Monetary Reponses to the Financial Crisis of 2007-08: The Case for Further Action

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Executive Summary

The first tremors of the global financial crisis and recession began in 2007. Two years later, the worst appears to be over and economies are showing initial signs of recovery. Over this period, central banks have pushed policy interest rates to historically low levels and have engaged in a variety of measures, both traditional and nontraditional, to ease financial market strains and to provide additional macroeconomic stimulus.

These central bank actions generally appear to have made a positive contribution to economic and financial conditions. In some cases, the evidence of these positive effects is clear. In other cases, the nature of the policies is such that it is difficult to gauge their effects.

Many of the policies adopted have aimed at returning liquidity and credit risk spreads on financial assets to normal levels, thereby encouraging a renewed flow of credit through the economy. To the extent that these policies have succeeded, they have reduced the "headwinds" that restrain economic activity, but they have not augmented macroeconomic stimulus beyond the level that would be implied by the current level of policy interest rates under normal financial conditions. Similarly, policies aimed at preventing the disruptive failure of systemically important financial institutions can help to prevent a negative shock to

economic activity, but they cannot be viewed as providing an independent positive stimulus. One class of nontraditional policies that may be able to provide additional macroeconomic stimulus is the large-scale purchase of longer-term assets. The economic literature and recent evidence suggest that such purchases can stimulate economic activity by lowering the spread between long-term and short-term interest rates. Another tactic pursued by several central banks for lowering longer-term interest rates is to provide guidance aimed at lowering expectations of the future path of short-term interest rates. However, such guidance appears to have had limited success to date. Other approaches to providing additional macroeconomic stimulus have not been adopted widely.

Empirical policy rules in the style of Taylor (1993) suggest that monetary policy is currently too tight and that central banks should take further steps to stimulate activity in all the major developed regions. This conclusion is also supported by forecasts of economic activity by central banks, international agencies, and the private sector, which almost universally project a very slow and weak recovery over the next two years with inflation rates considerably below the levels desired by central banks. The Bank of England provides an interesting exception to this pattern, as it projects much faster growth in the United Kingdom than other forecasters do.

I. A Timeline of Crisis Responses[1]

In early 2007, market participants began to be concerned about potential losses on financial assets from the incipient downturn in housing prices around the world. These concerns were most intense with respect to structured credit products based on U.S. subprime mortgage loans, which the ratings agencies were beginning to downgrade on a widespread basis. Prices of such assets dropped sharply and a number of U.S. mortgage companies specializing in subprime products failed. At the end of July, a mid-sized German bank with substantial exposure to U.S. subprime assets came under severe pressure and was recapitalized by its state-owned largest shareholder.

These concerns spilled over into broader financial markets on 9 August 2007, when a large European bank suspended withdrawals from three investment funds it sponsored, citing an inability to value some of the mortgage-related assets. Funding pressures quickly emerged across a wide range of European and U.S. financial institutions both because banks decided to hoard cash to meet potential calls on their credit lines to off-balance-sheet conduits and because of concerns about potential losses in the portfolios of financial institutions. In particular, the spreads of bank term funding rates over comparable-maturity overnight index swap rates soared and liquidity in the interbank and other credit markets vanished. The ECB and the Fed quickly responded to these pressures by injecting overnight funds into the banking system. By the end of August, both the ECB and the Fed had

[1] This paper focuses on the responses of the four main developed-country central banks: the Federal Reserve Board (Fed), the European Central Bank (ECB), the Bank of Japan (BOJ), and the Bank of England (BOE).

increased their supplies of longer-term funds to the banks and the Fed had narrowed the spread between the target federal funds rate and the rate on discount window borrowing. The BOE and BOJ did not noticeably alter their operating procedures in August 2007. All four central banks held their main policy rates constant that month. (See the timeline table at the end of this paper.)

Over the remainder of 2007, the Fed, the ECB, the BOE, and other central banks adopted further measures to increase liquidity in the banking system, including the frontloading of reserves into the banking system during each maintenance period (ECB and BOE), widening the penalty-free range for banks' reserve holdings (BOE), more frequent auctions of longer-term credit to banks (Fed, ECB, BOE), and the provision of term dollar funding to banks outside the United States through swap lines between the Fed and the ECB and Swiss National Bank (SNB). In conjunction with the Treasury, the BOE set up a special liquidity support facility for Northern Rock. Japanese markets were relatively unaffected by these strains, reflecting a much lower exposure to the housing bubble, and the BOJ did not adopt measures to increase liquidity. The Fed lowered its policy rate 100 basis points over the second half of 2007 and the BOE lowered its policy rate 25 basis points late in the year, while the ECB and BOJ held their policy rates steady.

