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Can Japan's Monetary Policy overcome the Dilemma it faces?

-Suggestions offered by Estimation of the Equilibrium Interest Rate -

Ryuzo Miyao
Professor, Graduate School of Economics, The University of Tokyo

Mototsugu Shintani
Professor, Research Center for Advanced Science and Technology, The University of Tokyo

Japan's monetary policy faces a dilemma in the second term of the Bank of Japan Governor Kuroda, and the second term of the framework that he has instituted. The realization of the 2% price stability target will take time; however, a further strengthening of monetary easing in order to prioritize the early achievement of this target will increase concerns over secondary effects. On the other hand, the hasty normalization of monetary easing or a change in the policy framework will create instability in the monetary environment and slow down Japan's economic recovery.

One key to overcoming this dilemma is whether or not the effects of monetary easing increase in the future without a change in the policy. If the performance of the economy improves, the economic stimulus effect of monetary easing will become stronger even if the operational target for the policy interest rate remains the same for the time being. If the benefits of the monetary easing policy increase in magnitude, the problem of secondary effects may be relatively mitigated. In this paper, the authors estimate the equilibrium interest rate (also known as the natural rate of interest), a neutral interest rate level that neither stimulates nor restrains the economy, and examine whether or not the effects of monetary easing will increase in the future.

The results of these estimates, based on multiple models, suggest that Japan's equilibrium interest rate has recently commenced an upward trend. The same trend could also be inferred from the potential growth rate, corporate capital investment and other economic indicators. If this steady increase in Japan's equilibrium interest rate continues into the future, the policy effects, i.e. the benefits of monetary easing, can also be expected to increase.

With the Bank of Japan's Governor Haruhiko Kuroda beginning his second term, a second round of monetary policy is commencing under his leadership, and the coming five years of policy management is a subject of close attention. The achievement of the BOJ's 2% price stability target will take some time, and concern over potential secondary effects will intensify if monetary easing is strengthened in order to prioritize the early achievement of this goal. On the other hand, if the Bank goes as far as hastily normalizing the easing policy or changes its policy framework, instability will be generated in the financial conditions, and this would act to dampen economic recovery. One key factor in overcoming this dilemma will be whether or not the effects of monetary easing will increase without a change in the Bank's policy. This paper will estimate the equilibrium interest rate (also known as the "natural" rate of interest), which is a neutral interest rate level that neither stimulates nor restrains the economy in order to examine the potential for the benefits of monetary easing to increase into the future[1].

Work will not disappear from Human Society

Following the appointment of Haruhiko Kuroda to the Governorship of the BOJ in 2013, the Bank displayed a change in its policy management approach towards the prioritization of the rapid realization of a 2% price stability target, and the implementation of all necessary policy for the achievement of this target. The impression made by the transition in the Bank's policy approach at a Monetary Policy Meeting in April 2013, directly following Governor Kuroda's appointment, towards large-scale easing – both quantitative and qualitative – and a stated goal of doubling the inflation rate to 2% in two years, remains fresh in the memory. Easing was expanded in October 2014, and in January 2016 the Bank further strengthened easing, moving to a negative interest rate policy. However, secondary effects manifested themselves in unexpected forms (for example, a negative 10-year government bond interest rate), and in September 2016 the Bank transitioned to a policy of short- and long-term interest rate control (yield curve control), which has persisted to the present.

Over the course of this period, the Japanese economy continued a prolonged recovery, driven at first by household consumption, and, following this, by improvement in corporate profits and employment. At the same time, while the inflation rate became positive and temporarily rose to close to 1%, considered overall, the upward pressure has been very relaxed. The latest projections by the Bank of Japan itself predict an inflation rate of 1.8% for both fiscal years of 2019 and 2020 (Outlook for Economic Activity and Prices, April 2018). It appears that the stable realization of the Bank's 2% price stability target will take some time.

The second term of the Kuroda regime faces the following dilemma: If the Bank maintains the same logic as it did during Governor Kuroda's first term, and further strengthens monetary

[1] For more details regarding the estimates discussed in this paper, please refer to the background paper "*Kinko rishiritsu no suikei shuho oyobi suitei kekka ni tsuite* [On the Estimation Methods and Resutls of Equilibrium Interest Rates]," is available on NIRA's homepage. (in Japanese)
http://www.nira.or.jp/president/opinion/entry/n180524_892.html

easing in order to prioritize the rapid achievement of the 2% target, it is predicted that the risk of secondary effects – the creation of an asset price bubble, a worsening in the profit margin of financial institutions, and a decline in fiscal discipline – will intensify. On the other hand, if the Bank places the greatest emphasis on the risk of secondary effects and hastily normalizes easing or even modifies its 2% target policy framework, the monetary environment will be rendered unstable, and economic recovery will be delayed. Neither strengthening easing nor pulling back from the policy represents an easy solution, and it can be predicted that this will represent a difficult task for policy management. This is the dilemma currently facing the Bank of Japan[2].

