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Chairman Greenspan's remarks today give us an opportunity to understand his thinking about the making of monetary policy and his analysis of the Federal Reserve's actions during the past 15 years. It was a period of substantial accomplishment that no doubt reflects in considerable measure the views of the Chairman himself.

The Fed's primary goal, price stability, has been achieved. Inflation declined from four percent at the end of the 1980s to 2 percent in the mid-1990s and about 1.5 percent now. The 2 percentage point difference between the interest rate on conventional Treasury bonds and on inflation-indexed bonds (TIPS) shows that financial markets expect inflation to remain at about two percent for at least the next decade.

The unemployment rate averaged only 5.6 percent during the past 15 years and real GDP grew at three percent. Although the Standard and Poors index of share prices is down about 25 percent from its peak, it increased at a 7 percent real rate over the past 15 years and produced a real return of nearly 9 percent when dividends are included.

This good performance has been achieved despite a variety of adverse shocks including the economic crises in Asia and Latin America, the massive defaults by Russia and Argentina, the collapse of Long Term Capital Management (LTCM), the sharp fluctuations of the dollar, the shock of September 11th, and the pressures caused by the war in Iraq.

The economy's good performance has not been an accident. It reflected the Federal Reserve's unambiguous commitment to the goal of long-term price stability and its communication of that goal to the public. But while such a long-term commitment is necessary, it is not enough in a rapidly changing environment. The Federal Reserve tightened aggressively when the risks of inflation rose (increasing the Fed funds rate to more than 9 percent in 1989 and to more than 6 percent in 2000) and it drove the interest rate down when the economy was weak and when the risk of deflation appeared.

Federal Reserve policy involves more than changing interest rates. Good crisis management at the time of the 1987 stock market crash, the Russian debt default, and the LTCM meltdown was very important for economic stability. The Fed also took the lead in strengthening the banking system by inducing banks to have more equity capital and by persuading the Congress to permit commercial

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banks to diversify into the underwriting activities previously reserved for investment banks.

The economy's favorable performance was helped by the surge of productivity that began in the mid-1990s. The productivity growth in the nonfarm business sector rose from about 1.5 percent a year between 1970 and 1995 to about 3 percent a year since then. The Fed's reaction to that productivity surge was perhaps its most important macroeconomic decision during the past 15 years.

Between 1995 and 2000, the Federal Reserve produced a monetary environment that permitted the economy to grow even faster than the rapidly rising potential GDP, thus driving the unemployment rate from 5.6 percent in 1995 to a remarkably low 4.0 percent in 2000. Not surprisingly, the tightening labor market caused compensation per hour to accelerate, rising from 2.2 percent in 1995 to 3.0 percent in 1996-97, 4.9 percent in 1998-99 and 7 percent in 2000. This did not, however, drive up product prices because the accelerating wage costs were balanced by the rising productivity. The rate of increase of the implicit price deflator for the nonfarm business sector actually fell from 2.0 percent in 1995 to about 1.8 percent in 2000.

While many observers spoke of a "new economy" in which all the old relations ceased to hold, the Fed correctly saw that this as a temporary opportunity which would only last as long as the increased rate of productivity growth was able to offset the accelerating rise of hourly compensation. With the end in sight in 1999, the Fed began raising the Federal funds rate and did so until an economic slowdown and stock market crash caused it to reverse the direction of monetary policy in late 2000. The subsequent labor market slack cut the rate of increase of hourly compensation from 7 percent in 2000 to 3.6 percent in 2001 and 2.8 percent in 2002.

The widespread talk about a new economy contributed to the rapid rise in share prices. The S&P index more than doubled between 1996 and 2000, increasing the risk of a subsequent collapse of share prices and a recession. As Chairman Greenspan noted in today's remarks, the Fed made the deliberate decision not to try to stop this potential share price bubble. They were convinced that raising margin requirements would be ineffective and that tightening money enough to stop a bubble would cause the recession that they hoped to avoid. It would be better, they concluded, to accept the risk of a bursting bubble and deal with the downturn if one occurred.

Just as the productivity surge helped to reduce inflation after the mid-1990s, the tax cuts since 2001 have helped to strengthen the recovery. There is of course a correct general presumption that fiscal policies are not appropriate as countercyclical measures. Legislative lags are long and excesses cannot be easily reversed. But when the rate of interest is so low that further reductions are impossible or ineffective, fiscal policy can play a useful role¹. The stimulative effect of the Fed's policy was reinforced by a range of tax policies that increased disposable income, reduced current and future

¹See Martin Feldstein, "A Role for Discretionary Fiscal Policy in a Low Interest Rate Environment," in the 2002 Federal Reserve Bank of Kansas City Annual Conference volume, Rethinking Stabilization Policy, 2003 (www.nber.org/w9203)

marginal tax rates, raised share prices and household wealth by cutting taxes on dividends and capital gains, and specifically encouraged investment in business equipment by accelerating depreciation.

