CHAPTER SEVEN

International Monetary Stability and Policy

James Bullard, Robert Kaplan, Dennis Lockhart, and John C. Williams

PART 1

International Monetary Stability: A Multiple Equilibria Problem?

James Bullard

Introduction

Should monetary policy be better coordinated across countries? This has been a classic question in international macroeconomics. In recent years, this question has again moved to center stage. The use of unconventional monetary policy in the United States, in particular, has been met with criticism from emerging markets. The so-called "Taper Tantrum" of the summer of 2013 reenergized the debate. The surprise renminbi devaluation in the summer of 2015 seemed to cause substantial volatility in global financial markets. One characterization of both of these events, along with others during this period, appears to be that a seemingly small adjustment to the policy stance in one country may have an outsized impact on global financial markets and, through that channel, an important

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impact on real activity in other nations. Expectations alone seemed to drive these macroeconomic events. How can such phenomena be reconciled with standard theories that are used to guide thinking at many of the world's central banks?

In these remarks, I will lay out some well-established conventional wisdom concerning international monetary stability based on a standard, multicountry New Keynesian model. I will then present an alternative interpretation based on a very similar multi-country New Keynesian model, but with some policymakers in some countries pursuing "bad" monetary policy. The notion of what constitutes "bad" monetary policy will have a precise definition in this story.

The bottom line of these remarks can be described in two parts as follows.

The conventional wisdom as I describe it suggests that under "good" monetary policy in each country, worldwide equilibrium is unique and international monetary policy coordination is unnecessary. The key condition that defines "good" policy in each country is that policymakers follow a rule that adheres to the Taylor principle, that is, that nominal interest rates are adjusted more than one-for-one with deviations of inflation from target. If this is the way the world economy operates—and much of modern central banking is indeed intellectually based on New Keynesian theory with flexible exchange rates—then there would be little need to discuss international monetary policy coordination further.

In the alternative interpretation, the Taylor principle is not adhered to by every central bank worldwide, and this defines "bad" monetary policy for the multicountry model. Research shows that the worldwide equilibrium is not unique in this case. In fact, there are a lot of equilibria and shocks to expectations alone could drive macroeconomic volatility. This may be one way to interpret events like the 2013 Taper Tantrum or the 2015 renminbi devaluation without departing from an otherwise standard New Keynesian

model. In addition, there is a very good reason to think that the world's central banks have had a harder time adhering to the Taylor principle in recent years: they have encountered the zero lower bound, which makes it difficult to lower nominal interest rates more than one-for-one with declines in inflation. If this is the way the world economy operates, then there may be more scope for international monetary policy coordination.

Conventional wisdom

In my characterization of the precrisis, traditional view of the international economy, there are many interacting "New Keynesian" economies.[1] Capital is mobile internationally. All exchange rates are perfectly flexible. Shocks occur at the country level. Each country has an independent monetary policy characterized by a Taylor-type monetary policy rule. This policy rule has a "good" property in that it adheres to the Taylor principle—nominal interest rates are adjusted more than one-for-one with deviations of inflation from an inflation target.

Should the world's central banks coordinate monetary policy in this environment? The short answer is no. In this baseline situation, research shows that the worldwide equilibrium is unique and that the payoffs from international monetary policy coordination are small. In principle, to be sure, there are gains to be had, and they would accrue in the worldwide equilibrium if all central banks augmented their policy rules to include a response to foreign inflation as well as to domestic inflation. But policymakers do almost as well with respect to their goals by simply ignoring this effect. Hence, the gains are small.

Many have concluded from this precrisis line of thinking that it does not pay to worry too much about international monetary

1. See, for some examples in the literature, Obstfeld and Rogoff (2002) and Clarida, Gali, and Gertler (2002).

policy coordination. The possible gains seem to be small, and, practically speaking, it would be difficult to get the world's policymakers to play the cooperative equilibrium.

Some of the recent empirical evidence in international macroeconomics raises questions about the traditional view. Edwards (2015), for instance, conducts an analysis of the 2000–2008 data for Chile, Colombia, and Mexico, countries with relatively free capital flows and flexible exchange rate regimes. He concludes that monetary policy across these countries is nevertheless closely related to US monetary policy. Rey (2015) also documents spillovers from US monetary policy to the United Kingdom, Sweden, Canada, and New Zealand using data stretching from the mid-1980s or mid-1990s (depending on the country) until 2012. These results are viewed by the authors as potentially invalidating traditional New Keynesian conceptions of the international monetary economy. But the alternative view, detailed below, suggests that it is not clear what to expect in these VAR-based analyses if at least one country is not adhering to the Taylor principle.

An alternative view

In the alternative view, all the features of the multicountry New Keynesian economy are the same as in the traditional view.[2] The only difference is that monetary policymakers in one or more countries are not following "good" monetary policy. This means that at least one national policymaker does not adjust the degree of policy accommodation more than one-for-one in response to deviations of inflation from target. In short, monetary policy does not adhere to the Taylor principle in at least one country. Precrisis, this situation might have been thought to characterize Japan as op-

2. For more detail on the alternative view, see Bullard and Singh (2008). See also Bullard and Schaling (2009).

posed to the United States or the euro area.[3] Postcrisis, deviations from the Taylor principle are arguably widespread.

Why is it reasonable to assume that some countries are following the "bad" monetary policy—that is, not adhering to the Taylor principle? These are not normal times for monetary policy in the United States or across the world economy. In particular, in many countries, it is difficult for monetary policy to respond to declines in inflation when the policy rate is subject to the zero lower bound. Many central banks, including the Fed, have tried to substitute for lower policy rates through unconventional policies, including forward guidance and quantitative easing. These types of approaches may or may not provide a good substitute policy, an issue that continues to be debated.[4]

If we suppose that one or more national policymakers are deviating from "good" policy in the sense defined here, then we have a clear result: worldwide equilibrium is no longer unique. This means that many volatile equilibria exist, and they are all consistent with market clearing and rational expectations. Observed volatility could be—but would not have to be—much larger than what would be observed if national central banks were adhering to the Taylor principle in their Taylor-type policy rules away from the zero lower bound. Shocks to expectations around the world could be important drivers of global macroeconomic volatility.[5]

In summary, under the alternative view the problem is that monetary policymakers in some countries are not adhering to the Taylor principle, possibly because they cannot do so due to the zero lower bound. The result is multiple equilibria and, potentially, a

3. This was the motivation for Bullard and Singh (2008).

4. Another way to think about deviations from the Taylor principle could be that central banks have been too slow to raise their policy rates even when standard Taylor-type rules advised otherwise. See Nikolsko-Rzhevskyy, Papell, and Prodan (2014) for estimates of whether the Fed adhered to the Taylor principle postcrisis. Their estimates suggest the Fed did not respond to inflation at all during this period.

