

Ryuzo Miyao: Central banking further into uncharted territory

Speech by Mr Ryuzo Miyao, Member of the Policy Board of the Bank of Japan, at a meeting held by the Foreign Correspondents' Club of Japan, Tokyo, 28 May 2013.

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Introduction

It is my honor and pleasure to have an opportunity to speak today at the Foreign Correspondents' Club of Japan. Almost five years have passed since the outbreak of the global financial crisis. Central banks in the advanced economies have been implementing unconventional monetary policies. With the introduction of quantitative and qualitative monetary easing – or QQE – in April, the Bank of Japan has decided to step further into uncharted territory of monetary policy.

Many central banks have been pursuing aggressive easing policies to put their economies on a sustainable growth path through price stability. Such aggressive measures have already come close to the boundaries of fiscal policy. The role of a central bank to ensure financial system stability has also become increasingly important.

To ensure price stability and financial system stability, central banks of today are mandated to play an ever larger role and to ensure accountability. They are expected to steer policy aggressively yet prudently. Today, I will talk about monetary policy of the Bank of Japan, which goes further into uncharted territory.

I. **Developments of economic activity and prices, and path toward achieving the 2 percent price stability target**

Let me begin by presenting a general picture of the current developments and outlook for economic activity and prices.

Japan's economy has started picking up. Public investment has continued to increase, and housing investment has generally been picking up. Private consumption has increased resilience. Exports and production have stopped decreasing. Business fixed investment appears to have stopped weakening. As for the outlook, domestic demand is likely to remain resilient due to the effects of monetary easing and various economic measures. The growth rates of overseas economies will gradually pick up. Japan's economy is expected to return to the moderate recovery path around mid-2013. Thereafter, a virtuous cycle of production, income, and spending is expected to be maintained. Japan's economy is likely to continue growing above the potential growth rate.

The year-on-year rate of change in the consumer price index (CPI, for all items excluding volatile food) has recently been around 0 percent or slightly negative. As for the outlook, it is expected to follow an upward trend. That reflects factors such as an improvement in aggregate supply and demand balance as well as a rise in the medium- to long-term inflation expectations. Toward the latter half of the three-year projection period, the CPI inflation is likely to reach the price stability target of about 2 percent (Chart 1).

Based on the general picture, in my view, the path toward achieving the 2 percent price stability target is expected to go through the following six steps (Chart 2).

First, the recovery in overseas economies will strengthen the recovery trend in Japan's production and exports, thereby increasing corporate profits. Second, financial conditions including asset prices will become even more accommodative. Behind that are several factors, such as the continued trend of investors' active risk-taking – the so-called "risk-on" trend, a moderate rise in U.S. long-term interest rates, and strong monetary easing by the Bank of Japan. Third, these two steps will encourage firms' positive initiatives to make fixed

investment and implement structural reform. That will in turn bring a gradual rise in the potential growth rate of Japan's economy. Fourth, with the expectations for sustainable economic recovery, household spending should stay firm and prices should gradually increase, accompanied by the narrowing of the negative output gap. Fifth, public inflation expectations will gradually rise. And, in that situation, the actual inflation rate is likely to rise above 1 percent during fiscal 2014. And sixth, as the virtuous cycle of a five-step path is maintained, economic recovery will continue. The public's expected inflation and the medium- to long-term trend inflation, the so-called "anchor," will likely increase gradually toward 2 percent. As a result, the actual inflation rate is projected to continue to rise, approaching the 2 percent price stability target.

As I told above, the Japan's economy is likely to achieve the 2 percent target as the inflation rate rises together with a sustainable economic recovery. Meanwhile, the public's expected inflation, a key element in the inflation outlook, consists of three factors. The actual inflation rate, expectations for economic recovery, and the medium- to long-term trend inflation (i.e., the anchor). In the fifth and sixth steps, it is important that the public's expected inflation rises as the actual inflation as well as expectations for economic recovery steadily rise. As the actual inflation rate rises further beyond 1 percent, the public recognizes that the anchor will increase accordingly.

II. Quantitative and qualitative monetary easing

Outline

In April, the Bank introduced the QQE policy. The new policy constitutes all necessary measures to achieve the price stability target of 2 percent at the earliest possible time, with a time horizon of about 2 years. A set of policy measures represents the Bank's very strong easing stance.