In the first few months of 2008, financial conditions deteriorated sharply, culminating in the nationalization of Northern Rock and the assisted takeover of Bear Stearns by JPMorgan. By April 2008, the Fed had lowered its policy rate another 225 basis points and the BOE had lowered its policy rate another 50 basis

points. The ECB and BOJ continued to hold their policy rates steady. Over this period the Fed increased the size of its term credit auctions for banks and its swap lines with the ECB and SNB, established a term securities lending facility, and established a direct credit facility for nonbank primary bond dealers similar to the discount window for banks. The Fed also made an emergency loan secured by assets of Bear Stearns to facilitate the acquisition of Bear Stearns by JPMorgan. The BOE established a term securities lending facility for banks.

Over the summer of 2008, financial conditions improved somewhat and inflation became a more prominent concern for central banks as commodity prices soared. The ECB raised its policy rate 25 basis points in July 2008 and the Fed, BOE, and BOJ held their rates constant.

Financial turbulence returned even more strongly in September 2008, with the failure of Lehman Brothers and the rescue of AIG. The crisis peaked in October 2008 as market participants lost confidence in financial institutions around the world. On October 8, the Fed, the ECB, the BOE and other central banks (but not the BOJ) announced an unprecedented coordinated cut in policy rates of 50 basis points. Later in October the Fed cut its policy rate another 50 basis points and the BOJ cut its policy rate 20 basis points. In November and December 2008 all four central banks made further policy rate cuts, totaling 85, 125, 250, and 20 basis points for the Fed, ECB, BOE, and BOJ, respectively.[2] The Fed also tried to push down expectations of the future path of the policy rate by stating that "economic

[2] The Fed cut its policy rate in December 2008 to a range of 0 to 25 basis points from a previous level of 100 basis points. The rate was around 15 basis points at year-end 2008.

conditions are likely to warrant exceptionally low levels of the federal funds rate for some time."

Central banks aggressively expanded nontraditional measures during the last few months of 2008. All four central banks broadened the collateral they accept in lending operations. The Fed established swap lines with the BOE, BOJ, and other central banks. The limits on the Fed swap lines with the ECB, SNB, BOE, and BOJ were eliminated. All four central banks increased their supply of longer-term funding to the banking system. The Fed and the BOJ took measures to support the commercial paper (CP) market. The Fed announced plans to support the asset-backed securities (ABS) market. The Fed announced large-scale purchases of longer-term debt issued or guaranteed by the federal housing agencies. In coordination with the Treasury, the Fed provided emergency support to AIG, Bank of America, and Citigroup secured by assets of those institutions. Governments in the euro area and the United Kingdom provided emergency support to several large financial institutions. The ECB narrowed the corridor between its standing deposit and lending facilities from 200 basis points to 100 basis points and it coordinated with the SNB to provide term swiss franc liquidity to European banks. The BOE converted its temporary securities lending scheme to a permanent discount window facility that lends liquid government bonds against a wide range of collateral. The BOJ announced increased purchases of JGBs and lowered the fee on its securities lending operations. In addition to these nontraditional central bank measures, governments in the euro area, the United States, and the United

Kingdom increased their guarantees of certain classes of bank liabilities, including deposits and senior debt. The U.S. Treasury also issued a temporary guarantee of money market mutual fund accounts.

Although the worst of the financial strains had passed by the end of 2008, the outlook for global economic activity continued to plunge in the first few months of 2009. The worsening economic outlook, including notably in eastern Europe, compounded the problems faced by financial institutions. The Fed and the BOJ had already lowered their policy rates to their implicit lower bounds of 0 to 25 and 10 basis points, respectively, but the Fed strengthened its guidance concerning future policy rates by replacing the phrase "some time" with "extended period". The BOE lowered its policy rate 150 basis points to an implicit lower bound of 50 basis points by March 2009. The BOE's *Inflation Reports* subsequently hinted that the policy rate was likely to remain at this level for the next two years, since such a policy path was projected to lead to a better inflation outcome than the higher policy path implied by market interest rates. The ECB lowered its main policy rate 150 basis points to a level of 100 basis points by May 2009 but it was not made clear whether this level is intended to be a lower bound. The ECB widened the corridor between its standing facilities back to 200 basis points in January 2009 and then narrowed it to 150 basis points in May. With the substantially increased provision of longer-term liquidity to banks in the euro area, the overnight interbank rate dropped below the main refinancing rate, though not below the 25 basis point rate paid on the standing deposit facility. In this sense, the ECB appears to have eased policy a

