Board of Governors of the Federal Reserve System

Speech

Chairman Ben S. Bernanke

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Long-Term Interest Rates

I will begin my remarks by posing a question: Why are long-term interest rates so low in the United States and in other major industrial countries?

At first blush, the answer seems obvious: Central banks in those countries are pursuing accommodative monetary policies to boost growth and reduce slack in their economies. However, while central banks certainly play a key role in determining the behavior of long-term interest rates, theirs is only a proximate influence. A more complete explanation of the current low level of rates must take account of the broader economic environment in which central banks are currently operating and of the constraints that that environment places on their policy choices.

Let me start with a brief overview of the recent history of long-term interest rates in some key economies. Chart 1 shows the 10-year government bond yields for five major industrial countries: Canada, Germany, Japan, the United Kingdom, and the United States. Note that the movements in these yields are quite correlated despite some differences in the economic circumstances and central bank mandates in those countries. Further, with the notable exception of Japan, the *levels* of the yields have been very similar--indeed, strikingly so, with long-term yields declining over time and currently close to 2 percent in each case. The similar behavior of these yields attests to the global nature of the economic and financial developments of recent years, as well as to the broad similarity in how the monetary policymakers in the advanced economies have responded to these developments. Of course, Japanese yields are clearly a case apart, as Japan has endured an extended period of deflation, while inflation in the other four countries has been positive and generally close to the stated objectives of the monetary authorities. But even Japanese yields have shown some tendency to fluctuate along with other benchmark yields, and they have also declined over the period shown.

In my comments, I will delve more deeply into the reasons why these long-term interest rates have fallen so low. This examination may be useful both for understanding the current stance of policy and also for thinking about how rates may evolve. In short, we expect that as the economy recovers, long-term rates will rise over time to more normal levels. A return to more normal conditions in financial markets would, of course, be most welcome. Many commentators have noted, however, that both an extended period of low rates and the transition back toward normal levels may pose risks to financial stability. In the final portion of my remarks, I will discuss some aspects of how the Federal Reserve is approaching these risks.

Why Are Long-Term Interest Rates So Low?

So, why are long-term interest rates currently so low? To help answer this question, it is useful to decompose longer-term yields into three components: one reflecting expected inflation over the term of the security; another capturing the expected path of short-term real, or inflation-adjusted, interest rates; and a residual component known as the term premium. Of course, none of these three components is observed directly, but there are standard ways of estimating them. Chart 2 displays one version of this decomposition of the 10-year U.S. Treasury yield based on a term structure model developed by Federal Reserve staff.[1] The broad features I will emphasize are similar to those found by other authors using a variety of methods.[2]

All three components of the 10-year yield have declined since 2007. The decomposition attributes much of the decline in the yield since 2010 to a sharp fall in the term premium, but the expected short-term real rate component also moved down significantly. Let's consider each component more closely.

The expected inflation component has drifted gradually downward for many years and has become quite stable. In large part, the downward trend and stabilization of expected inflation in the United States are products of the increasing credibility of the Federal Reserve's commitment to price stability. In January 2012, the Federal Open Market Committee (FOMC) underscored this commitment by issuing a statement--since reaffirmed at its January 2013 meeting--on its longer-run goals and policy strategy, which included a longer-run inflation target of 2 percent.[3] The anchoring of long-term inflation expectations near 2 percent has been a key factor influencing long-term interest rates over recent years. It almost certainly helped mitigate the strong disinflationary pressures immediately following the crisis. While I have not shown expected inflation for other advanced economies, the pictures would be very similar--again, except for Japan.

With the expected inflation component of the 10-year rate near 2 percent and the rate itself a bit below 2 percent recently, it is clear that the combination of the other two components--the expected path of short-term real interest rates and the term premium--must make a small net negative contribution.

The expected path of short-term real interest rates is, of course, influenced by monetary policy, both the current stance of policy and market participants' expectations of how policy will evolve. The stance of monetary policy at any given time, in turn, is driven largely by the economic outlook, the risks surrounding that outlook, and at times other factors, such as whether the zero lower bound on nominal interest rates is binding. In the current environment, both policymakers and market participants widely agree that supporting the U.S. economic recovery while keeping inflation close to 2 percent will likely require real short-term rates, currently negative, to remain low for some time. As shown in chart 2, the expected average of the short-term real rate over the next 10 years has gradually declined to near zero over the past few years, in part reflecting downward revisions in expectations about the pace of the ongoing recovery and, hence, a pushing out of expectations regarding how long nominal short-term rates will remain low.[4]

As the persistence of the effects of the crisis have become clearer, the Federal Reserve's communications have reinforced the expectation that conditions are likely to warrant highly accommodative policy for some time: Most recently, the FOMC indicated that it expects to maintain an exceptionally low level of the federal funds rate at least as long as the unemployment rate is above 6.5 percent, projected inflation between one and two years ahead is no more than a half percentage point above the Committee's 2 percent target, and long-term inflation expectations remain stable.[5]

In discussing the role of monetary policy in determining the expected future path of real short-term rates, I have cheated a little: What monetary policy actually controls is *nominal* short-term rates. However, because inflation adjusts slowly, control of nominal short-term rates usually translates into control of real short-term rates over the short and medium term. In the longer term, real interest rates are determined primarily by nonmonetary factors, such as the expected return to capital investments, which in turn is closely related to the underlying strength of the economy. The fact that market yields currently incorporate an expectation of very low short-term real interest rates over the next 10 years suggests that market participants anticipate persistently slow growth and, consequently, low real returns to investment. In other words, the low level of expected real short rates may reflect not only investor expectations for a slow cyclical recovery but also some downgrading of longer-term growth prospects.[6]

Chart 3, which displays yields on inflation-indexed, long-term government bonds for the same five countries represented in chart 1, shows that expected real yields over the longer term are low in other advanced industrial economies as well. Note again the strong similarity in returns across these economies, suggesting once again the importance of common global factors. While indexed yields spiked up around the end of 2008, reflecting market stresses at the height of the crisis that undercut the demand for these bonds, these effects dissipated in 2009. Since that time, inflation-indexed yields have declined steadily and now stand below zero in each country.[7] Apparently, low longer-term real rate expectations are playing an important role in accounting for low 10-year nominal rates in other industrial countries, as well as in the United States.