5. Size matters in this argument, so it is really a question of whether the central banks affiliated with the largest economies are adhering to the Taylor principle.

lot of excess volatility in the worldwide equilibrium. Whether the United States or other countries are following the Taylor principle today hinges on what one thinks about unconventional monetary policy. If unconventional monetary policy is largely an ineffective substitute for nominal interest rate reductions, then a stronger case can be made in favor of the alternative view and hence in favor of some form of international monetary policy coordination. The alternative view may be one way to represent recent events in global financial markets in response to monetary policy decisions, such as the 2013 Taper Tantrum or the 2015 renminbi devaluation.

Relation to Taylor

Taylor (2013) interprets recent monetary policy developments in the United States and other advanced economies, such as extended periods of near-zero nominal interest rates and quantitative easing programs, as deviations from rules-based policy. Deviations from rules-based monetary policy at some central banks may create incentives for other central banks to deviate from rules-based policy. This process can cause a breakdown in global monetary policy arrangements and lead to an inefficient global equilibrium.

This idea has a flavor similar to the one presented here. I interpret the Taylor concept of central banks "deviating from rules-based policy" as the Bullard-Singh concept of central banks "following a Taylor-type rule that does not adhere to the Taylor principle."

Conclusion

The conventional wisdom on international monetary policy coordination as I have described it provides a good baseline for thinking about the precrisis situation in international monetary policy. In that view, domestic policymakers should take care of their own affairs and, in doing so, would create a worldwide equilibrium which

is nearly the best attainable. The alternative multiple equilibria view of worldwide equilibrium is more radical and less established. It has the virtue of adopting a nearly identical set of assumptions relative to the conventional wisdom, except that monetary policymakers in some countries no longer adhere to the Taylor principle. In this situation the worldwide equilibrium may be excessively volatile and subject to expectations shocks in a way that would not be possible in the conventional view. This may be one way to make sense of some postcrisis global macroeconomic developments. The difference between the conventional wisdom and the alternative view is essentially a judgement on whether global monetary policymakers have been able to effectively replicate "good" monetary policy rules in the aftermath of the global financial crisis through unconventional policy.

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PART 2

International Monetary Stability and Policy

Robert Kaplan

Discipline is an essential element of effective monetary policy. Part of being disciplined is clearly articulating the key drivers of monetary policy decisions as we try to achieve full employment and price stability.

One difficulty is that distinctions and complications that were once of second-order importance for the conduct of monetary policy loom much larger today as companies, economies, and financial markets become more globally integrated. Below, I discuss these distinctions and complications in the context of the original 1993 formulation of the Taylor rule, which suggests that the central bank adjust the stance of monetary policy in response to deviations of inflation from target and deviations of real activity from potential (Taylor 1993). However, these issues are relevant to broader discussions concerning the role and appropriate stance of monetary policy as well.

Implementation of the Taylor rule

To implement the Taylor rule (or simply track its prescriptions), one must answer several very practical questions, including: (1) Which price index should be used for measuring inflation? (2) Which index of real activity should be used for measuring slack? (3) How can we gauge whether monetary policy is accommodative or not? In particular, what is the neutral rate? These questions are central to properly using rules-based decision-making tools. I will offer thoughts on each of these questions, but I'll spend most of my time discussing the third issue—the challenge of assessing the level of monetary policy accommodation.

Which price index?

The original formulation of the Taylor rule suggests that the Federal Reserve respond to changes in the gross domestic product (GDP) deflator—a broad measure of the prices received by US producers. The FOMC, however, uses the personal consumption expenditures (PCE) deflator as its principal inflation gauge. The PCE index measures the prices paid by US households and is influenced by what's happening to import prices. As the US economy has become more open, the distinction between price indexes which exclude and which include, imported goods and services has become more important. The correlation between quarterly GDP and PCE inflation rates was 0.90 in the late 1950s through the early 1980s (see table 7.1). In the 2000s, the correlation has dropped to 0.58. Similarly, the correlation between inflation as measured by the GDP and gross-domestic-purchases deflators has dropped from 0.99 to 0.75. Fifty years ago—even 30 years ago—it didn't significantly matter which of the major inflation gauges the Fed used to guide policy. Now, the choice is of some importance.

Which measure of real activity?

The original formulation of the Taylor rule has the Fed respond to the gap between real GDP and an estimate of the US economy's

TABLE 7.1. In a globalized economy, how you measure inflation matters.

	Correlation between Inflation Measures	
Time Period	GDP and PCE	GDP and GD Purchases
1956–1970	0.90	0.99
1971–1985	0.90	0.96
1986–2000	0.83	0.87
2001–2015	0.58	0.75

productive potential. One could argue, though, that the Fed's job is to stabilize aggregate *demand,* as measured by gross domestic *purchases,* rather than aggregate *output,* as measured by real gross domestic *product*. As international trade and capital flows have grown, the distinction has become more important. Over the 20 years from 1956 through 1975, gross domestic purchases averaged 1.6 percentage points above GDP, and the gap between the two measures of real activity had a standard deviation of just 0.6 percentage points (see table 7.2). Over the 20-year period ending in 2015, both the average gap and the standard deviation of the gap more than doubled, to 3.6 percentage points and 1.3 percentage points, respectively. The Taylor rule calls for a half-percentage-point change in the funds rate for each one-percentage-point change in slack, so the almost five-percentage-point increase in the gap between purchases and product that we saw between 1996 and 2005 means that the funds rate would have increased by almost 2.5 percentage points more over this period had the Fed followed a Taylor rule based on gross domestic purchases rather than GDP. (The more rapid pace of tightening would almost certainly have altered the course of the economy, and so the actual cumulative funds-rate impact of the counterfactual policy probably would have been less than 2.5 percentage points.)

TABLE 7.2. In a globalized economy, whether you look at purchases or at product matters.

Gross Domestic Purchases as a Percent of Gross Domestic Product			
Time Period	Mean	Standard Deviation	Range (highest–lowest)
1956–1975	101.6	0.60	3.0
1976–1995	101.2	1.08	4.7
1996–2015	103.6	1.30	4.8

How should one gauge the level of monetary policy accommodation?

In the original formulation of the Taylor rule, policy is judged accommodative when the real federal funds rate is less than 2%, and restrictive when it is above 2%: the long-run equilibrium or neutral real interest rate (r^*) is implicitly assumed to equal 2%.

However, the neutral rate, the rate that signifies the dividing line between an accommodative and a restrictive monetary policy, is "unobserved"—that is, we must infer this rate from other financial and economic data. Additionally, the neutral rate is not static, and I am strongly persuaded by arguments that declining expectations of future GDP growth (heavily impacted by aging demographics) in advanced economies, a decline in productivity growth, and the continued emergence of the United States as a source of safe assets have all contributed to a decline in the neutral rate.

Determining the neutral rate

Since the neutral rate is unobserved, policymakers use various methods to make an estimate of the neutral real rate. While different approaches yield varying estimates, they each indicate that there has been a significant decline in the real neutral rate over the past several years.

In January 2012, Federal Reserve policymakers submitted their projections of the appropriate path of the federal funds rate over the medium term. Since that date, the median projection of these policymakers has declined from a 4.25% longer-run nominal funds rate to 3.0% in the June 2016 submission. Given the Federal Open Market Committee's commitment to a 2.0% longer-run inflation target, these projections imply a reduction in the longer-run neutral real interest rate from 2.25% at the beginning of 2012 to 1.0% today. Yields on Treasury Inflation-Protected Securities (TIPS)

have signaled a substantially similar decline in the longer-run neutral real rate.