bit more than would be implied by holding the main refinancing rate at 1 percent, and the true lower bound for the overnight interbank rate may be the 25 basis points paid by the ECB's deposit facility, which is equivalent to the 25 basis points paid by the Fed on excess reserves.

In 2009, the Fed expanded its purchases of long-term agency securities, expanded the range of securities eligible for financing under its asset-backed securities program, and began to purchase longer-term Treasury securities. The BOE announced a program to buy long-term gilts, commercial paper, and corporate bonds. The ECB announced a program to buy covered bonds, albeit to a much smaller extent than the Fed and BOE programs. The BOJ began outright purchases of CP and corporate bonds with residual maturities of up to one year, although the amounts undertaken were relatively small.

II. Is It Working?

All the central banks covered here lowered their traditional policy rates in response to the financial crisis. It is widely accepted that lower short-term interest rates do provide macroeconomic stimulus.[3] The Fed and BOE have gone somewhat further and attempted to lower longer-term interest rates by implying that policy rates are likely to remain close to their current levels for an extended period. However, the term structure of interest rates continues to slope upward in both countries over the next two years to a much greater extent than can be plausibly

[3] It is an open question whether financial strains reduce the magnitude of stimulus for a given policy rate reduction. Many nontraditional policy measures may be viewed as attempts to unblock the transmission channels for traditional policy.

explained by term premiums, suggesting that these communications have had at best partial success in persuading markets that ultra-low policy rates will last more than a few months.[4]

Another common policy response has been to combat elevated spreads and reduced liquidity in the interbank funding market. Policies include increasing the amount and term of collateralized lending to financial institutions, frontloading the provision of bank reserves, broadening the range of collateral accepted, and narrowing the spreads between deposit and credit facilities. Central banks surely have lowered spreads in this market below where they would otherwise be. But, measuring this effect is extremely difficult. A simple correlation of the size of these central bank programs with the size of the spreads is not informative because causality runs in both directions: higher spreads induced central banks to expand their programs and larger programs helped to hold down spreads. The former effect clearly dominated between mid 2007 and late 2008. Christensen, Lopez, and Rudebusch (2009) attempt to disentangle these effects by comparing the behavior of interest rates in markets with and without a Fed lending program. They conclude that the Fed's Term Auction Facility (TAF) lowered three-month dollar interbank rates roughly 300 basis points as of late 2008.[5] Spreads in the interbank funding

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[4] Central banks could, in principle, exert a stronger effect on market expectations by committing to a path of future policy rates. But such a commitment entails a significant risk to future economic outcomes because circumstances may not turn out as projected, and the central bank's scope for addressing the unexpected developments will be restricted. Even a commitment to a policy path conditional on specific macroeconomic outcomes is risky because of the difficulty of incorporating every contingency into the terms of conditionality.

[5] Taylor and Williams (2008) argue that TAF had no effect on interbank rates, but this conclusion was based on the coefficient on a temporary dummy variable for TAF auction dates. McAndrews,

market have declined considerably this year, but they remain somewhat higher than before the onset of the financial crisis.

Central banks also have adopted programs to help specific nonbank credit markets. For these programs, particularly in the United States, the evidence is clear that the programs did succeed in lowering spreads. Spreads on eligible CP dropped sharply immediately after the launch of the Fed's CP programs and these spreads have remained near normal levels since then. Spreads on consumer ABS began to decline immediately after the announcement of the Fed's Term ABS Loan Facility (TALF) program and there were further declines as the program began operations (although consumer ABS spreads remain somewhat above historic norms). Moreover, consumer ABS issuance jumped to near-normal levels after the start of the Fed's program from near-zero levels. Finally, spreads on agency securities over comparable-maturity Treasury securities, which had been elevated before the announced Fed purchase program, declined sharply with the announcement of the agency purchase program and have drifted down further since then. These spreads are now close to, or even lower than, historical averages—strong evidence of the successful impact of the large purchase program. [*I suspect effects of programs in other countries were much smaller because the sizes of the programs are smaller, but I need to check*.]