Overcoming the Dilemma: Will the Benefits of Monetary Easing Increase?

Is there a means of overcoming this dilemma? One key will be whether or not the benefits of monetary easing, i.e. the economic stimulus effect, increase without a change in the policy.

Generally, the degree of easing in monetary policy can be evaluated by comparing the level of the policy interest rate (typically, the short-term interest rate) and the equilibrium interest rate (more specifically, the equilibrium real interest rate), a neutral interest rate level that does not affect the economy or prices. If the policy interest rate (the real rate defined as the nominal rate less expected inflation rate) is lower than the equilibrium interest rate, the monetary policy stance can be judged as expansionary; by contrast, if the policy interest rate is higher, monetary policy can be judged as contractionary. Therefore, if the equilibrium interest rate were to increase due to factors such as an increase in the performance of the economy without any change in the target level of the policy interest rate, the degree of monetary easing would increase, and the economic stimulus effect would be boosted. If, following this scenario, the benefits of the easing policy increase while concern regarding the secondary effects remains constant, the issue represented by those secondary effects would, relatively speaking, be eased. As a result, while the dilemma would remain, it could be overcome.

However, there is some room for argument as to whether or not concern regarding secondary effects can be regarded as a given, i.e. as fixed, under a long-term easing regime. The main risks related to unconventional monetary policy are indicated as being: (i) financial imbalances (asset price bubbles, etc.); (ii) impact on the financial system (decline in profits for financial institutions, etc.); and (iii) effects related to fiscal policy (risk related to monetary financing, etc.). It is naturally the case that each of these areas will require careful examination in future: In relation to (i), as to whether or not expectations will become excessively bullish in the event that the fundamentals of the economy strengthens; in relation to (ii), as to whether or not the vulnerability of the financial system will increase, given the possibility that the low-profit

[2] This paper will focus on yield curve control, the BOJ's major future policy framework, and discuss the effect of monetary policy by considering the gap between the policy interest rate and the equilibrium interest rate. While the policy effects of the "quantitative" aspect of quantitative and qualitative monetary easing which has been emphasized by the Bank – large-scale expansion of the monetary base and buybacks of long-term government bonds – are still being verified, a clear economic stimulus effect (stock prices, exchange rate, etc.) has been reported (Miyao, R., *Hidentoteki kin'yu seisaku – Seisaku tojisha toshite no shiten* ["*Unconventional Monetary Policies – A Perspective from an Involved Party*"], 2016, Yuhikaku Publishing, in particular Chapter 3). The Bank of Japan has announced that it will continue its policy of expansion of the monetary base until the actual inflation rate stably exceeds its target of 2%, and expects recovery in the economy to continue to be supported by the effect of the quantitative approach.

environment for financial institutions will become structural: and in relation to (iii), as to whether or not the nation falls into a state of fiscal dominance (a state in which the government loses fiscal discipline and the central bank follows the government in a subservient role)[3].

Overview of Equilibrium Interest Rate: Long-term Trend Factors and Other Fluctuating Factors

In this section, we provide a detailed explanation of the equilibrium interest rate, this paper's main focus[4].

As indicated above, the term "equilibrium interest rate" generally refers to a neutral real interest rate that does not affect the economy or prices, acting neither to ease nor to tighten. Theoretically, the equilibrium interest rate can be defined as a real interest rate that balances savings and investment in a situation in which prices are elastic and full employment has been achieved. If the actual real interest rate is higher than the equilibrium interest rate, output will fall below the full employment level (this is termed "equilibrium output" or "natural output"), acting to push prices down. Alternatively, if the real interest rate is lower than the equilibrium interest rate, it will act to increase output and prices.

