *
US MB	1.487	1.672	1.458	1.106	0.510	0.413		2.277	0.795	0.276
USM2	0.657	0.133	0.697	1.978	2.708 *	1.304	1.141		1.429	1.622
US Share(2005=100)	0.389	2.165	1.127	1.666	1.654	0.129	1.699	0.320		1.622
USProd	1.509	2.015	1.034	1.498	0.199	1.237	1.347	1.347	1.338	
2008-2011	BOJAC	FExRes.	MB	M2	JGBYield	JPNNikkei	US MB	USM2	US Share	US Prod
BOJAC		1.384	0.781	1.057	1.310	5.604 ***	0.354	0.921	4.674 **	0.579
BOJFExRes.	2.421		0.845	0.894	1.923	6.197 ***	6.197 ***	1.321	5.807 ***	1.861
JPNMB	1.017	1.157		1.346	0.570	3.614 **	0.195	1.262	2.030	0.673
JPNM2	1.011	0.321	1.692		0.249	1.722	1.425	0.418	2.453 *	0.594
JGBYield	0.788	1.567	0.317	0.746		1.507	0.405	0.489	1.330	0.494
JPNNikkei	2.727 *	3.299 *	2.313	1.581	0.939		2.415	2.230	3.703 **	2.787 *
US MB	2.457 *	3.761 **	1.360	0.796	0.865	0.531		4.823 **	4.224 **	5.435 **
USM2	3.359 *	4.451 **	1.465	0.583	0.565	0.641	1.556		2.370	2.176
US Share	1.248	4.036 **	0.804	0.953	0.916	0.422	2.634 *	1.774		4.914 **
USProd	2.280	3.350 *	0.690	0.517	1.256	1.710	1.976	2.441	3.254 *	
2011-2014	BOJAC	FExRes.	MB	M2	JGBYield	JPNNikkei	US MB	USM2	US Share	US Prod
BOJAC		3.412 *	0.713	1.086	1.069	0.602	1.763	1.186	1.937	0.756
BOJFExRes.	0.364		0.413	1.787	0.447	1.549	0.552	4.512 **	5.712 ***	1.169
JPNMB	0.636	2.314		0.655	1.185	0.638	1.894	1.383	1.578	1.104
JPNM2	2.424	2.217	2.427		0.287	1.150	1.233	1.274	1.371	2.125
JGBYield	0.538	0.047	0.813	2.000		2.106	0.600	0.435	0.175	1.030
JPN Nikkei	0.802	1.828	0.726	2.258	1.685		1.314	0.869	3.289 *	0.230
US MB	1.201	1.455	0.785	3.783 *	0.120	3.496 **		1.223	2.628 *	0.752
USM2	0.420	1.650	1.721	3.787 *	0.275	0.336	1.275		4.575 **	0.224
US Share	0.057	8.753 ***	0.033	1.314	0.229	0.075	0.832	1.622		0.423
USProd	2.355	1.393	3.644 **	5.520 ***	1.139	0.108	0.916	0.604	0.715	

Notes: 1 The periods are from April 2001 to Aug.2008, Sept 2008 to Feb. 201, and March 2011 to June 2014.
2. BOJFExRes: Foreign Banks' excess reserve of BOJ current account The covered period is from Jan 2005 to June 2014.
3. Calculation based on the average of 1st to 4th lags of the variables
4. Figures are F-value. ***, **, * denote significance at 1%, 5%, and 10%.
Sources: Author's calculation based on IFS database (IMF), Bank of Japan, Federal Reserve

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[13]The period is basically devided before and after the Global Financial Crisis, triggered by the Lehman Shock (Sept.2008). The period is also devided before the Comprehensive Monetary Easing (CME) in Japan and QE2 in the USA. The period from March 2011 to June 2014 is most recent one, and it starts from March 2011, since the monetary base had not increased substantially until February 2011 in both Japan and the US, even the BOJ's CME and FRB's QE2 had been introduced by that time.

[14] The money flows from the US monetary base should change in the process of 'tapering' of the Federal Reserve(clearly stated in the FOMC in Septemebr 2014). The causality from the Japanese market could be more apparent in such a situation.

