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7. Effects of the Bank of Japan's Quantitative Easing Policy on Economic Activity

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Introduction

From March of 2001 through March of 2006, the Bank of Japan (BOJ) supplemented its zero-interest-rate policy (ZIRP) with a policy of quantitative easing (QEP). QEP included an expansion of bank reserves and related holdings, as the BOJ significantly increased its direct purchases of Japanese government bonds (JGBs) and other securities. Japanese economic activity clearly improved during QEP. Real GDP growth averaged 1.8 percent from 2001-2007, about a percentage point higher than in the six-year period from 1995 to 2001. Growth of Japanese GDP relative to working-age population in fact compared favorably with that of the United States (top of exhibit 1). However, core inflation remained stubbornly negative throughout the period, although rising oil prices pushed headline inflation into positive territory (bottom of exhibit 1).

The question of how effective QEP was in stimulating the Japanese economy is still unsettled. There is general consensus that the policy did result in lower long-term interest rates (e.g. Kimura and Small (2004), Oda and Nagahata (2005), Ugai (2006)). However, views on the extent of QEP's contribution to economic growth as well as on exactly how it worked are more diverse. Ugai (2006), in a comprehensive literature survey, states that QEP was effective in "averting further deterioration" of the economy. Mihira et. al. (2006) find some evidence that QEP had a positive macroeconomic effect, but are unable to clearly identify the transmission mechanism. We might note that these studies typically focus on the effect of monetary policy on GDP, but there were a number of other important factors affecting the Japanese economy during this period. In particular, a surge in economic growth of Japan's major trading partners, notably China, led to a rapid expansion of Japanese exports. In addition, government spending was contracting, working against the expansionary monetary policy. This suggests that it may also be useful to look at the individual components of GDP in gauging the effects of QEP.

In this note we first provide some estimates of the effect of QEP on yields of Japanese long-term bonds, both government and corporate. We then describe some model simulations designed to gauge the potential effect of a reduction in interest rates of this size on the economy. In the second part of the note we look at changes in the major spending components of Japanese GDP to provide a more complete picture of the sources of the pickup in economic growth during the QEP period.

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Our main conclusions are:

- The reduction in long-term interest rates attributable to QEP might have been as large as 50 basis points, although estimates vary considerably. Our model simulations suggest that a decline in long-term rates of this size might have raised real GDP growth by about ½ percentage point per year on average, ceteris paribus. A second simulation that includes a proxy for easier lending conditions suggests that the effect could have been as large as ¾ percentage point per year. This stimulus would have worked by raising consumption and private investment, and, to a lesser extent, by lowering the foreign exchange value of the yen and thus boosting net exports.

- Although QEP likely contributed to the step-up in Japanese economic growth in the 2000s, it was not the only, and quite possibly not the most important, influence on the Japanese economy during this period. Net exports played a very important role in the improvement in growth, and the stimulus appears to have come mostly as a result of robust external demand associated with a boom in Japan's major trading partners, especially in developing Asia. At the same time, contractionary Japanese fiscal policy worked in the opposite direction from QEP.

Effect of QEP on Long-Term Interest Rates and Economic Activity

Consistent with a wide range of literature (Bernanke, Reinhart, and Sack (2004), Kimura and Small (2004), Oda and Nagahata (2005), and Ugai (2006)), we find that QEP had a significant effect on reducing long-term bond yields beyond what would have been expected with zero interest rates alone. We estimated a simple yield-curve regression for the 10-year JGB yield, using as explanatory variables GDP growth, inflation, and the spread between U.S. ten-year treasuries and the effective U.S. federal funds rate, as well as a dummy variable for the QEP period. We found that during QEP, the yield on the 10-year bellwether JGB rate was reduced a statistically significant 50 basis points below what the model would otherwise have predicted. This estimate is toward the high end of the range of other analysts' estimates of the effect of QEP on long-term yields, but is still not implausible. A similar regression using the long-term bank prime rate charged to corporate borrowers produced similar results, suggesting that the corporate rate largely followed the decline in government bond yields.

These results suggest that QEP could have had a significant impact on long-term yields independent of macroeconomic conditions, thereby providing a channel through which non-standard monetary policy may have boosted the Japanese economy. We used the staff's FRB/Global model to try to assess the impact such a reduction in interest rates should have had on the Japanese economy. Consistent with the estimate described above (which is of course subject to considerable uncertainty), our first model simulation assumes that quantitative easing reduced 10 year nominal JGB yields by 50 basis points

over the three year simulation horizon considered.[2] We assume that Japanese monetary policy was constrained by the zero bound throughout the simulation horizon.

Because the historical evolution of the economy reflects the effects of the quantitative easing that actually took place, we structure the simulation to address the question of what would have happened in the absence of such policies. Accordingly, exhibit 2 compares the actual path for key macroeconomic variables (solid lines) to an alternative in which the autonomous component of long-term JGB yields is assumed to be 50 basis points higher (dashed lines). The shock is assumed to begin in mid-2001. The persistent rise in long-term yields has a significant restraining effect on real activity. The simulation indicates that GDP growth would have been about ½ percentage point lower in 2002 and 2003 had the government not engaged in quantitative easing. Moreover, inflation would have been about ½ percentage point lower in 2003-2004 in the absence of quantitative easing. The higher real long-term interest rates implied by the alternative are consistent with a markedly stronger path for the yen. As seen in the lower right panel, the real value of the yen against the dollar would have been roughly 5 percent stronger in the absence of quantitative easing.