The third and final component of the long-term interest rate is the term premium, defined as the residual component not captured by expected real short-term rates or expected inflation. As I noted, the largest portion of the downward move in long-term rates since 2010 appears to be due to a fall in the term premium, so it deserves some special discussion.

In general, the term premium is the extra return investors expect to obtain from holding long-term bonds as opposed to holding and rolling over a sequence of short-term securities over the same period. In part, the term premium compensates bondholders for interest rate risk--the risk of capital gains and losses that interest rate changes imply for the value of longer-term bonds. Two changes in the nature of this interest rate risk have probably contributed to a general downward movement of the term premium in recent years. First, the volatility of Treasury yields has declined, in part because short-term rates are pressed up against the zero lower bound and are expected to remain there for some time to come. Second, the correlation of bond prices and stock prices has become increasingly negative over time, implying that bonds have become more valuable as a hedge against risks from holding other assets.[8]

Beyond interest rate risk, a number of other factors also affect the term premium in practice. For example, during periods of financial turmoil, the prices of longer-term Treasury securities are often driven up by so-called safe-haven demands of investors who place special value on the safety and liquidity of Treasury securities. Indeed, even during more placid periods, global demands for safe assets increase the value of Treasury securities. Many foreign governments and central banks, particularly those with sustained current account surpluses, hold substantial international reserves in the form of Treasuries. Foreign holdings of U.S. Treasury securities currently amount to about $5-1/2 trillion, roughly half of the total amount of marketable Treasury debt outstanding. The global economic and financial stresses of recent years--triggered first by the financial crisis, and then by the problems in the euro area--appear to have significantly elevated the safe-haven demand for Treasury securities at times, pushing down Treasury yields and implying a lower, or even a negative, term premium.[9]

Federal Reserve actions have also affected term premiums in recent years, most prominently through a series of Large-Scale Asset Purchase (LSAP) programs. These programs consist of open market purchases of agency debt, agency mortgage-backed securities, and longer-term Treasury securities. To the extent that Treasury securities and agency-guaranteed securities are not perfect substitutes for other assets, Federal Reserve purchases of these assets should lower their term premiums, putting downward pressure on longer-term interest rates and easing financial conditions more broadly. Although estimated effects vary, a growing body of research supports the view that LSAPs are effective at bringing down term premiums and thus reducing longer-term rates.[10] Of course, the Federal Reserve has used this unconventional approach to lowering longer-term rates

because, with short-term rates near zero, it can no longer use its conventional approach of cutting the target for the federal funds rate.[11] Accordingly, this portion of the decline in the term premium might ultimately be attributed to the sluggish economic recovery, which prompted additional policy action from the Federal Reserve.

Let's recap. Long-term interest rates are the sum of expected inflation, expected real short-term interest rates, and a term premium. Expected inflation has been low and stable, reflecting central bank mandates and credibility as well as considerable resource slack in the major industrial economies. Real interest rates are expected to remain low, reflecting the weakness of the recovery in advanced economies (and possibly some downgrading of longer-term growth prospects as well). This weakness, all else being equal, dictates that monetary policy must remain accommodative if it is to support the recovery and reduce disinflationary risks. Put another way, at the present time the major industrial economies apparently cannot sustain significantly higher real rates of return; in that respect, central banks--so long as they are meeting their price stability mandates--have little choice but to take actions that keep nominal long-term rates relatively low, as suggested by the similarity in the levels of the rates shown in chart 1. Finally, term premiums are low or negative, reflecting a host of factors, including central bank actions in support of economic recovery. Thus, while the current constellation of long-term rates across many advanced countries has few precedents, it is not puzzling: It follows naturally from the economic circumstances of these countries and the implications of these circumstances for the policies of their central banks.

How Are Long-Term Rates Likely to Evolve?

So, how are long-term rates likely to evolve over coming years? It is worth pausing to note that, not that long ago, central bankers would have carefully avoided this topic. However, it is now a bedrock principle of central banking that transparency about the likely path of policy, in general, and interest rates, in particular, can increase the effectiveness of policy. In the present context, I would add that transparency may mitigate risks emanating from unexpected rate movements. Thus, let me turn to prospects for long-term rates, starting with the expected path of rates and then turning to deviations from the expected path that may arise.

If, as the FOMC anticipates, the economic recovery continues at a moderate pace, with unemployment slowly declining and inflation expectations remaining near 2 percent, then long-term interest rates would be expected to rise gradually toward more normal levels over the next several years. This rise would occur as the market's view of the expected date at which the Federal Reserve will begin the removal of policy accommodation draws nearer and then as accommodation is removed. Some normalization of the term premium might also contribute to a rise in long-term rates.