Under the framework of an economic growth model, this equilibrium interest rate corresponds to the real interest rate on the optimum growth path in the long-run (i.e., the real interest rate consistent with the balanced growth path, on which prices are flexible and supply and demand are matched). Because the equilibrium interest rate is a concept that corresponds to equilibrium output (that is, full employment output), the fact that it corresponds to the potential growth rate (the growth rate under equilibrium output) can be intuitively understood. The equilibrium interest rate can formally be derived explicitly from the optimum household consumption and savings behavior that forms the foundation of optimum growth theory (the Euler equation for consumption). As a result, the equilibrium interest rate can be expressed as the total of a component that corresponds to the long-term potential growth rate (the productivity growth rate, etc.) and a component that is explained by short-term fluctuating factors (changes in household preferences, fiscal policy, and other demand shocks). In other words, it can be expressed as follows:

The equilibrium interest rate = A long-term trend component (corresponding to the potential growth rate) + A cyclical component (fluctuations due to demand shocks, etc.).

Discussions based on the approximation "equilibrium interest rate (or natural rate of interest) ≒ potential growth rate" are frequently encountered. This can be understood as an

[3] For more detail, see, for example, Miyao, R. "*ICT no shinten to kin'yu seisaku unten* ("The Development of ICT and the Management of Monetary Policy")," NIRA Opinion Paper No. 33, December 2017.
[4] For discussions regarding the equilibrium interest rate, see Oda, S. and Muranaga, J., "*Shizen rishiritsu ni tsuite: Riron seiri to keisoku* ("The Natural Rate of Interest: A Survey of Theory and Measurements")," Bank of Japan Working Paper Series No. 03 – J – 5, October 2003, and Iwasaki, Y. et al, "*Wa ga kuni ni okeru shizen rishiritsu no doukou* ("Trends in the Natural Rate of Interest in Japan")," Bank of Japan Review, 2016 – J – 18, October 2016.

approach that focuses on long-term trend factors, making it possible to ignore the short-term fluctuating factors in the second term of the equation above.

The approach taken to the calculation of estimates below will reflect this idea of dividing the equilibrium interest rate into long-term trend factors and other fluctuating factors.

Approach to the Estimation of the Equilibrium Interest Rate

This section will introduce methods employed in the estimation of the equilibrium interest rate. The main approaches to estimation of the equilibrium interest rate are: (1) The univariate time-series approach (the Hodrick-Prescott filter [hereafter, referred as "HP filter"]); (2) The Laubach-Williams model; and (3) The dynamic stochastic general equilibrium (DSGE) model. An overview of the characteristics of each of these approaches will be offered.

(1) Univariate time-series approach (HP filter)

The univariate time-series approach (HP filter) is a method of statistically extracting trend components from actually observed real interest rate data. Based on the assumption that the real interest rate is constantly fluctuating around the equilibrium interest rate, an estimated value for the equilibrium interest rate is isolated using the HP filter.

The major feature of the HP filter is the method's simplicity, and it is also sometimes used to estimate potential GDP and potential growth. It should be noted that this approach relies solely on statistical procedure of data smoothing and does not involve any economic theory.

(2) The Laubach-Williams model

The Laubach-Williams model is an approach that explicitly incorporates standard economic theory (IS curves, Philips curves, etc.) in the estimation of the equilibrium interest rate.

As already indicated, the equilibrium interest rate is a neutral real interest rate that does not affect the economy or prices, acting neither to ease nor to tighten. The Laubach-Williams model assumes an IS curve for aggregate demand in the economy. If the real interest rate is higher than the equilibrium interest rate, aggregate demand or the gap between supply and demand will decrease; if the real interest rate is lower, aggregate demand or the gap between supply and demand will increase. On supply side, the model incorporates a traditional Philips curve so that the inflation rate is determined by the adaptive expectation of inflation by market participants and the output gap (i.e., real GDP minus potential GDP). In addition, the trend component of the potential growth rate is assumed to be described by a random walk process. Demand shocks are similarly defined as random walk variables. Considered from the perspective of the equation above, in the Laubach-Williams model, the equilibrium interest rate is formularized in such a way that both the trend component in the first term and the cyclical component due to demand factors in the second term are incorporated (and in each case the effect of shocks is formularized as a persisting stochastic trend).

The distinctive feature of the Laubach-Williams model is that while it is more or less

informal, it explicitly displays the structure of an economic model. It does not incorporate the dynamically optimized behavior of households and firms as does the DSGE model discussed below. Nevertheless, IS and Philips curves are both relational formulas employed in standard macroeconomic theory, and the consideration of such theoretical mechanisms is a feature offered by the Laubach-Williams model that is not offered by the univariate time-series approach. It is more general than the univariate time-series approach in the sense that it does not only incorporate a trend component due to the potential growth rate but also other sources of fluctuations due to demand shocks. The fact that the US Federal Reserve Bank has published up-to-date estimates based on the Laubach-Williams model (on the personal webpage of Federal Reserve Bank of San Francisco President John Williams) suggests the model's importance.