John Williams, president of the San Francisco Fed, working with Thomas Laubach, on the staff of the Board of Governors, has done pioneering research on the neutral rate that argues that the longer-run neutral real rate depends on the economy's potential growth rate, which varies over time, as well as other unobserved factors (2003). As of the first quarter of 2016, the Laubach-Williams model implied a 0.2% neutral real rate.

Evan Koenig and Alan Armen (2015) at the Dallas Fed use movements in slack to help identify the neutral real rate. They focus on shorter-run r*, and rather than make r* a direct function of growth in potential output, Koenig and Armen draw on signals from the financial markets and changes in household wealth. They argue that wealth growth and long-term yields do a good job of picking up changes in growth prospects and capture movements in other r* determinants.

The Koenig-Armen model says that the short-run neutral real rate was -1.3% in the first quarter of 2016, about 1.5 percentage points below the latest Laubach-Williams estimate of the longer-run rate and only 15 basis points above the actual real rate. Policy was only modestly accommodative in the first quarter of 2016, according to Koenig-Armen.

Potential reasons for decline in the neutral rate

As discussed earlier, a major driver of the decline in the neutral rate is a decrease in estimates of future growth. In the first quarter of 2003, the Congressional Budget Office (CBO) projected five-year potential growth would average 3.25% per year; in the first quarter of 2008, the prospective five-year growth estimate was 2.88% per year, and today, prospective five-year growth is estimated to be 2.28% per year.

This growth slowdown has been mostly due to demographics—baby boomers are moving into their retirement years—but weaker productivity growth also contributes significantly to the decline. Given the deterioration in US growth prospects, it makes sense that the longer-run neutral real interest rate has fallen. This deterioration appears to be occurring across all advanced economies, which helps explain the historically low level of interest rates we are seeing.

To illustrate this point further, I refer to work done by the CBO that details the negative impact on potential GDP growth of weaker trend growth in the potential labor force, primarily due to demographics, as well as slower productivity growth (table 7.3).

Another likely reason for the decline in the neutral rate is the emergence of the United States as chief supplier of safe assets to the world. In an increasingly globally connected world, the search for safety and return occurs globally—meaning that low rates in one country can quickly impact interest rates in other countries. Robert Hall of Stanford University and the Hoover Institution argues that the representation of risk-averse foreign investors in US financial markets has increased and that this trend has contributed to downward pressure on the neutral real rate (2016).

TABLE 7.3. Sluggish labor-force growth has contributed to a weakening in potential GDP growth.

	Annualized Growth Rates (percent/year), CBO Estimates		
Time Period	Potential GDP	Potential Labor Force	Productivity
1956–1975	3.83	1.88	1.92
1976–1995	3.13	1.78	1.33
1996–2015	2.39	0.88	1.50
2016–2025	1.94	0.49	1.44

Short-run volatility in the neutral rate

Another challenge for policymakers is short-term volatility in the neutral rate. Financial markets are today much more global and interconnected than they were 25 years ago. Investment portfolios are increasingly global, and asset allocators increasingly think globally in making investment decisions. Because financial markets trade in real time, market strains or other challenges in one market now have the potential to rapidly affect currency, debt, and equity markets globally. We saw this unfold in January and February when the devaluation of the Chinese currency was accompanied by a steep sell-off in Chinese markets, which then transmitted to a tightening in global financial conditions.

This tightening threatened to impact underlying economic activity. In response, central bankers were forced to adjust the path of monetary policy and alter their communication.

Concluding Observations

A disciplined approach to monetary policy requires a discussion of the key inputs into decision-making tools. Appropriate measures of the price level, output gap, and the neutral rate must be identified. Of particular concern today is an apparent decline in the neutral rate as a result of lower levels of expected GDP growth as well as the emergence of the United States as a source of safe assets. These issues must be carefully examined as policymakers attempt to use monetary policy tools to help inform decision making.

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PART 3

Post-2008 Central Bank Operating Frameworks: Differences, Commonalities, and Implications for Reform

Dennis Lockhart

I think my copanelists James Bullard, John Williams, and Robert Kaplan probably had a similar experience to mine in preparing for this meeting. Last week was the April Federal Open Market Committee meeting. And then I had my own financial markets conference Monday and Tuesday, and a speech Tuesday night, so I first got into the subject matter of today's conference yesterday. And my first reaction to the topic of the international monetary system and reform was sort of a classic expectation that we would be talking about—and I should be talking about—the reserve currency system, the role of the dollar, the exchange system, and any international agreements that relate to that. These are questions of coordination of national monetary policies that have been touched on today, along with fault lines in these arrangements, the transmission of stress, and how to address imbalances through collective action. I then read John Taylor's speech delivered at the October 2015 Baker Institute conference titled Currency Policy Then and Now: 30th Anniversary of the Plaza Accord, in which he first put out the proposal for domestic establishment and reporting of rules-based monetary policies as the foundation for rules-based reform at the international level. I realized that John was suggesting more of what I'm going to talk about: that the individual policy frameworks of central banks around the world, if somewhat more

uniform, taken collectively, can amount to some sort of reform of the international system.

I would say the "system" is currently more described as the sum of national policies. I'd like to make some key points that are not prescriptive but really observations about the changes in central bank operating frameworks post-2008. There are some common aspects, and there are a number of differences in these operating frameworks. Let me define "operating framework" as how a central bank interacts with the banking system and financial markets to implement monetary policy. And there are four topics that I think are worth looking at. First is the size and composition of central bank balance sheets. The second deals with questions that central banks are grappling with regarding counterparties and acceptable collateral. Generally, what institutions should have access to central bank facilities? A third topic is the shift, as opposed to traditional monetary policy, to floor systems, with administered rates and remuneration of reserves. And the fourth is the interaction of operating frameworks with regulation.

If you look at those four topics, I'd say some common themes emerge. We clearly are in the era of unconventional policy and the use of unconventional policy tools. That involves engagement in large-scale quantitative easing when needed and appropriate. Central banks are dealing with a broader range of asset classes, especially in crisis situations, and they are dealing with international counterparties as required. The differences between operating frameworks or operating approaches in the major central bank countries really are dictated by somewhat different circumstances, as well as institutional details in those countries, or, in the case of the European Currency Board, the currency area.

So let me take those four topics one by one and make a few observations, first about central bank balance sheets. There is a general recognition that quantitative easing and targeted lending or asset purchase programs are necessary in some circumstances.

But there is no consensus about what should be the nature of those programs. The Japan experience suggests to me that there are some limits to what quantitative easing programs can achieve, and I would make the observation that Japan has gone so far with their programs that they may run the risk of really distorting fairly materially sovereign debt markets in Japan. The ECB experience suggests complex programs may be less effective. One of my colleagues spent a full day studying the balance sheet of the ECB, trying to understand from the assets that had been acquired what they were doing. He found that to be a difficult process. They have a complex program. Since quantitative easing programs involve a fiscal aspect, there is nervousness about precommitting to programs, and there is some anticipation on the part of central banks of political controversy. And among central banks there is admiration for the 2008 Memorandum of Understanding (MOU) between the Bank of England and Her Majesty's Treasury, which created a new legal entity that bears all the profit and losses from unconventional monetary policy. But I would say at the same time, similar MOUs would be difficult, if not impossible, to achieve in most countries.