To illustrate possible paths, Chart 4 displays four different forecasts of the evolution of the 10-year Treasury yield over coming years. The black line is the forecast reported in the December 2012 Blue Chip Financial Forecasts survey. The green line gives the Congressional Budget Office forecast published in February, and the blue line presents the median from the Survey of Professional Forecasters, as reported in the first quarter of this year. Finally, the purple line shows a forecast based on the term structure model used for the decomposition of the 10-year yield in chart 2.[12] While these forecasts embody a wide range of underlying models and assumptions, the basic message is clear--long-term interest rates are expected to rise gradually over the next few years, rising (at least according to these forecasts) to around 3 percent at the end of 2014. The forecasts in chart 4 imply a total increase of between 200 and 300 basis points in long-term yields between now and 2017.

Of course, the forecasts in chart 4 are just forecasts, and reality might well turn out to be different. Chart 5 provides three complementary approaches to summarizing the uncertainty surrounding forecasts of long-term rates. The dark gray bars in the chart are based on the range of forecasts reported in the Blue Chip Financial Forecasts, the blue bars are based on the historical uncertainty regarding long-term interest rates as reflected in the Board staff's FRB/US model of the U.S. economy, and the orange bars give a market-based measure of uncertainty derived from swaptions. These three different measures give a broadly similar picture about the upside and downside risks to the forecasts of long-term rates. Rates 100 basis points higher than the expected paths in chart 4 by 2014 are certainly plausible outcomes as judged by each of the three measures, and this uncertainty grows to as much as 175 basis points by 2017. Note, though, that while the risk of an unexpected rise in interest rates has drawn much attention, the level of long-term interest rates also could prove to be lower than forecast. Indeed, by the measures shown in chart 5, the upside and downside risks to the level of rates are roughly symmetric as of 2017.

We also have some historical experience with increases in rates during tightening cycles to consider. For example, in 1994, 10-year Treasury yields rose about 220 basis points over the course of a year, reflecting an unexpected quickening in the pace of economic growth and signs of building inflation pressures. This increase in long-term rates appears to have reflected a mix of a pronounced rise in the expected path of the policy interest rate and some increase in the term premium.[13] A rise of more than 200 basis points in a year is at the upper end of what is implied by the mean paths and uncertainty measures shown in charts 4 and 5, but these measures still admit a substantial probability of higher--and lower--paths.

Overall, then, we anticipate that long-term rates will rise as the recovery progresses and expected short-term real rates and term premiums return to more normal levels. The precise timing and pace of the increase will depend importantly on how economic conditions develop, however, and is subject to considerable two-sided uncertainty.

Managing Risks Associated with the Future Course of Long-Term Interest Rates

As I noted when I began my remarks, one reason to focus on the timing and pace of a possible increase in long-term rates is that these outcomes may have implications for financial stability.

Commentators have raised two broad concerns surrounding the outlook for long-term rates. To oversimplify, the first risk is that rates will remain low, and the second is that they will not. In particular, in an environment of persistently low returns, incentives may grow for some investors to engage in an unsafe "reach for yield" either through excessive use of leverage or through other forms of risk-taking. My Board colleague Jeremy Stein recently discussed how this behavior may arise in some financial markets, including credit markets.[14] Alternatively, we face a risk that longer-term rates will rise sharply at some point, imposing capital losses on holders of fixed-income instruments, including financial institutions. Of course, the two risks may very well be mutually reinforcing: Taking on duration risk is one way investors may reach for yield, and the losses resulting from a sharp rise in longer-term rates will be greater if investors have done so.[15]

One might argue that the right response to these risks is to tighten monetary policy, raising long-term interest rates with the aim of forestalling any undesirable buildup of risk. I hope my discussion this evening has convinced you that, at least in economic circumstances of the sort that prevail today, such an approach could be quite costly and might well be counterproductive from the standpoint of promoting financial stability. Long-term interest rates in the major industrial countries are low for good reason: Inflation is low and stable and, given expectations of weak growth, expected real short rates are low. Premature rate increases would carry a high risk of short-circuiting the recovery, possibly leading--ironically enough--to an even longer period of low long-term rates. Only a strong economy can deliver persistently high real returns to savers and investors, and the economies of the major industrial countries are still in the recovery phase.

So how can financial stability concerns--which the Federal Reserve takes very seriously--be addressed? Our strategy, undertaken in cooperation with other regulators and central banks, has a number of elements.

First, we have greatly increased our macroprudential oversight, with a particular focus on potential systemic vulnerabilities, including buildups of leverage and unstable funding patterns as well as interest rate risk.[16] Under the umbrella of our interdisciplinary Large Institutions Supervision Coordinating Committee, we pay special attention to developments at the largest, most complex financial firms, making use of information gathered in our supervision of the institutions and drawn from financial market indicators of their health and systemic vulnerability. We also monitor the shadow banking sector, especially its interaction with regulated institutions; in this work, we look for factors that may leave the system vulnerable to an adverse "fire sale" dynamic, in which declining asset values could force leveraged investors to sell assets, depressing prices further. We exchange information regularly with other regulatory agencies, both directly and under the auspices of the Financial Stability Oversight Council. Throughout the Federal Reserve System, work in these areas is conducted by experts in banking, financial markets, monetary policy, and other disciplines, and at the Federal Reserve Board we have established our Office for Financial Stability Policy and Research to help coordinate this work. Findings are presented regularly to the Board and to the FOMC for use in its monetary policy deliberations.

Second, recognizing that our monitoring of the financial sector will always be imperfect, we are using regulatory and supervisory tools to help ensure that financial institutions are sufficiently resilient to weather losses and periods of market turmoil arising from any source. Indeed, reflecting expectations embodied in the new Basel III and Dodd-Frank standards, the largest and most complex financial firms have substantially increased both their capital and their liquidity in recent years. Our current round of stress testing of the largest bank holding companies, to be completed early this month, examines whether the largest banking firms have sufficient capital to come through a seriously adverse economic downturn and still have the capacity to perform their roles as providers of credit. In a related exercise, we are also asking banks to stress-test the adequacy of their capital in the face of a hypothetical sharp upward shift in the term structure of interest rates.