For central bank asset purchase programs that focus on relatively liquid long-term government and government-backed securities, the major effect is likely

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Sarkar, and Wang (2008) show that there is a significant and sustained effect on interbank rates on the TAF announcement dates.

to be through the term spread on all long-term assets. For example, the Fed explained that its decision to purchase longer-term Treasury securities was intended to "help improve conditions in *private* credit markets" (italics added). This view is based on theories such as the habitat preference model, in which investors have preferences over the maturity distribution of their portfolios. To induce investors to sell longer-term assets to the central bank requires a reduction in the yield (increase in the price) of such assets.

Many economists believe that altering the maturity of assets available to the public is likely to have minimal effects at best on the term structure of interest rates. This view reflects the literature studying Operation Twist in the early 1960s, which did not find robustly significant effects of a swap between short-term and longer-term Treasury securities in the Fed's portfolio.[6] However, as noted by Solow and Tobin (1987), the Federal Reserve purchases during Operation Twist were small and were soon more than offset by Treasury actions. Overall, there was little movement in the average maturity of Treasury debt held by the public and thus little hope of estimating a statistically significant and robust effect. A new generation of studies, using a longer span of data, consistently do find a noticeable effect of shifts in the maturity structure of Treasury debt on the term structure.[7] The estimated size of this effect depends on the degree of theoretical restrictions

[6] The current program differs from Operation Twist in that the reduction in long-term bonds is financed by reserve creation rather than sales of short-term Treasury bills. However, with interest rates on bank reserves and short-term bills roughly equal in the current environment, the two assets should be viewed as close substitutes and thus the effect on the term spread should be similar.
[7] All of the studies focused on the United States. See Friedman (1981), Frankel (1985), Agell and Persson (1992), Kuttner (2006), and Greenwood and Vayanos (2008).

imposed on the estimating equation and it is somewhat sensitive to sample period. Nevertheless, the effect always has the correct sign. Based on these studies, a plausible range for the effect of central bank purchases of long-term Treasury securities equivalent to 1 percent of the outstanding stock of Treasury debt is a reduction in the 10-year term spread of 1 to 10 basis points, with a number of estimates clustered around 5 to 7 basis points.[8] These estimates are lower than the proponents of Operation Twist appear to have assumed, implying that only very large operations are likely to be successful.

The movements of long-term yields immediately after the announcements of large-scale purchases of long-term assets by the Fed and the BOE provide further evidence on the effect of such policies on the term spread. The following table [*Need to update UK pending Datastream access*] lists the movements in various interest rates over one- and two-day event windows surrounding Fed and BOE communications about such asset purchases.[9] Note that the movements are common across all long-term interest rates, including private-sector rates, but are much smaller for short-term rates. Also, the continued evidence of such effects on

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[8] The studies differed in their definitions of "long term" and in their definitions of the relevant stock of assets by which shifts are normalized. I have attempted to translate the results into a common metric, defining long-term assets as those with maturities greater than 2 or 3 years.

[9] On November 25, 2008 the Fed announced a program to purchase up to $100 billion of agency debt and $500 billion of agency MBS. On December 1, Chairman Bernanke raised the possibility of buying longer-term Treasury securities. On December 16 the FOMC confirmed the agency program and reiterated the possibility of buying Treasury securities. On January 28 the FOMC disappointed markets by not announcing Treasury purchases. On March 18 the FOMC announced a Treasury purchase program of up to $300 billion and expanded the agency MBS program to $1.25 trillion. On March 5 the BOE announced an asset purchase program of £75 billion, potentially expandable to £150 billion. On May 7 the BOE expanded the asset purchase program to £125 billion, an amount under the ceiling of £150 billion set by the Chancellor of the Exchequer. On August 6 the BOE expanded the program to £175 billion, and the Chancellor approved an increase in the ceiling to this amount.

the day of the August 6 BOE policy announcement (the final column) suggest that the rise in long-term government bond rates in April through June reflected other factors, such as rising government debt issuance and an unwinding of safe-haven flows, rather than a change in the market's assessment of the impact of asset purchases.[10]

Interest Rate Movements After Central Bank Communications on Asset Purchases
(basis points)