As for the size of the Bank's balance sheet as a whole, namely, quantity, the operational target was changed from the overnight call rate to the monetary base. It will increase at an annual pace of 60–70 trillion yen. As for the composition of assets on the balance sheet, namely, quality, the Bank increased the amount and extended the maturities of Japanese government bonds (JGBs) to be purchased. Specifically, the Bank will purchase a massive amount of JGBs so that the outstanding amount of its JGB holdings will increase by 50 trillion yen annually. The average remaining maturity of JGBs purchased will be extended to about 7 years. And, the Bank substantially increased the purchase of risk assets such as exchange-traded funds (ETFs) and Japan real estate investment trusts (J-REITs).

The new policy framework has three main things. First, the Bank took very drastic steps both in terms of quantity and quality. Second, rather than adopting an incremental approach, the Bank took all-out measures necessary to overcome deflation. And third, the Bank decided to continue with the QQE policy as long as it is necessary for maintaining the 2 percent price stability target in a stable manner. The Bank thus made a firm commitment to continuing the powerful easing by linking it with the policy target.

If I may add another point, the Bank will conduct the current policy within the framework of flexible inflation targeting. Like many other central banks that have adopted inflation targeting, the price stability target will be achieved in a balanced manner, accompanied by a sustained economic recovery. That does not mean that the Bank conducts monetary policy rigidly to achieve the 2 percent target inflation rate at any cost. While the target is pinpointed at 2 percent, it does not mean that any deviation from 2 percent is unacceptable. Rather, the inflation rate has to be maintained averagely and stably.

Long-term interest rate path

Transmission channels of the QQE are mainly for working on longer-term interest rates and asset prices, as well as for encouraging portfolio rebalancing and inflation expectations (Chart 3).

Here, let me summarize the impact of the QQE on long-term interest rates. First, the purchase of JGBs will absorb those securities circulating in the market. Thus it will continue to put downward pressure on the term premium of JGB yields. Second, as expectations for economic recovery and inflation rise, the expected short-term interest rates (i.e., the future path of short-term interest rates) will gradually increase. Note that the expected short-term interest rates form the basis of long-term interest rates. There may be upward pressure on long-term interest rates in Japan, reflecting, for example, a steady recovery in the U.S. and overseas economies and a rise in long-term interest rates overseas. That can also be interpreted as a rise in expected short-term interest rates.

Therefore, the future path of long-term interest rates will receive both upward and downward pressure. It will depend on policy actions and their effects, as well as changes in external conditions. Here is an important point. Even when there is upward pressure on long-term interest rates due to expectations for economic recovery, monetary policy will continue to put downward pressure on interest rates, and therefore strongly support economic recovery. If the aggressive easing policy continues when expectations for economic recovery and inflationary expectations steadily rise, it will further increase an economic stimulus. Such effect has to be well kept in mind.

In the meantime, there has been a rise in long-term interest rates. Several factors contributed to that move, such as a rise in long-term interest rates in the United States and Europe as well as a rise in Japanese stock prices. The Bank has been carefully examining developments in the bond market and closely communicating with market participants. In order to encourage policy effects, the Bank continues to pursue flexible market operations by adjusting the frequency, pace, and scope of purchases, as necessary.

When considering the future path of long-term interest rates, we need to avoid an unintended rise in interest rates due to an increase in fiscal risk premiums. The government's efforts toward restoring fiscal soundness have received close attention overseas. It is strongly expected that such efforts will steadily make progress.

More fundamentally, to reduce the risk of an unintended rise in interest rates, it is necessary to constantly enhance the credibility of Japan's economy and its growth potential through regulatory and institutional reforms. To keep extremely accommodative financial conditions leading to economic growth, it is critical to further support "animal spirits" – that is, entrepreneurship – in the private sector. That should be achieved mainly through regulatory and institutional reforms as well as trade policy.

Meanwhile, an exit strategy from the unprecedented easing policy is expected to take some time. It is still premature to discuss any concrete plan at this stage. When the time comes, it will be necessary to design a smooth exit strategy that market participants can anticipate. On this point, the Federal Reserve has been discussing exit strategies and making efforts to convey information to the public. What matters is to ensure that long- and short-term interest rates as a whole will follow a stable path. It also matters to enhance the market's predictability for the outlook for economic activity and prices as well as policy management through enhanced communication. While keeping such future challenges in mind, the Bank will continue to conduct appropriate monetary policy.

