

The Inflation Outlook
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I am pleased to be with you tonight to discuss my views on the outlook for inflation.¹ In its most recent statements, the Federal Open Market Committee has identified “the risk that inflation will fail to moderate as expected” as its “predominant policy concern.” This places current inflation and the inflation outlook squarely at center stage in thinking about the economy and monetary policy. So in my remarks tonight, I will take a closer look at inflation’s recent behavior and the prospects for its future behavior. In doing so, I’ll place particular emphasis on what we’ve learned in recent years about inflation dynamics, particularly the interplay between real activity and inflation expectations. As always, these remarks should be taken as my own personal views, and not necessarily shared by any of my colleagues in the Federal Reserve.

Recent Inflation

To put the current situation in context, recall that under Chairman Paul Volcker, the FOMC brought inflation down to below 4 percent in the mid-1980s. (Throughout my remarks tonight, unless otherwise noted, I will be referring to inflation measured by the 12-month growth rate in the monthly price index for core personal consumption expenditures.) Under Chairman Alan Greenspan, core inflation fluctuated between 3½ percent and 5 percent until 1992, but fell to near 2 percent in 1994, and below 2 percent in March 1996. Inflation then remained between 1 percent and 2 percent more or less continuously until April 2004. The exception was several months during the second half of 2001 as the economy slipped into a recession.² From 1996 through 2003, a period of eight years, core PCE inflation averaged 1.6 percent, and was between 1 and 2 percent 90 percent of the time.

In early 2003, inflation fell, and for some months inflation was reported to be below 1 percent at an annual rate.³ This led to concern about the possibility of excessive disinflation, and in response, the FOMC statement at the May meeting cited the risk of “an unwelcome substantial fall in inflation,” and at the June 2003 meeting, the FOMC reduced the target federal funds rate to 1 percent. While the Committee had not then, and has not since, established an explicit numerical target range for inflation, the May 2003 statement was taken to many observers as establishing an implicit lower bound on the range of inflation rates the Committee would find acceptable.⁴

Core inflation has increased since 2003. From a low of 1.3 percent for the 12 months ending in September 2003, it rose to more than 2 percent in April 2004, and has fluctuated between 2 percent and 2.4 percent ever since. Monthly readings have exhibited wider swings in recent months, and 12-month inflation has fluctuated accordingly, falling to 2.1 percent in November but then rising 2.4 percent again for February. (Translating the April CPI report suggests that core PCE inflation will step up to 2.2 percent.) Given these repeated swings, it is not surprising that it is difficult to pick out a definite trend,

and in fact, no statistically significant moderating trend has emerged yet, an issue I will return to later in my talk. About all one can say with confidence is that core inflation is now fluctuating around 2¼ percent.

Chairman Ben Bernanke, in his March 28 testimony to the Joint Economic Committee, said about core inflation that “recent readings have been somewhat elevated and the level of core inflation remains uncomfortably high.” In addition, I and several other FOMC participants have expressed dissatisfaction with the current level of inflation. Even though, as I noted earlier, the Committee has not established an explicit numerical objective or range for inflation, some observers have taken recent comments as indicating an upper bound on the range of desired inflation rates, analogous to the way the Committee’s May 2003 statement was taken as marking a lower bound.

The central question, then, regarding the outlook for inflation is whether core inflation will “moderate” to an acceptable rate in coming quarters. Some forecasters *are* expecting inflation to decline this year and next, and many of them link this decline to the expectation that real growth has been weak and is expected to remain below trend over the next few quarters. The relationship between real activity and the inflation outlook, which I will discuss in more detail later on, is important enough to warrant a look at selected components of final demand.