(3) The DSGE model

Estimation of the equilibrium interest rate using the DSGE model explicitly considers the dynamically optimized behavior of households and firms. In essence, the representative household seeks to maximize the utility it obtains from consumption and leisure into the future. The representative firm seeks to maximize its profit in each period, and sets prices with consideration of adjustment costs into the future. The model employed in this paper assumes that the central bank follows monetary policy rules that consider the zero interest rate constraint. Given the model's complete specification of the structure of the economy, ultimately determining the equilibrium interest rate requires the solution of a complex nonlinear equation, and its estimation also demands a sophisticated method. In addition, equations corresponding to IS curves and Philips curves can be obtained by linear approximation, making it possible to discuss the relationship of correspondence between the DSGE model and the Laubach-Williams model discussed above.

The DSGE model is the main analytic tool driving contemporary macroeconomic analyses. Its major distinctive feature is that it is a structural model that incorporates a complete description of the behavior of economic agents. The use of the model also enables the analyst to avoid "the Lucas critique" of policy analyses. At the same time, numerous variations in model settings can be considered, and the results of estimations are dependent upon the preconditions of the model. It is therefore important to test the robustness of the model structure and assumed parameters. The analysis conducted in this paper will proceed with attention to robustness.

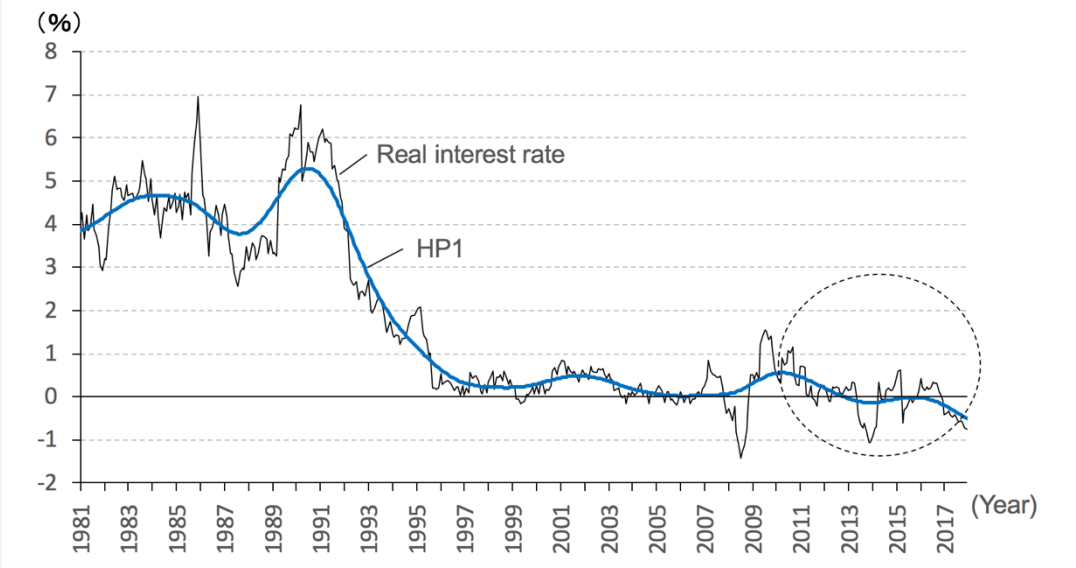
Results suggest that the Equilibrium Interest Rate has displayed an Upward Trend in Recent Years

We will now consider the results of estimations based on the three methods discussed above in sequence.

First, Figure 1 shows values estimated using the HP filter (blue solid line, HP 1 series). Based on the HP1 series, the equilibrium interest rate, which had exceeded 5% in around 1990, declined monotonously until 1999. Following this, despite slight increases in the first half of the 2000s and

around 2010, figures have been largely static, and have recently declined to become negative.

Figure 1 The equilibrium interest rate based on the HP filter



(Note) The real interest rate is a series obtained by subtracting the expected inflation rate (estimated using an autoregressive model) from the uncollateralized overnight call rate.
HP1 is a series of estimated values for the equilibrium interest rate (smoothness parameter = 14,400); monthly, January 1981 to December 2017.
(Source) Estimates by the authors.