Risks

There are both upside and downside risks concerning the outlook for economic activity and prices. Those include developments in overseas economies and global financial markets, the conduct of policies both at home and abroad, and the private sector's economic activity.

Going forward, if such risks come out, we will comprehensively assess how large and persistent these risks are, and make adjustments as needed.

The point is that the Bank is firmly committed to continuing with the QQE policy as long as necessary to achieve the 2 percent price stability target. Let us consider a case that downside risk comes out and the outlook becomes weaker than the baseline scenario. Market participants expect that achieving the target will be delayed. Thus they expect the duration of the QQE will be extended and the total amount of asset purchases will increase. As a result, an accommodative effect will become stronger and the effects on longer interest rates and asset prices will be further strengthened. That will in effect help accelerate achieving the price stability target. By contrast, in case upside risk comes out, a reverse mechanism will work. In such a manner, commitment to the continuation of the QQE policy and linking it with the price stability target will reduce the effects of both upside and downside risk. In other words, the policy framework contains an “automatic stabilizing mechanism” that stabilizes the economy and policy duration.

III. Japan’s experience under quantitative easing policy

Evaluating quantitative easing policy

The Bank pursued quantitative easing (QE) policy between 2001 and 2006. It was a policy framework regarded as a frontrunner of unconventional monetary easing. In terms of quantity, the main operating target was the current account balance on the Bank’s liability side. The Bank increased the current account balance step by step from about 5 trillion yen at the time of the introduction to about 35 trillion yen. On the asset side, the Bank initially increased the purchase of JGBs and later diversified its market operations. While regarded as part of prudential measures, the Bank also decided to purchase risk assets. Namely, it purchased equities held by financial institutions in order to address concern over the financial system. The Bank also made a commitment to continuing with the QE policy until the CPI inflation rate rose stably above zero percent.

A survey of empirical studies in 2006 (see Ugai (2006)) summarized the effect of the QE policy as follows. The commitment to policy continuation effectively lowered the short- to medium-term zone of the yield curve through lowering expected short-term interest rates. On the other hand, quantitative expansion of the balance sheet and qualitative changes in the composition of the assets, including the purchase of JGBs, had mixed effects. These effects included portfolio rebalancing and changes in expected short-term interest rates, namely, signalling effects. The survey only evaluated to what extent the QE policy had contributed to easing financial market conditions. An evaluation of a more important effect, namely, its ultimate impact on economic activity and prices, was not clearly conducted at that time.¹

Since then, empirical studies on the QE policy have shown gradual progress in terms of impact on financial market conditions and macroeconomic effects on economic activity and prices.² Now several studies examine its impact on economic activity and prices. The main

¹ An effect of preventing further deterioration in economic activity and prices through avoiding financial institutions’ funding concern and ensuring financial system stability was considered to be substantial.

² As a recent study on the effects on financial conditions, Ueda (2006) carried out an event analysis and analyzed the effects of two months window induced by policy changes. The study found that an increase in quantity associated with increased purchases of JGBs that was implemented at the outset of the introduction of quantitative easing policy worked on stock prices and foreign exchange rate in a significant manner. The effect of an increase in quantity without increases in JGB purchases was not significant. As a study on the ultimate impact on economic activity and prices, time-series analysis by Honda, Kuroki and Tachibana (2007) is well known. There is also a recent study by Kimura and Nakajima (2013) and Shibamoto and Tachibana (2013).

finding of empirical studies so far is that it had a positive effect on the real economy, mainly through the stock price route (see Honda et al. (2007), Shibamoto and Tachibana (2013)).