Real Activity

Housing construction is the component of aggregate output that has understandably attracted the most attention lately. The recent weakness followed a decade-long period of sustained growth in housing activity, which was driven by favorable fundamental factors, such as improving prospects for real income growth, unusually low inflation-adjusted mortgage interest rates, increasing population, and the favorable tax treatment of owner-occupied housing. By the end of 2005, though, demand appeared to have been largely satiated in most local markets. Since then, although some markets continue to show steady growth, many markets have seen sharp reductions in construction and homes sales, and a slowdown in housing price appreciation. Indeed, in some locations prices have begun to decline. The fact that housing data are typically somewhat noisier in winter months is making it difficult to gauge whether housing demand has reached bottom as yet. Even if it has, however, the need to work off an overhang of new homes inventories is likely to depress new construction spending for several months to come.

One prominent feature of the expansion of housing activity was a dramatic advance in lending to subprime borrowers, and the recent increase in delinquencies and defaults in this sector has raised concerns. This is not the time for a thorough review of the subprime mortgage market – that would be a separate speech.⁵ All things considered, the macroeconomic effects of recent developments in the subprime market are likely to be relatively limited, and I do not expect any significant spillovers to the rest of the economy.

Business investment spending has been an impressive source of strength over much of this expansion. Real spending on equipment and software increased at a healthy 8.7 percent annual rate from the first quarter of 2003 to the first quarter of 2006. Spending on structures picked up at the end of 2005, increasing 14 percent in the four quarters ending in Q3. Business investment faltered late last year though, with weaker sales of autos and construction materials apparently playing important roles. Most of the fundamentals for business investment are still quite positive, however; profitability is high, the cost of capital is fairly low, and funds for new investment are readily available on favorable terms. Thus I expect investment to gain momentum this year, and we are already seeing some favorable signs.

Growth in consumer spending has been another source of strength in this economic expansion. That growth has been underpinned by solid real income growth during the recovery and favorable prospects for future income growth. Many observers hypothesized that the drag from weakening housing markets would spill over and dampen consumer spending. That hasn't happened. Last year, real consumer spending rose 3.6 percent, and in the first quarter it increased at a 3.8 percent annual rate.

Some observers have questioned the outlook for consumer spending, often citing statistics that lead them to believe that consumer debt is too high or consumer saving is too low. I won't argue with the data – by the usual measures saving *is* quite low, with the widely cited personal saving rate clocking in at negative 1 percent for the first quarter. But keep in mind that the personal saving rate has been on a downward trend from about 10 percent in the early 1980s to about minus 1 percent now. A number of forces could potentially be at play here, including, for example, the significant credit market innovations that have taken place over that period.⁶ I understand how historical averages can exert a gravitational pull on the forecasts of variables like the saving rate, and I don't believe the downward trend is likely to persist indefinitely. But having said that, it's not obvious to me why we should expect that long-term trend to reverse itself beginning precisely next quarter.

An alternative perspective on savings and consumption is that the strong recent growth in household spending indicates optimism about future income prospects, rather than any fundamental recklessness. The labor market is reasonably tight, with the unemployment rate at 4.5 percent. Earnings are growing at about a 4 percent rate. The working age population is growing at a 0.9 percent annual rate, and payroll employment has grown significantly more rapidly, at a 1.6 percent rate for the last few years. While employment growth won't be above average forever, prospects for real income growth look pretty solid. Moreover, household net worth is up to 5¾ years of disposable personal income, and has been rising during this recovery, which suggests that savings, properly measured, might not be so low after all. As always, real wage growth will tend to track gains in labor productivity, and while productivity growth was fairly strong for the first several years of this decade, the recent slowdown is a negative risk for consumer spending. On balance, though, I expect consumer spending to remain reasonably healthy.

Putting this all together, I expect overall growth to come in below trend in the first half of this year, but to return to trend by the end of the year, based on my expectation that the housing market is likely to find a bottom some time this year and no longer be a drag on top line growth, business investment will pick up, and consumer spending will remain healthy.