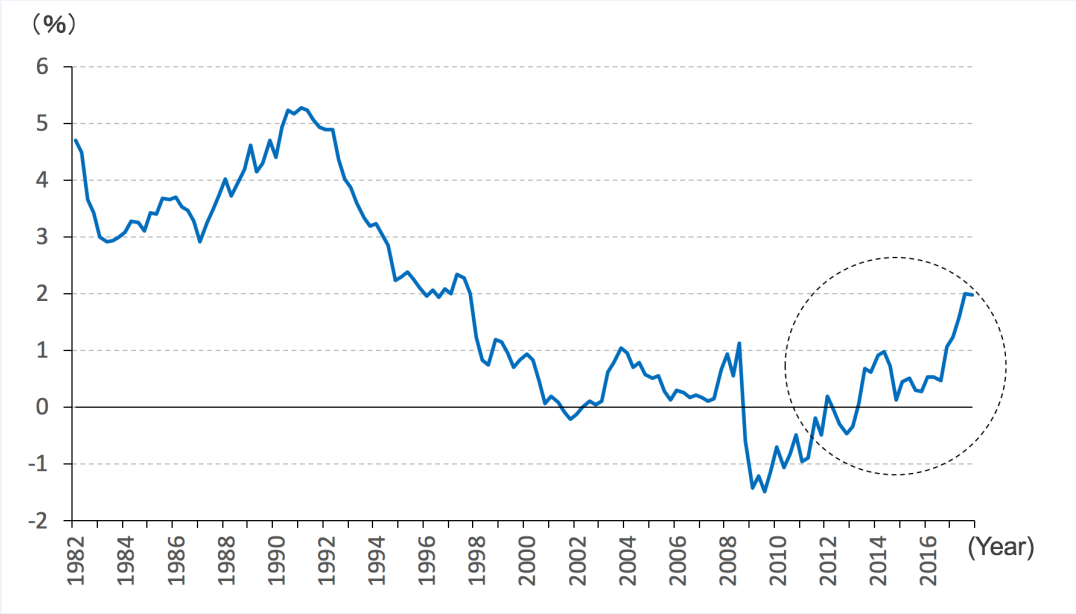
However, because the HP filter is a method that extracts the trend component from actual real interest rate data, persistent deviation from the real interest rate can by definition not be tolerated. In particular in this case, the results show that the equilibrium interest rate has recently declined to become negative, but this reflects the fact that the observed real interest rate has displayed a declining tendency. It must therefore be borne in mind that results reflect the specific characteristics of the HP filter. To go further, given that the results of estimations using the HP filter are known to be unstable at the end point (the final period of the sample), it is necessary to be aware that the results may be significantly corrected by the addition of data.

Next, Figure 2 shows results for the equilibrium interest rate calculated using the Laubach-Williams model (real-time estimates)[5]. The estimates based on the Laubach-Williams model show that following a peak of around 5% in the first half of the 1990s, the equilibrium interest rate declined basically consistently, dipping slightly into negative figures in the early 2000s. This is consistent with the estimates obtained using the HP filter. Following this, the rate became positive, and remained largely static, with slight fluctuations. Immediately following the global financial crisis, the rate declined rapidly to below −1%, after which it increased largely

[5] The Kalman filter is employed when potential variables are calculated based on the Laubach-Williams model. Two types of series can be calculated: Real-time estimates, using only the data available at the time of the evaluation ("one-sided estimates"), and smoothed estimates, using all of the data for a sample period, including the future ("two-sided estimates"). Because real-time estimates are used in international comparisons employing the Laubach-Williams model, real-time estimates are reported in this paper. Smoothed estimate results are shown in Figure 3 in the background paper.

monotonously, reaching a level of around 2% most recently. In the background here is an increase in estimated values for the potential growth rate. However, in the case of the estimates obtained using the HP filter, the rate was either largely static or displayed a moderate decline in the period following the global financial crisis. The two set of results contrast on this point. In addition, because the potential growth rate rose to be higher than the equilibrium interest rate from 2000, the other cyclical factors (demand shock factors) became negative, and this appears to have continued to act as a factor driving the equilibrium interest rate downwards. Furthermore, the interest elasticity parameter for the IS curve was changed, and the qualitative result remained robust (see Figures 4 and 5 in the background paper).