6.3 Impulse Response Functions of the Monetary Base (from Japan to the US)

This section will examine the relationship between the Japanese and the US markets through the impulse response function of VAR model(Granger Causality and Impulse Response Functions). As mentioned above, the US and Japanese markets are closely associated and integrated, depending upon the monetary policy in both countries, especially after the Global Financial Crisis. The effects of BOJ's monetary base on several variables, including the monetary base, excess reserves of Foreign Banks' BOJ Current Account, M2 as well as stock prices in Japan and the US markets are examined (Model 3)

The overall impact of monetary expansion of the BOJ current account on the US market has become very large in terms of the response of US monetary base recently (Fig.14-1). The shock of increase in the BOJ current account has positive influence on the US monetary base during 2011-2014,while foreign banks' excess reserves of BOJ Cureent Account (heareafter FEXRESV) also put positive effect on the response of US Money stocks (M2) during 2011-2014 (Fig.14-2). It could imply that through the channels of private banks account, several financial investment activities are undertaken, originally from the BOJ current account under massive expansion of QQE in Japan. It is therefore likely that money shift from the reserve at the BOJ current account to the US market by the US banks increased significantly during the period of pre-QE2.

It should be noted here that the shock of FEXRESV has negative impact upon the US share prices during 2008-2011, while that became insignificant during the period 2011-2014. This may be related to the fact that FRB's monetary easing under QE2 had not been initiated before 2010, so that the impact on the US stock market was mainly from the monetary expansion in Japan, rather than the FRB.

On the other hand, the BOJ current account has positive impact upon the US monetary base during 2011-2014. This shows that monetary base between the US and Japan has become closely related,and that are significantly influenced by the monetary easing policy in Japan and the USA.

6.4 Impulse Response Functions of the US Monetary Base (the US & Japan)

Now we examine the effects of US monetary policy in the domestic (US) and Japanese markets. As shown in Fig.15-1, the US monetary base has not given significant effect on the US domestic market over the period 2008-2014. Moreover, the industrial production shows negative response under monetary easing during 2008-2014. In fact, the US monetary base has *not given any significant impact upon the US market and the real economy* during 2011-2014. On the other hand, *interest rate as a policy tool could be more effective* than that of monetary easing policy[15], since the response functions of REER and yield of TB (2y), as well as share prices to FF rate during 2008-2014 are in line with the theoretical outcome of the financial market (Fig.15-2).

The US monetary base has significant effect on the impulse response of M2 during 2008-2011 and 2011-2014, as well as monetary base in Japan during 2008-2011(Fig.16).

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[15] The Federal reserve is expected to continue the current low interest policy, irrespective of the decision of tapering of the current QE3, which may be in line with this paper's analysis.

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Fig.14-1: Impulse Response to BOJ's Monetary Easing in the US Market/Economy