When discussing the effects of the QE policy, it is intrinsically difficult to strictly distinguish various aspects contained in the policy and analyze their effects respectively. It has a quantity aspect, namely, expansion of the monetary base or the total balance sheet through an increase in the Bank's current account deposits. It has a quality aspect, namely, changes in the composition of assets including purchasing JGBs. And it has an aspect of putting downward pressure on longer-term interest rates through the commitment to continuing easing policy, namely, the policy duration effect. An increase in quantity is naturally accompanied by changes in asset composition. When the purchase of JGBs lowers longer-term interest rates, such a decline can be caused by a decline in term premiums. It also could be caused by a decline in expected short-term interest rates (signalling effect). Then the latter overlaps the policy duration effect through commitment. Rather than decomposing and discussing the effects of quantity, quality, and commitment separately, it is important to analyze the overall effect of the policy as a package. That is especially necessary in analyzing the ultimate effect on the macroeconomy.

Effects of quantitative easing policy on the macroeconomy: an analysis based on a time-series approach

Based on the recent progress in empirical studies, let me show you what I have analyzed about the effects of the QE policy on the macroeconomy. Here I used a time series approach. That approach has been frequently used to analyze the effects of monetary policy. I should emphasize that what I am going to show you here is only a tentative empirical result.

For an outline of an analytical method used here and the details of empirical results, please see the appendix. In the basic models, production, the monetary base, stock prices, the foreign exchange rate, and the inflation rate were used.

For analysis, I used three sample periods. First, March 2001 to March 2006, when the QE policy was implemented. Second, March 2001 to March 2007, extending the period for one year. And third, March 2002 to March 2007, shortening the second period by one year. The second period took into account the possibility that the easing effect would increase as the exit approached. By extending the sample period and comparing it with the first sample period, one could assess the policy effect during the final phase of the QE policy. About one year since the beginning of the QE policy, an increase in quantity was accompanied by an increase in the purchase of JGBs. By comparing the second and the third sample periods, one could analyze whether changes on the Bank's asset side represented by the purchase of JGBs, namely a qualitative aspect, had brought a difference in the policy effect³

Main empirical results can be summarized as follows.

First, an exogenous increase in the monetary base had a positive effect on production and stock prices and a negative effect on the foreign exchange rate, namely, the yen depreciation. Note that those effects were associated with some uncertainty.

Second, there was a positive effect on the inflation rate in the second sample period. The effect was not clear for the other sample periods.

Third, comparing the first and second sample periods, the effect on production was stronger, more long-lasting, and statistically significant in the second period. It suggests that quantitative easing might have had a stronger effect through the end of the policy.

³ It is also possible to set the end of the third sample at March 2006 and to compare it with the first sample period. In such case, the number of samples decreases and the standard error of the empirical results becomes larger. Here, to make a comparison based on a more accurate estimate with securing a larger number of samples, I compared the estimated results of the second and the third sample periods.

Fourth, comparing the second and third sample periods, the effect on production was weaker in the third period. The initial phase of quantitative easing was accompanied by an increased purchase of JGBs, and the financial system was uneasy at that time. The effect of a qualitative aspect might have been more pronounced in the beginning.

In summary, the QE policy as a whole had a certain effect on economic activity, which is production here, and a transmission channel through asset prices – namely, stock prices and the foreign exchange rate – was working. Its effect on prices was not as clear as that on economic activity. Compared to an improvement in economic activity, the response in prices was not that substantial. This result can be interpreted that a slope of the Phillips curve during quantitative easing was relatively flat.

What I have shown here is the effect of an exogenous increase in the monetary base during the estimation periods. Yet, we should not interpret this effect as purely coming from the aspect of quantity only. Rather, we should understand this effect coming from the policy package as a whole. The package includes changes on the asset side, including an increase in JGB purchases. It also includes purchases of banks' shareholdings, therefore containing the effect of stabilizing the financial system. And it further includes the commitment effect through the end when the exit from the policy was more recognized.

Please allow me to repeat that the results and interpretations above are only tentative, and that the empirical evidence accompanies considerable uncertainty.

Implication on quantitative and qualitative monetary easing

Based on the tentative analysis of the QE policy's experience, what implications can we draw for the performance of the current QQE policy?

