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The Role of Money and Growth Expectations in Price Determination Mechanism

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Abstract

There is a positive cross-country correlation between money growth and inflation rate, and both money growth and inflation rate of Japan are lower than those of other advanced countries. In the "Money view" based on the quantity theory of money, it can be interpreted that Japan's low inflation results from the low growth of money. However, the time-series correlation between money growth and inflation rate in advanced countries including Japan has declined since the mid 1990s. Furthermore, during this period, a strong positive correlation between the potential growth rate and the long-term inflation expectation is observed in Japan, and these facts are not consistent with the Money view. Japan's potential growth rate declined sharply in the past two decades in contrast to other advanced countries, and as a result expectations for future economic growth also declined, which may possibly have caused deflation in Japan. In the "Expected Burden view" based on the fiscal theory of the price level, growth expectations affect the price level as follows: 1) the decline in growth expectations increases the future fiscal burden on the private sector; 2) the private sector then cuts its expenditures to increase savings for the future burdens; 3) as a result, the aggregate demand decreases and hence the aggregate price level falls. This paper examines whether such a mechanism has indeed worked in Japan or not, comparing the inflation developments in the US and the euro area.

Keywords: Money view, Expected Burden view

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1. Introduction

In the US and the euro area, where the core CPI inflation rates have declined recently, there are growing concerns about whether disinflation will continue going forward and proceed to a deflationary situation, or whether disinflation will be restrained and the inflation rates will reverse the downward trend. Phillips curve may help us to answer this kind of question because we can forecast inflation rates by substituting the projected output gap into the Phillips curve. Japan's inflation rate can be also forecasted by the same method.

Although Phillips curve is a useful model to forecast inflation rates, it is important to examine price fluctuations through several perspectives rather than the single approach of the Phillips curve. In addition, while the Phillips curve is effective in explaining price fluctuations over the short term, it may not necessarily be appropriate for explaining price fluctuations over the long term. That is, when we forecast inflation rates over the coming 1-2 years by using Phillips curve, we need to assume that the long-term expected inflation rate is exogenously given. The Phillips curve alone cannot lead to an answer about how the inflation rate (and expected inflation) will change over the long term.

The purpose of this paper is to examine price fluctuations from a long-term perspective rather than from a short-term perspective. Because prices are flexible in the long-run, the actual inflation rate is equal to the expected inflation rate, and the output gap is zero. Therefore, the Phillips curve, into which the expected inflation and the output gap are substituted, is ineffective to explain the long-run price fluctuations. This paper examines the two views about the long-run price determination mechanism: 1) the "Money view," where changes in money affect the price level; and 2) the "Expected Burden view," where changes in growth expectations affect the price level via changes in the fiscal burdens and the debt burdens of the private sector.

The remainder of the paper proceeds as follows. Section 2 presents several facts about price fluctuations in advanced countries, and Section 3 raises issues to be discussed. Section 4 explains the two views about the long-run price determination mechanism. Section 5 and 6 examine price fluctuations in the US, the euro area, and Japan. Finally, Section 7 concludes.

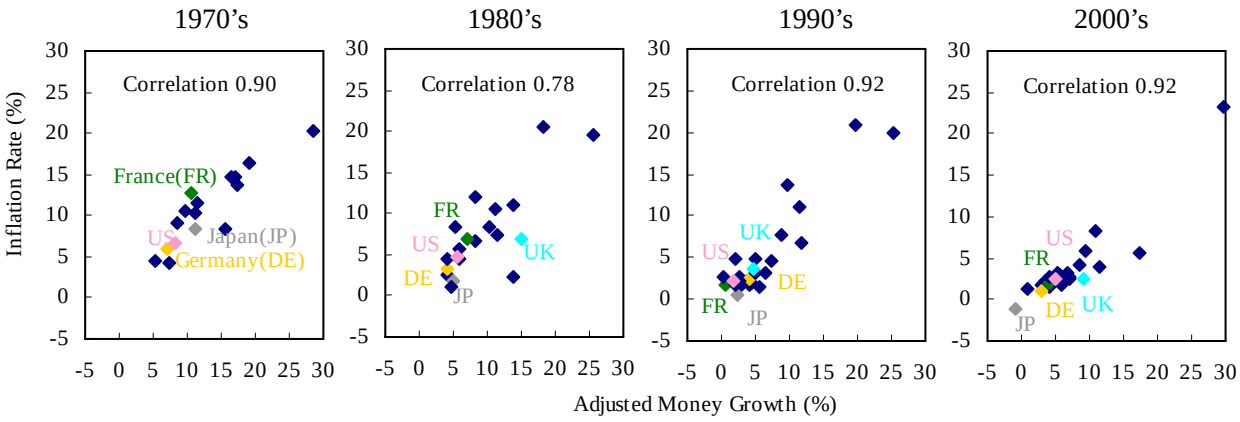
2. Fact-findings: Relationship among the Inflation Rate, Money Growth, and Real Growth Rate

In this section, we present four facts about price fluctuations in advanced countries, focusing on the relationship among the inflation rate, money growth, and real output growth rate. Note that "money" in this paper refers to broadly defined money stock such as M2 and M3, and not the monetary base.

Fact 1. Adjusted money growth rates(*) and inflation rates averaged on a ten-year basis in the OECD countries show a positive cross-country correlation in all sample periods (Figure 1). That is, in the countries with higher inflation, money growth is higher and in contrast, in the countries with lower inflation, money growth is lower. Note that both money growth and inflation rate of Japan are lower than those of other advanced countries.

(*) Adjusted money growth is defined as money growth minus real GDP growth.