Third, our approach to communicating and implementing monetary policy provides the Federal Reserve with new tools that could potentially be used to mitigate the risk of sharp increases in interest rates. In 1994--the period discussed earlier in which sharp increases in interest rates strained financial markets--the FOMC's communication tools were very limited; indeed, it had just begun issuing public statements following policy moves. By contrast, in recent years, the Federal Reserve has provided a great deal of additional information about its expectations for the path of the economy and the stance of monetary policy. Most recently, as I mentioned, the FOMC announced unemployment and inflation thresholds characterizing conditions that will guide the timing of the first increase in the target for the federal funds rate. Further, the FOMC stated that a highly accommodative stance of monetary policy is likely to remain appropriate for a considerable time after our current asset purchase program ends. By providing greater clarity concerning the likely course of the federal funds rate, FOMC communication should both make policy more effective and reduce the risk that market misperceptions of the Committee's intentions would lead to unnecessary interest rate volatility.

In addition, the Federal Reserve could, if necessary, use its balance sheet tools to mitigate the risk of a sharp rise in rates. For example, the Committee has indicated its intention to sell its agency securities gradually once conditions warrant. The Committee also noted, however, that the pace of sales could be adjusted up or down in response to material changes in either the economic outlook or financial conditions. In particular, adjustments to the pace or timing of asset sales could be used, under some circumstances, to dampen excessively sharp adjustments in longer-term interest rates.

Conclusion

Let me finish with some thoughts on balancing the risks we face in the current challenging economic environment, at a time when our main policy tool, the federal funds rate, is near its effective lower bound. On the one hand, the Fed's dual mandate has led us to provide strong support for the recovery, both to promote maximum employment and to keep inflation from falling below our price stability objective. One purpose of this support is to prompt a return to the productive risk-

taking that is essential to robust growth and to getting the unemployed back to work. On the other hand, we must be mindful of the possibility that sustained periods of low interest rates and highly accommodative policy could lead to excessive risk-taking in some financial markets. The balance here is not an easy one to strike. While the recent crisis is vivid testament to the costs of ill-judged risk-taking, we must also be aware of constraints posed by the present state of the economy. In light of the moderate pace of the recovery and the continued high level of economic slack, dialing back accommodation with the goal of deterring excessive risk-taking in some areas poses its own risks to growth, price stability, and, ultimately, financial stability. Indeed, as I noted, a premature removal of accommodation could, by slowing the economy, perversely serve to extend the period of low long-term rates.

For these reasons, we are responding to financial stability concerns with the multipronged approach I summarized a moment ago, which relies primarily on monitoring, supervision and regulation, and communication. We will, however, be evaluating these issues carefully and on an ongoing basis; we will be alert for any developments that pose risks to the achievement of the Federal Reserve's mandated objectives of price stability and maximum employment; and we will, of course, remain prepared to use all of our tools as needed to address any such developments.

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1. Estimates are based on the model of D'Amico, Kim, and Wei (2010). That model employs the "arbitrage-free" term structure framework and jointly models real yields, nominal yields, and inflation as functions of four underlying latent factors. Historical data on nominal yields, real yields, and inflation can be used to estimate these underlying factors and the relationship of real and nominal yields to the factors. Based on this information, the model can be used to produce estimates of the components of nominal yields shown in chart 2. Note that inflation in chart 2 is measured by the consumer price index; inflation measured by this index is close to but on average slightly higher than inflation as measured by the price index for personal consumption expenditures, the measure to which the Federal Open Market Committee's 2 percent inflation objective refers. Return to text

2. For example, this decomposition as estimated based on expectations as reported in the Blue Chip Financial Forecasts gives broadly similar results, as do many standard term structure models. Return to text

3. See Statement on Longer-Run Goals and Monetary Policy Strategy (PDF), as amended effective on January 29, 2013. Return to text

4. Real interest rates are not constrained by the zero bound, and the fact that expected average real short-term interest rates are near zero reflects that the nominal rate is expected, on average, to run close to the expected inflation rate, which is near 2 percent. Return to text

5. See the FOMC's December statement at Board of Governors (2012). Return to text

6. Between April 2009 and October 2012, expectations for average growth over the next 10 years, as reported in Consensus Forecasts, have fallen about 0.2 percentage points for the United States. This reduction in growth expectations is a broad phenomenon: Between April 2009 and October 2012, the average prediction for growth over the next 10 years for Canada, Germany, Japan, and the United Kingdom has fallen between 0.1 and 0.6 percentage points. Return to text

7. It is important to note that these indexed yields are likely being pushed down by term premiums akin to the term premiums in nominal rates discussed in this speech. Return to text

8. See, for example, Campbell, Sunderam, and Viceira (2009). Return to text

9. There are some additional more technical features of the Treasury market that push down the term premium. For example, the Treasury term premium is likely also depressed by the global demand for Treasury securities for use as collateral or margin in funding or derivatives markets. Return to text

10. See, for example, Gagnon, Raskin, Remache, and Sack (2011); Li and Wei (2012); Hamilton and Wu (2012); D'Amico, English, López-Salido, and Nelson (2012); Rosa (2012); Krishnamurthy and Vissing-Jørgensen (2011); and Hancock and Passmore (2012). Return to text

11. Term premiums, calculated using similar methods, have also declined fairly sharply recently in Canada, Germany, and the United Kingdom; somewhat less so in Japan. This result is notable in that the central banks of these economies, with the exception of the Bank of England, have not pursued large-scale purchases of longer-term securities. Return to text