Figure 2 The equilibrium interest rate based on the Laubach-Williams model



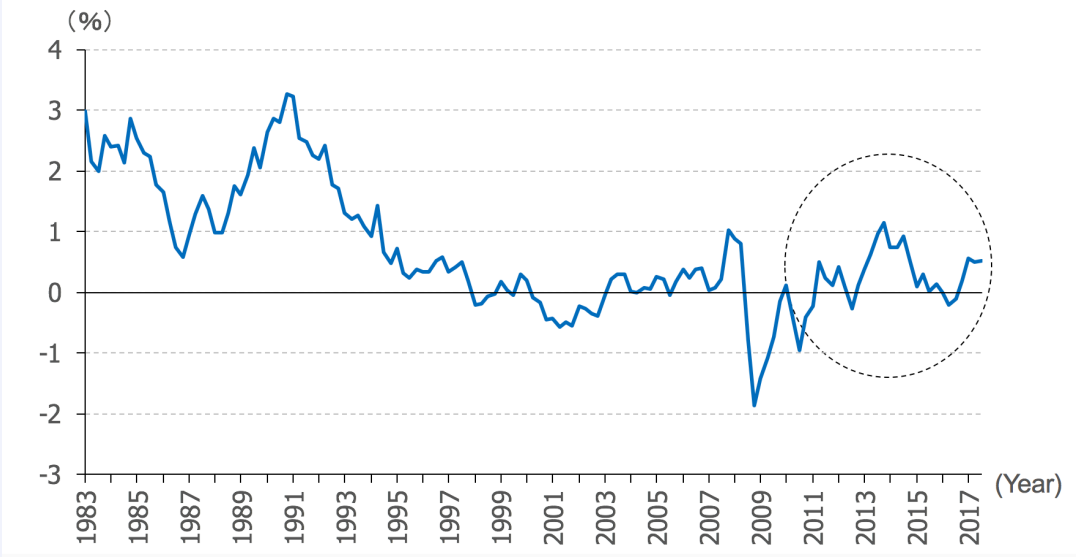
(Note) Values estimated for the equilibrium interest rate based on the Laubach-Williams model (real-time, quarterly estimates, 1982 Q1 to 2017 Q4).
(Source) Estimates by the authors.

Lastly, Figure 3 shows the equilibrium interest rate calculated using the DSGE model[6]. While the rate declined somewhat below 1% in the mid-1980s, following this it displayed an increasing tendency, until it exceeded 3% at the beginning of the 1990s. Following this the rate progressively declined until the latter half of the 1990s, taking a negative value in the latter half of the 1990s and the first half of the 2000s, but it did not decline below -1%. Immediately following the global financial crisis, the rate displayed a rapid decline to close to -2%. Following this, it transitioned to an upward footing, with the most recent figures between 0% and 1%. Estimates were also conducted using the DSGE model based on other settings (a linear model, a nonlinear model without the zero interest rate constraint, and a combination of the zero interest rate constraint and a linear model), and the qualitative result remained robust (see Figure 7 in the

[6] Estimates obtained using a nonlinear model with the zero interest rate constraint. Here, the steady-state value for the equilibrium interest rate for the entire period was 0.46%. For details of the method of solving the model and the estimation method, see the Technical Appendix in the background paper.

background paper).

Figure 3 The equilibrium interest rate based on the DSGE model

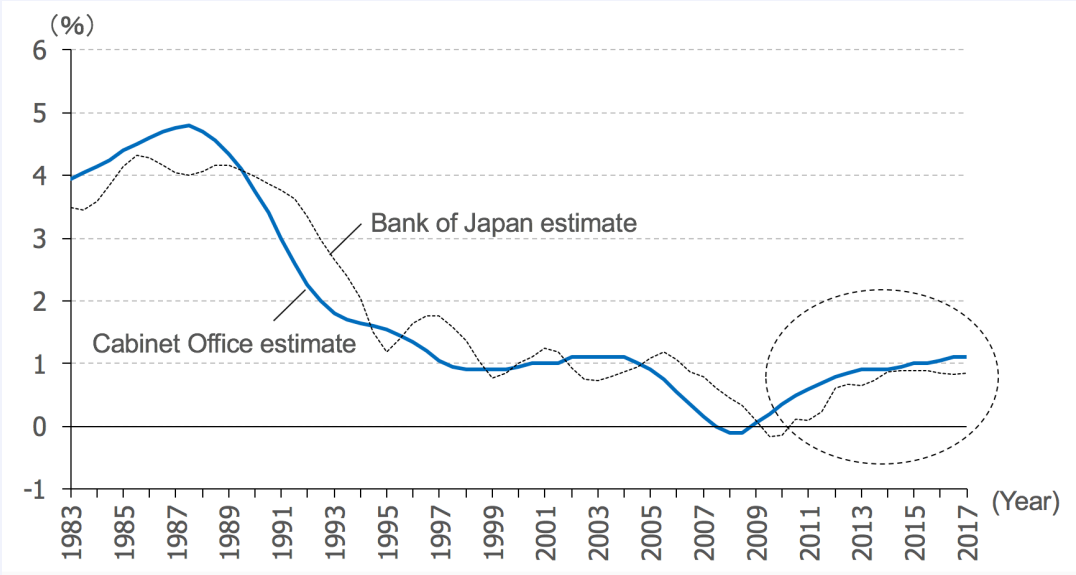


(Note) Values estimated for the equilibrium interest rate based on the DSGE model (nonlinear with the zero interest rate constraint, quarterly estimates, 1983 Q2 to 2017 Q4)
(Source) Estimates by the authors

