Implications of Behavioral Economics for Monetary Policy

Janet L. Yellen

I want to congratulate the Federal Reserve Bank of Boston for organizing a fascinating and thought-provoking conference. I applaud the Bank's decision to establish a center to promote and support research in behavioral economics and concur wholeheartedly with the judgment that motivates this initiative—namely, that research in behavioral economics is broadening and enriches our understanding of decisionmaking. This research has the potential to strengthen the conceptual and empirical underpinnings of macroeconomic policy.

The Federal Reserve is one of a growing number of organizations that have already taken to heart some implications of behavioral economics research. This year, we began to automatically enroll new employees into the Federal Reserve System's retirement savings plan, defaulting them into an asset allocation fund that includes fixed income, domestic, and international equity investments. Employees who do not want to participate can, of course, easily opt out of the program. But our early experience mirrors well-known research findings: so far, an overwhelming fraction of employees who were defaulted into the savings plan remain enrolled in it. Of course, this default choice reflects our System's appreciation of the striking findings of behavioral economics concerning the sensitivity of saving decisions to automatic enrollments.

In terms of the Federal Reserve's public policy responsibilities, I can easily envision other ways in which explorations in behavioral economics could be of practical use. For example, one of the Federal Reserve's duties is to design consumer disclosures, including the information that borrowers receive from lenders when they take out a mortgage, apply for a credit

card, or lease a new vehicle. As we have unfortunately seen recently, such disclosures have not always been effective in conveying the key information relevant to such decisions in a salient, understandable, and timely way. Indeed, recent research by the Federal Trade Commission[1] documents that a large fraction of mortgage borrowers fail to understand the financial implications of prepayment penalties and other complex loan features. To improve the effectiveness of such disclosures, the Federal Reserve has begun to use consumer testing techniques to redesign and refine these disclosures,[2] but there remains substantial scope for behavioral research to contribute to the design and implementation of more effective practices in the consumer disclosure area.

Today, however, I would like to focus on some implications of behavioral economics for the conduct of monetary policy. I will concentrate on the implications of behavioral research for the Phillips curve, though the other papers delivered at this conference demonstrate that behavioral economics has implications for many other aspects of macroeconomic modeling. These include the behavior of housing and other asset prices, as well as the specification of crucial components of aggregate demand, such as the consumption function.

The Phillips curve is a core component of every realistic macroeconomic model. It plays a critical role in policy determination because its components importantly influence the short- and long-run tradeoffs that central banks face as they strive to achieve price stability and, in the Federal Reserve's case, maximum sustainable employment—our second congressionally mandated goal. I will argue that behavioral economics can enhance our understanding of the Phillips curve, and that this refinement is important for two reasons. First, better models of the inflation process help improve our forecasts and clarify limitations on what monetary policy *can* achieve. Second, the theoretical underpinnings of the Phillips curve are important in understanding what central banks *should* do. In other words, beyond determining the constraints governing what monetary policy is feasible, macroeconomic models underpinning the Phillips curve have implications for the way in which central banks should interpret their price stability mandate and for assessing the welfare costs of fluctuations in output and inflation.

The New Keynesian model provides theoretical microfoundations for a Phillips curve that relates actual inflation to expected inflation one period ahead as well as to marginal production costs.[3] This model has become a standard workhorse for policy analysis and provides loose justification for empirical implementations of the Phillips curve. These implementations typically relate actual inflation to lags of inflation (as a proxy for expected inflation), to a measure of the output or unemployment gap (which proxies for cyclical fluctuations in marginal cost), and to other variables reflecting supply shocks (such as the prices of energy and imported goods). The coefficient on the unemployment gap in the Phillips curve determines the slope of the short-run Phillips curve relationship between unemployment and inflation. This parameter is crucial for monetary policy because it influences the sacrifice ratio—the cost in terms of unemployment or lost output due to lower inflation. Virtually all empirical research on the inflationary process finds that the short-run Phillips curve is flat enough to generate a significant short-run tradeoff.

Of course, the existence of this empirical short-run tradeoff between inflation and unemployment also helped motivate the development of the New Keynesian model in the first place. In particular, with no frictions and with fully maximizing agents, markets should always clear, and the labor market should be no exception. Thus, the short-run Phillips curve "should be" vertical.[4] This divergence between theory and reality was the original motivation for New Keynesian economics. But in contrast to the ad hoc behavioral assumptions underlying old-style Keynesian theory, modern researchers have amended the neoclassical model with well-specified assumptions concerning the nature of preferences, the process of decisionmaking, the frictions characterizing markets, and the details of expectation formation. The objective has been to build macroeconomic models on sound microfoundations that are not only rigorous but also realistic.