	United States					United Kingdom		
	2008		2009			2009		
	Nov. 25	Dec. 1-2	Dec. 16-17	Jan. 28-29	Mar. 18-19	Mar. 5	May 7	Aug. 6
	buy more	buy more	buy more	buy less	buy more	buy more	buy more*	buy more
1-Yr. Treasury	-8	-6	0	5	-12			
10-Yr. Treasury	-21	-24	-35	26	-48	-30	7	-10
10-Yr. Swap	-29	-23	-35	35	-31	[-20]		
10-Yr. Agency	-60	-52	-40	27	-55	NA	NA	NA
30-Yr. MBS**	-67	-49	-26	35	-28	NA	NA	NA
10-Yr. Corp. AA	-26	-30	-46	24	-47	[-30]		

Note: Event windows are 1-day for morning announcements and 2-day for afternoon announcements.
*The announced increase was close to market expectations. An initial drop in yields was reversed over the course of the day as global bond yields rose strongly.
**MBS event windows are one day longer than others.

These announcement effects are roughly consistent with the range of plausible estimates reported in the econometric literature. A precise comparison is complicated by issues such as 1) the substitutability between agency securities and corporate debt on the one hand and Treasury securities and gilts on the other hand, 2) the extent to which markets anticipated these announcements, 3) the extent to which markets extrapolated additional purchases beyond those announced, 4) the

[10] Also supporting this view is the fact that corporate bond rates fell markedly in April through June.

extent to which the programs affected market expectations of future short-term interest rates, 5) the length of time markets expect central banks to hold these assets, and 6) the speed with which markets price in the full effects of announced purchases.

Overall, the evidence supports the view that large-scale alterations in the relative supply of short-term and long-term debt in private hands can affect the term structure of interest rates. The size of this effect is relatively small, so large quantities must be purchased. Importantly, the effect seems to spill over across all long-term debt securities, including classes that are not included in the purchase programs, such as corporate debt and swaps in the United States.

III. Is It Enough?

Clearly, central banks on both sides of the Atlantic have been very responsive to the financial crisis, both in terms of traditional monetary policy and in terms of nontraditional monetary policies and the provision of liquidity. Nevertheless, further policy easing is warranted. A common method for gauging the appropriate stance of traditional monetary policy supports this conclusion. Furthermore, nontraditional policy measures and liquidity provision for the most part have not fully offset the effects of financial turbulence on market liquidity and credit availability, [11] thus they should be viewed as helping traditional policy channels to function more normally rather than providing additional macroeconomic stimulus

[11] Surveys of bank lending standards in these four regions show a pronounced tightening of credit terms and conditions in 2008 with very little easing (or even further tightening) in 2009.

beyond that implied by traditional policy measures. The main caveat to this conclusion arises from the potential effects of purchases of long-term liquid assets on long-term interest rates. However, as discussed below, economic forecasts of central banks and other institutions overwhelmingly suggest that the announced policy programs fall short of what is desirable.

The Taylor Rule

Figure 1 (at the end of the paper) shows that three-month interbank interest rates (the solid lines) are around 1 percent or lower in each of the main regions and are projected by the OECD to drift lower over the next year. However, Taylor-style policy rules (the dashed and dotted lines) call for negative interest rates in every region. The gaps between policy rates and policy rules are especially notable for the euro area and Japan, particularly in light of the fact that central banks in these regions have been least aggressive in implementing nontraditional measures.

The dashed lines are the original Taylor (1993) rule, shown in equation (1), using output gaps estimated by the OECD and assuming a target inflation rate of 2 percent in the euro area, United Kingdom, and United States, and 1 percent in Japan. As in the original rule, the equilibrium real interest rate is assumed to be 2 percent.[12]

1) $$r_t = 2 + (p_t - p_{t-4}) + 0.5(p_t - p_{t-4} - \pi^*) + 0.5(y_t - y_t^*)$$

[12] Data are quarterly, from *OECD Economic Outlook* database. Inflation is the (logarithmic) percentage change in the private consumption deflator.

The dotted lines are estimated rules over the period 1984Q1-2007Q2, using the specification in equation (2).[13] This specification allows for slow adjustment of the policy rate and does not require estimates of the output gap; it uses the actual GDP growth rate as an alternate measure of real activity.[14] In addition, the intercept freely estimates the combined effects of the equilibrium real interest rate, the inflation target, and the potential growth rate.[15] The coefficient on inflation does not differ significantly from that in Taylor's original rule for any region.