Figure 1. Cross-country Correlation between Money Growth and Inflation



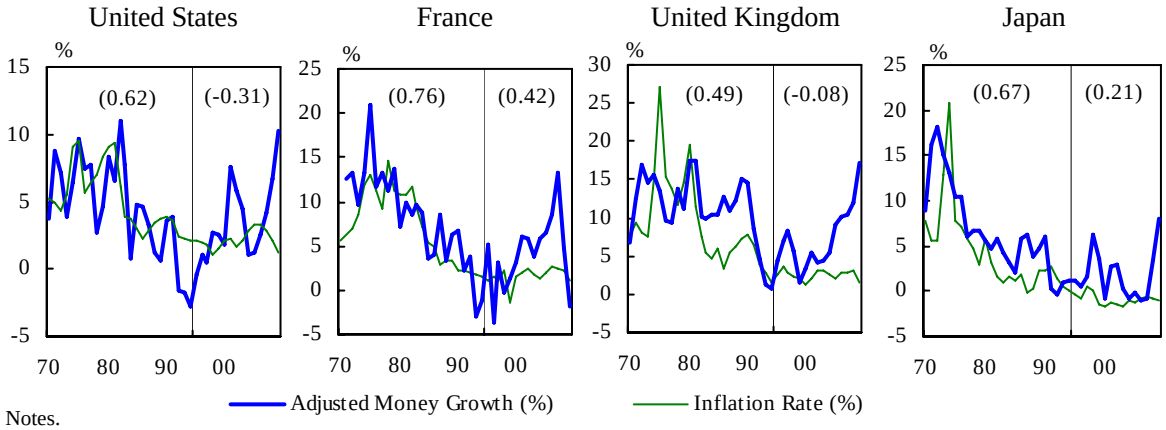
Notes.
1. Money growth and inflation rate are changes in M3 and GDP deflator, respectively. Data for 2000's are up to 2008 except for the US whose money growth is only available up to 2005.
2. The sample countries are OECD countries. The number of sample countries differs across decades because of data availability.

Sources. International Monetary Fund, "International Financial Statistics", OECD, Each country's statistics.

Fact 2. The time-series relationship between adjusted money growth and inflation rate in advanced countries shows a positive correlation from the 1970s to the first half of the 1990s (Figure 2). However, the time-series correlation between them declined after the

latter half of the 1990s in all advanced countries.[1] This is because inflation rates remain relatively stable even when the money growth fluctuates more significantly than the real output growth.

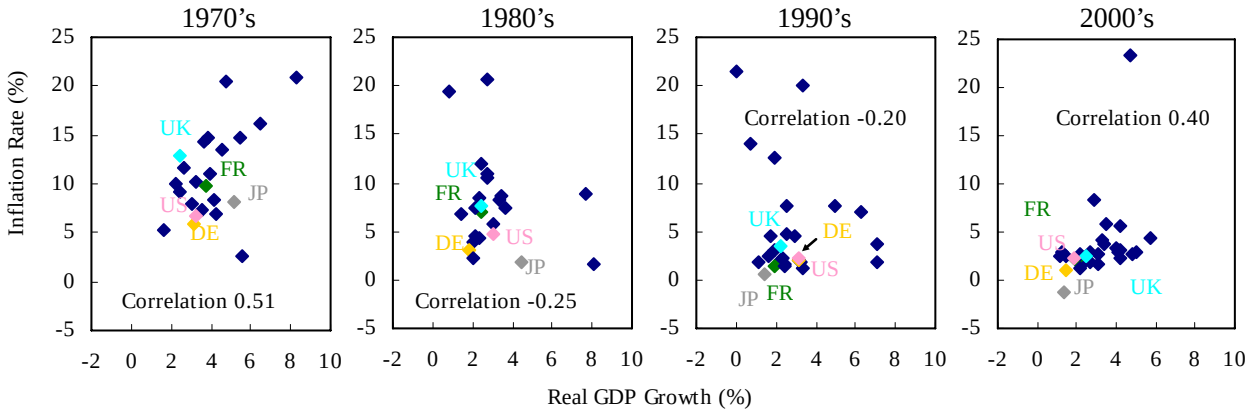
Figure 2. Money Growth and Inflation in Advanced Countries



Notes.
1. Figures in parentheses are correlation coefficients of 1970-1994 and 1995-2009. Money growth is based on M2 for the US and Japan, M3 for France, and M4 for the UK, respectively. Each money indicator is chosen because of the availability of long time-series data.
2. Because of the data discontinuity of Germany in 1990's, France is selected as the representative of the euro area.
Sources. International Monetary Fund, "International Financial Statistics", Eurostat, Each country's statistics.

Fact 3. Next, we focus on the relationship between the real output growth and inflation, not the relationship between money growth and inflation. Real GDP growth

Figure 3. Inflation and Real Output Growth Rate



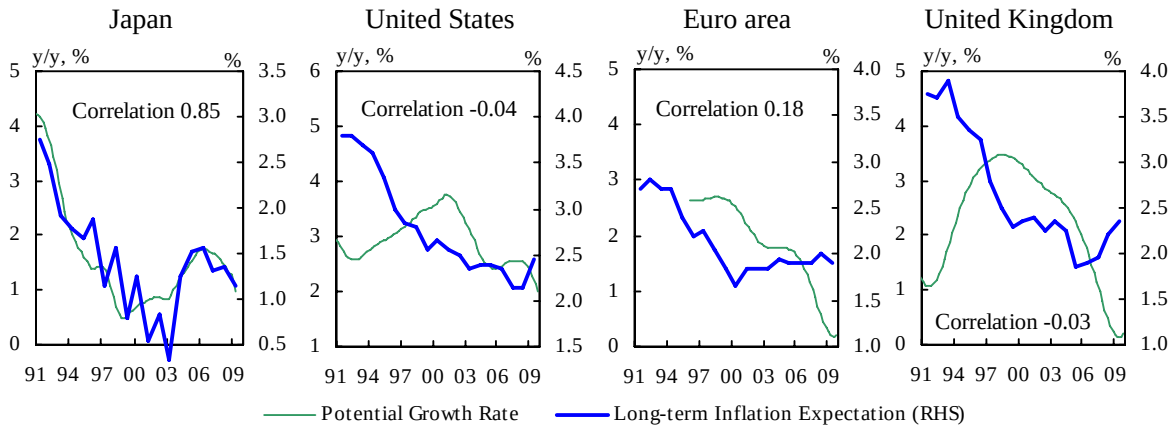
Notes.
1. Inflation rate is measured by GDP Deflator.
2. The sample countries are OECD countries. The number of sample countries differs across decades because of data availability.
Source. International Monetary Fund, "International Financial Statistics".

[1] See Bank of Japan (2003) for how the time-series correlation between money growth and the inflation rate decreased in Japan since the mid 1990s.

rates and inflation rates averaged on a 10-year basis in the OECD countries show no or only a low cross-country correlation in all sample periods (Figure 3). In the long run, the real GDP growth rate converges to the potential growth rate, and the inflation rate averaged over the long term is not much affected by the real economy in the advanced countries as a whole.