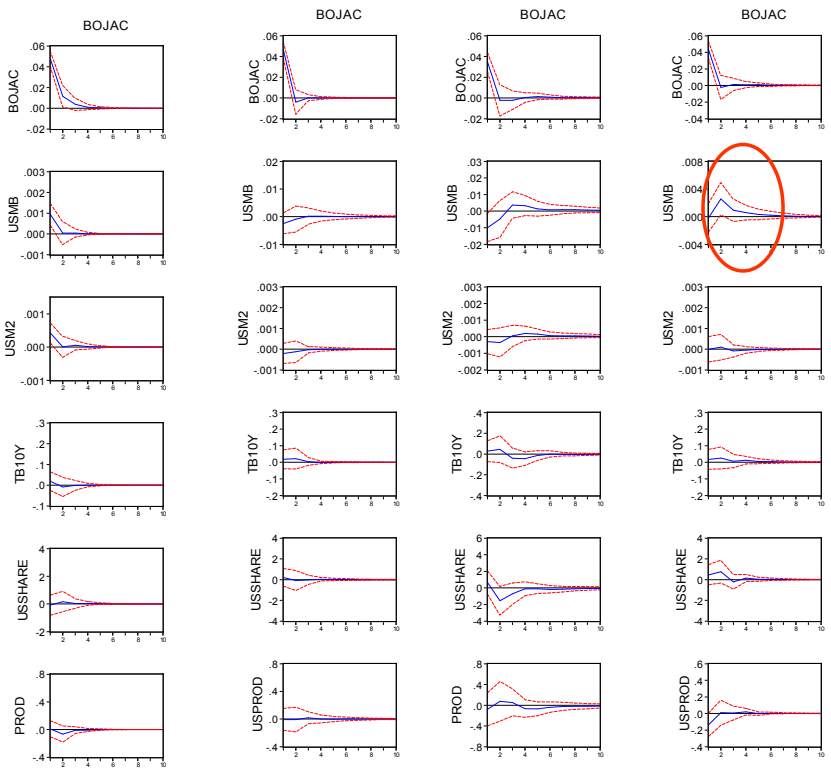
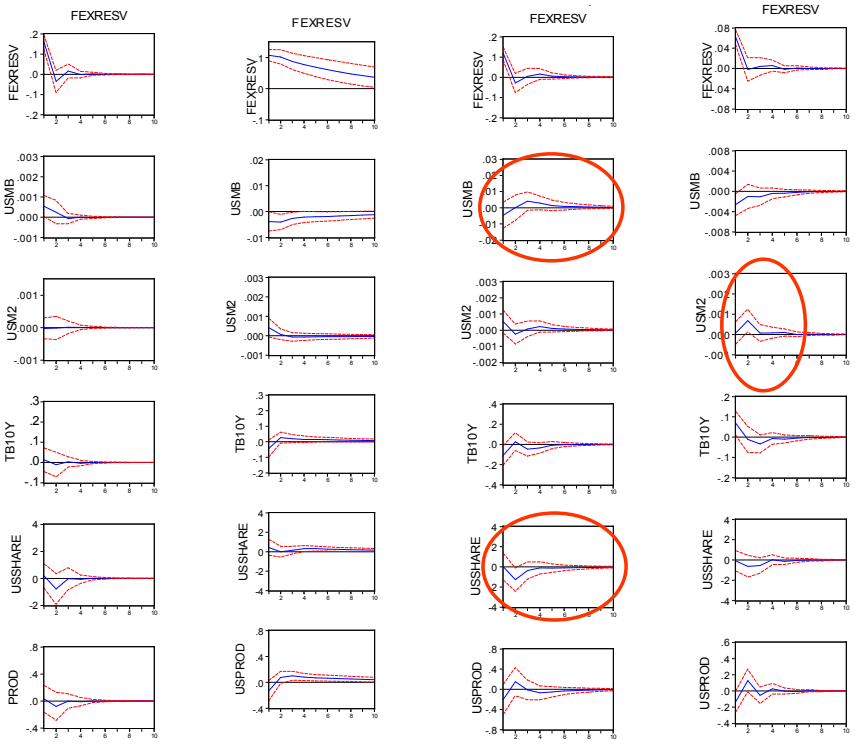


Fig.14-2: Impulse Response to Foreign Banks' Ex. Reserve in the US Market/Economy



Note: The figures of Foreing Banks' BOJ current account are only available since 2005.

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Fig15-1: Impulse Response to the US Monetary Base (USA)

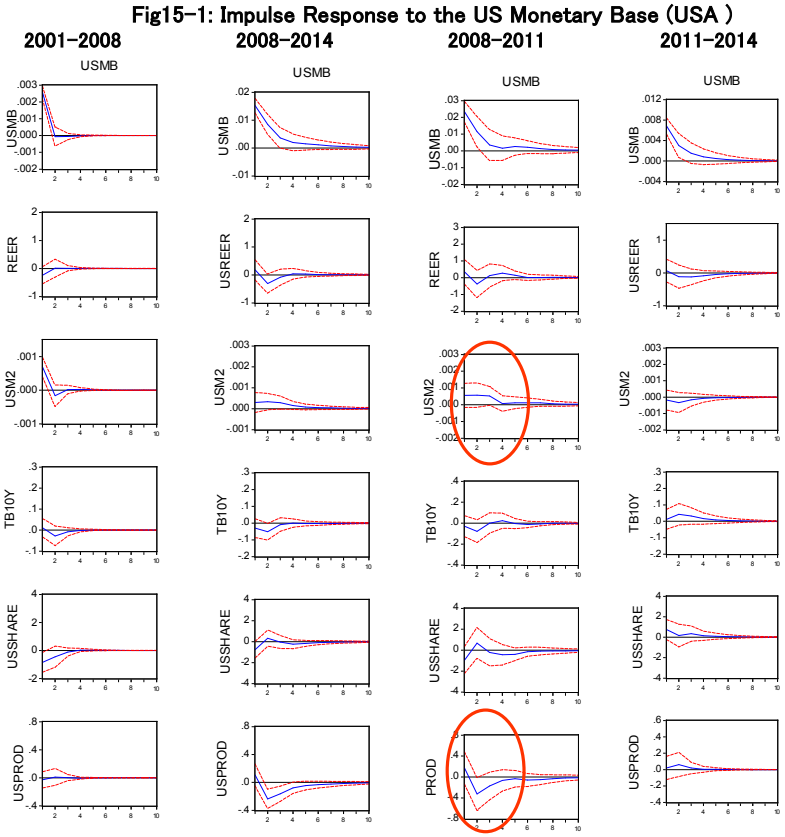

Fig15-2: Impulse Response to theUS Federal Fund Rate(USA)