Viewed in this light, the now-standard New Keynesian approach explains the short-run Phillips curve tradeoff by introducing a key friction into neoclassical theory, namely, price stickiness; such a friction is often justified as a menu cost of changing nominal prices. The consequence is that firms change the prices they charge only periodically, not continu-

ously. With staggered decisionmaking across price-setters, the aggregate price level exhibits inertia, thus rationalizing the short-run Phillips curve tradeoff. Other frictions, such as wage rigidity and habit persistence in consumption, are typically added to improve the fit of the model.

Behavioral macroeconomic models have extended this agenda, both by providing new justifications for wage and price rigidity and by incorporating additional departures from the frictionless benchmark. Of course, the jury is still out on which modifications are most important empirically for understanding the macroeconomy. Nevertheless, the evidence presented throughout this conference regarding how individuals and firms behave is too compelling to simply ignore. Let me discuss a few examples of how behavioral macroeconomics augments our standard models used for policymaking.

Some behavioral models assume that people follow simple heuristics or rules of thumb that require relatively little cognitive effort or time, such as focusing on only a few salient details of a problem. Indeed, the psychology and economics literature that builds on the work of Kahneman, Tversky, and others generally concludes that people do not make decisions in the fully rational way commonly envisioned in standard economic models. As Benjamin and Laibson (2003) summarize the findings of this literature: "economic agents make good decisions but not perfectly rational ones" (2).

Other behavioral models, including those surveyed by Fehr, Goette, and Zehnder and by Rotemberg (both in this volume), go much further, arguing that individual behavior is affected by a reliance on nominal frames of reference and by considerations such as envy, fairness, social norms, and social status. As Rotemberg makes clear, such assumptions can also rationalize the phenomenon of price stickiness embodied in the Phillips curve.

Of course a logical question is why such additional complexities are worth incorporating into macroeconomic models if the New Keynesian approach, based on costly price adjustment, is empirically satisfactory. The problem is that the New Keynesian Phillips curve is *not* fully satisfactory. For example, it is not consistent with contractionary disinflations or with the inflation persistence observed in the postwar period. It also

is not consistent with empirical estimates of the joint responses of unemployment and inflation to monetary shocks.[5]

Behaviorally based macroeconomic models help address these concerns about the New Keynesian Phillips curve, notably by modifying the process of expectations formation, the feedback between expected future inflation and current inflation, the link between labor-market conditions and firms' marginal cost, and the impact of supply shocks on the inflation process. These behaviorally informed macroeconomic models also offer new insights. For example, Mankiw and Reis (2002) assume that decisionmakers form expectations using sticky or stale information, an assumption they justify on behavioral grounds. To keep their model more tractable, they assume that all agents act as if they had rational expectations, but that most agents use outdated information when forming these expectations. With this amendment of the standard New Keynesian model, the Mankiw-Reis version generates a short-run Phillips curve that is downward-sloping and that is consistent with inflation persistence and costly disinflation.

Of course, the assumption of rational expectations, which Mankiw and Reis maintain, is a clear but probably unrealistic benchmark. Ball (2000) suggests, based on near-rationality, that perhaps people forecast with optimal univariate estimation rather than acting as if they knew the entire model.[6] For the postwar period, this approach makes expected inflation close to being last period's inflation—so expectations depend heavily on recent experience. Inflation is thus persistent, but this persistence is not structural. An important implication for policy is that, if policymakers change their behavior, the empirical dynamics of inflation could change markedly.

Let me next turn to the long-run properties of the Phillips curve. Most macroeconomists accept that the long-run Phillips curve is vertical, so that steady-state unemployment is unaffected by the average level of inflation. Intriguingly, some behavioral models raise the possibility that steady-state unemployment might depend on the inflation rate.[7] For example, Akerlof, Dickens, and Perry (2000) explore the implications of a model with money illusion, a phenomenon which, according to surveys and other empirical evidence, appears to be both widespread and significant

in decisionmaking. In their model, when inflation is sufficiently low, most agents do not focus on the difference between real and nominal variables, so inflation is relatively unimportant for nominal wage bargaining and for prices. As real inflation rises, however, it becomes salient to a growing fraction of agents who take it fully into account. This hypothesis gives rise to a long-run Phillips curve that is bowed in at very low inflation rates, backward-bending at slightly higher rates, and ultimately vertical at the "natural rate" when inflation is sufficiently high. The implication is that a very small amount of inflation may lower equilibrium unemployment. Beyond a point, however, higher inflation raises equilibrium unemployment since inflation becomes an increasingly salient factor in decisionmaking. Akerlof, Dickens, and Perry (2000) argue that, in the late 1990s, as inflation fell to low levels, it became less salient to wage bargaining, reducing the effective natural rate of unemployment.