12. This projection assumes that two key components of the 10-year Treasury yield shown in chart 2--the expected average real short-rate and the term premium--revert to their respective mean levels over the period 2000 to 2006 during the next 5 years; the expected average inflation component is assumed to remain constant near the 2 percent level prevailing at the end of 2012. Return to text

13. The two components were intertwined, as measures of uncertainty about the path of policy moved up sharply, likely contributing to a rise in term premiums. Notably, in this episode, the rise in rates created some stress in financial markets but did not lead to serious financial instability, nor did it significantly impair economic activity. However, one would not want to conclude from that one case that sharp rises in rates do not pose risks. Return to text

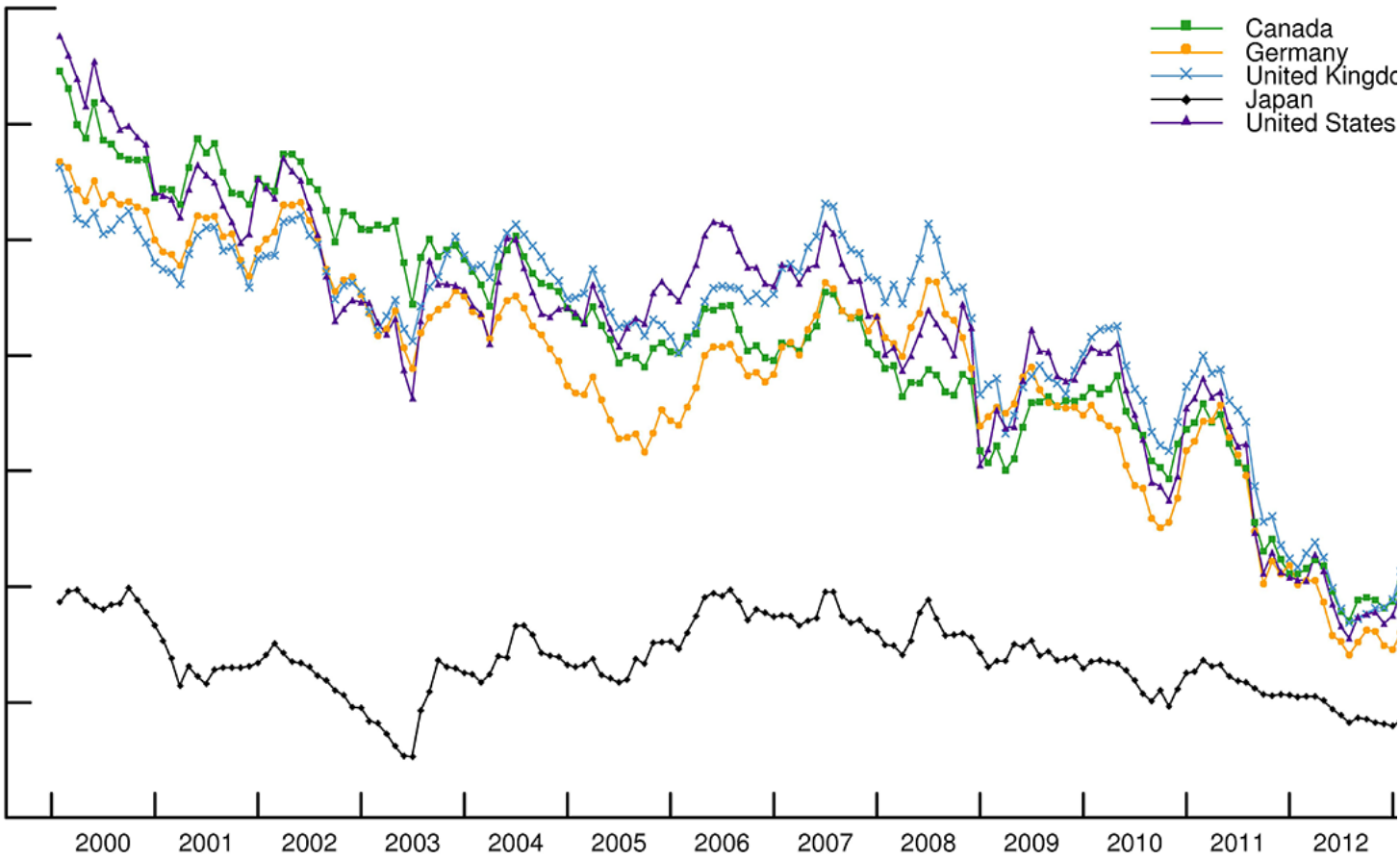
14. See Stein (2013). Return to text

15. On the other hand, some risk-taking--such as when an entrepreneur takes out a loan to start a new business or an existing firm expands capacity--is a necessary element of a healthy economic recovery. Moreover, although accommodative monetary policies may increase certain types of risk-taking, in the present circumstances they also serve in some ways to reduce risk in the system, most importantly by strengthening the overall economy, but also by encouraging firms to rely more on longer-term funding, and by reducing debt service costs for households and businesses. Return to text