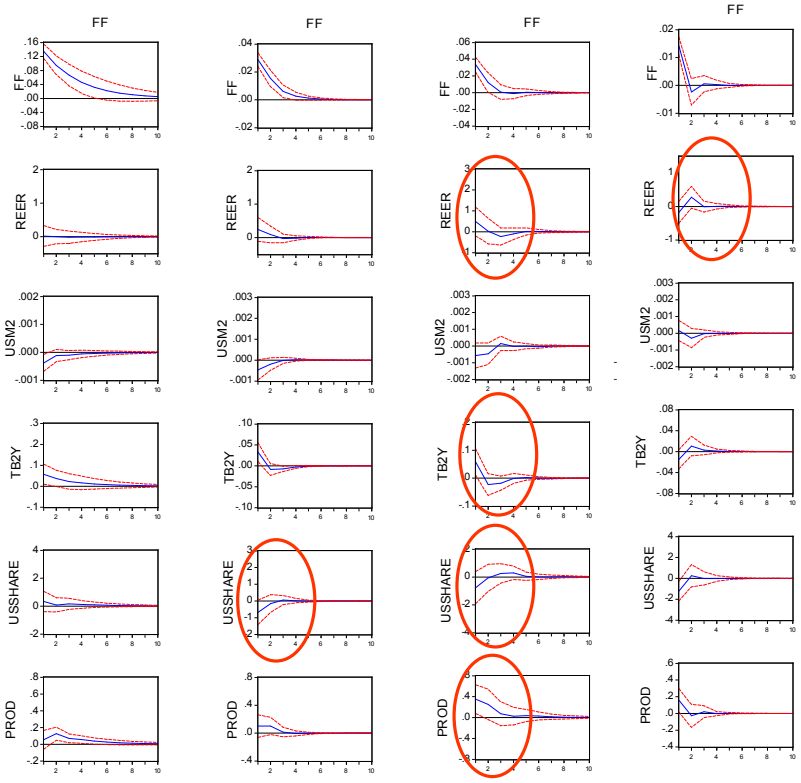

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Fig.16: Impulse Response to the US Monetary Base (Japan)