Looking back on the economic conditions, a virtuous cycle in the economy emerged through the latter half of quantitative easing policy, during the 2003–2006 period. During that period, people came to have the prospect of resolving banks' nonperforming loan problem and financial system instability. With the tailwind of a strong recovery in overseas economies, Japanese firms made progress to resolve the "three excesses," namely, the excesses in employment, capital stock, and debt. They also made efforts to carry out structural reform and new investment spending. Those efforts were strongly supported by the accommodative financial conditions with quantitative easing and the exchange rate policy at that time. The economic recovery continued and the output gap turned positive. The negative inflation rate reduced and the medium- to long-term trend inflation rate clearly rose. In short, during the 2003–2006 period, Japan experienced a virtuous cycle: a recovery in overseas economies, aggressive monetary easing, progress in structural reform, a rise in the potential growth rate of the economy, a sustained economic recovery, and an increase in the medium- to long-term expected rate of inflation (Charts 4-6).

The QQE policy will proceed with a much larger scale and drastic easing measures both in terms of quantity and quality, compared with the QE policy. Now the economies at home and abroad are heading toward a recovery and we have the prospects for a virtuous cycle, in which many aspects seem to overlap those during the 2003–2006 period. The Bank's baseline scenario for economic activity and prices is to achieve the price stability target under a virtuous cycle similar to that during the 2003–2006 period. The current QQE policy, together with cumulative effects since the period of comprehensive monetary easing, will further strongly support such a baseline scenario from the financial side.

Unlike that period, the Bank clearly set the 2 percent price stability target. By taking all possible measures necessary for achieving the target at the earliest possible time, the Bank showed its strong stance on achieving the target. On that basis, the Bank made a commitment to continuing with the QQE policy as long as it is necessary for maintaining the 2 percent target in a stable manner. It is expected that a mechanism for which the public inflation expectations rise will work stronger than during the 2003–2006 period.

Concluding remarks

Japan's economy over the past few years has been generally defensive. Behind that were the persistent slowdown in overseas economies, investors' risk aversion in global financial markets, and the yen's appreciating trend. With a high degree of uncertainty about the outlook, Japanese firms focused on taking a defensive stance, holding back active initiatives, including business fixed investment.

Many Japanese firms have potential for fighting against headwind. In fact, some reports indicate that more than 20,000 firms have existed for more than 100 years. Many firms have changed their business structures in response to changes in external conditions and have been continuing business. Japanese firms still have potential for growing by bringing together technology and wisdom and creating high value-added goods and services at home and abroad. Overseas economies and global financial markets have started to improve. Firms are finally beginning to enjoy an environment in which they can show their entrepreneurship, or "animal spirits."

The Bank has decided on the QQE policy. The policy will support those who try to make progress in the real economy from the financial side, and help achieve sustainable economic growth through price stability. The Bank has moved further into uncharted territory. Policy management and its accountability matter more than ever. The Bank will continue to make utmost efforts to assess the economic conditions accurately and conduct policy appropriately.

Thank you.

Appendix: Effects of the quantitative easing policy on the macroeconomy: outline of an empirical analysis

About the effects of Japan's quantitative easing policy, I have conducted an analysis based on a time-series approach (vector autoregression model). In this appendix, I will explain the outline of the empirical analysis.

Background

Interdependence between economic variables is generally expressed in simultaneous equations. Based on the equations, we can analyze how major economic variables – such as economic activity, prices, money, and asset prices –, which are determined within a model, are influenced by changes in external factors, for example, monetary policy.

A time-series approach is, along with a traditional large-scale econometric model, one of the main analytical approaches to estimate policy effects. It can provide analysis using a relatively small-scale model with less identifying restrictions. In macro-empirical analyses on Japan's quantitative easing policy, time-series models have been used as a major tool (Honda et al. (2007) etc⁴).

Outline of the analysis

A basic model is a vector autoregression (VAR) model consisting of four variables: the industrial production (y), the monetary base (MB), the nominal foreign exchange rate (e), the Nikkei stock average (pk), or five variables adding the consumer price inflation rate (π). Each variable except the inflation rate is logarithmic value and monthly data are used⁵.

There are three sample periods: (i) March 2001-March 2006, (ii) March 2001-March 2007, and (iii) March 2002-March 2007. The lag order of the model is four periods.

Based on standard recursive restrictions, exogenous changes in the monetary base are identified as the monetary policy shock.

Analysis goes as follows. Estimate a reduced form model of the above four or five variables, impose constraints for structural model identification, and estimate a structural model. Then estimate how an increase in one unit of an identified monetary base shock, changes of 1 percent, influences variables within the model over time, that is, a dynamic effect. That can be obtained as an impulse function of a monetary base shock on each variable.