Turning to the subject of counterparties and collateral, before the crisis, central banks had rather strict requirements for collateral and counterparties. And during the crisis, those standards were liberalized. It raises the question, Are pre-2008 standards simply too tough for all circumstances, and how much of loosened or changed standards are likely to persist on a permanent basis? In the United States, the reverse repurchase agreement facility now has almost 140 counterparties, and the majority of those counterparties are money market mutual funds. In the United Kingdom, the Bank of England invited some nonbanks to apply for full access to Bank of England services, as if they were banks, if they were regulated, liquidity dependent, and Systemically Important Financial Institutions if you will. The ECB and the Bank of Japan are acquiring

corporate securities as part of their QE programs. So in general, central banks are grappling with this question, and there is no clear consensus.

There has been a shift to floor systems with administered rates. The conditions are that reserves at almost all central banks are abundant, and so reserve requirements are a dead issue. Central banks are now willing to use floor systems with full reserve remuneration, because in a low rate environment, there's not a big expense involved. But there is a feeling that such big systems might become more difficult to manage when rates get back to more normal levels. Balance sheets are too large and the expense could lead to capital losses under certain scenarios, and that could give rise, of course, to what I euphemistically will call "political economy concerns." The current prevalence of floor systems has led to a new appreciation of their advantages: transparency and very simple administration.

So let me now turn to the final topic, and that is operating frameworks and their interaction with regulation. New regulatory frameworks have generally increased banks' demand for high-quality liquid assets. And in general, there is a recognition that there is tension between maintaining market liquidity and achieving the intent of macroprudential bank policy.

Let me close with these very simple observations. Major central banks have new operating frameworks with common themes at work but quite a number of differences based on their individual circumstances. All major central banks are grappling with the question, Where is this going? Where is this headed? And taken together, there is high uncertainty regarding the future of the sum of the parts of operating frameworks of major central banks.

PART 4

The Decline in the Natural Rate of Interest: An International Perspective

John C. Williams

First, I want to thank John and the other organizers for inviting me today. I try to attend this conference every year, and I've made it the past four. I come here for a number of reasons. One is that it brings together the best minds in monetary policy. Another is that it's always a wonderful experience to hear from Secretary Shultz, providing both his current views and a longer-term perspective. Some of the issues we're dealing with today aren't unique to our time, and we can learn from the experiences of the past.

Over the years, we've talked a lot about policy rules. We've discussed Fed governance, central bank strategies, and other related matters. As I listened to John Taylor's talk today, I agreed very much—as, I think, did most of us—with the notion that we should be systematic in our approach to making policy. We should be more transparent about what our policy strategy is and share that information with the public. To me it seems an admirable and excellent goal to work for a world in which central banks all not only follow their own domestic mandates but also pursue systematic, well-designed policies and share that information. And I hope that we can move towards that end.

But in my nine remaining minutes, I'm going to raise one challenge to that central-banking utopia, which I think is a serious concern. It picks up on what Rich Clarida said when he dangled the teaser of my topic today, which is r*, or the natural rate of interest. Rich actually asked Thomas Laubach and me to prepare a paper for a National Bureau of Economic Research conference this summer that looks more broadly at the question of r*. Instead of being entirely United States–focused, we take our methodology

and apply it to other countries. The Laubach-Williams model is basically a vector autoregression (VAR) model overlaid with a Kalman filter, in which we try to infer the natural rate of interest based on the relationships between real output, real interest rate, and inflation.

For the United States, we found the striking result that in the past, the natural rate of interest—or the intercept in the Taylor rule, if you will—was running somewhere around two and a half percent, meaning that we would say r* was historically around two and a half. But our model indicates that it's come down dramatically over the past 25 years, reaching around zero in the United States. A lot of the decline in our estimate of the neutral rate transpired over the years since 2007; specifically, that drop was about two percentage points. A large share of the decline is explained in our model by the slowdown in estimated potential, or trend, output growth. But some of it is explained by other factors.

Because the model is based on a purely statistical method, the Kalman filter, I can't tell you exactly what these other factors are, though a number of people are doing research on the subject. But if you go back to John Cochrane's presentation, you get some idea. He showed an equation that relates the neutral real interest rate to the growth rate of consumption and some other factors, which I believe include changes in the risk spread, the discount factor, the distribution of income, and possibly much more.

The important point is that, based on a very simple VAR-type framework that we developed 15 years ago, these factors have also fallen quite a bit: our model estimate of the natural rate of interest in the United States has come down from around two and a half to close to zero.

Now let me share some other, more preliminary results. My coauthors probably won't appreciate me spilling the beans this afternoon, but here we go. We took the same basic methodology and applied it to the euro area, Canada, and the United Kingdom. What

we find is much the same pattern that we see in the United States. For example, if you look at the euro area in 1990, our estimates come in at about two and a half. I think that's consistent with pretty much anybody's view of a normal natural rate of interest. Today, it's about minus one half percent. We also find a smaller, but still sizable, decline in the estimated natural rate of interest in both Canada and the United Kingdom. In all four of these major economies, r* has declined over the past 25 years. These estimates are generally stable over the 1960s, '70s, '80s, up until the '90s, when they are followed by a pronounced decline.

We see the same pattern in potential output growth. So to return to what Rob said earlier, the demographics we're seeing in the United States are happening across the globe. They're happening in the advanced economies. They're happening in Asia. Much more dramatically, in Japan, the labor force is already shrinking.

So what does this mean? There are two overarching takeaways. First, it is a lot harder to follow a Taylor rule with a two percent inflation target if the neutral real interest rate is as low as some of our estimates. Let's take one half percent as an example. You're hitting the zero lower bound much more frequently even if you're just following a standard Taylor rule. It's going to be very hard to achieve your inflation goal on a regular basis when you're constrained by the lower bound as often as that.

Second, there's a very strong correlation in these results across countries. This goes back to something Rich highlighted, which I think is very important: our estimates were done country by country. We were not imposing any linkages across geographies. However, economic theory tells us there should be global factors driving movements in r*. Again, we didn't incorporate global links in our estimates, but the movements in r* are clearly correlated across countries. We're undertaking formal econometric analysis to discover what the global r*, or should I say, the intergalactic r*, is [laughter].

Ultimately, there are a lot of similarities on the supply side of the economy, the trend in productivity growth, demographics, and other areas, which are affecting economies across the globe, not only the advanced ones but emerging markets as well. So this is not just a US issue. This isn't just a post-financial-crisis issue. This is more a concern about how monetary policy should operate in the future. And quite honestly, it raises the question of whether our inflation targeting framework, with a two percent inflation target, is really the right way to achieve our goals in a low r* global environment. I'm not going to try to answer that today. There's a lot of research being done on that question. But this is a topic that we should keep front of mind when we think about what kind of rules we should move towards, again, not just in the United States but in countries across the globe.