Fact 4. Finally, we examine the relationship between the long-term inflation expectation and the potential growth rate (Figure 4). The private sector's inflation outlook over the coming 5-10 years by the Consensus Forecast is used as the long-term inflation expectation. In the US, the euro area, and the UK, there is no time-series correlation between the long-term inflation expectation and the potential growth rate, which is consistent with Fact 3. However, only in Japan, a strong positive correlation between them is observed.

Figure 4. Potential Growth Rate and Long-Term Inflation Expectations



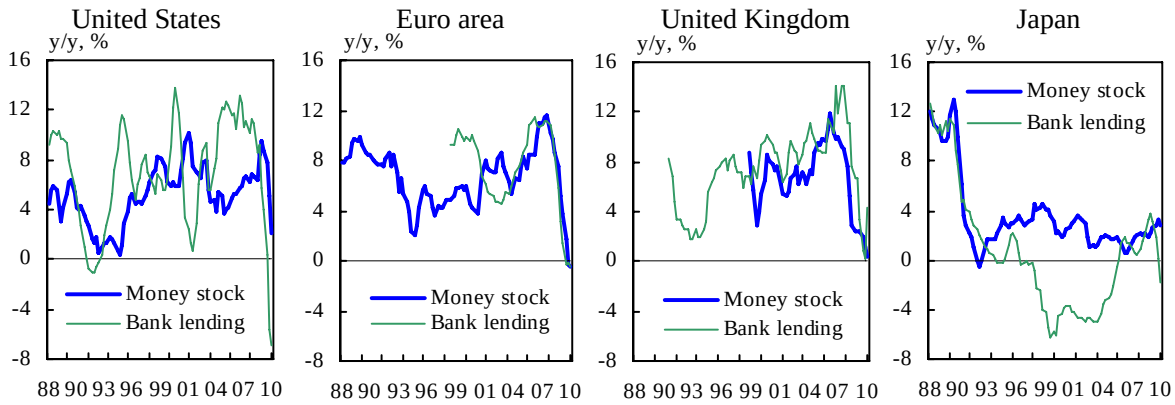
Notes.
1. Long-term inflation expectation for each year is 5-10 years ahead outlook averaged on April and October survey results of Consensus Forecast. Potential growth rates are measured by BOJ for Japan, CBO for the US, and the Hodrick-Prescott filter of real GDP for the euro area and the UK, respectively.
2. German data is used for inflation expectations up to 2002 in the euro area.
3. Correlation coefficients are calculated for the 1991-2009 sample period.
Sources. Each country's statistics, Consensus Economics.

3. Issues to be Raised

Based on the facts presented above, we raise the following two issues.

First, regarding the US and the euro area, where the money growth has dropped sharply (Figure 5), what views should be taken on the inflation outlook?[2] Given the cross-country correlation between inflation and money growth (Figure 1), should we take the view that the decline in money growth will increase the downward pressure on prices as is the case of Japan's economy after bursting of the bubble?[3] Or, given the decreasing time-series correlation between money growth and inflation over recent years (Figure 2), should we take the view that lower money growth will not have any significant impact on inflation?

Figure 5. Money Growth in Advanced Economies



Note. Money growth is based on M2 for Japan and the US, M3 for the euro area, M4 (excluding intermediate other financial corporations) for the UK, respectively.
Sources. Each country's statistics.

Secondly, regarding Japan, how should we interpret the facts that while the time-series correlation between the inflation rate and the money growth is decreasing (Figure 2), the correlation between the long-term expected inflation rate and the potential growth rate remains strongly positive (Figures 4)? Neither of the facts is consistent with the quantity theory of money.[4] Furthermore, in contrast to other

[2] As mentioned above, in this paper, "money" refers to broadly defined money stock such as M2 and M3 and not the monetary base. While the monetary base significantly increased after the financial crisis in the US and the euro area as a result of the liquidity provision by the FRB and the ECB, growth of the money stock declined sharply due to slowdown in bank lending.

[3] In Japan, the growth in bank lending decelerated rapidly after the burst of the bubble, and continued to remain stagnant for a long time. Looking at the US and the euro area, the growth in bank lending is still continuing to decline, and the pace of the decline is much faster than that in Japan after the burst of the bubble.

[4] If we base our interpretation about the positive correlation between the potential growth rate and the long-term expected inflation rate on the quantity theory of money, we may conclude that the long-term inflation rate declined because money growth rate decreased significantly and concurrently

advanced countries, why is the positive correlation between the long-term expected inflation rate and the potential growth rate observed only in Japan?

In the following, we proceed with these two issues based on the two views: the Money view and the Expected Burden view (hereafter the EB view).

4. Two Views on the Price Determination Mechanism

In this section, in order to understand the difference between the Money view and the EB view, the relationship between the private sector and the government is explained by using their budget constraints. Since these two views have different perspectives on how the private sector and the government behave in the economy, they lead to the different price determination mechanism.

Inter-temporal Budget Constraints of the Private Sector and the Government

The inter-temporal budget constraint of the private sector can be expressed as the following balance sheet:

Balance Sheet of the Private Sector

Assets	Liabilities
Market value of government bonds Discounted present value of labor income Discounted present value of social security benefits	Discounted present value of consumption expenditures Discounted present value of taxes and social security contributions

Assets of the private sector comprise the current outstanding balance of financial assets and the discounted present value of labor income and social security benefits. Net financial assets of the private sector are equal to the market value of government bonds.[5] The private sector uses these assets to pay the liabilities, which comprise the discounted present value of consumption expenditures as well as the discounted present value of taxes and social security contributions. An even balance of assets and liabilities means

when the potential growth rate declined. However, if the influence of money is dominant over the inflation to that extent, there is no way that the time-series correlation between money growth and inflation should collapse, which contradicts *Fact 2*.

[5] In this paper, investment expenditures such as housing and capital investments are omitted for simplification. If such expenditures are taken into consideration, housing and capital stocks are added on the asset side of the balance sheet. However, such a revision does not affect the main mechanism of price determination.

that the households use up the assets by the end of their lifetime.