Closely related to the idea of money illusion is downward nominal wage rigidity which, as Fehr, Goette, and Zehnder (this volume) discuss, may reflect considerations of fairness. Pervasive evidence of such nominal rigidity was identified, for example, by the International Wage Flexibility project (see Dickens et al., 2007). As Tobin (1972) originally showed, such downward nominal wage rigidity means that at sufficiently low inflation rates, a significant fraction of firms would optimally cut nominal wages. This possibility is explored in another paper by Akerlof, Dickens, and Perry (1996). In their model, if productivity growth and steady-state inflation are low, then long-run unemployment might be relatively high. The reason is that some firms might need to cut real wages which, at very low inflation, requires nominal wage cuts. If they are unwilling or unable to implement such cuts, then these firms may lay off workers instead. This reduction in labor demand leads to an increase in unemployment. Of course, if productivity growth is high, as it has been on average since the mid-1990s, then downward nominal wage rigidity becomes a less important issue.[8] Behavioral considerations thus point to the possibility of a long-run tradeoff between inflation and unemployment at very low inflation rates.

Downward nominal wage rigidity, as well as downward real wage rigidity, may also affect the linkages in the Phillips curve among unemployment, marginal cost, and inflation. In particular, norms governing

the pay increases that are deemed fair may result in a short-run Phillips curve that is convex rather than linear. The nonlinearity is due to the fact that even with high unemployment rates, firms are unwilling to treat workers in ways they consider unfair—either by cutting nominal wages or by raising nominal wages by less than workers think they should receive, causing inflation to "bottom out" as unemployment rises. For the United States, Clark, Laxton, and Rose (1996) find evidence of nonlinearity, although tests to discriminate among alternative functional forms of the Phillips curve suffer from extremely low power, making a reliable assessment of the degree of convexity impossible. The degree of convexity of the short-run Phillips curve is potentially important, however, because the volatility of unemployment and mean unemployment are inversely related along paths with constant expected inflation. This means that policies to stabilize unemployment produce the payoff of lowering it on average.

Another implication of behavioral economics for the Phillips curve relates to the impact of productivity growth on equilibrium unemployment when real wages exhibit some rigidity, a phenomenon found by the International Wage Project to be prevalent in many countries. Ball and Moffitt (2001), for example, have shown that shifts in productivity growth, like other supply shocks, can shift the Phillips curve and thereby change, at least for a time, the equilibrium unemployment rate, or the nonaccelerating inflation rate of unemployment (NAIRU). Behavioral economics suggests that social norms may govern the real wage increases that workers consider fair, and that these norms or aspirations may be historically rooted. Shifts in productivity growth make it easier or more difficult for firms to meet these norms, altering, at least for a time, the unemployment rate that is consistent with growth in real wages that is in line with productivity. During the 1990s, faster productivity growth enabled firms to more easily meet norms for real wage growth that were depressed by the post-1973 productivity decline. In this view, the sluggish upward adjustment of norms enabled unemployment to fall to 40-year lows without igniting inflation. In essence, the short-run NAIRU was below its long-run level. By contrast, the poor experience of the 1970s reflected the collision of inherited norms for rapid real wage growth with the unpleasant reality of a sharp productivity slowdown.

Let me conclude these remarks on the implications of behavioral research for the properties of the Phillips curve by noting that at least some of the behaviorally based insights have already crept into our internal analysis and forecasts. For example, Federal Reserve policymakers often attributed favorable inflation performance in the late 1990s to fast productivity growth and its effect on the short-run NAIRU. And policy simulations with FRB/US, the Board of Governors' main model, sometimes assume that agents form expectations by estimating reduced-form vector autoregressions rather than using model-consistent expectations. Moreover, issues related to communications and credibility figure prominently in Federal Open Market Committee discussions, because members recognize that well-anchored inflation expectations, as we have had in the United States since the mid-1980s, can reduce the sacrifice ratio and the sensitivity of inflation to supply shocks. More generally, the Federal Reserve recognizes that public understanding of its reaction function can help people form expectations in ways that are likely to enhance the stability of the economy. Given the importance that expectations formation plays in all aspects of modern macroeconomic models, I see a high payoff to further behavioral research on how people actually form expectations. Moreover, behavioral research could be very useful in helping us understand how best to communicate our views on the economy and on policy.