The last thing I would like to note—and I know John's going to say it, so I'm going to say it before he has a chance—is that these estimates are very uncertain. Our original paper, which we wrote 15 years ago, made two statements. First, "Here's our estimate," and second, "Don't trust our estimate." So I would again stress that there is a lot of uncertainty about r*. It's very difficult to extract from the data what the natural rate of interest is, and there are other models and estimates out there.

But when we're thinking about robust policy strategies, I would include the possibility that the natural rate of interest has fallen a good deal, that it is maybe even close to zero. Thank you.

GENERAL DISCUSSION

SEBASTIAN EDWARDS: We talk a lot about policy rules and coordination and Taylor rules and inflation targeting. What we haven't talked much about is what the target ought to be. And that probably it is more and more difficult, with an r* around zero, to follow these kinds of rules with two percent inflation targeting. So in order to make this an open-ended question, I would like to ask everyone in the panel what they think about the Olivier Blanchard 2010 proposal, which was a very simple one, which was, instead of a two percent target, let's go to a four percent target. And you may say you don't want to answer, but four percent as a target as we normalize the system—Is that something that you think is reasonable?

ROBERT KAPLAN: I'll help out by going first here. The Fed has a target of two percent, and my own view is that I shouldn't be speculating publicly about deviating from that. The most appropriate thing for me to do is to reaffirm that two percent is our target.

DENNIS LOCKHART: As a practical matter, I don't see any movement away from the target that was established in January 2012. And I personally think communicating that change would be extraordinarily difficult with the public. It could very well be disruptive. So in a very pragmatic sense, we have the two percent target, and I don't see there'll be a move away from that in the near term.

JOHN WILLIAMS: I'll delve a little bit further into this topic. We don't want to change horses midstream. We are close to our two percent inflation goal. The US economy is in a very good position. I'm optimistic in terms of how we're doing in achieving that goal. But, I am also watching what's happening in the euro area. I'm watching what's happening in Scandinavia, Japan, and

other countries, where they are all struggling to get to their inflation goals. I think that we owe it to ourselves as researchers, academics around the world, and policymakers to be thinking really hard right now whether that's the right strategy for the future. Now, Evan Koenig is here, he's done some really good research on nominal GDP targeting, and there's been a lot of research on price-level targeting as well. I think there are other options in the literature besides raising the inflation target that I think will both provide a strong nominal anchor—because you don't want to lose that—and at the same time give us maybe more of a protection against these kinds of issues like the zero bound. But I do think this is the time to really think hard about this. I look around at what's happening, at what the ECB's doing, pushing every pedal to the metal, if you will, and how hard it is just to get to their inflation target. I mean, this is completely the opposite experience of what I was taught when I took economics. I thought that, you know, when you go into central banking, the thing was to make sure you didn't let inflation get too high. I didn't know that my career was going to be solving. . . . It was a Stiglitz transformation, right? The sign was the wrong one.

ROBERT KAPLAN: Evan Koenig is at the Dallas Fed, and, as you can imagine, we talk a lot about nominal GDP targeting. As a former businessperson, I'm very sensitive to the fact that global debt is high relative to GDP: if you look at advanced economies, it is extremely high. It takes nominal income to service nominal debt. Given that debt is a big challenge in the world, there's a lot to be said for thinking hard about nominal GDP targeting and doing more work on that approach.

BOB HALL: A complimentary question is, How negative are you willing to go? The Fed is the only major central bank that has absolutely refused to even think about a negative policy rate. At least, that's what it seems.

JOHN WILLIAMS: That's unfair, Bob! At our conference in March, Ben Bernanke was speaking, you asked him the question, and he answered.

BOB HALL: Well, he's not in charge anymore.

ROBERT KAPLAN: I'm happy to go first on this question also, because I've already addressed it publicly. I used to live in Japan. While their circumstances differ a little bit from the United States and Europe, the Japanese experience is indicative. Japan, as we know, is dealing with a number of issues, but most significantly Japan is aging so rapidly that its population is declining. They've tried to deal with their demographic problem by getting women into the workforce. And that has helped to some extent. Additionally, the Japanese have very high levels of debt to GDP.

In my view, what the Bank of Japan has done with interest rates might buy some time. It might. Alternatively, it might do more harm than good. But it will not address these fundamental issues of an aging population and high levels of debt to GDP. These issues will require structural reforms. That's the key point. Japan is a good example of the need for policies beyond monetary policy. Structural reforms and fiscal policy need to play a role.

Turning to the United States, you never want to dismiss a tool, but the issues we're facing are going to require structural reform and fiscal policy action. When I think about the effects that negative rates here would have on the money market industry and on commercial paper, which is a critical funding source for companies, and the impact on financial institutions more broadly, it makes me wonder whether negative rates wouldn't create more problems than solutions. I think we should be broadening the conversation to include tools beyond monetary policy.

ANDREW LEVIN: So just to follow up on the previous question for a second. When the FOMC adopted the statement on longer-run goals and strategy—let me just read you the final sentence of it.

It's really important: "The committee intends to reaffirm these principles and to make adjustments as appropriate at its annual organization meeting each January"—*make adjustments as appropriate*. Now I think what the Fed should do following the example of the Bank of Canada is to have a regular review. It could be a three-year review or a five-year—in Canada, it's a five-year process—where you systematically look at things like this and other elements of the longer-run goals and strategy, with input from academics and central banks around the world and discussions with government officials, just like they do at the Bank of Canada: could be enormously helpful. Now the Bank of Canada's done this five times. They've actually never changed the inflation target. But I think it's helpful to the public process to go through. As we've discussed, the Fed should adopt a systematic and transparent strategy. And the Fed should regularly revisit that strategy and change it periodically as appropriate.

So the other thing I wanted to ask about, my question was, about the longer term . . . about the r*. So I just checked, the Philadelphia Fed survey of financial forecasts is pretty much like any other. Their consensus for the ten-year average of the three-month Treasury bill rate is 2.5. And you subtract a two percent inflation, you're at 0.5. Very consistent with what President Williams said. I've actually been wondering for quite a long time, Why is the Federal Reserve's median assessment of r* systematically higher than professional forecasters? Now, I'm not saying it's wrong. And obviously, there is uncertainty. It seems to me the Federal Reserve needs to start engaging in a public process for key things like this, and potential output, and the nonacceleratng inflation rate of unemployment (NAIRU), and maximum employment, to have a public discussion and engage in views so people understand. Maybe they come along and decide the Fed's right and the professional forecasters' views are distorted. But it needs to be more transparent.

DENNIS LOCKHART: Well, some of John Williams's comments in meetings I've attended have been helpful in shaping my thinking. And I think what John was saying earlier is that r* may be zero now. But our projections of r* are time varying, and they rise with better economic conditions or with the achievement of our objectives. So the medium-term numbers are not necessarily consistent with what he said.