The foregoing simulation abstracts from any effects of quantitative easing on the ability of corporate borrowers to obtain financing. On the one hand, the financial weakness of banks and firms may have reduced the stimulus from lower interest rates described above (see note 6). On the other hand, it is plausible that quantitative easing may have helped to boost banks' liquidity and thus ease borrowing conditions for the corporate sector, even if there is no conclusive econometric evidence (including our work described above) on this point. We thus consider a second alternative simulation which assumes that QEP reduced corporate loan rates relative to comparable-maturity government bond yields by 25 basis points, as a proxy for its effect in relaxing lending constraints. This assumption is made in addition to the 50-basis-point reduction in JGB rates considered in the previous simulation. [3] The results of this simulation are shown in exhibit 3, where the alternative again is structured to show what would have occurred in the absence of QEP. The results indicate that real GDP growth would have been about ¾ percentage point per year lower in 2002-2003 in the absence of QEP, and inflation more than ¾ percentage point lower in 2003-2004. Thus, assuming that QEP had a modest influence on corporate borrowing conditions in addition to its effect on bond yields, the simulation results suggest that it could have played an important role in precluding a sharper contraction in Japanese activity and in forestalling a much larger decline in inflation.

Changes in Components of Real GDP

[2] We employ a three-year simulation horizon, which is less than the duration of the actual QEP, because the model tends to exhibit instabilities when policies are set to counterfactual paths for too long a period. The model results should be interpreted as illustrative of what might have taken place over the entirety of the QEP period.

[3] The choice of 25 basis points is arbitrary, but based on the view that the stimulus provided through relaxation of bank lending constraints was likely smaller than that provided by reducing JGB yields.

Between 1995-2001 and 2001-2007, the growth rate of real GDP in Japan stepped up by about 1 percentage point (table 1). As suggested by the simulations in the previous section, some of this improvement may have been a result of the QEP. This policy should have worked primarily through private investment and to a lesser extent through consumption, both of which contributed somewhat more to real GDP growth in the QEP period than in the preceding period, as shown in the third column of the table.

Table 1: Contributions to real GDP Growth (percentage points)*			
	1995-2001	**2001-2007**	**Change**
GDP	**.9**	**1.8**	**1.0**
Domestic Demand	**.8**	**1.1**	**.4**
Consumption	.5	.8	.2
Private Investment	.0	.4	.4
Government	.3	-.2	-.4
Inventory change	.0	.1	.1
Net exports	**.0**	**.7**	**.7**
Exports	.3	1.1	.8
Imports	-.3	-.4	-.1

Based on annual data.

However, there were other important influences on GDP growth during this period. The contribution of government spending dropped by nearly ½ percentage point. At the same time, the contribution of net exports to GDP growth increased from 0 in the 1995-2001period to .7 percentage points between 2001 and 2007. The improvement was entirely on the export side, as imports made a slightly larger negative contribution in the second period. As a result of the increase in exports, the share of net exports rose from about ½ percent of GDP in 2001 to nearly 5 percent of GDP in 2007.

As noted above, part of the rise in net exports could have reflected the effect of the QEP in reducing the nominal exchange rate. Although a full assessment of this issue is beyond the scope of this note, we have estimated some simple export and import equations (not shown) to try to gauge the importance of external demand and exchange rates, respectively, to the sizable swing in net exports. As shown in the chart at the top of exhibit 4, the GDP growth of Japan's trading partners picked up significantly in the QEP period, which likely provided substantial stimulus to export growth. At the same time, the Japanese effective exchange rate declined in both real and nominal terms (bottom of exhibit 4), and this should have contributed to stronger exports and weaker imports.

As shown in table 2, the export equation suggests that a little more than half of the increase in the export contribution to real GDP growth between the two periods (about ½ percent of GDP) is attributable to the increased rate of foreign GDP growth. The faster rate of depreciation of the exchange rate in the second period is estimated to have raised the contribution of net exports to GDP growth by .2 percentage points, divided about equally between higher exports and lower imports. Some of this effect may have been a result of QEP, but exactly how much is very difficult to gauge.

In sum, even if we attribute much of the acceleration in private domestic spending and decline in the yen to QEP, and this remains uncertain, the boom in demand from Japan's trading partners most likely also played a crucial role in the acceleration of the Japanese economy during the 2000s. At the same time, the contraction in government spending appears to have played a significant role in offsetting the expansionary monetary policy.

Table 2: Effects of Explanatory Variables in Export and Import Equations on Contributions to GDP Growth (percentage points)

	1995-2001	2001-2007	change
Exports	.3	1.1	.8
Foreign GDP growth	.4	.9	.5
Real Exchange Rate	.1	.2	.1
Residual	-.1	.1	.2
Imports*	-.3	-.4	-.1
Japanese GDP growth	-.1	-.4	-.3
Real Exchange Rate	.0	.1	.1
Residual	-.2	-.2	.0

*A rise in imports represents a negative arithmetic contribution to GDP growth.

Implications for the United States

As the United States approaches the zero lower bound, there are several important implications from the Japanese experience:

- It appears that non-standard monetary policy can affect long-term interest rates, thus creating a channel through which stimulus can be provided even when policy interest rates are at the zero lower bound.

- Although QEP may have had positive effects on economic activity, robust external demand also appears to have been very important to the recovery of the Japanese economy during this period. The United States is currently facing a much less hospitable environment for export growth due to weak economic activity abroad. Furthermore, safe haven considerations may limit the extent of dollar depreciation.

- Fiscal consolidation appears to have acted as a counterweight to expansionary monetary policy during the QEP period in Japan. Given the dismal outlook for the economies of our trading partners, fiscal support is likely even more critical for the United States in the present situation.

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