Having outlined how behavioral research affects our understanding of what monetary policy can do, I now want to address the question of what policy should do. Specifically, what we can learn about the appropriate objectives of monetary policy?

I will start with inflation. In the long run, everyone agrees that inflation primarily reflects the actions of the central bank. But what inflation rate should we strive for as a long-run policy objective? Existing theoretical work, grounded in neoclassical models, provides surprisingly little guidance. It points to the importance of shoe-leather costs, since individuals tend to economize on their use of cash as inflation rises. However, these costs are probably small at low to moderate rates of inflation. More important, in all likelihood, is the impact on the incentive to save and invest stemming from the interaction of inflation with the tax code. But findings from behavioral economics bring other considerations into play. Empirically, the evidence from surveys performed by Shiller (2007)

and those discussed by Di Tella and MacCulloch (in this volume) reveal that individuals strongly dislike inflation. It appears to reduce reported happiness. Such evidence, along with research suggesting that individuals heavily rely on nominal frames of reference in decisionmaking, reinforces the desirability of keeping inflation rates quite low. After all, zero inflation, correctly measured, means that the distinction between real and nominal variables is unimportant; indeed, targeting a constant price level would make it easier for people to plan for the future. However, some policy considerations highlighted by behavioral research point in the opposite direction. For example, the tendency of workers to ignore inflation in wage bargaining until it becomes salient and the prevalence of downward nominal wage rigidity suggest that there may be potential benefits from choosing an inflation target that is low but positive. These arguments reinforce a case for maintaining some small inflation cushion to guard against deflationary risks due to the zero nominal bound on interest rates. Although empirical work suggests that downward nominal wage rigidity is prevalent in the United States, its importance diminishes when productivity growth is high, as it has been since the mid-1990s.

Let me next turn to some implications of behavioral economics for the Federal Reserve's role in stabilizing the real economy. Along with price stability, output stabilization has been an important policy objective during the postwar period, and fluctuations in both output and unemployment have diminished. The questions for policymakers are how large are the welfare losses that result from such output volatility and how beneficial would further reductions be?

Perhaps surprisingly, standard economic theory suggests that the losses associated with output volatility of the magnitude experienced during the postwar period are quite small. Lucas (1987, 2003) spawned a large literature by arguing that the welfare gains from *additional* stabilization of the economy are tiny. Given standard preferences and the observed variance of consumption around a linear trend since 1947, he calculates that the representative American consumer would be willing to reduce his average consumption by a trivial amount, only one-half of one-tenth of a percent, to eliminate *all* remaining consumption volatility.[9] Lucas concluded that stabilizing output, even if possible, should not be a macroeconomic priority.

If Lucas's calculation was correct, then the average person in the United States would value consumption stabilization (complete insurance) by only around $16 a year.[10] Compared with the premiums we pay for very partial insurance (for example, collision coverage on cars), this seems implausibly low. The New Keynesian model offers one basis to conclude that the stabilization costs may be larger. For example, Galí, Gertler, and López-Salido (2007) argue that because of wage and price markups, steady-state employment and output are inefficiently low. In their model, the welfare effects of booms and recessions are asymmetric because marginal increases in employment result in diminishing welfare gains. In good times, with low unemployment, the marginal gain from additional job creation may be low, because marginal employees may be close to indifferent in choosing between work and leisure. In contrast, job creation in bad times may yield a sizable welfare surplus. As a result, recessions are particularly costly—welfare falls by more during a business cycle downturn than it rises during a symmetric expansion. If good policy can reduce the frequency and severity of recessions, then the analysis by Galí, Gertler, and López-Salido suggests that the resulting welfare gains from stabilization may be substantial.