JOHN WILLIAMS: Can I respond quickly? As to Andy Levin's first point, I want to affirm I agree a hundred percent. The earlier point about longer-term strategies, whether it's price-level targeting, inflation targeting, and all that, that we should be having conferences, pulling together experts and policymakers, having really serious discussions exactly along the Bank of Canada model, I agree a hundred percent. That's why I'm raising this issue the way I'm doing it. Because we need to think about this in the same way that I think people thought about it very seriously when inflation targeting first was. . . . New Zealand introduced it on the fly, but other countries thought heavily about that. And my answer on the r* is that people's views are evolving, as Rob Kaplan said. As the data have confirmed that it's declined, estimates have been moving lower. And I'll admit my own estimates have been moving down over time.

ALLAN MELTZER: When you think about r*, and the possibility that it is substantially declined, do you relate that in your mind that this is the first recovery in the postwar period without any investment in the United States and in Europe? No investment at all. People are buying stock back at very high prices that you have created for them, and that's a sign of pessimism on the part of managers. Now in your mind is that pessimism in any way related to the fact that we have substantial new regulation of the economy that is putting fiscal burdens on companies that they don't like? That looking ahead, there is $20 trillion of government debt that somehow will have to be handled that nobody

wants to talk about? That on top of that government debt, there's $90 trillion, estimated, of unfunded liabilities that nobody even mentions? And that that may have some substantial effect on resource allocation? And that, if you look at the European economies—France, Germany—and then go to Japan—declining populations, huge debt to GDP ratio. China, declining population: the estimate that I've seen is that the 1.4 billion Chinese by the end of this century will be 500 million. That's a decline of a little over one percent a year, which is not unimaginable. But these are real burdens. Does that have any effect on your thinking on low real rates of return?

JOHN WILLIAMS: Yes. And I believe there are potentially better solutions to the r* problem than to have a higher inflation target. The preferred solution would be to put into place fiscal, structural, and other policies that raise r*. By the way, Larry Summers says that, too.

ALLAN MELTZER: Amen!

JOHN WILLIAMS: So we finally have everybody in the whole range of economics agreeing. So I agree completely: r* is affected by all types of policies. After all, it's the intersection of aggregate demand and aggregate supply at a real interest rate. But until that happens, I think we need to be thinking about how to best conduct monetary policy.

DENNIS LOCKHART: The challenge of our times right now is becoming clear, and that is growth. And every major economic zone in the world is struggling with growth one way or another, even including China with a slowdown. And you cited a number of things that I think are much more structural in nature than simply headwinds, which we point to all the time as the reason why we haven't broken out from a two-percent world to a three-percent world. If someone presented me just a binary, pick-one-side-or-the-other question: Do you believe that in the foreseeable future, fairly long term, we're in a two-percent world,

or is there a chance of a four-percent world? I'd have to side with two percent, and results may be below that. And there are a number of reasons. Allan, you've mentioned them: demographics; weak investment, sometimes influenced by fiscal issues; just a range of things that are not for the Fed to solve, that are in the way of breaking out of that kind of two-percent torpor, and I use that word generalizing for the term "low growth." The one that is I think underappreciated is demographics. Governor Shirakawa, the former governor of the Bank of Japan, made a tour of the United States and came through my bank a while back. And he basically has a slide show on Japanese demographics. And his message was twofold. One, 30 years ago he had no interest in the subject whatsoever, and it was not on his screen. And today, he thinks it is the number one problem of Japan. And two, his message was, you ought to pay attention to it as well. And so, I think the consequences of the demographic changes in the United States are not fully factored into the longer-term projections.

RICHARD CLARIDA: I guess it's sort of like Elvis is entering the building. So I guess I'll try to turn this into a question. But I think there are two things: one is a point that I think John would also agree with, which is, yeah, r* is unobservable, as is the natural rate of unemployment. But I think the analogy is a good one in that we're not entirely flying blind. I mean, if r* were really two or two and a half, we would see it in other parts of the economy, just like if the NAIRU were seven, or two even, you would see it. So I think that we don't want to be too pessimistic about it being a good input to policy with standard errors, just like the NAIRU's been an input to policy in the original Taylor rule.

And then the other point is, I think—and I applaud Andy Levin's point about thinking of a Fed discussion of a strategy at a periodic basis—I guess I would point out, as you think about alternatives to this strict two percent inflation target, I think

there's a real difference in transitioning from where we are to some version of a price-level strategy versus the nominal GDP. Price level would be referring to some average rate of inflation over some interval that you can measure and define. The trouble with that nominal GDP target is you may lose the inflation angle. It depends on how you get to five-percent nominal GDP. If you get there with four percent inflation, one percent growth, that's not. . . . So, I don't view them as being equivalent as a practical matter, even though when I write down a model there might be more of a speech.

STEVE LIESMAN: John Williams, it's sort of consensus, I think, in this room that rules-based monetary policy is better and leads to better economic outcomes. So my question is, Do you agree with that conclusion, and do you agree that the outcomes have been better when you follow a more systematic rule? And I don't know if it's out of bounds for me to ask John Taylor to respond.

JOHN WILLIAMS: I think we agree actually. I think that where you can, you would want monetary policy to be as systematic and predictable, understandable, clear, transparent as possible. And that's why I've spent most of my career studying versions of the Taylor rule and other strategies related to that. I'm not picking which rule is the best rule here but really thinking seriously about that question. My own view is that, when we hit the zero lower bound, it made being predictable and transparent very difficult because we couldn't move the policy instrument in response to economic news the way we'd want, because we did not want to go to negative at the time but chose to use other policy instruments, like, QE and forward guidance. So during that whole seven years of essentially zero interest rates, we weren't able to demonstrate the systematic policy reaction to economic developments that we normally would and couldn't always clearly communicate and show how our thinking was evolving with the data. So I am looking forward to the time when interest

rates are well away from zero, and you see our policy actions being data dependent in a predictable and consistent way, as in the past. The positive sign I would say that I'm already seeing—and I did an economic letter on this a few weeks ago—was that, during the zero lower bound period, clearly the markets were not paying attention to the macro news in terms of thinking what the Fed was going to do, because we were at zero, and we seemed to be locked down at zero, especially with our forward guidance. But now, as we've moved away from zero and as we've talked about being data dependent, market responses to macro news and other information seem to be moving closer to what we saw during the period that John Taylor highlights as a period of predictable monetary policy. So in our analysis we looked at how markets responded to news in the 1990s when policy was following something like the Taylor rule. Well, we're not quite there yet, but we're getting closer to seeing markets respond to the news just like they did back in the '90s. But I do want to see us get all the way there and have a policy that's as predictable and systematic as possible.

One thing I will push against a little bit is the notion that we, somehow, the nineteen of us, will agree to one policy rule. One of the strengths, and Secretary Shultz brought this up in his comments and I agree with him a hundred percent, one of the strengths of the Fed structure is that we have nineteen people of very different backgrounds, different perspectives, different experiences, and that's all sitting around the table, and we don't have to all agree that there's one rule to rule them all. We can actually have that debate, discussion, live every time. But I do agree that we should be agreeing on strategy, and I think that we do, and being as transparent as we can about how we are executing on that strategy.