Substituting the principle of equivalent of three aspects (income = production = consumption expenditure + government expenditure) into the private sector's inter-temporal budget constraint leads to the following government's inter-temporal budget constraint:[6]

Market value of government bonds = Discounted present value of fiscal surplus

The fiscal surplus measures a government's investment-saving balance, which is defined as "taxes + social security contributions – social security benefits – government expenditures." The above budget constraint means that the fiscal surplus serves as a redemption resource for government bonds, and it can be expressed as the government's balance sheet as follows:

Balance Sheet of the Government

Asset	Liability
Discounted present value of fiscal surpluses	Market value of government bonds

An even balance of asset and liability means that the government's solvency condition holds.

As is obvious from the derivation of the government's budget constraint, the government's balance sheet is inextricably related with that of the private sector: 1) the discounted present value of fiscal surpluses, which is an asset of the government, is a liability for the private sector; 2) the government bonds, which is a liability of the government, is an asset for the private sector.

In the following analysis, it is useful to show the government's inter-temporal

[6] See below for the derivation of the government's budget constraint. Here, *pv* represents the discounted *p*resent *v*alue of each variable, and the dotted underline shows the principle of equivalent of three aspects.

Market value of government bonds + Labor income^{pv} + Social security benefits^{pv} = Consumption expenditure^{pv} + Taxes^{pv} + Social security contributions^{pv}

Market value of government bonds + Consumption expenditure^{pv} + Government expenditure^{pv} + Social security benefits^{pv} = Consumption expenditure^{pv} + Taxes^{pv} + Social security contributions^{pv}

Market value of government bonds + Government expenditure^{pv} + Social security benefits^{pv} = Taxes^{pv} + Social security contributions^{pv}

Market value of government bonds = Taxes^{pv} + Social security contributions^{pv} − Social security benefits^{pv} − Government expenditure^{pv}

Market value of government bonds = Fiscal surplus^{pv}

budget constraint in real terms. For purpose of simplification, we assume that the real fiscal surplus is constant every period, and then the following equation is obtained:

$$\frac{B}{P} = \frac{S}{r},$$

where S is the real fiscal surplus, r is the discount rate (i.e., the real interest rate), B is the nominal market value of government bonds, and P is the price level.[7] The left-hand side of the above equation (B/P) and the right-hand side (S/r) represent the real value of government bonds and the discounted present value of the real fiscal surplus, respectively.[8] For purpose of simplification, the government bonds are assumed to fully comprise short-term zero coupon bonds, and hence the market value of government bonds B is given at the beginning of the period. In addition, under price flexibility which is a good assumption for examining the long-run price determination mechanism, the discount rate r (i.e., real interest rate) is equal to the natural rate of interest rate, which depends on the potential growth rate.

Based on the above preparations, we now explain the difference between the Money view and the EB view. In both views, the government's inter-temporal budget constraint ($B/P = S/r$) is satisfied. However, they are significantly different from each other in whether this constraint is considered to be an identity equation or an equilibrium equation which determines the price level P.

The View that Changes in Money Affect Price Level: Money View

The Money view regards the government's inter-temporal budget constraint ($B/P = S/r$) as an identity equation. In this view, the price level P is determined based on the quantity theory of money. This theory assumes that in the quantity equation ($MV = PY$) the velocity of circulation V is constant in the long run. Then, the amount of money stock M determines nominal output PY. Under flexible prices in the long run, real output Y is equal to the potential output which is exogenously given, and hence the amount of

[7] Note that constant fiscal surplus S must take a positive value to redeem government bonds. If we assume that fiscal surplus S is variable, this will only make the government's inter-temporal budget constraint more complicated, but the essence of the following discussions is not significantly affected.

[8] The discounted present value of the real fiscal surplus S is derived as follows:

$$\frac{S}{1+r} + \frac{S}{(1+r)^2} + \cdots\cdots + \frac{S}{(1+r)^n} \cdots\cdots = \frac{S}{r}$$

money stock M determines the price level P. In essence, when the money supply increases and exceeds the money demand that people desire to hold, the price level P rises as people spend excess money to purchase goods. On a growth rate basis, money growth determines inflation.

In the Money view, since the price level P is determined based on the quantity equation ($MV = PY$), the real value of government bonds (B/P) is also determined. Therefore, given the discount rate r, the government adjusts fiscal surplus S so that $B/P = S/r$ holds. For example, when the price level P declines as a result of a decrease in money stock M and the real value of government bonds (B/P) increases, i.e. $B/P > S/r$, the government raises fiscal surplus S by increasing taxes and reducing expenditure so that the solvency condition holds. It is the implicit premise of the Money view that the government adjusts fiscal surplus S in accordance with the fiscal rule ($S = rB/P$) regardless of the price level P and the discount rate r taken under given B.

The View that Changes in Growth Expectations Affect Price Level: Expected Burden View

In contrast to the Money view, the EB view regards the government's inter-temporal budget constraint ($B/P = S/r$) as an equilibrium equation to determine the price level P while treating the quantity equation ($MV = PY$) as an identity.

The EB view is based on the fiscal theory of the price level, and its price determination mechanism is explained as follows.[9] Suppose that growth expectations decline as a result of the decline in the potential growth rate. This leads to the decline in the discount rate r, and hence the discounted present value of the real fiscal surplus (S/r) increases and exceeds the real value of government bonds (B/P), which implies that liabilities exceed assets on the private sector's balance sheet. That is, in spite that the real fiscal surplus S is constant over the future, the expected burden of the private sector increases when the income outlook declines due to lower growth expectations. Because the private sector's expected fiscal burden exceeds the real value of the government bonds held by the private sector (i.e. $B/P < S/r$), the private sector increases savings to provide for the future and reduces consumption expenditures. As a consequence, in the goods market, demand falls below supply and the price level P declines. The price level

[9] See Sims (1999), Christiano and Fitzgerald (2000a,b), Leeper (1991), Cochrane (2000), and Woodford (1996, 2001) for details regarding the fiscal theory of the price level.

continues dropping until the private sector's liabilities no longer exceed the assets, in other words, until the government's asset no longer exceeds its liability and hence the government's solvency condition ($B/P = S/r$) is satisfied. In sum, when growth expectations decline, the private sector starts to reduce its consumption expenditures, because its permanent income decreases due to the increase in expected fiscal burden, and this results in weak demand and price declines.[10]

In the EB view, the government does not adjust its fiscal surplus S even when its solvency condition is no longer satisfied as a result of changes in economic conditions. Instead of the government, the private sector adjusts its expenditures so that the government's solvency condition is satisfied. For this reason, when the discount rate r declines due to lower growth expectations under given B, the price level P drops because the private sector reduces its consumption expenditures. After the price level P is determined this way, money stock (M) is supplied endogenously so that it meets the transaction demand for money (PY/V), which is determined by the potential output (Y) and the constant velocity of circulation (V). For example, if the price level P falls as a result of the decline in growth expectations, the transaction demand for money decreases. From the viewpoint of financial institutions, they cannot increase lending as borrowing demand does not pick up and consequently, money growth declines. In other words, money is the "result" of price fluctuations under the EB view, while money is the "cause" of price fluctuations under the Money view.