Behavioral considerations suggest some additional reasons why output stabilization may raise welfare. In particular, some of the behavioral phenomena already discussed create the tantalizing prospect that a more stable economy may benefit from higher average levels of employment, output, and consumption. As DeLong and Summers (1988, p. 434) once put it, stabilization might "fill in troughs without shaving off peaks."[11] Or, as in Barlevy (2004), stabilization might increase the economy's long-run growth rate. In contrast, both the neoclassical model, analyzed by Lucas, and the New Keynesian model, analyzed by Galí, Gertler, and López-Salido, predict that mean consumption, output, and unemployment are unaffected by the volatility of these variables.

One behavioral reason that a more stable economy might enjoy lower average unemployment relates to the convexity of the short-run Phillips curve. If this relationship is convex, rather than linear, higher volatility in unemployment is associated with a higher mean unemployment rate. Recall that such convexity could reflect the influence of downward rigidity in either nominal or real wages. Interestingly, using U.S. data for the period 1971 to 1995, Debelle and Laxton (1997) estimate that the increase in mean unemployment associated with the volatility in unemployment over this period amounted to a nontrivial 0.33 percent.[12] Yellen and Akerlof (2004) show that a similar argument applies if the long-run Phillips curve is not vertical at low inflation rates.

For policymakers, the bottom line of such research is that behavioral economic models tend to reinforce the priority that policymakers should attach to the goal of stabilizing output. But the magnitude of any potential welfare gains is difficult to infer from existing empirical estimates of the Phillips curve. In principle, the happiness literature might give us some more direct evidence on these benefits. As Di Tella and MacCulloch emphasize, there is persuasive evidence that people's happiness is inversely correlated with both unemployment and inflation. The finding that lower unemployment raises satisfaction even when it is fairly low to start with is consistent with the New Keynesian assumption that equilibrium unemployment is inefficiently high. But this finding sheds little light on how policymakers should assess the welfare consequences of business cycle fluctuations—a wider assessment hinges on the more subtle issue of how volatility in unemployment affects well-being for a given mean. Regarding this point Wolfers (2003), using subjective measures of satisfaction, found evidence of nonlinearity in the relationship between life satisfaction and unemployment, a result implying that unemployment volatility does undermine a sense of well-being. Even so, Wolfers found that the welfare benefits of reducing volatility are subject to rapidly diminishing returns, so that further reductions in the volatility of unemployment would raise welfare by only a relatively small amount, albeit by more than Lucas's estimate.

There is a lot more work to be done to validate and confirm that happiness responses do correspond to well-being.[13] In addition, we care about more than just whether people are happy; we'd like to understand why they are happy. There is considerable scope for additional refined survey evidence that focuses more precisely on what it is that individuals dislike about unemployment and inflation, and the reasons behind this aversion.[14]

Let me conclude by summarizing what I think policymakers can learn from behavioral research bearing on the Phillips curve. This research pro-

vides clear-cut evidence that people's behavior often deviates from the way that benchmark neoclassical theories assume they will act. Individuals have money illusion, follow heuristic rules of thumb, and care about issues like fairness and equity. As I've discussed, there is a growing body of literature showing that macroeconomic theories built on behavioral foundations have strikingly different implications from those predictions that follow from more standard theories. Behavioral research thus offers the promise of unified theories that can explain microeconomic behavior as well as the movements of macroeconomic aggregates.

With respect to the Federal Reserve's dual mandate, behavioral research supports the view that inflation is costly, although very modest inflation might help protect against downward nominal wage rigidity. Behavioral macroeconomic models also provide theoretical underpinnings for the view held by most policymakers that, in the short run, monetary policy can and should strive to stabilize the real economy.

In sum, research on behavioral economics is as exciting for policymakers as it is for academics. It helps policymakers understand what they should care about and improves the quality of our economic models. The work at this conference highlights some of the progress that has been made, but also suggests that the marginal product of further research in behavioral economics is still likely to be very high.

■ *I am deeply indebted to staff in the Economic Research Department of the Federal Reserve Bank of San Francisco, and most particularly to John Fernald, for their help in preparing these remarks.*

Notes

1. See Lacko and Pappalardo (2007).

2. See Kroszner (2007).

3. The New Keynesian intuition for such a relationship is that firms that are readjusting their prices today will want higher prices if the marginal cost of production is relatively high—but they are also concerned that they might be unable to change their price in the future. Hence, if they expect inflation to be high in the future, they will want to raise their price by more today in order to keep from being stuck with a price that is too low.