Empirical results

Appendix Charts 1 and 2 illustrate the dynamic effect of a monetary base shock on each variable, that is, an estimated value of impulse response. A solid line in the chart is a point estimate of impulse response, and dotted lines are one standard error band (68 percent confidence interval).

⁴ A method to analyze macroeconomic effects other than a time-series approach includes a "plug-in" approach, in which policy-induced developments of financial variables are thrown into an existing econometric model, and a dynamic stochastic general equilibrium model (Chung et al. (2012), Chen et al. (2012)).

⁵ The details of data are as follows. Indices of industrial production (seasonally adjusted. Source: Ministry of Economy, Trade and Industry). Monetary base (adjusted for reserve ratio, average amount outstanding, seasonally adjusted. Source: Bank of Japan home page). Nominal effective exchange rate (Source: Bank of Japan home page). The Nikkei stock average (monthly average of daily figures. Source: Bloomberg). Consumer price inflation rate (year-on-year rate of change, all items excluding food and energy. Source: Ministry of Internal Affairs and Communications).

Estimated impulse response showed that, by an exogenous increase in the monetary base, production increased, stock prices rose, and the foreign exchange rate depreciated. The standard error bands were wide to a certain degree, and some included zero in the confidence interval. Therefore it should be noted that estimated results were accompanied by some uncertainty.

For the inflation rate, there was to some extent a statistically significant positive effect in the sample period (ii) (Appendix Chart 2, middle row, bottom box). In other sample periods, the effect was limited.

Comparing the three sample periods, as a whole, the effect (point estimate) in the period (ii) was generally the largest and long-lasting and had a statistically significant impact on production.

Additional analyses

I have added several different specifications – different variables, sample periods, lag orders, and identification restrictions – to the above basic model and made additional analyses about the robustness of the empirical results.

Specifically, (i) use the Bank's current account instead of the monetary base, (ii) add other variables that are deemed important for the economic and financial conditions at that time (add each variable to the four-variable model): variables include the U.S. stock prices, Japan-U.S. interest rate differentials for 2-year government bonds and 10-year government bonds, the long-term interest rate, net exports, real business fixed investment, and potential output⁶ (iii) use different sample periods: March 2001-March 2008 and March 2002-March 2007, (iv) use different lag orders: 6 and 8 period lags, and (v) use different identifying restrictions.⁷

These additional analyses generally showed similar results, which confirmed that the above-mentioned empirical results were robust to a certain degree.