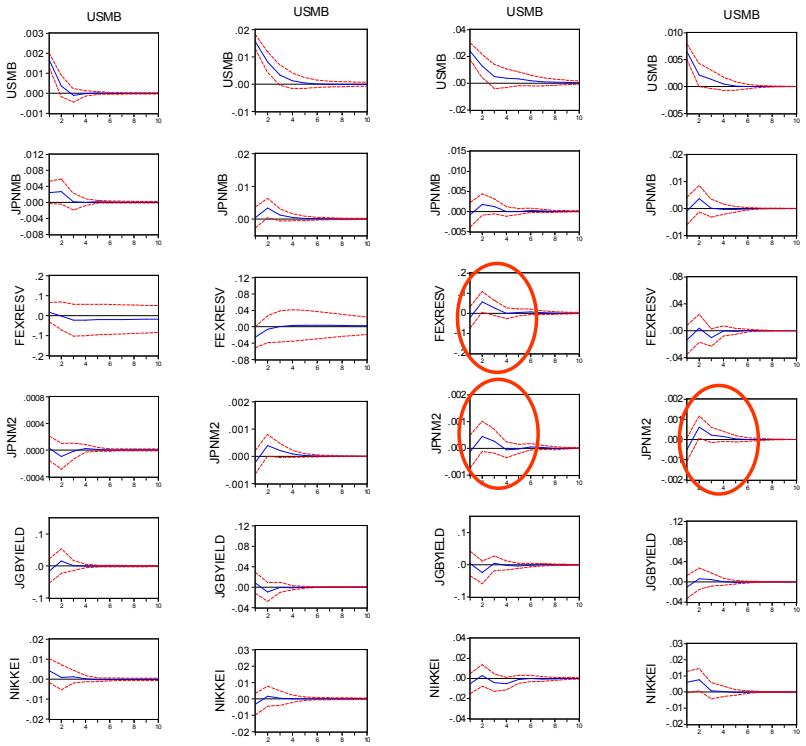
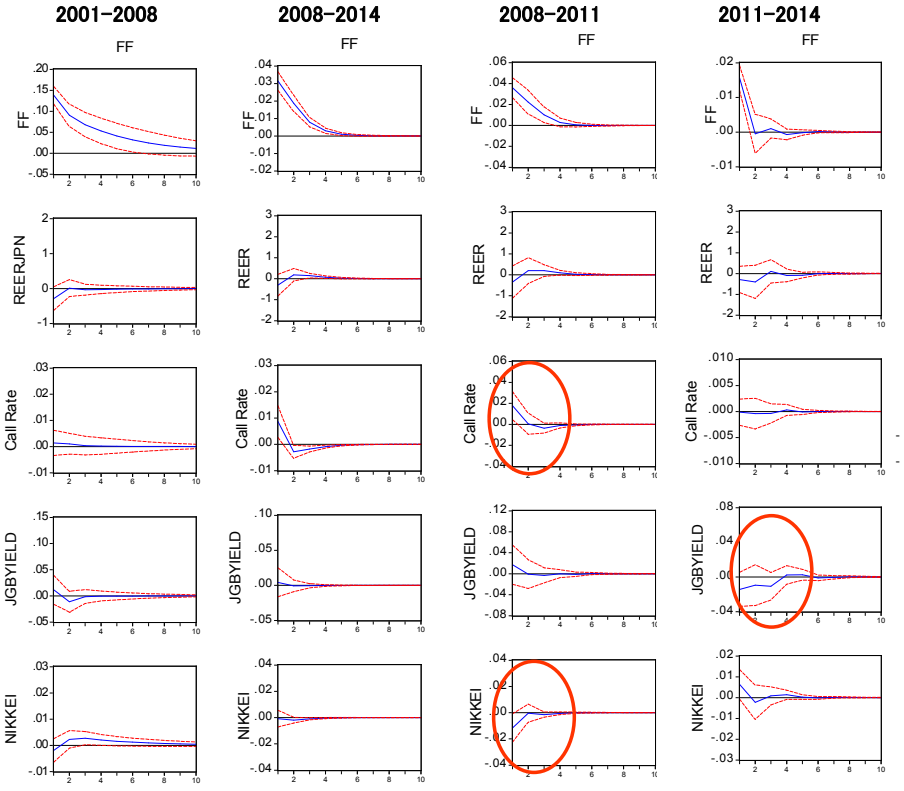


Fig.17: Impulse Response to the US Federal Fund Rate (Japan)



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It should be noted that Nikkei has some positive respone to the US monetary base recently(2011-2014). The federal fund(FF) rate, as a policy based interest rate, also has significant impact upon the Japanese market(Fig.17).

The FF rate has negatively affected on the Japanese government bond yield during 2011-2014, which indicates that if interest rate in the US market rises, then the dollars exchange rate appreciate (as shown as REERin Fig.15-2). It means that JGB(Japanese Government Bond) could be positively bought by the investors, which would resul in fall in JGB yield. During 2008-2011, on the other hand, FF rate has negative effect on the stock prices (Nikkei) in Japan, and this would indicate that if FF rate were to fall, as a result of the monetary policy to be eased by FRB, the exchange rate of Yen should depreciate, and Nikkei price would rise accourdingly. During 2011-2014, the effect of FF rate upon the call rate became insignificant, possibly due to the substantial fall in FF rate during the period.

The result of impulse response functions of Japanese market to the US monetary base suggests that the US monetary easing policy (QE2 and 3) has played an important role in carry trade of international money flows into the Japanese market.

6.5 The Monetary Policy and its Impact on the Markets in the US and Japan

As shown in the Granger Causality and impulse response functions given above, BOJ's monetary base has significantly influenced on the US capital and financial market. The US monetary easing also influenced on the Japanese monetary and financial market significantly in recent years , as summerised in Table 4.