The past 15 years have been characterized by a range of novel challenges. Chairman Greenspan emphasized in his remarks that dealing with such uncertainty is the essence of making monetary policy.² Although he noted the importance of forecasting, his discussion makes it clear that the forecasting process must do more than indicate the most likely future path of the economy or the most likely path conditional on alternative monetary policies.

The key to what Chairman Greenspan calls the risk management approach to monetary policy is to recognize that the full distribution of possible outcomes must be considered, at least conceptually. The Bayesian approach to decision making to which he refers begins by identifying all of the different possible “states of the world” (i.e., values of exogenous variables, behavioral response parameters, etc) and assigning a subjective probability to each such state. Each combination of a “state of the world” and an action by the Federal Reserve produces some nonstochastic outcome. For each potential action, it is then in principle possible to calculate the expected utility of that action, using the subjective probabilities of the different states of the world. The optimal policy is the one with the highest expected utility.

This is of course not a practical recipe for decision making. It is rather a conceptual framework for organizing thinking. In practice it implies that it may be best for the Fed to take the action that would not be appropriate if the most likely conditions (i.e., the most likely “state of nature”) prevailed. When there are asymmetric risks, the appropriate policy gives more weight to the possibility of a very damaging outcome that has a low probability than to a less damaging outcome with a greater probability.

My favorite example of this Bayesian approach to risk is the problem of someone who must decide whether to carry an umbrella for the day even though the probability of rain is not high. If he carries the umbrella and it does not rain, he is mildly inconvenienced. But if he doesn’t carry the umbrella and it rains, he will suffer getting wet. A good Bayesian finds himself carrying an umbrella on many days when it does not rain.

The policy actions of the past year were very much in this spirit. The Fed cut the interest rate to one percent to prevent the low probability outcome of spiraling deflation because it regarded that outcome as potentially very damaging while the alternative possible outcome of a rise of the inflation rate from 1.5 percent to 2.5 percent was deemed to be less damaging and more easily reversed. Similarly, the large budget deficits in 2003 might have been unnecessary and risked overstimulating a

²I have discussed the role of uncertainty in monetary policy in remarks for the 2003 Federal Reserve Jackson Hole conference; see Martin Feldstein, “Monetary Policy in an Uncertain Environment,” Forthcoming in Monetary Policy and Uncertainty, Federal Reserve Bank of Kansas City, 2004 (www.nber.org/w9969)

strong economy. But the possibility of a much more damaging decline of demand provided the rationale for the expansionary fiscal policy. As it turned out, the monetary and fiscal policies were both helpful and did not overstimulate the economy. But even if they had done so, a Bayesian central banker and a Bayesian Treasury secretary would regard the policies to have been ex ante appropriate.

Chairman Greenspan commented also on the debate about inflation targeting. He noted that the operational difference between formal inflation targeters like the Bank of England and those other central banks like the Fed and the European Central Bank that do not have explicit inflation targets is really a matter of degree since all major central banks have price stability as a goal and those that use explicit numerical inflation targets give themselves substantial flexibility in the way they are implemented.

The case for an explicit inflation target is that it might make it easier to control inflation by providing an anchor for the public's expectations. However, a formal numerical inflation target might have the opposite effect if the central bank misses its target for an extended period of time. Moreover, the commitment to a formal numerical target might from time to time cause a central bank to take actions that it would otherwise judge to be inappropriate simply to reinforce public confidence.

The usefulness of an explicit inflation target is likely to differ from country to country and from time to time. The evidence of Ball and Sheridan³ indicates that the inflation targeting countries have been able to reduce inflation more readily than those without inflation targets but only because they started with higher rates of inflation. Controlling for that initial condition, there is no apparent gain from having a formal inflation target. But this regression study is itself ambiguous because it does not take into account other differences among countries and among different periods of time. Like other aspects of monetary policy, this issue is likely to be debated for years to come.

What is clear, however, is that the policies pursued by the Federal Reserve during the past 15 years have produced a very satisfactory performance. Thanks to the Chairman's speech today we have a better understanding of the reasons for that good performance.

³Laurence Ball and Niamh Sheridan, "Does Inflation Targeting Matter?", NBER Working paper 9577, forthcoming in the NBER Conference Volume Inflation Targeting, edited by Ben Bernake and Michael Woodford.