The Phillips Curve

As I mentioned earlier, many commentators base their belief that inflation will moderate on their belief that output growth will be below trend for the next few quarters. This connection is based on a popular – though I will argue incomplete and potentially misleading – understanding of the relationship between inflation and real economic activity. This relationship is usually described by the “Phillips curve,” which typically shows an inverse relationship between inflation and unemployment or the “output gap.”⁷ One way of thinking about the Phillips curve is to see it as describing a set of options facing policy makers – as if to say, “You can have less inflation with more unemployment or less unemployment with more inflation.” This characterization is very much in keeping with one of the earliest expositions of the Phillips curve as a tool for economic analysis and policy. In 1960, Paul Samuelson and Robert Solow estimated a Phillips curve for U.S. data, following A.W. Phillips’ earlier exercise for the United Kingdom, and indicated that this curve described the set of options available to policy makers “in the years immediately ahead.”

This traditional view of the Phillips curve sees the relationship between the real growth and the outlook for inflation as a *structural* part of the economy, that is, as invariant to alternative approaches to policymaking. Under this view, growth below trend causes a growing amount of “slack” in the economy, which in turn eases price pressures. And conversely, of course, price pressures build up when aggregate demand runs ahead of the economy’s capacity for growth, making labor and commodity markets tight. This view sees policymakers as controlling inflation by using interest rates to engineer the appropriate amount of slack.

But this view of the Phillips curve is out of date and can be seriously misleading. As a purely empirical relationship, it broke down entirely during the 1970s, when inflation and unemployment were both simultaneously elevated. Modern monetary economics now understands the relationship between inflation and real activity as resulting from the decentralized price- and wage-setting decisions of firms and workers facing frictions that make very frequent price re-adjustments suboptimal. Firms set prices based on their expectations regarding the marginal cost of production and the rate at which overall nominal demand will change over their planning horizon. Aggregating across sellers, one finds that the current overall price level, and thus current inflation, depends on expected future inflation and real marginal cost. Under certain assumptions, real marginal cost moves one-for-one with a measure of aggregate economic activity such as the output gap or the unemployment rate.⁸

The result is a version of the Phillips curve in which current inflation depends on expected future inflation and an indicator of current economic activity, such as unemployment or the “output gap.” But to state it this way – with inflation depending on a real variable – is entirely arbitrary. One could just as well write the relationship the other way and say that unemployment, for example, depends on inflation and expected inflation. In fact, inflation and real economic activity are the joint outcome of decentralized decisions made by participants in the economy about demand, supply, prices and wages. So it is just as correct (or rather incorrect) to say below-trend growth will drive inflation down, as it is to say that falling inflation will keep growth below trend. Because inflation ultimately depends on the actions of the central bank, those decentralized decisions will depend on past, present and expected future central bank policy choices. Thus, it is central banks, not the labor market, that drive inflation down.

The behavior of inflation expectations is vitally important to a central bank that is attempting to reduce inflation. If inflation expectations are low and consistent with the reduction in inflation that the central bank wishes to bring about, it will be important to assure that they do not drift higher during the disinflation process. If inflation expectations have become elevated, a sustained reduction in inflation will require bringing inflation expectations down as well.

Inflation expectations embody assumptions – either explicit or implicit – about how the central bank is going to conduct monetary policy in the future. One possibility is that expectations are the result of past experience – that people simply extrapolate the recent behavior of inflation into the future. Statistically, this approach to expectations may work reasonably well for people most of the time, especially if the fundamental behavior of the central bank is not changing much. People taking this approach would tend to not adjust their expectations for future inflation until they saw movements in actual inflation. In this case, a successful disinflation that brings down both actual and expected inflation could be protracted and costly. With inflation expectations tied down by past experience, the remaining mechanism for bringing down inflation is just the mechanism of the original Phillips curve – an increase in real interest rates that slows aggregate demand and reduces actual inflation.