5. Price Fluctuations in the Euro Area and the US

Fiscal Deficits and the Inflation Outlook in the Euro Area

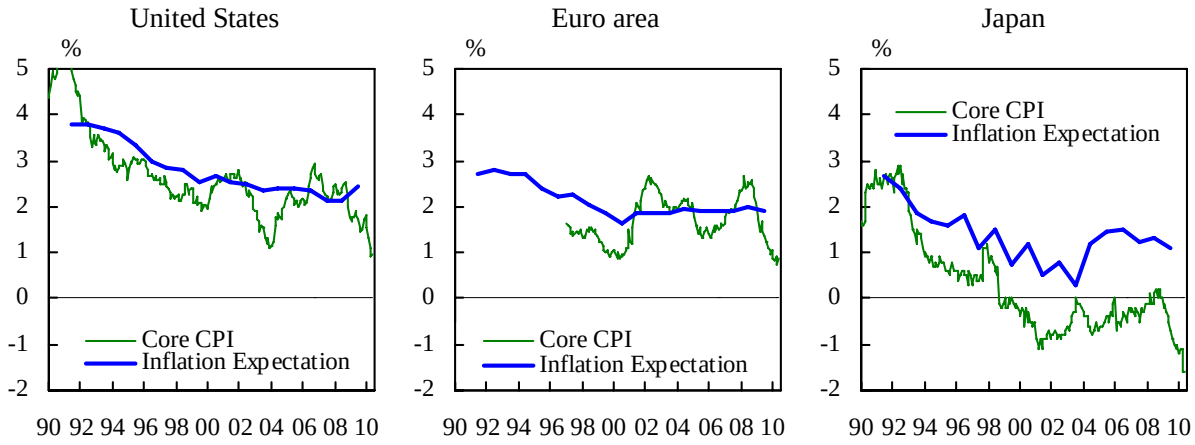
In the peripheral euro area countries, the growing concerns about the governments' solvency raised sovereign risk in 2010. That is, market participants suspected that the discounted present value of the fiscal surplus is smaller than the market value of government bonds ($B/P > S/r$), and hence the government's solvency condition is not satisfied. In order to simplify the explanation, we have assumed that the government

[10] If we assume that the labor income grows at the potential growth rate r, the discounted present value of labor income is not affected by changes in the discount rate r. Under this assumption, when the fiscal burden increases as a result of a decline in growth expectations, the private sector's permanent income decreases by just as much.

bonds are fully composed of short-term zero coupon bonds, but they actually include long-term bonds. In this case, if investors who are aware of the sovereign risk increase the selling pressure on government bonds, the price of long-term government bonds drops and the market value of government bonds B declines. The selling pressure on government bonds from investors continues until $B/P = S/r$ is satisfied. However, if adjustments are made to recover the solvency condition only by lowering government bond prices (i.e., increasing the interest rate of government bonds), the economy will fall into severe confusion. This is because, if government bond prices are left to drop, the government will face difficulties in rolling over funds raised via bonds or in new issues, which will then increase the possibility of default upon redemption. Accordingly, the governments of the peripheral euro area countries including Greece have made commitments to increase fiscal surplus S by fiscal austerity through tax increases and expenditure cuts. That is, the governments promote fiscal consolidation in order to recover their own solvency conditions ($B/P = S/r$), while entrusting price stability to the ECB's monetary policy. Such policy framework is consistent with the Money view.

Based on the Money view, the long-term inflation outlook in the euro area depends on whether the money growth will recover or not. As shown in Figure 6, the long-term inflation expectation currently remains stable at around 2% in spite of the contraction of money (Figure 5). This may be because the private sector anticipates that the current

Figure 6. Core Inflation and Long-Term Inflation Expectations



Notes.

1. Core inflation is measured by CPI excluding energy and food for the US, CPI excluding energy and unprocessed food for the euro area, and CPI excluding energy and food (adjusted to exclude the effect of a change in consumption tax rate) for Japan, respectively.
2. Long-term inflation expectation for each year is 5-10 years ahead outlook averaged on April and October survey results of Consensus Forecast.
3. German data is used for inflation expectations up to 2002 in the euro area.

Sources. Each country's statistics, Consensus Economics.

contraction of money is only a temporary phenomenon and that the money growth will eventually recover as financial intermediary functions improve again. However, such an outlook may encompass a downside risk, especially in the peripheral euro area countries. Under a negative feedback loop between the financial sector and the real economy, if banks maintain a strict attitude toward lending over a long period, money growth will fail to recover and that the long-term inflation expectation will decline gradually.