16. See Adrian, Covitz, and Liang (forthcoming). Return to text

Chart 1. 10-Year Government Bond: Nominal Yield

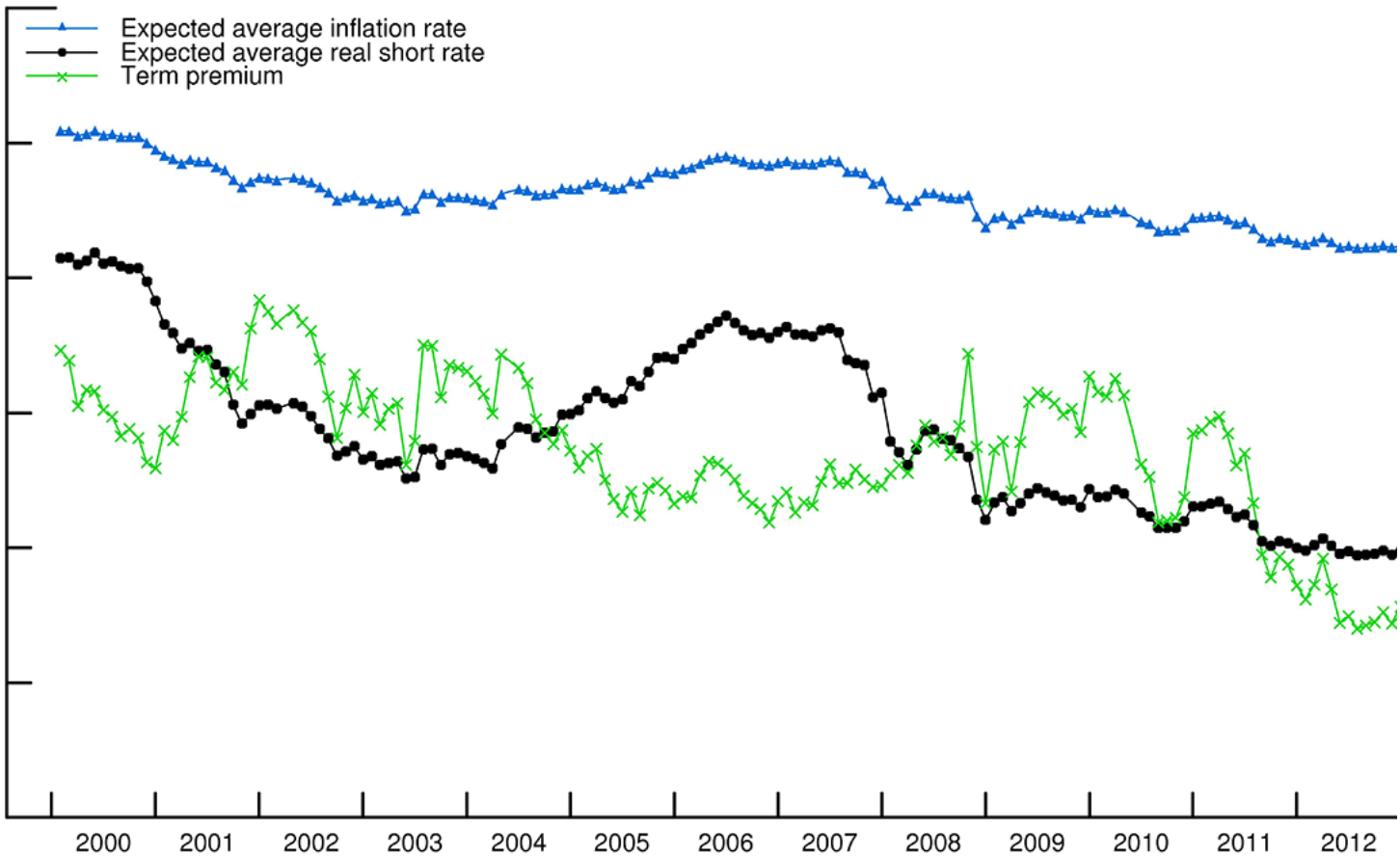
Monthly



Note: 10-year zero-coupon sovereign bond yields.
Source: Federal Reserve Board staff estimates.

Chart 2. Decomposition of 10-Year Treasury Yield

Monthly



Note: Decomposition of 10-year zero-coupon Treasury yield based on the term structure model of D'Amico, Kim, and Wei (2010).
Source: Federal Reserve Board; Barclays PLC; staff calculations.