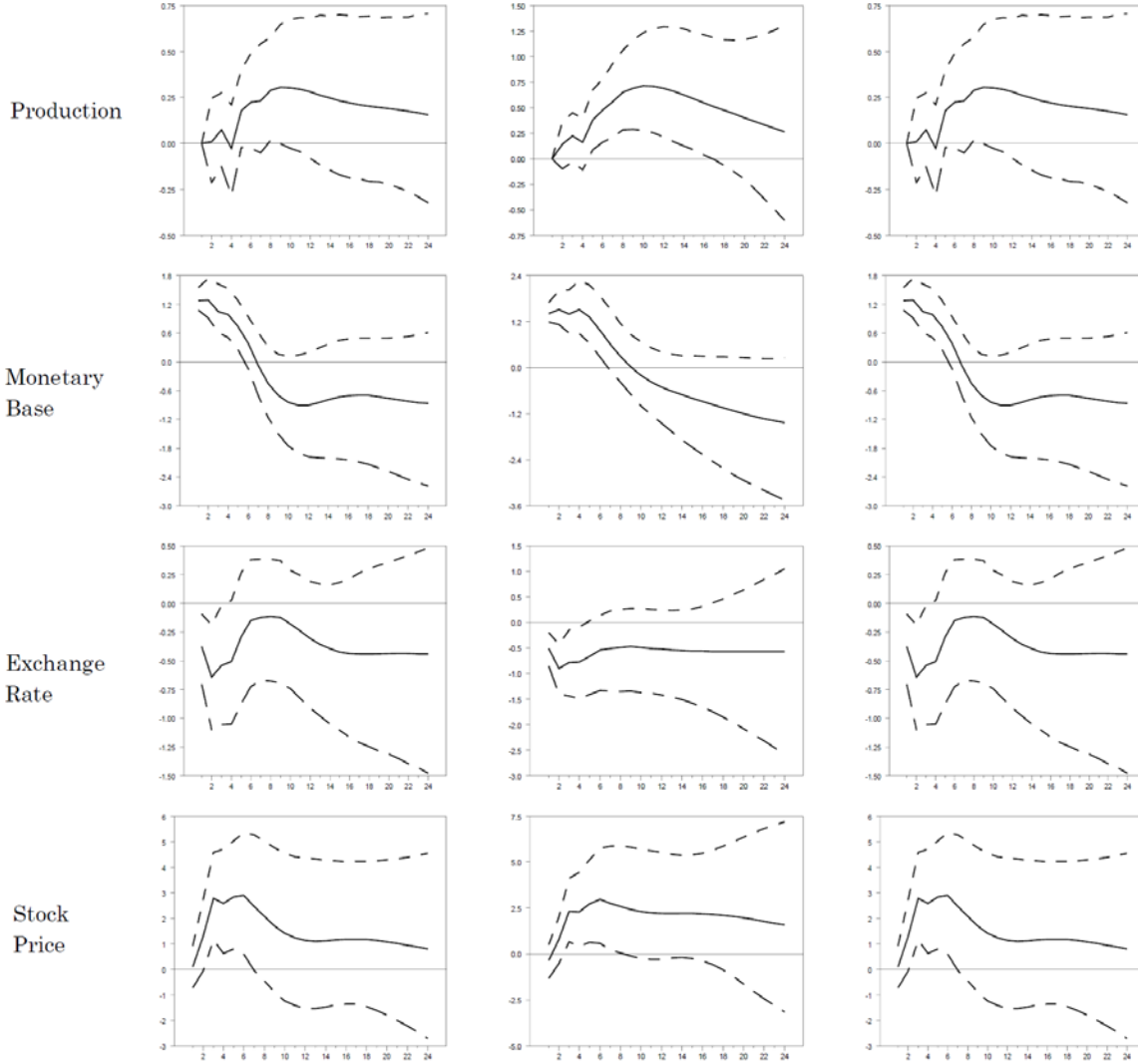
⁶ I have constructed 5-variable models by adding each variable to the end of 4-variable model, and estimated based on recursive restrictions. Variables were the Dow Jones industrial average for the U.S. stock prices (monthly average), the U.S. government bond yield minus JGB (2-year bond and 10-year bond) for Japan-U.S. interest rate differential. Long-term interest rate was 10-year bond yield. Net exports and business fixed investment were monthly data obtained by linear interpolation of the quarterly real data (the Cabinet Office statistics). I have estimated potential output, based on a production function approach (convert quarterly data into monthly data using linear interpolation). All variable were logarithmic value except for interest rate variables.

⁷ Here I have used following identifying restrictions: (i) change the ordering of the variables with maintaining recursive restrictions, and (ii) assume different non-recursive restrictions. For the former assumption, I have estimated following five-variable models with different orderings: (y, e, pk, MB, π), (MB, e, pk, y, π), (e, pk, MB, y, π). For the latter, the following contemporaneous restrictions were assumed in the estimation based on the main five-variable model: stock-price shock and/or inflation shock are allowed to have a contemporaneous effect on monetary base (that is, removing cotemporaneous zero restrictions from the policy response of monetary base) and MB shock and/or exchange rate shock are not allowed to have a contemporaneous effect on inflation (that is, adding these contemporaneous zero restrictions).

(Appendix Chart 1)

Macroeconomic Effects of Increase in the Monetary Base during Quantitative Easing Policy
-- 4 Variable Model (Production, Monetary Base, Exchange Rate, and Stock Price) --