DENNIS LOCKHART: My way of thinking about the rules-versus-discretion question and policy setting is, I'll pick up where John

Williams started, and that is predictable, systematic, disciplined, consistent over time, yes. I think we all agree with that.

In actually setting policy, I get a little uncomfortable with too much reliance on simply the calculation of an equation telling you what you should be doing. I think a certain amount of judgment is inevitably going to be in the process. I would not like to see the debate simply shift to the estimations within the equation, which can be all over the map depending on what a particular reserve bank president thinks, his or her r*, for example, or what the output gap might be, or whatever. So we could end up easily bogged down and not making a rule work. So I don't really gravitate to the extremes on this in terms of rules-based policy setting. At the same time, I understand discretion, if it is defined as "making it up as you go along, with much inconsistency over time," clearly a dangerous approach. So I see it as being guided by rules with inevitably some judgment involved.

JOHN TAYLOR: My concern here is that, even with the best of policymakers' intentions, policy rules can start to have other things come into play that look like discretion. I teach my students it's like the old story of the wolf in sheep's clothing, except it is discretion in rules clothing. For example, before Janet Yellen became chair, she wrote a piece about how the coefficient on output in the Taylor rule should be one rather than .5. And that's when the gap was big. As soon as the gap was zero, she started talking about another issue: r* as zero rather than two. It's an amazingly quick shift. Now that may be completely as policymakers see it. But you've got to worry about that. The reduction in estimated r* from four percent to three and a quarter percent occurred in only two years? Just to be candid, I worry about groupthink. The intentions I think are clear, but in practice?

GEORGE SHULTZ: Has the Fed made a careful study of the increase in the regulatory morass that's now gripping our country? You seem to be pessimistic about the future, and it seems to me that

every way you turn, there's a regulatory arm telling you that you can't do it. Allan talked about the reduction in the number of banks. Here's a personal experience. I wanted to add a bedroom on the first floor of our house here on the Stanford campus. It took a year to get permission. And for a long while, they were saying I had to dig an eighty-foot-long, six-foot-deep trench around the house to find any evidence that an earthquake took place in California. Everywhere you turn, there's a regulator telling you that you can't do it. Suppose we just did away with all this regulation and let people struggle for themselves? Probably the economy would take off like a bird. Have you studied this question?

ROBERT KAPLAN: I will start with John Taylor's comment on the danger of groupthink. I would note that the four of us come from a variety of different backgrounds but, independently, are winding up with somewhat similar positions. That makes me think there's validity to these arguments. Turning back to regulatory burden: yes, I think there needs to be a broad cost-benefit analysis of regulation in the United States, not just financial regulation. Papers by Alan Krueger and others suggest that the problem is not confined to federal regulation. A lot of the burdensome regulation—and we see this in our Dallas Fed surveys—is state and local: fees, licenses. Cost-benefit analysis is not *the* answer, but it is a part—along with five or six other things—of the answer, and I would love to see a comprehensive review. It will not be done, as you know, by the Fed. But I think as Fed leaders, we can and do talk about this, because I think it is an issue that needs to be addressed.

JOHN COCHRANE: We were talking about low inflation, especially Europe's very low inflation, and what they should do about it. There was some discussion that maybe central bankers should just announce a higher inflation target. I was going to channel Jim Bullard and say, well, that probably isn't going to work,

because if you can't get inflation up to two, and then you announce four, then the public finds out you're completely powerless to do anything you want. I was also going to see if Jim was still with me in considering the Fisherian heresy: if you look at the data, and if you look at every new Keynesian model, you see that inflation follows an interest rate peg. Maybe Europe is a giant case of pedal misapplication, and that by lowering rates, they are in fact stepping on the inflation brakes, and the answer is to raise rates? Jim, are you still on board with that? Or can I start a discussion on that issue?

JAMES BULLARD: When I talk about neo-Fisherian effects, I like to talk about them going down. You stay at a zero nominal interest rate for a long time: I can see that dragging inflation expectations down. This applies to a negative interest rate as well. I think it's a tougher story to tell going up, that you can set nominal interest rates higher and get inflation expectations to go higher. It seems plausible that you can set nominal interest rates low and stable, and that actually leads to lower inflation globally. So I think that's plausible given what's happened to inflation in the last seven to eight years globally. A pegged negative rate under that interpretation would lead to even lower inflation. So it depends on how much inflation you want, I guess.

V. V. CHARI: I couldn't resist a minor technical point for Jim Bullard. The issue of multiplicity or determinacy depends critically on the behavior of the policy rule off the equilibrium point. So that's something Andy and Pat and I have written about, so I just wanted to say that.

But I wanted to raise a broader question. I wanted to go back to John Taylor's proposal. Let me start with a terminological. . . . It's not really a quibble, but I think it goes to the heart of the issue. I think that the use of the term "rules" rather than "discretion" is not a helpful way of addressing this issue. Why? If I define a rule simply as something that is a relationship that

describes how the history of past events leads to current policy, even when policy's conducted under discretion, that can be described as a rule. It goes back to something that Bill English said. So I think the right distinction is when the policies are chosen with or without commitment, not so much whether it's rules rather than discretion. I think that's the key difference.

Now if I think about policies being chosen under commitment, then they typically have the feature—in environments where commitment really matters—that they're going to be situations, states of the world in the future, where what you want to do, if you could do it and get away with it, is to deviate from whatever it is you chose earlier and committed to. So the key thing about all this is private agents have got to believe that you're going to follow that rule.

And so I want to put in a plug, a particular theoretical plug, for John Taylor's proposal. One of the insights from game theory is, it's a lot easier to get people to commit to a particular strategy for making policy if the consequences for deviating from that policy are more severe. They don't have to be catastrophic, but they're more severe. One of the advantages of John's rule is, to the extent that you have a traditional agreement on this and to the extent that you are warned that a significant deviation from whatever strategy you'd agreed upon earlier occurs, then that's more likely to lead to bigger problems internationally, which may help discipline individual policymakers. Anyway, taking all that as given, I think that at least two of the presidents here seem to be in favor of adopting a strategy and then trying to speak to it. I guess I'd like to hear from the other two whether they think it's a good idea, too.

TERRY JONES: I'll make this a more pragmatic question, since I write for an audience, and I regularly get letters and sometimes phone calls and whatever. People asking me, Well, what is the Fed going to do if something goes wrong? We see here in the

first quarter we had a less than one percent GDP number. A lot of people brushed it off; they said we always have a bad number in the first quarter. Well, maybe so, but I've also seen a number of investment houses raising their estimates of the risk of a recession. What can the Fed do now should the economy reverse and go negative? Do you have tools other than negative interest rates? They don't seem to have worked in Japan very well or in Europe. Quantitative easing may have stabilized markets somewhat, but it sure didn't do much for economic growth. Do you have tools that can address a recession right now? Or is it basically going to come down to you arguing you've done all you can; it's now down to the fiscal policy types to takeover?