Alternatively, people may take a more forward-looking approach. They may believe that current inflation has deviated temporarily from its long-run trend, and so they may discount recent observations. Moreover, they take into account that inflation will behave differently in the future if the behavior of the central bank changes. This is likely to be particularly important if the central bank communicates convincingly its intention to behave differently. For example, in many countries inflation expectations seemed to shift when the central bank adopted inflation targeting. Public understanding of the central bank’s long-run goals and of how the central bank would respond to various potential economic disturbances helps anchor inflation expectations.

Inflation Expectations

If inflation expectations are a key determinant of the current behavior of inflation, then what do we know about the recent behavior of inflation expectations? There are a variety of indicators and as you might expect, none of them is perfect. Survey measures have the longest track record. The Philadelphia Fed compiles and publishes the Survey of Professional Forecasters every quarter. Their most recent compilation, published just last week, reports a mean expectation for core PCE inflation of 2.1 percent through the end of 2009. The average forecast for CPI inflation from the Blue Chip survey is 2.4 percent for core Consumer Price Index in 2007, and 2.3 percent in 2008, which based on an assumed gap of four-tenths between PCE and CPI inflation translates into 2.0 percent and 1.9 percent, respectively, a bit lower than the Philadelphia survey. Consumer surveys, in contrast, yield much higher figures. Among respondents to the Reuters - University of Michigan survey, the median expected inflation over the next year is 3.2 percent and the median expected inflation over the next ten years is 3.1 percent. Economists typically discount data from such consumer surveys in which respondents have little or no economic incentive to forecast well. Professional forecasters presumably perceive a pecuniary benefit to having a documented record of accuracy.

Measures of expected inflation can be derived from the spreads between indexed and non-indexed U.S. Treasury securities – the so-called TIPS spread. The improvement in recent years in the depth and liquidity of the market for indexed securities provides at least some confidence that such measures reflect a reasonable aggregation of market participants' inflation expectations. The implied expectation of CPI inflation over the next five years was around 1½ percent in early 2003, rose to near 2½ percent in 2004, and has been trading around 2.3 percent in recent weeks. Taking off four-tenths for the average PCE-CPI spread, this translates to around 1.9 percent. Expectations for five-year inflation beginning five years from now have been running recently between 2.4 percent and 2.5 percent.

Another place to look for evidence on inflation trends is the growth in labor compensation. Hourly compensation in the nonfarm business sector accelerated from under 4 percent in 2005 to 5 percent in 2006. This is consistent with the broad acceleration in average hourly earnings shown in the Employment Report, and the upswing in the Employment Cost Index. Inflation-adjusted compensation gains should (and generally do) track labor productivity gains fairly closely. This is algebraically equivalent to saying that the markup over unit labor costs should be fairly constant. If so, the growth in unit labor costs should provide a gauge of expected inflation trends, the idea being that workers and firms set current wages based on their near-term expectations for real productivity gains and inflation. Productivity growth was relatively high early in this decade, but has decelerated recently and averaged 1.6 percent last year. As a result, unit labor costs have accelerated and have averaged 2.4 percent over the last two years. The markup has been relatively steady at an elevated level over the two years, which with rising unit labor costs is consistent with the rise in inflation we've seen.

If unit labor costs continue to advance at recent rates, either inflation will keep pace with unit labor costs, or the increase in labor costs will be absorbed by firms lowering their markups. It is true that the markup implied by the productivity and unit labor cost

numbers have been high by historical standards, which accords well with the recent strength in business profits, but our understanding of aggregate movements in the markup is limited. The markup has tended to revert to its mean, but it can deviate for long stretches of time. So while it is possible that the markup might fall to offset a rise in unit labor costs, if we don't know why the markup is elevated now, it's hard to have much confidence in a forecast that it is going to come to our rescue just in the nick of time. If the markup remains relatively high, and unit labor costs continue to advance at or above 2 percent, then we are likely to see inflation continue at about 2 percent.