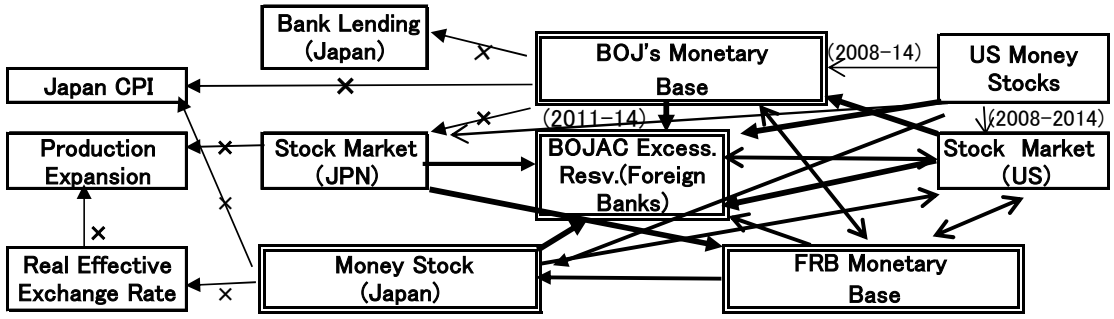
Table 4: Effects of Monetary Policy (Japan & USA)

(a) Shock	(b) variables	2001-06	2001-08	2005-08	2008-11	2011-14	2008-14
JPNMB	USMMB	−	−	−	−	+	−
FEXRESV			−	−	+	−	−
JPNMB	USM2	−	−	−	−	−	−
FEXRESV			−	−	−	+	−
JPNMB	USTB10Y	−	−	−	−	−	−
FEXRESV			−	−	−	−	+
JPNMB	USShare	+	−	−	−	+	−
FEXRESV			−	−	▲	−	+
JPNMB	USPROD	−	−	−	−	−	−
FEXRESV				−	+	+	−
USMB	USREER	+	−	−	▲	−	▲
	JPNMB	−	−	−	+	+	+
	FEXRESV		+	−	+	+	+
	USM2	−	▲	−	+	−	+
	JPNM2	−	▲	−	+	+	+
	USTB10Y	▲	−	−	▲	+	▲
	JGBYield	−	−	−	−	−	−
	USShare	▲	▲	−	−	−	−
	Nikkei	▲	−	−	−	+	−
	USPROD	+	+	−	▲	−	▲
FF	USREER		−		+	+	+
	JPNREER		−		+	+	−
	USM2		−		−	−	−
	JPN Call Rate		−		+	−	−
	USTB2Y		−		▲	−	−
	JGBYield		−		−	▲	−
	USShare		−		▲	−	▲
	Nikkei		+		▲	+	−
	USPROD		−		+	−	−

Notes 1 ＋denotes increase or appreciation; ▲ denotes minus effects or decrease; - denotes insignificance in the impulse responses.
2 The data on foreign banks' excess reserve of BOJ Current Account (FEXRESV) is only from Jan. 2005 to date.

Therefore, it is likely that the reserves held by foreingbanks at the BOJ's current account have been spent for capital and financial investment. This could be one of the reasons why the monetary policy has become ineffective in stimulating the real economy in Japan.

Fig.1: Monetary Policy and the Market(2008-2014)



Note: The direction of arrow indicates causality and association. ' × ' denotes that no significance in causality and impulse response.

7. Concluding Remarks

This paper analyses the effects of monetary policy on the markets and the real economies in Japan and the USA, based on the VAR models between 2001 and 2014, covering the period of the Quantitative Monetary Easing Policy (2001-2006), Comprehensive Monetary Easing (2010-2011), as well as the Qualitative and Quantitative Monetary Easing (QQE) Policy (2013- to date) in Japan and QE2 and QE3 in the USA.

The results of analyses indicate that the abundant liquidity provided by BOJ has not been utilized for productive investment even under the extremely easy monetary policy in Japan, which is also shared by the US market. As the analysis of Granger Causality and the impulse response functions demonstrates, it has become more difficult for BOJ to have substantial impact on the market by quantitative monetary policy under increasing international capital flows. The monetary and financial markets in the US and Japan have become more associated and integrated each other recently. In the case of Japan, the excess reserve of the BOJ current account might have been utilized for financial investment through carry trade, which is supposed to have accelerated under the BOJ's monetary easing policy. The massive liquidity expanded under the QE2 and QE3 in the US market also have put significant impact upon the market in Japan.

Therefore, tapering of the FRB's QE3 should put some pressure on the BOJ's continuation of the current QQE policy, as a 'safety net' of global money supply. However, the original purpose of reviving the domestic real economy in Japan would not be realized under the current completely free capital account regime, since the abundant liquidity under BOJ's QQE policy should only increase financial investment. If the monetary authority were to attain the original purposes to recover the real economy effectively, there should be some alternative way. In this regard, some policy on capital account and financial management may be considered to attain independence on the domestic monetary (incl. interest rate) policy in the medium to long term perspective[16].

[16] Please see Ohta(2012) on the importance of management and controls of capital account to attain stability of the market and achieve stable growth of the economy.

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