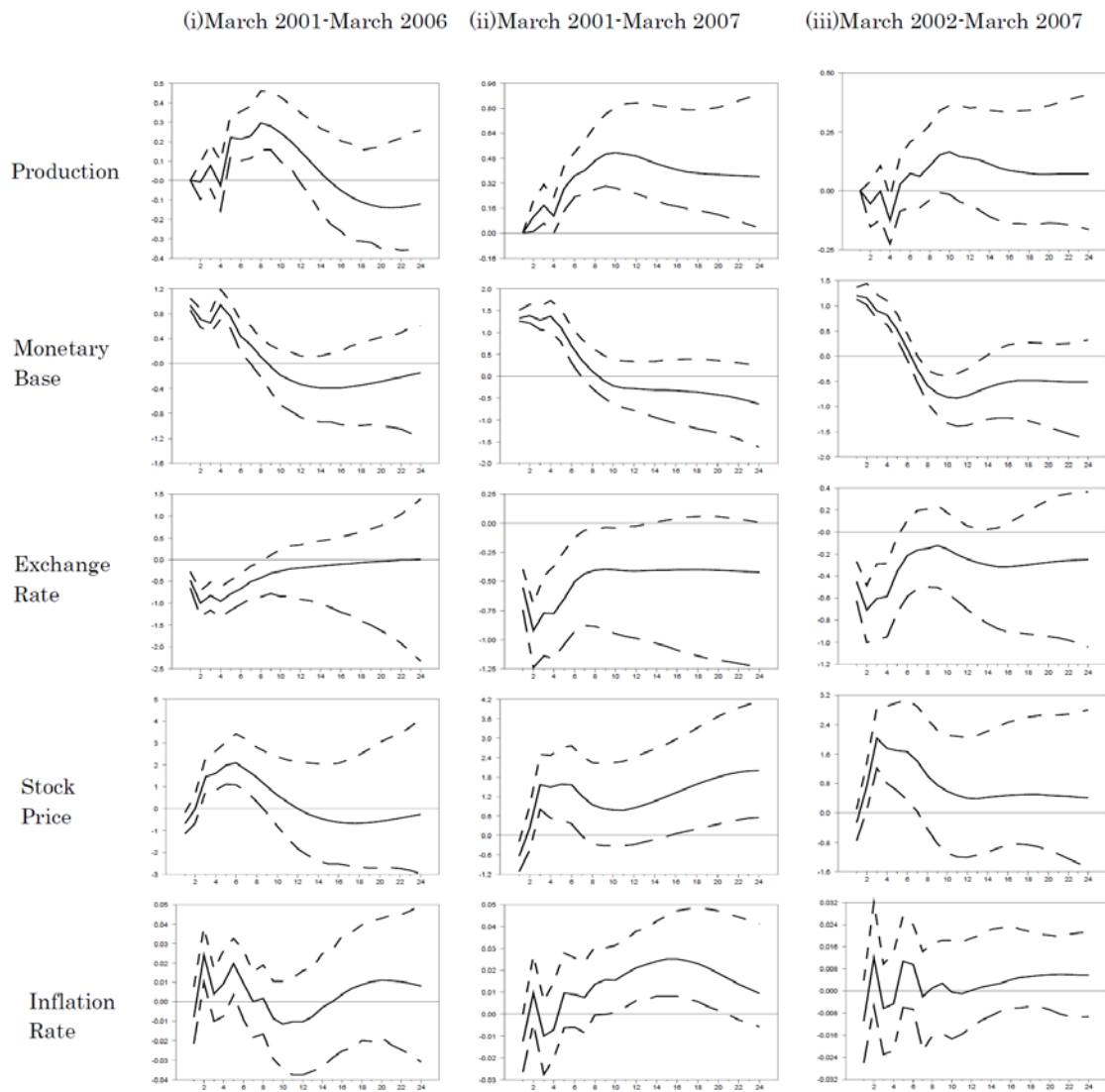
(i) March 2001-March 2006 (ii) March 2001-March 2007 (iii) March 2002-March 2007



Note: A solid line is a point estimate of impulse response, and dotted lines are one standard error band (68 percent confidence interval). Y-axis represents logarithmic value of respective variables and X-axis represents periods (up to 24th period).

(Appendix Chart 2)

Macroeconomic Effects of Increase in the Monetary Base during Quantitative Easing Policy -- 5 Variable Model (Production, Monetary Base, Exchange Rate, Stock Price, and Inflation Rate) --



Note: A solid line is a point estimate of impulse response, and dotted lines are one standard error band (68 percent confidence interval). Y-axis represents logarithmic value of respective variables (with the exception of inflation rate) and X-axis represents periods (up to 24th period).

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