Inflation Outlook in the US

Also in the US, the core inflation rate has continued to decline recently, while the long-term inflation expectation remains stable at the 2% level as shown in Figure 6. It may be possible to interpret that the long-term inflation expectation remains stable despite drops in growth in bank lending and money because the private sector anticipates that bank lending will increase and the inflation rate will rise once adjustments are complete in the real estate market and the financial intermediary functions of banks improve. The accommodative monetary policy of the FRB seems to have supported such expectations by the private sector. Such interpretation is consistent with the Money view, also taken into consideration the fiscal rule introduced by the US government.[11]

When presenting the Federal Reserve's semiannual Monetary Policy Report to the Congress in July 2010, Chairman Bernanke was asked whether there was a risk of the US economy slipping into deflation like Japan, and he replied: "Forecasts are very uncertain, but I don't view deflation as a near-term risk for the United States." As reasons to explain this, he pointed out two structural differences between Japan and the US. First, Japan's economy has been relatively low in productivity in recent years, and it's got a declining labor force. As a result, Japan's potential growth rate is lower than the US. Second, while there also in Japan were much longer-lived problems with the banking system which were not addressed for some years, the US policy makers were very aggressive in addressing the banking system issues after the financial crisis. The second point seems to be based on the Money view. However, the Money view suggests

[11] In February 2010, the Obama administration introduced the "pay as you go" budget rule, which requires that any new spending or tax cuts be budget-neutral, offset by spending cuts or tax increases elsewhere. Because this rule helps the government to achieve fiscal soundness, the tacit premise of the Money view seems to be satisfied.

that if the financial intermediary functions in the US fail to recover as expected, the slower growth of bank lending and money may continue and there is a possibility that the long-term inflation expectation will also decline gradually. If the bank lending and money continues to contract, financial constraints on the households and small firms that do not have access to the capital markets suppress their economic activities and sluggishness of the economy becomes increasingly apparent over the long term. As a result, downward pressures on the price level are strengthened.

6. Price Fluctuations in Japan

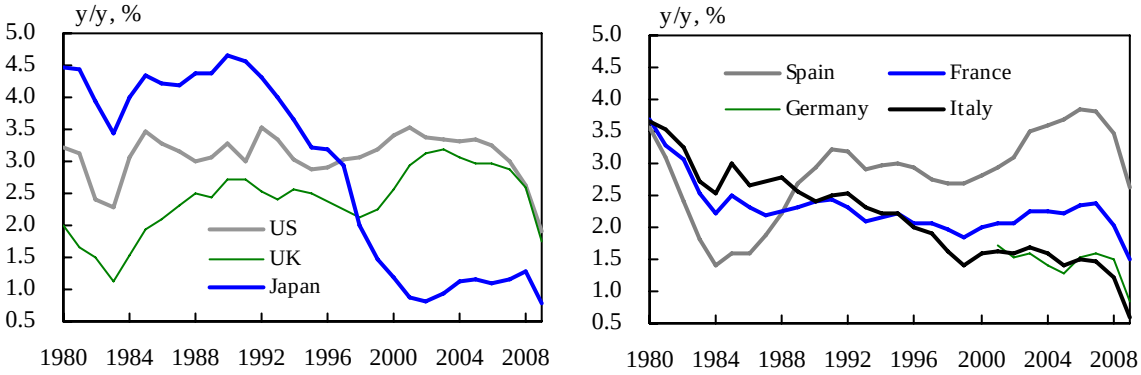
Declines in Growth Expectations and Inflation Rates

Because the disinflation period in Japan during the 1990s, the first half of the 1990s in particular, overlaps the period when money growth slowed down due to declines in bank lending, price fluctuations at that time may be consistent with the Money view. The EB view does not seem to apply to this period because, in the early stages of the bubble burst, the private sector did not have a real-time awareness that the potential growth rate had declined and that the expected burden had increased. However, as the period of slow economic growth was prolonged, the growth expectations of the private sector started to decline, and this may have affected the price level via changes in the discounted present value of the fiscal surplus. In other words, downward pressures on the price level based on the EB view may have started to strengthen gradually.

As shown in Figure 7, in the past two decades, Japan's potential growth rate proxied by the 10-year moving average of the real growth rate declined significantly, which is very contrast to other advanced countries. The potential growth rate, which was at the 4% level during the 1980s, has declined to around 1% in the 2000s. The decline in the potential growth rate was caused not only by the decrease in the labor force. Other contributing factors include the suppressed growth of capital stock due to the firms' balance-sheet adjustment and the decline in the growth of productivity (TFP) due to the deterioration in the financial intermediary functions and the resulting distortion in resource allocations. As these factors became gradually apparent, growth expectations (and hence the discount rate r) declined and the future fiscal burden of the private sector increased. As a result, the private sector started to increase savings to provide for the

future fiscal burden while suppressing consumption expenditures. Such behavior of the private sector led to the continued decline in the aggregate demand and strengthened the downward pressure on the price level, which is considered to have caused the high correlation between the potential growth rate and the long-term expected inflation rate in Japan (Figure 4).[12]

Figure 7. 10-year Moving Average of Real GDP Growth Rate



Note. Germany's data is only available from 2001.
Sources. Each country's statistics.

Why is the Correlation between Potential Growth and Expected Inflation Strongly Positive only in Japan?

Rearranging the government's inter-temporal budget constraint ($B/P=S/r$) as an equation that represents the price level P leads to:

$$P = \frac{B}{S} r \ .$$

Here, we take long-term government bonds into consideration as well as short-term zero coupon bonds. The decline in the potential growth rate leads to the decrease in long-term interest rates, i.e. the rise in prices of long-term government bonds, and hence the market value of government bonds B increases. Then, downward pressure on the price level P due to the drop in the discount rate r caused by the decline in the potential growth rate is to some extent offset by the increase in the market value of government bonds B. In addition, the central bank's monetary easing also leads to the further decline in the long-term interest rates, i.e. the increase in B, and reduces the downward pressure

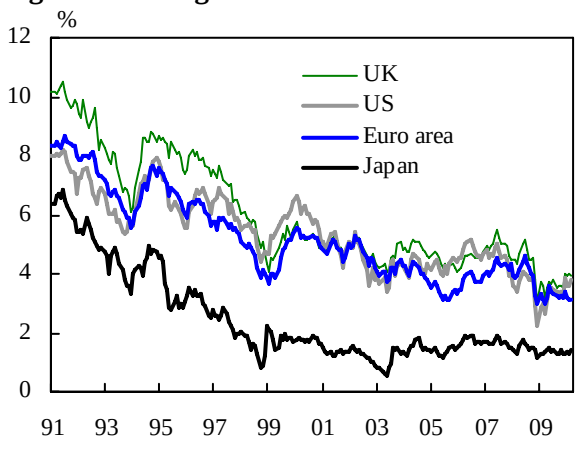
[12] The EB view demonstrates the relationship between the potential growth rate (r) and the price level (P) and does not directly show the relationship between potential growth and inflation. However, when the price level P changes as a result of changes in the potential growth rate, the inflation rate moves at the same time in that process.

on the price level *P*. However, when the potential growth rate declines very significantly over a long period, there remains less room for the long-term interest rate to decline, and the market value of government bonds *B* approaches the upper limit, which implies that the economy falls into the Keynes's "liquidity trap". Then, adjustments caused by the decline in the discount rate *r* can only be absorbed by the fall in the price level *P*, and the deflationary pressure starts to strengthen.