Corroborating evidence on inflation expectations is provided by recent work by James Stock and Mark Watson.⁹ They estimate a model of postwar U.S. inflation that allows them to decompose inflation into a “trend” and “transitory” components, each with their own time-varying volatility. The time-varying volatility feature allows for changes over time in the portion of the variability in inflation that is due to long-lasting swings in trend inflation, as we saw in the Great Inflation of the 1970s, as opposed to short-run transitory movements in inflation. They find that the variability in the trend component of inflation has fallen dramatically since the 1970s, consistent with other research that has documented a fall in the “persistence” of inflation since then.¹⁰

Stock and Watson's methodology implies that the best forecast for future inflation is the current estimated value of the trend component, which they put at 2.1 percent (for core PCE inflation) as of the first quarter of 2007. This measure of trend inflation has been above 2 since the fourth quarter of 2004, and peaked at 2.2 percent in the second quarter of 2006. Interestingly, their measure of trend was between 1.3 percent and 1.8 percent for over eight straight years from 1996 to 2003.

The Stock and Watson framework provides a natural way to assess whether any moderation in core inflation is evident yet. Their measure of trend inflation fell by 6 basis points from the peak (2.17 percent) in the second quarter of last year to the first quarter of 2007 (2.11 percent). Given the shape of the probability distribution around their estimates, this decline does not appear to be statistically significant.

Outlook

A variety of expectations measures then, point to expectations for core PCE inflation of about 2 percent right now. What does this imply about the outlook for actual inflation, which is now running at about 2¼ percent? The current level of inflation expectations is likely to exert a gravitational pull on actual inflation, if monetary policy actions are not inconsistent with those expectations and no concerted effort is made to shift expectations. Policy actions at variance with those expectations – for example, significant easing at a time of elevated or rising inflation – would likely call those expectations into question and lead to a change in assessments regarding future inflation. But as long as policy actions appear to be plausibly consistent with movement toward 2 percent inflation and nothing else acts to alter inflation expectations, that's likely to be the best forecast of where inflation is headed.

Could inflation fall below 2 percent, say to 1½ percent? That depends. Without a prompt fall in inflation expectations, a reduction in inflation below 2 percent is likely to be temporary and hard to sustain. With expectations left alone, the remaining mechanism for bringing down inflation is the traditional Phillips curve mechanism, that is, an increase in real interest rates that slows aggregate demand and reduces both inflation and real activity. If expectations do not adapt to lower inflation, a sustained reduction in employment and output would be required to push inflation down.

The prospects for bringing inflation down below 2 percent thus hinge on the extent to which a reduction in inflation expectations can be brought about. How difficult would that be? Using changes in the target interest rate alone, the process is likely to be difficult and time-consuming. Costly reductions in real incomes and employment would be required until inflation expectations adapt. Without information suggesting a change in the pattern of monetary policy conduct or clarifying the intentions of policymakers, market participants could well interpret policy moves as the continued implementation of past strategy.

One natural approach to bringing inflation expectations down more expeditiously, should that be the desire, would be a strategy of clear communications about policymakers' intentions. Just how responsive would inflation expectations be to such communications? General conclusions are unlikely, because the results will depend on the nature of communications, the nature of the accompanying actions, and the context in which they are received. There are many historical examples of significant shifts in monetary policy expectations; examples include the fiscal reforms accompanying the ends of hyperinflations, the governance changes accompanying the adoption of explicit inflation objectives in other countries, and the operational regime shift adopted by the Volcker-led FOMC in 1979.

These examples involved fairly dramatic and sizable shifts in the conduct of monetary policy, however. Shifting inflation expectations from 2 percent down to 1.5 percent or 1 percent represents a far smaller change in policy, and thus ought to be less difficult. In fact, exactly the opposite transition was made three years ago. As I noted earlier, core inflation was between 1 and 2 percent from 1996 through early 2004, and since early 2004 core inflation has been between 2 and 2½ percent. Inflation expectations seem to have shifted up accordingly; for example the TIPS spread was around 1½ percent in 2003. The fact that core inflation so recently spent eight years between 1 and 2 percent suggests that convincing the public that we were returning to such a period would not be that difficult, especially in light of the fact that the Committee did not, during that earlier period, announce an intention to keep core inflation within that band.