Chart 3. Inflation-Indexed Government Bond Yield

Monthly

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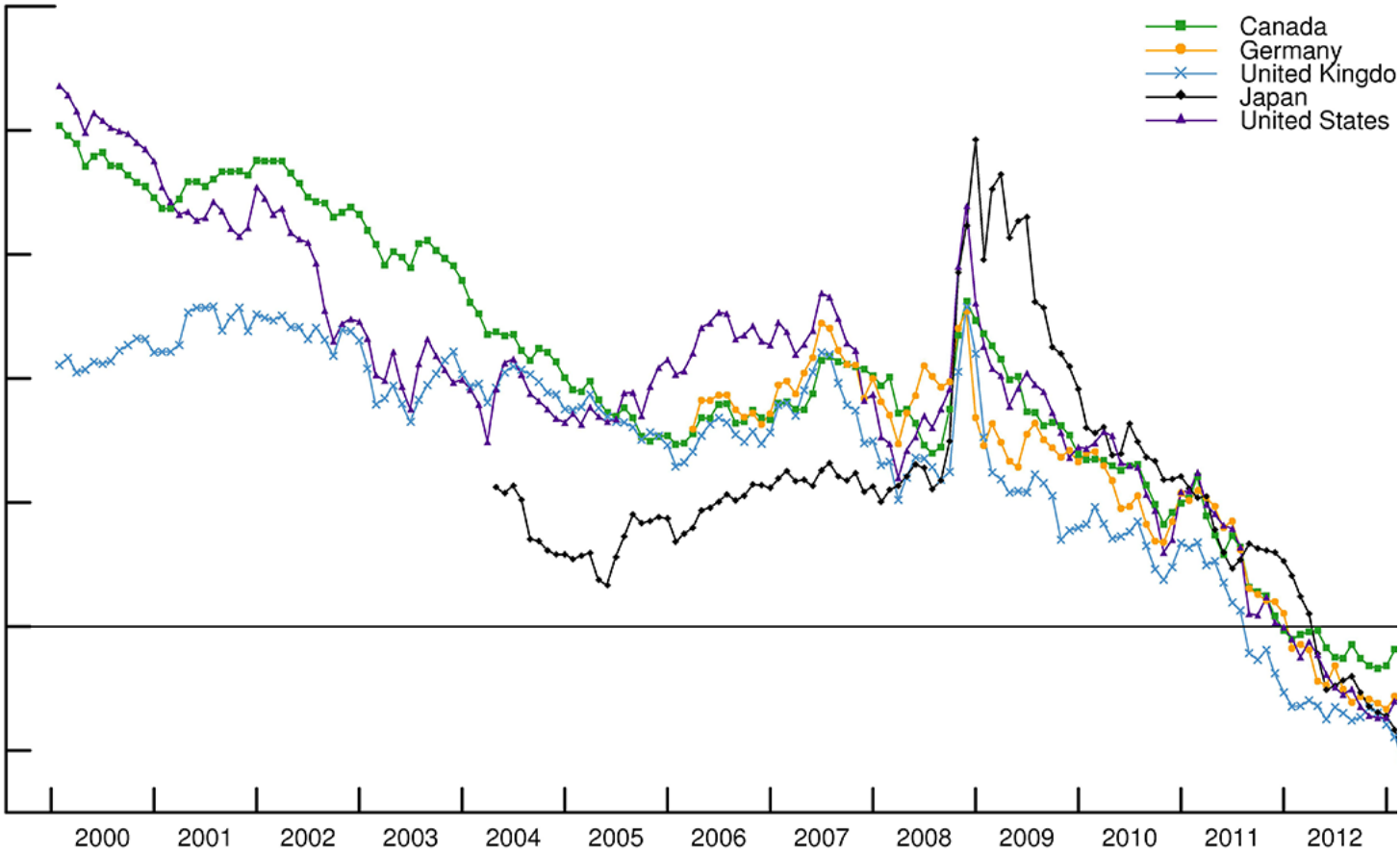
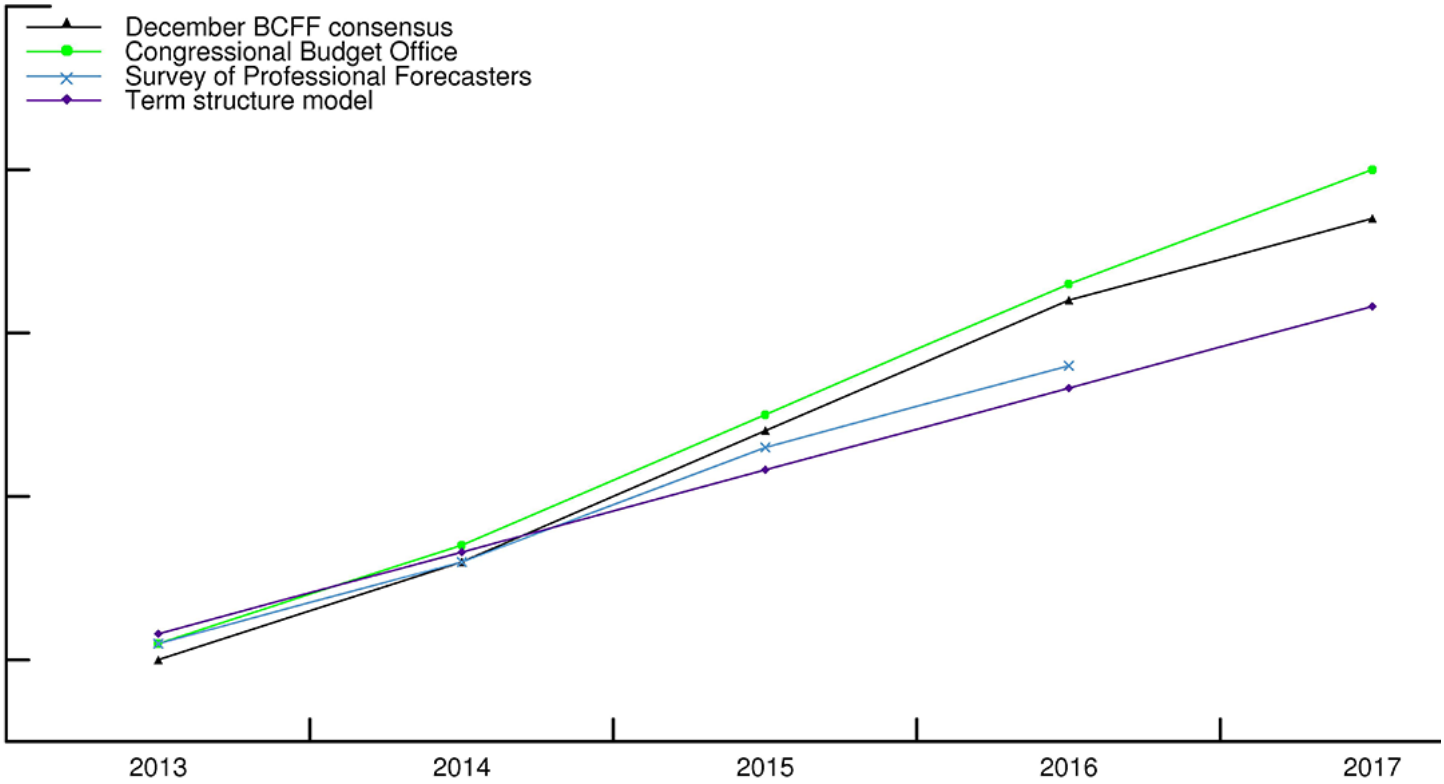


Note: Par yields. The maturity for the U.S., U.K., and German bonds is 10 years. The current maturity for the Japanese bond is 5 years, and that for the Cana bond is 8 years.