JOHN WILLIAMS: I'll answer that last one. First of all, I can't believe that you actually get letters and phone calls in this day and age. Second, I think we know what we would do. We'd do what we have done in the past. I disagree with your premise that it didn't work. In 2010, we had a very serious discussion about policy options. I wasn't on the committee at the time, but there was a discussion about what tools we should be deploying, and in the end they were asset purchases and eventually very strong forward guidance. My own view is the forward guidance clearly moved market expectations dramatically. QE moved asset prices pretty significantly as well. So if we get another significant negative shock, we have a list of things we can do. First, we won't raise rates. The markets expect us to raise rates over the next couple of years. If we get a negative shock, we'll change their expectation: we won't raise rates, which will add to policy accommodation. We can cut them closer to zero if necessary. We can go to QE4. This is an audience that doesn't want to hear this, but we could do QE4; we could do forward guidance again. So I think we've developed a playbook. I think it's worked. I think it was only appropriate given the extraordinary circumstances. But I think we know what we would do if that situation were to occur. Neg-

ative interest rates I still think is at the bottom of the list, because these other tools are the better tools. I don't think this is going to happen. I think this is a very unlikely scenario, because we're basically at full employment where core inflation is just a few tenths below our target. It's kind of a puzzling discussion. I keep hearing about negative interest rates in the United States, when really we're on the road to normalizing policy, at least from my perspective. Oh, was I supposed to put a disclaimer on that? I only speak for myself.

DENNIS LOCKHART: I think John Williams covered anything I would cover. Do we have a new rabbit to pull out of the hat? I am not aware of one. It's the tool bag we have used in the past, and we have some scope for applying that if the conditions require.

ROBERT KAPLAN: I don't have anything to add to that.

JAMES BULLARD: I think negative rates are very unlikely.

DAVID MALPASS: We've been talking today about r* being near zero and potential GDP estimates coming down quite a bit. How is that consistent with the forward communication that's trying to get people to raise the probability of rate hikes? How do you put together rate hikes with the tone of the discussion earlier?—maybe to John Williams or anyone.

JOHN WILLIAMS: The way I'm usually asked this is, "Don't you believe your own model?" The answer is that the nominal Fed funds rate is below 50 basis points. Let's assume a value of r* of zero; I agree with Dennis's point that this may be a reasonable short-term r* estimate at this point in time. Core inflation is running at about 1.6%, and we're at full employment. That tells you that we need to be moving toward that r*. Put another way, the real Fed funds rate is below minus one percent, well below the estimate of r*, indicating that policy is very supportive of growth. So there is no inconsistency.

It is, though, consistent with the notion that we should be moving gradually. We're talking about two or three rate

increases this year and a gradual path over next year. I think that's consistent with the view that the longer-run value of r* may not be zero, but it's much lower than it was in the past.

ROBERT KAPLAN: I'll make one other comment. Another reason for this impetus is that there is a cost to this level of accommodation: a cost to savers, which we hear about all the time, distortions in the process of making asset allocation and investment decisions, and other imbalances that are created, which can be costly and which can in fact be very painful to unwind and which are much easier to see in hindsight than in real time. So this is another reason why we're very focused on this effort to normalize the stance of policy. But on the other hand, we can't force it beyond what conditions allow.

DENNIS LOCKHART: I think a gradual path to a lower destination is really the picture that we're presented with. And I am concerned that, if the r* discussion, the growth discussion, the atmosphere that would suggest not moving, overpowers our decision making, we will lose credibility in the process. So there's a balancing act here. I see it as consistent to pursue normalization but, in all likelihood, to a lower destination.

JAMES BULLARD: I think one of the legacies of the crisis is that the Fed started using the "dot plot" to give forward guidance. And now that we've lifted off, we're still using the dot plot to give forward guidance. I've started to wonder if we really want to be doing that. That embodies an assumption that there is going to be some kind of mean reversion in productivity and in a variable like r*. Do we need to, or do we want to, make that kind of assumption? In the past, the Fed would have said, "We've set interest rates where we want to set them for today, and if the data come in in a different way, then we'll change the interest rates in a way that's appropriate for that," but the Fed would have not given this sort of forward guidance. Now we put a lot of words around that that say that the dots, of course, are de-

pendent on how the economy evolves, and we think this is the most reasonable scenario, and so on. But in previous years, we used the dot plot to try to convey forward guidance. So I refer to it as "quasi-forward guidance," and I've been a bit concerned about that recently.

CHRISTOPHER ERCEG: So I just had a quick question on the issue of fiscal consolidation, that, in order to achieve fiscal sustainability, so we have the latitude to deploy fiscal policy when needed, if we prospectively hit the zero lower bound again, presumably, fiscal consolidation has to start at some point. But in an environment where r* appears to be very low, it makes it more complicated to pursue fiscal consolidation. So I was wondering about any sort of guidance you might offer in terms of how far a country has to be along in terms of recovery before it will be appropriate to pursue a strategy of fiscal consolidation.

HARALD UHLIG: When you look at inflation, it's been sort of remarkably stable. And we talk a lot about the New Keynesian theories all giving us kind of opposite conclusions. I mean you talk about inflation: How do you look at this? Do you think the Fed can tap itself proudly on its shoulder about having achieved this remarkably stable inflation since 2009? Or do you have this eerie feeling that you guys don't have anything to do with inflation at this point?

JAMES BULLARD: Low inflation is the question of our time in central banking. Why we did not get a repeat of the 1970s with central banks doing all the things that they've done in the last six or seven years is a fantastic question. I think that should lead us to doing a thorough reexamination of most monetary economics and monetary theory. We know a lot from that literature that I think maybe it doesn't get enough play in policy circles. A lot of things depend upon expectations, for instance. So to get to the bottom of why we have low inflation we really need to reexamine monetary theory.

ROBERT KAPLAN: My own view is that the Fed has done everything it can over the last several years. However, as a person with a markets background, I am sensitive to the fact that there are big, powerful secular forces at play. It's like going into the ocean when there's a big wave coming—you think that you can work through it, and it just crushes you. As has been said, aging demographic trends are extremely powerful, and they're unfolding in every advanced economy. Not everyone agrees with the implications of the second secular force: high (and growing) levels of debt to GDP. Increasing global interconnectedness is another important secular trend that can create spillovers back to the United States. For example, high levels of overcapacity and increasing levels of debt to GDP in China have the potential to impact the world economy and financial markets (as we saw in January and February of this year). These secular trends are powerful. It may not be fully appreciated just how powerful they are in impacting economic conditions.

DENNIS LOCKHART: I side with Jim's view that we may not be too far away, and, if we are not able to get inflation up to target or moving decidedly toward target, a rethink may be required; that there's a theoretical basis for believing that if we have a policy that resembles what we've had for several years, that is, essentially throwing everything we have at it, and we still can't get to target, it's time for a reappraisal. And when I vote—I was a voter last year—so when I voted in December for liftoff, I was comfortable enough with the idea of "reasonable confidence." That was just based on no evidence, just confidence. But I also said at the same time in public remarks that I'd be looking for real evidence as 2016 unfolded. And maybe we're seeing some real evidence of some firming. But if that all reverses and in another year or more we're still where we are, and we can't get inflation up, I think that the notion of a rethink really does come into play.