In short, in Japan, the decline in the potential growth rate led to the decrease in the long-term expected inflation rate not only because the magnitude and the period of decline in the potential growth rate were significant and long, but also because this reduced the room for the long-term interest rate to decline (Figure 8). Since there is not much room left to raise the market value of government bonds *B* despite the commitment to the ultra-low interest rate policy, the increased present value of the fiscal surplus resulting from the decline in the potential growth rate (i.e., discount rate *r*) can only be absorbed by the drop in the price level *P* in Japan. On the other hand, in the US and the euro area, since the potential growth rate is not expected to have declined significantly and permanently and as a result, there still is room left for the long-term interest rate to decline, it has not yet led to the decline in the long-term inflation expectation. However, depending on the future path of the potential growth rate and long-term interest rate in the US and the euro area, it is still possible that the mechanism based on EB view starts to work and strengthens the downward pressure on prices in these countries, as is the case in Japan.

It may be interesting to note that there is a classic example that the constraints on the government bond prices affected the aggregate price level. In the US, the bond-price

Figure 8. Long-term Government Bond Yields



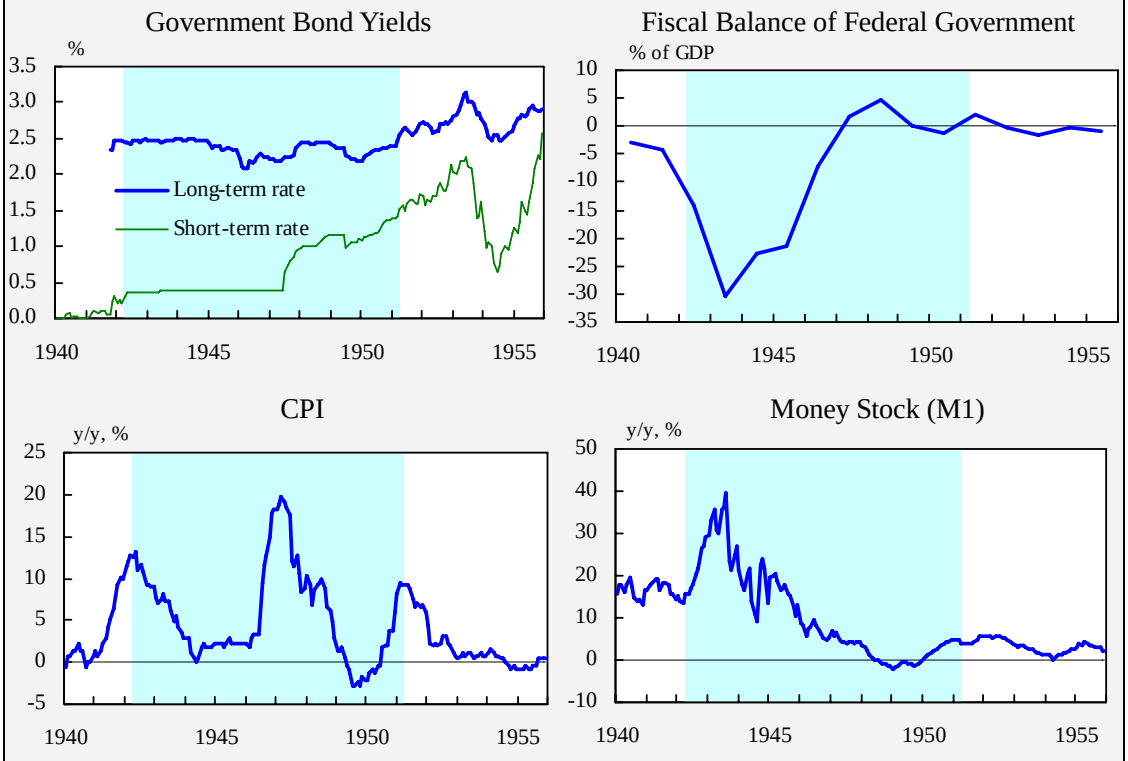
Source. Bloomberg.

support program was adopted during the period from 1942 to 1951. In this period, changes in the discounted present value of the fiscal surplus S/r resulted in fluctuations in the price level P because the Federal Reserve used monetary policy to maintain the market value of government bonds B. See the BOX for details.

BOX: Price Developments under the US Bond-Price Support Program

According to the EB view, when the market value of government bonds are maintained constant, the discounted present value of the fiscal surplus directly affects the aggregate price level. Keynes's "liquidity trap" is an example of the situation where the market value of government bonds are maintained constant because there is no room for bond prices to rise. There is also a case where fluctuations in government bond prices are suppressed by the policy, as is the US bond-price support program from 1942 to 1951. In 1942, the Fed and the Treasury agreed to an interest rate control program in order to facilitate the raising funds for the war, and this was continued until the Treasury-Fed Accord of March 1951.

BOX Figure. US Economic Indicators from 1940 to 1955



Notes.
1. Shaded areas indicate the period of the US bond-price support regime (from April 1942 to March 1951).
2. Short-term interest rate is measured by 3-month T-Bill.
Sources. Bureau of Labor Statistics, NBER, St. Louis Fed, Office of Management and Budget.

Under the bond-price support regime, fiscal development clearly had a significant impact on the course of inflation.[13] As shown in BOX figure, the CPI inflation rate was stable until 1946 due to wage and price controls, but surged toward 1948 after the price control was lifted. This price surge may be related with the fiscal deterioration (i.e., contraction of fiscal surplus *S*) during wartime, which instilled the private sector's expectation that the government's deteriorated fiscal condition would continue in the future. The decrease in the discounted present value of the fiscal surplus caused the wealth effect for the private sector, and then the private sector increased the selling pressure on government bonds in order to increase its expenditures. However, since the Fed maintained government bond prices constant, the selling pressure did not end. In other words, because the price of government bonds was maintained at a high level, the private sector with increased wealth continued to sell government bonds to increase its expenditures. As a result, the aggregate price level rose so that the real value of government bonds declined and finally it became commensurate with the present value of the fiscal surplus.