2) $$r_t = \rho\, r_{t-1} + (1-\rho)\left\{\alpha + (p_t - p_{t-4}) + \beta(p_t - p_{t-4}) + \delta(y_t - y_{t-4})\right\}$$

Figure 1 shows that both policy rules called for a sharp drop in short-term interest rates beginning in 2008Q4. In every region, both rules call for a negative short-term interest rate through at least the end of next year, based on current forecasts of GDP and inflation. Estimates of equation (2) using OECD output gaps instead of GDP growth rates reach the same conclusion. Krugman (2009) and Guha

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[13] Prior to 1999, euro-area data are GDP-weighted averages of the six largest member countries. This sample corresponds to the period of relative macroeconomic stability in these regions. However, there have been notable shifts in the framework or goals of monetary policy since 1984. For example, U.S. inflation appeared to move down persistently in 1991, the BOE moved to inflation targeting in 1993 and was granted independence in 1997, the BOJ was granted increased independence in 1998, and the ECB began operations in 1998. Estimating the policy rules over these shorter samples yielded less sensible coefficients with large standard errors that were generally not significantly different from the full-sample estimates. A notable exception is the euro area, for which the coefficient on GDP growth declines an economically (though not statistically) significant amount, from 3 to 1.5.

[14] Levin, et al. (1998) show that policy in the United States has a significant lag component and that it appears to respond more strongly to output growth than the output gap, perhaps reflecting the difficulty of estimating output gaps in real time.

[15] Recasting equation (2) in error-correction form leads to rejection of the null of non-cointegration among these three variables at the 10 percent level for every region.

(2009) cite other estimates that the ideal policy rate in the United States should be even lower, around -5 to -7 percent.

Estimated Policy Rules, Equation (2), 1984Q1 – 2007Q2

	Euro Area	Japan*	U.K.	U.S.
ρ	0.93 (.02)	0.90 (.03)	0.83 (.05)	0.86 (.03)
α	-6.58 (3.30)	-0.22 (.80)	-3.16 (2.08)	-4.33 (1.49)
β	0.56 (.41)	0.19 (.32)	1.02 (.29)	0.72 (.37)
δ	3.05 (1.27)	0.79 (.26)	1.40 (.47)	1.59 (.31)
Root MSE	0.39	0.33	0.72	0.46

Note: Coefficient standard errors in parentheses.
*A four-quarter dummy was added for the imposition of the consumption tax in 1997, but the estimated effect was not significant at any level.

Economic Forecasts

Forecasts of economic activity and inflation provide another basis on which to judge the stance of policy. Given the lags in monetary transmission, the stance of policy in mid-2009 will have only a marginal effect on output and inflation in 2009. However, current policy can have a significant effect on output and inflation in 2010. A simple benchmark for countercyclical policy in the face of a large output gap is that output should be forecasted to grow faster than potential after six to nine months unless inflation is expected to be higher than desired. According to the August 2009 issue of *Consensus Forecasts,* GDP is expected to grow more slowly in 2010 than its long-run rate in the euro area, United Kingdom, and United States,

and only slightly faster than its long-run rate in Japan, which experienced the sharpest contraction of these four regions in 2009. In the euro area and United Kingdom, GDP is not forecasted to grow faster than the long-run rate even in 2011. Inflation in all four regions is expected to be lower than the rates desired by policymakers.

The following table shows essentially similar results from forecasts by the OECD and IMF. The OECD projects large negative output gaps in each of these regions with no significant reductions in output gaps over the four quarters of 2010. Both the OECD and the IMF project GDP growth in 2010 that is low by historical standards, although apparently the OECD has marked down potential growth rates to roughly these levels. Clearly, few forecasters are expecting any noticeable recovery of these economies toward their potential next year. Inflation rates are also projected to be significantly lower than desired levels next year. Overall, none of these forecasts satisfies the simple benchmark for appropriate monetary policy in any of these regions.

2009 Macroeconomic Forecasts

	OECD (June)				IMF (April)	IMF (July)
	2010 4Q Inflation	2010 4Q GDP Growth	2010Q4 Output Gap	2010 4Q Gap Change	2010 4Q Inflation	2010 4Q GDP Growth
Euro Area	0.4	0.9	-5.8	0.3	0.6	0.6
Japan	-1.5	0.8	-6.1	0.0	-0.4	0.9
U.K.	0.9	1.1	-6.2	0.0	1.0	0.5
U.S.	0.5	1.4	-5.3	0.1	0.1	1.7

Central bank forecasts from three of these four regions also support the case for looser monetary policy.