Other Economic Indicators also Point to an Upward Trend in the Equilibrium Interest Rate

In addition to the estimation results discussed above, there are some other economic indicators closely related to the equilibrium interest rate. The potential growth rate is one of these indicators. As indicated in the equation discussed above, the potential growth rate corresponds to the long-term trend component of the equilibrium interest rate, and numerous discussions employ the approximation "equilibrium interest rate ≒ potential growth rate." Figure 4 shows the potential growth rate as calculated by the Cabinet Office and the Bank of Japan. Both series are estimated using standard production functions and move closely to each other. From an initially high level, the rate declines significantly in the first half of the 1990s, dropping further at the time of the global financial crisis, following which, it has risen in recent years. Overall, this trend is consistent with the results of the estimations based on the Laubach-Williams model and the DSGE model, shown in Figures 2 and 3 respectively.

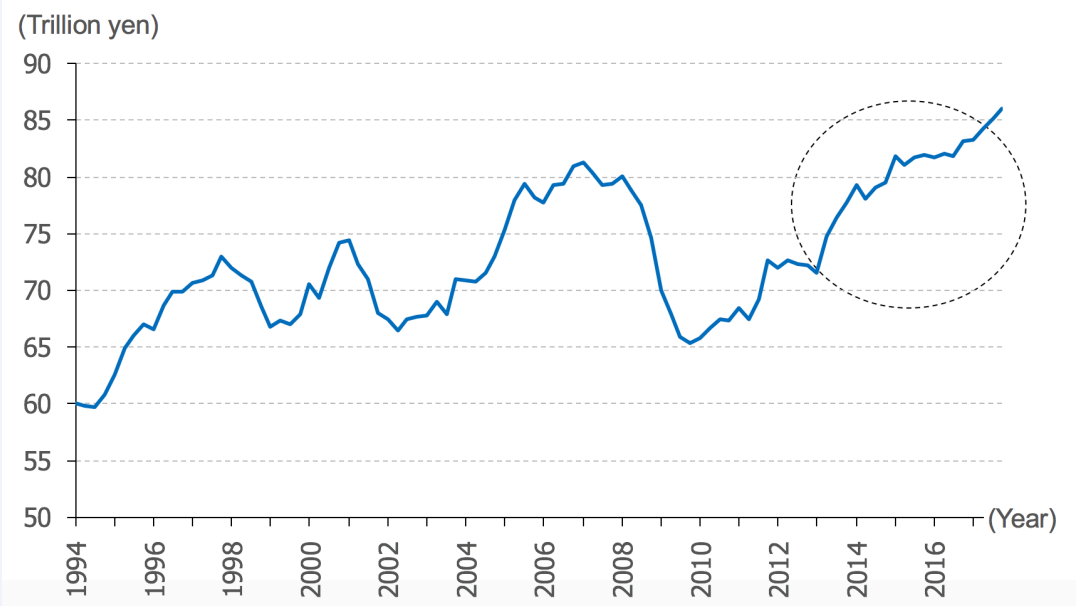
Figure 4 The potential growth rate has also displayed a recent upward trend



(Note) Half-yearly data, first half fiscal 1983 to first half fiscal 2017
(Source) Cabinet Office, Bank of Japan.

Corporate capital investment trends also offer a useful reference as another economic indicator. Figure 5 shows corporate capital investment (real value). It can be seen that capital investment has increased in vigor in recent years. Standards for the System of National Accounts of Japan were revised at the end of 2016, and research and development expenses are now included in the new series (2008 SNA). An increase in research and development investment has contributed to the recent invigoration of capital investment, supporting the increase in the potential growth rate on the twin fronts of capital deepening and total factor productivity.