Source: Bloomberg.

Chart 4. Alternative 10-Year Treasury Yield Forecasts

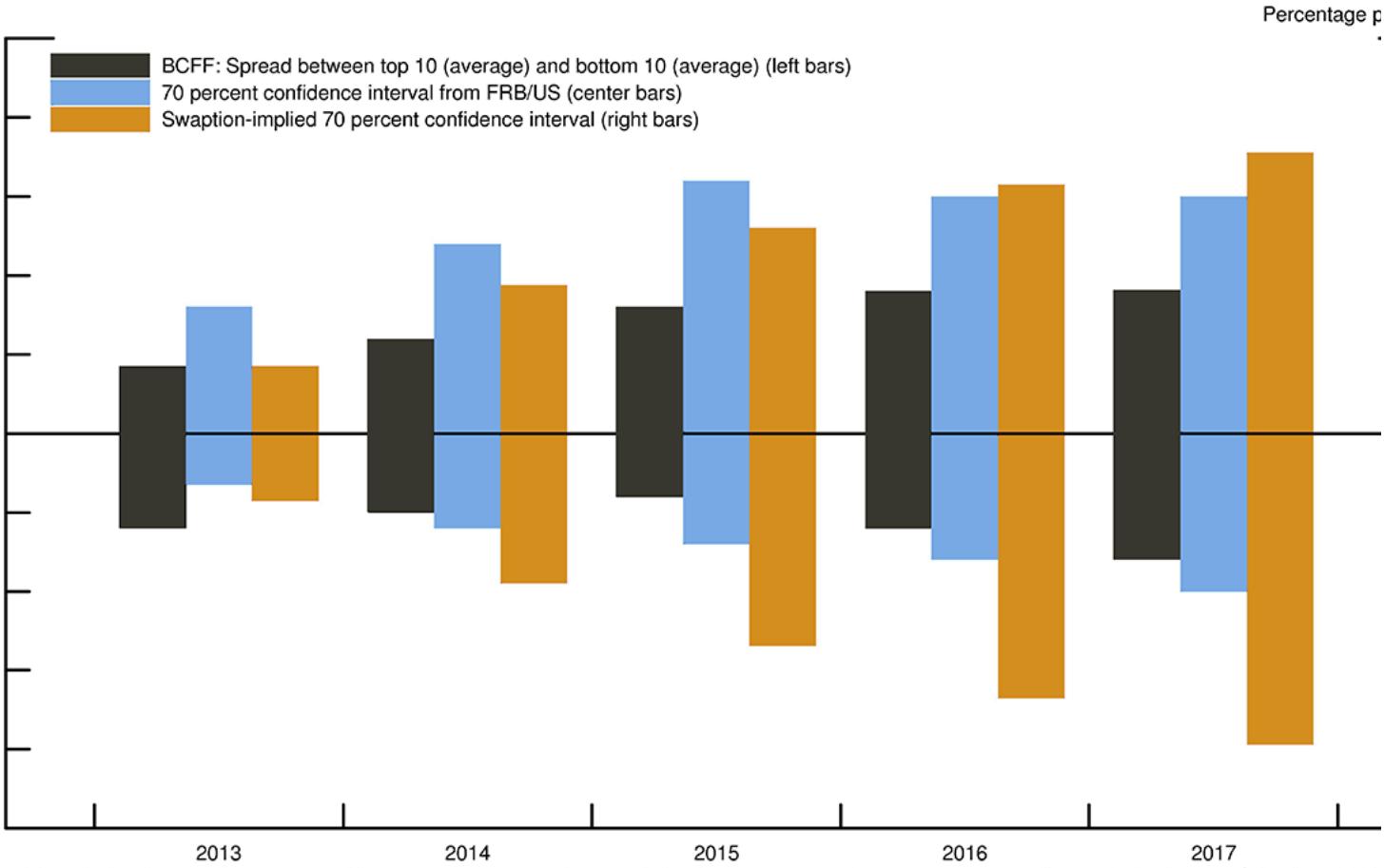
Annual average



Note: The term structure model forecast assumes that the expected real rate and term premium components of the 10-year nominal yield as shown in chart 2 revert to th pre-crisis means over a 5-year period while the expected inflation component remains constant at the level at the end of 2012.

Source: For December BCFF consensus, Blue Chip Financial Forecasts (BCFF) survey, December 2012; for Congressional Budget Office, Congressional Budget Office *The Budget and Economic Outlook: Fiscal Years 2013 to 2023* (Washington: CBO), February 5; for Survey of Professional Forecasters, Survey of Professional Forecasters for

Chart 5. Measures of Uncertainty around 10-Year Rate Forecasts (Centered around Respective Means)



Note: In the chart, each range or confidence interval is reported as a deviation from the mean path under the corresponding method. The Blue Chip Financial Fo (BCFF) measure uses the spread between the average of the highest 10 individual forecasts and that of the lowest 10 individual forecasts. The confidence intervals from FRB/US are based on stochastic simulations of the FRB/US model with shocks drawn randomly from the set of model equation residuals over the period from 1969 to 2011. The swaption-based measure is derived from the term structure of swaptions on 10-year swap rates.

Source: For BCFF measure, Blue Chip Financial Forecasts survey, December 2012; for FRB/US measure, Federal Reserve Board, FRB/US model; for swaption measure, J.P. Morgan and staff calculations.

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