- The midpoint of Eurosystem (ECB and national central banks) staff projections of GDP growth in 2010 is -0.3 percent with an inflation midpoint of 1.0 percent. Both of these are clearly below desired levels, even after factoring in a possible decline in the potential growth rate.
- The midpoint of BOJ policy board member forecasts of GDP growth in fiscal year 2010 is 1.0 percent, below the recent historical average of output growth, but close to the BOJ's assessment of the current growth rate of potential. The midpoint of policy board members' inflation forecasts is -1.0 percent, well below the BOJ's definition of price stability, which is centered around 1.0 percent.
- The midpoint of the central tendency of FOMC participants' projections for the U.S. unemployment rate at the end of 2011 is 8.6 percent, far above the midpoint of their estimates of the "longer-run" rate of 4.9 percent.[16] FOMC participants project core inflation to be about 1.3 percent in 2011, compared to a longer-run view of inflation of around 1.8 percent.

It is not clear when these central banks expect inflation to return to its desired level, but it is surely further out than the commonly used two-year horizon.

The BOE provides an exception to this pattern. The BOE projects output and

[16] This forecast also suggests that the Fed is not expecting a very large stimulative effect from its long-term asset purchase program.

inflation under two alternative assumptions: market expectations of future policy rates and a constant policy rate. Under a constant policy rate at 0.5 percent and planned long-term asset purchases of £175 billion, the BOE projects that output will grow around 3.5 percent in 2010 (Q4/Q4) and that inflation will return to its target rate by late 2011. Under market expectations of interest rates, the BOE projects slightly lower growth and a continued undershooting of its inflation target. From these projections we are led to infer that the BOE expects to hold policy rates at their current level through at least early 2011 and that looser policy is not needed to attain a desired outcome for inflation. Under either set of assumptions, the BOE projects much more rapid growth of GDP in 2010 than most outside forecasters. It may be that the BOE believes that its asset purchase program will have a significant stimulative effect.

Recap

Altogether then, the evidence from Taylor-style policy analysis and a wide range of economic forecasts suggests that further monetary policy stimulus would be appropriate in the major developed regions. A notable exception to this conclusion is found in the BOE forecast for the U.K. economy, which suggests that maintaining the current policy stance over the next two years will lead to a satisfactory outcome. However, most other forecasters have a more downbeat outlook for the U.K. economy. It is also notable that in the euro area and Japan, where the estimated shortfall of traditional monetary stimulus is greatest, central banks have been least aggressive in pursuing nontraditional monetary policies.

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Timeline of Central Bank Responses to the Financial Crisis				
Japan	United States		United Kingdom	Euro Area
	increased liquidity and expanded term loans to banks, narrowed spread on discount window loans	Aug 2007		increased liquidity and expanded term loans to banks
	increased term liquidity to banks, lowered policy rate 100 b.p.	Sep 2007 through Dec 2007	frontloaded bank reserves, widened reserve target range, increased term liquidity to banks, lowered policy rate 25 b.p.	frontloaded bank reserves, increased term liquidity to banks, provided dollar liquidity through Fed swaps
	increased term liquidity to banks, began term loans to primary dealers, established term securities lending, loan for Bear Stearns, lowered policy rate 225 b.p.	Jan 2008 through Apr 2008	established term securities lending, lowered policy rate 50 b.p.	increased dollar liquidity through Fed swaps
		May 2008 through Aug 2008		raised policy rate 25 b.p.
increased term liquidity to banks, supported CP market, provided dollar liquidity through Fed swaps, increased JGB purchases, lowered fee on security lending, lowered policy rate 40 b.p.	increased term liquidity to banks, supported CP market, broadened collateral accepted, began outright purchases of agency securities, loans for AIG, Bank of America, and Citigroup, lowered policy rate 185 b.p. and guided down future expectations	Sep 2008 through Dec 2008	increased term liquidity to banks, provided dollar liquidity through Fed swaps, broadened collateral accepted, lowered policy rate 250 b.p.	increased term liquidity to banks, increased dollar liquidity through Fed swaps and provided swiss franc liquidity through SNB swaps, broadened collateral accepted, narrowed corridor between standing facilities, lowered policy rate 125 b.p.
began outright purchases of CP and short-term corporate bonds	began purchasing longer-term Treasury securities and expanded purchases of agency securities, began to support ABS market	Jan 2009 through Aug 2009	began purchasing longer-term gilts, corporate bonds, and CP, lowered policy rate 150 b.p.	increased term liquidity to banks, began purchasing covered bonds, lowered policy rate 150 b.p.