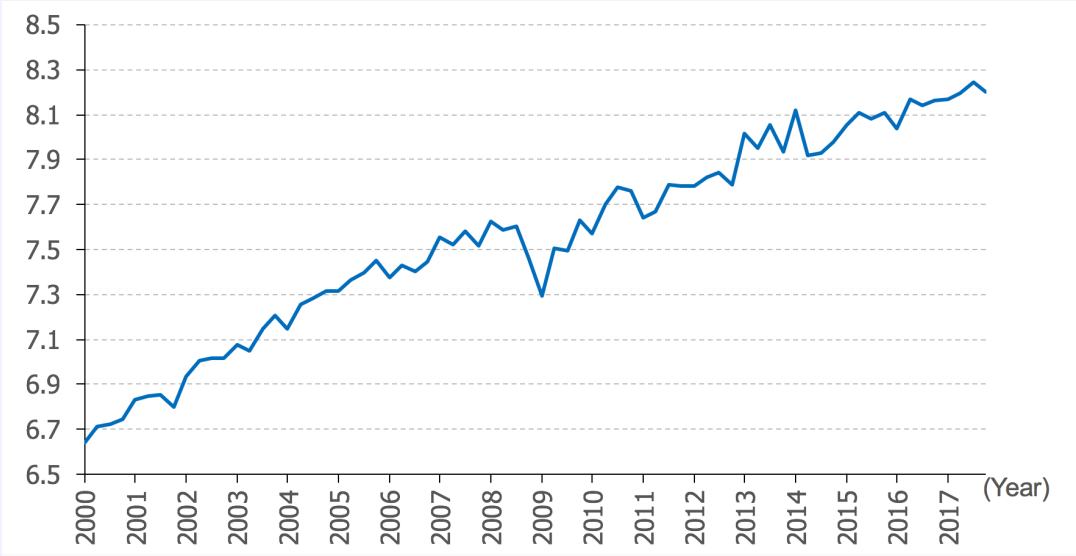
Figure 5 Corporate capital investment is also displaying a continuing increase



(Source) Cabinet Office, "National Accounts of Japan"

Figure 6 shows labor productivity for Japan as a whole. Here, labor productivity is real GDP divided by the figure obtained by multiplying the number of employed persons by the number of hours worked (man hours). Labor productivity has continued to increase stably from 2000 to the present, displaying steady growth without a reduction in pace even with a recent increase in the number of employed persons. We may infer that this stable improvement trend on the supply side as a whole has also been a factor supporting the increase in the equilibrium interest rate.

Figure 6 Labor productivity (man hour-based) is also continuing a stable increase



(Note) Quarterly data, labor productivity = real GDP (trillion yen)/[Number of employed persons (10,000 people) × total actual working hours (2015=100)]
(Source) Cabinet Office, "National Accounts of Japan"; Statistics Bureau, Ministry of Internal Affairs and Communications, "Labor Force Survey"; Ministry of Health, Labour and Welfare, "Monthly Labour Survey"

Economic Trends show the Benefits of Monetary Easing to be Increasing

Taking into consideration estimates of the equilibrium interest rate obtained using three approaches and the evidence of other economic indicators, we may infer that overall, the Japanese economy has continued a steady improvement in performance, and the equilibrium interest rate itself is trending upwards.

If this trend continues, we can predict that even if there is no change in monetary policy – that is, even if the current long-term interest rate target is maintained – the degree of monetary easing will increase, and its effect in stimulating the economy will also be boosted. There are of course a range of routes available for the propagation of the effects of monetary easing other than the traditional interest rate channel (a gap between the policy interest rate and the equilibrium interest rate), including stock prices, the exchange rate, and bank credit. As the US and other overseas economies continue to improve, overseas potential growth rates and equilibrium interest rates have also ceased their decline or are beginning to recover (and as a result, it is predicted that US interest rates will commence a gradual increase). The additional effect of recovery in the global economy will presumably further increase the effects of easing.

This increase in the benefits of monetary easing increases the potential for overcoming the monetary policy dilemma discussed at the beginning of this paper. This is because an increase in policy effects will ease the issue of secondary effects to some extent. Naturally, it will be necessary to closely examine whether the upward trend in the equilibrium interest rate will continue into the future, and whether the risk of secondary effects will increase. On the other hand, announced policy changes or revisions of the framework can be expected to entail considerable costs, whether in the direction of easing or tightening. We must not forget that a scenario in which monetary policy management that appears staid is in fact overall optimal and will continue to produce significant effects is certainly possible.

Ryuzo Miyao
Professor, Graduate School of Economics, The University of Tokyo. Ph.D. (Economics), Harvard University. Former Member of the Policy Board, Bank of Japan (March 2010 – March 2015). Specializes in monetary economics and empirical macroeconomic analysis.

Mototsugu Shintani
Professor, Research Center for Advanced Science and Technology, The University of Tokyo. Ph.D. (Economics), Yale University. Specializes in macroeconomics and econometrics.

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