In many recent instances, FOMC actions or statements appear to have induced simultaneous short-run movements in market participants' expectations regarding the path of the federal funds rate and inflation. For example, following the heavy hurricane season of 2005, energy prices surged, policy expectations initially softened, and measures of inflation expectations rose. Shortly thereafter, core inflation also increased. Expectations were subsequently realigned after a number of speeches and statements by

FOMC members, but similar sequences occurred in early 2004 and the spring of 2006. A similar episode occurred in the spring of 2006 in response to another round of energy price increases. Inflation expectations rose, but were subsequently tamped down by Committee member communications. In both cases, the movement in inflation expectations was relatively contained, but these short-run spikes suggest a pliability of inflation expectations in the current environment.

The outlook for inflation, then, is to an important extent contingent on policymakers' assessments of their ability to influence the evolution of inflation expectations. Such assessments will inevitably be inexact. Although there may be no precise historical analogs for communication and actions to reduce inflation expectations in circumstances like the present, my sense is that clear communications accompanied by consistent actions could bring about a relatively prompt and low-cost reduction in inflation.

But in any event, there is little disagreement about the central importance of inflation expectations for the conduct of monetary policy. Inflation expectations are an *outcome* of monetary policy, *not* an autonomous help or hindrance, and central banks are as responsible for the behavior of inflation expectations as they are for the behavior of inflation.

Thank you.

¹ I am grateful to John Weinberg and Roy Webb for assistance with these remarks.

² The insurance payments associated with the September 11, 2001 attacks were treated as an offset to net premiums paid for insurance in the National Income and Product Accounts, resulting in a sharp decline in measured inflation for that month, and a corresponding increase in 12-month measured inflation for September 2002, when core PCE inflation was 2.4 percent on a twelve-month basis. "Business Situation", *Survey of Current Business*, November, 2001, pp. 1-7.

³ PCE inflation for the second quarter of 2003 was originally reported as 0.7 percent.

⁴ Daniel Thornton, "The Lower and Upper Bounds of the Federal Open Market Committee's Long-Run Inflation Objective," Federal Reserve Bank of St. Louis *Review*, May/June 2007, Vol. 89 No. 3.

⁵ Bernanke, Ben S., "The Subprime Mortgage Market," Federal Reserve Bank of Chicago's 43rd Annual Conference on Bank Structure and Competition, Chicago, Illinois, May 17, 2007, and Lacker, Jeffrey M., "The Evolution of Consumer Finance," Conference of State Bank Supervisors, Norfolk, Virginia, May 18, 2006.

⁶ John Weinberg, "Borrowing by U.S. Households," Federal Reserve Bank of Richmond 2005 Annual Report..

⁷ Lacker, Jeffrey M., "Inflation and Unemployment," Charlotte Economics Club, Charlotte, N.C., April 11, 2007, and "Inflation and Unemployment: a Layperson's Guide to the Phillips Curve," Federal Reserve Bank of Richmond 2006 Annual Report, forthcoming.

⁸ Robert G. King, "The New IS-LM Model: Language, Logic and Limits", Federal Reserve Bank of Richmond, *Economic Quarterly*, Fall 2000, Vol. 86 No. 3.

⁹ Stock and Watson "Why has inflation Become Harder to Forecast?" *Journal of Money, Credit and Banking*, forthcoming. See also Steven Cecchetti, Peter Hooper, Bruce Kazman, Kermit Schoenholtz, and Mark Watson, "Understanding the Evolving Inflation Process," U.S. Monetary Policy Forum 2007, the Initiative on Global Financial Markets. I am grateful to Mark Watson for providing us with the computer code to estimate the decomposition.

¹⁰ John Williams, "Inflation Persistence in an Era of Well Anchored Inflation Expectations," Federal Reserve Bank of San Francisco *Economic Letters*, October 13, 2006.