Then, deflation progressed over the period 1948-1950. This corresponds to the period in which the large wartime deficits had ended, and the US government budget was instead in surplus. Deflation resulted from the increase in the discounted present value of fiscal surplus under the bond-price support regime. And, with regard to the subsequent resurgence of inflation toward 1951, when the Korean War broke out, it was anticipated that the fiscal deficit would increase again, which seems to have served as inflationary pressure.

Japan's Fiscal Conditions and the EB View

In this paper, in order to simplify our explanation about the EB view, fiscal surplus *S* is assumed to be constant. Some may point out that this is an unrealistic assumption given the fiscal conditions in Japan after the bursting of the bubble, where the fiscal deficit expanded and the government debts went on increasing. However, even if the fiscal surplus *S* is assumed to be variable, it does not change the main mechanism of the EB view. What is important in the EB view is the discounted present value of the fiscal surplus and not the fiscal surplus for the current period. Even when the current fiscal deficit expands as the tax revenue declines as a result of a recession, the discounted present value of the fiscal surplus may remain unchanged if the private sector expect that the future tax will increase by as much as the increase in the fiscal deficit this

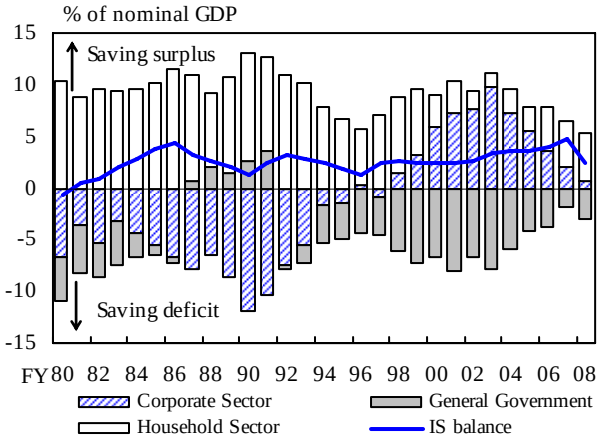
[13] See Woodford (2001) for details.

year.[14] On the contrary, the discounted present value of the fiscal surplus increases, if the private sector expects that the real output growth rate will decline permanently and as a result the discount rate r decreases. This then strengthens the downward pressure on the price level. As is obvious from a simple calculation, a few percentage-point drop in the discount rate r has the effect of multiplying the discounted present value of the fiscal surplus.[15] For this reason, even if the government debt B increases, as is the case in Japan, downward pressures on the price level P may occur when the present value of the fiscal surplus S/r has significantly increased due to the decrease in the discount rate r.

Sluggish Consumption and Increased Demand for Government Bonds

The EB view gives us a hint about the reason that sovereign risk has not emerged in Japan to date despite the massive government debt. As a result of the decline in growth expectations and the increase in the expected fiscal burden of the private sector, the private sector's savings (i.e., its demand for government bonds) increased sufficiently. This helped the government bonds to be almost absorbed by domestic investors and kept

Figure 9. Investment-Saving Balances in Japan



Note. IS balance to GDP ratios.
Source. Bank of Japan, "Flow of Funds".

[14] From the perspective of the EB view, whether fiscal policy affects the price level depends on whether the discounted present value of the fiscal surplus changes or not. An increase in the fiscal deficit does not have any impact on the price level unless the discounted present value of the fiscal surplus changes.

[15] All other conditions being equal, for example, a permanent reduction in the discount rate r from 4% to 1% has the effect of increasing the discounted present value of the fiscal surplus by four times, and pushing down the price level considerably.

the sovereign risk low.

In Japan, the household net saving rate has been on a decreasing trend since the 1990s (Figure 9), but this mainly results from the population aging and does not necessarily suggest that individual households reduced their savings and increased consumption expenditures. In reality, since the household sector as a whole suppressed consumption, the aggregate demand slowed down and the business fixed investment did not grow so much. As a result, net savings of the private sector, sum of the corporate and the household sectors, increased from mid 1990s to around 2003, and financial institutions increased the purchase of government bonds because of the decrease in lending to the private sector.

7. Conclusion

There is a positive cross-country correlation between adjusted money growth and inflation (Figure 1), because the quantity equation of money ($MV = PY$) holds in both the Money view and the EB view, and changes in velocity (ΔV) may not differ much across countries. On the other hand, while the government's inter-temporal budget constraint ($B/P = S/r$) is also satisfied in both views, a positive cross-country correlation between output growth (related to the discount rate r) and change in the price level P is not observed (Figure 3). This is because the market value of government bonds B and fiscal surplus S differ significantly across countries.

It is not appropriate to explain Japan's price fluctuations by a single view, i.e., either the Money view or the EB view. The disinflation period during the 1990s, the first half of the 1990s in particular, overlaps the period of sluggish growth of money due to the decline in bank lending, which is consistent with the Money view. However, a strong positive correlation between the long-term inflation expectation and the potential growth is observed in Japan, which is not consistent with the Money view. From the perspective of the EB view, growth expectations (and hence the potential growth rate) need to be raised in order to overcome Japan's deflation.[16] If growth expectations of Japan's

[16] As well as the improvement in growth expectations (i.e., the increase in the discount rate r), the permanent reduction in fiscal surplus S decreases the present value of the fiscal surplus (S/r) and dispels deflationary pressures. However, it is very difficult for the government to credibly commit to reducing fiscal surplus S permanently, because Japan's outstanding debt-GDP ratio is the worst among industrialized nations. That is, against the backdrop of the government's deteriorated fiscal

economy improve, the expenditures of the private sector will increase, and the aggregate price level will reverse to an upward trend. The Bank of Japan recently introduced the fund-provisioning measure to support strengthening the foundations for economic growth. This aimed to improve growth expectations and overcome deflation.

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condition, the private sector probably expects that tax will be raised in the future by just the same amount as the current increase in the fiscal deficit, and hence the discounted present value of fiscal burdens is not lessened and deflationary pressures is not dispelled. In addition, as seen in Greece, if reduction in fiscal surplus S is considered to be a lack of fiscal discipline by market participants, the market value of government bonds B will decline as a result of growing selling pressure on bonds, which then weakens the upward pressure on the price level.