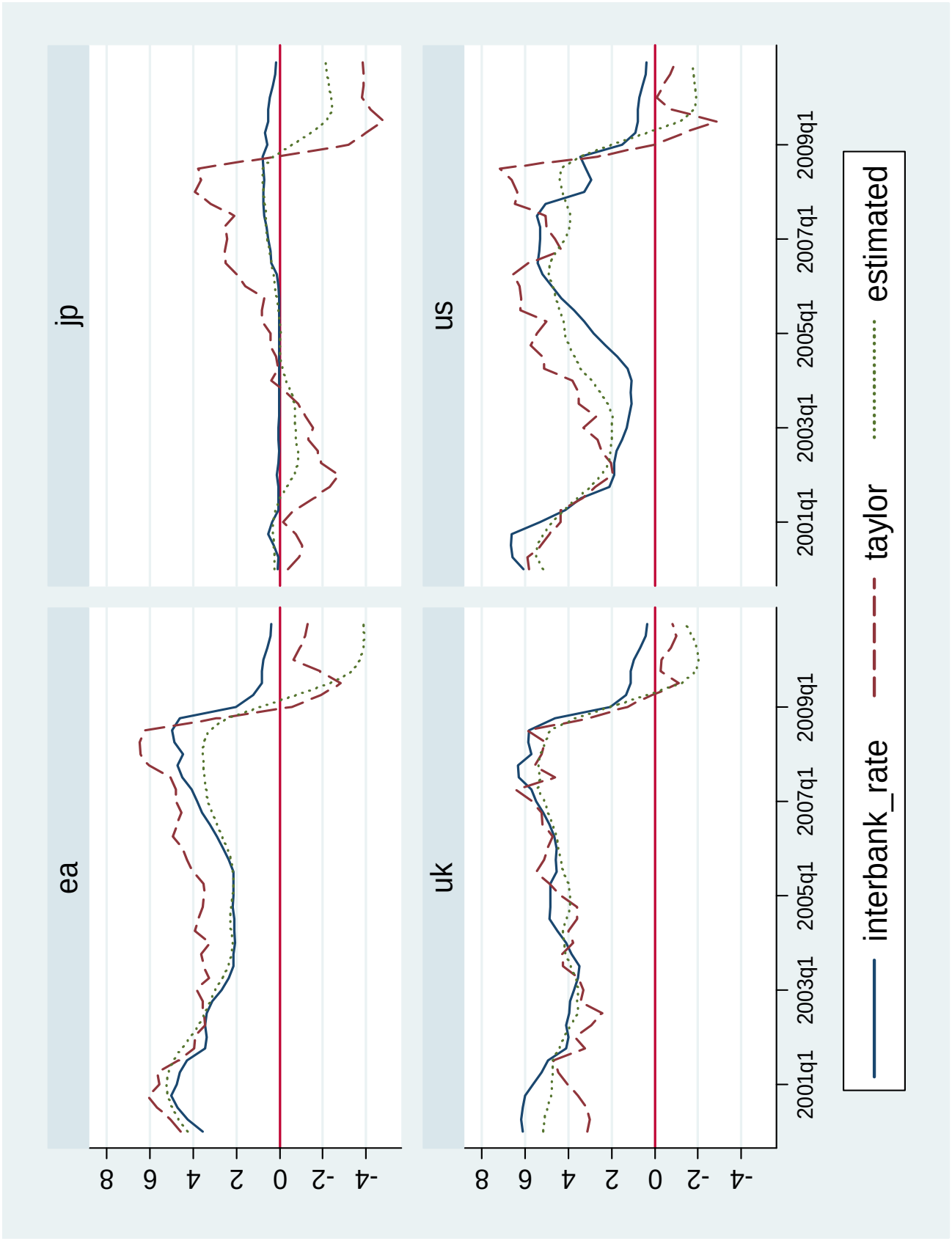

Figure 1. Three-month interbank rate and policy rules