4. In a simple version of the New Keynesian Phillips curve, Mankiw (2001) shows that the slope of the curve is $\alpha\lambda^2/(1-\lambda)$, where λ is the fraction of agents that adjust their prices each period and α is the response of the desired real price to movements in the unemployment gap, with a small value of α reflecting greater real rigidity. With perfectly flexible wages and prices, $\lambda = 1$ and the curve is vertical.

5. Mankiw (2001) highlights these critiques.

6. A key motivation for Ball (2000) is that inflation appears very persistent in the postwar period but not persistent under the gold standard, which was a very different monetary regime. Common features of New Keynesian models, such as backward-looking agents or price indexing, can yield more persistence but not its apparent regime-specific nature.

7. Technically, in standard Phillips curve models, this relates to whether the coefficient on expected inflation is 1.00.

8. Recent productivity data have been, on balance, weaker than the average since the mid-1990s. But most, if not all, estimates of trend productivity growth remain above the average growth rate from 1973–1995.

9. As Lucas (2003) makes clear, even taking his estimates at face value, such a calculation does not imply that the Federal Reserve should ignore fluctuations. Very long, very deep downturns, such as the Great Depression, are costly, and policy has avoided such episodes during the postwar period, presumably averting sizable welfare costs.

10. Reis (2007) suggests this way of framing the benefits of stabilization.

11. Yellen and Akerlof (2004) survey this literature.

12. 0.33 percent is the estimated difference between the average historical rate of unemployment and the deterministic NAIRU, defined as the unemployment rate consistent with nonaccelerating inflation in the absence of shocks.

13. Responses do appear correlated with things like income, employment status, education, marital status, and so forth. And there is some evidence that these measures are, in turn, mirrored in suicide data (see Daly, Wilson, and Johnson 2007), which is clearly of a very objective nature.

14. Shiller (1997) took this approach in asking people about inflation.

References

Akerlof, George A., William T. Dickens, and George L. Perry. 1996. "The Macroeconomics of Low Inflation." *Brookings Papers on Economic Activity* 1: 1–59.

Akerlof, George A., William T. Dickens, and George L. Perry. 2000. "Near-Rational Wage and Price Setting and the Long-Run Phillips Curve." *Brookings Papers on Economic Activity* 1: 1–60.

Ball, Laurence. 2000. "Near-Rationality and Inflation in Two Monetary Regimes." Working Paper No. 7988. Cambridge, MA: National Bureau of Economic Research.

Ball, Laurence, and Robert Moffitt. 2001. "Productivity Growth and the Phillips Curve." In *The Roaring Nineties: Can Full Employment Be Sustained?* ed. Alan B. Krueger and Robert Solow, 61–90. New York: Russell Sage Foundation and The Century Foundation.

Barlevy, Gadi. 2004. "The Cost of Business Cycles under Endogenous Growth." *American Economic Review* 94(4): 964–990.

Benjamin, Daniel J., and David I. Laibson. 2003. "Good Policies for Bad Governments: Behavioral Political Economy." Manuscript prepared for Federal Reserve Bank of Boston Behavioral Economics Conference, June. Available at http://bosfed.org/economic/conf/conf48/papers/benjamin_laibson.pdf.

Clark, Peter, Douglas Laxton, and David Rose. 1996. "Asymmetry in the U.S. Output-Inflation Nexus: Issues and Evidence." *IMF Staff Papers* 43(1): 216–250.

Daly, Mary C., Daniel J. Wilson, and Norman J. Johnson. 2007. "Relative Status and Well-Being: Evidence from U.S. Suicide Deaths." Working Paper Series 2007-12, Federal Reserve Bank of San Francisco. Available at http://www.frbsf.org/publications/economics/papers/2007/wp07-12bk.pdf.

Debelle, Guy, and Douglas Laxton. 1997. "Is the Phillips Curve Really a Curve? Some Evidence for Canada, the United Kingdom, and the United States." *IMF Staff Papers* 44(2): 249–282.

DeLong, J. Bradford, and Lawrence H. Summers. 1988. "How Does Macroeconomic Policy Affect Output?" *Brookings Papers on Economic Activity* 2: 433–480.

Dickens, William T., Lorenz Goette, Erica L. Groshen, Steinar Holden, Julia, Messina, Mark E. Schweitzer, Jarkko Turunen, and Melanie E. Ward. 2007. "How Wages Change: Micro Evidence from the International Wage Flexibility Project." *Journal of Economic Perspectives* 21(2): 195–214.

Galí, Jordi, Mark Gertler, and J. David López-Salido. 2007. "Markups, Gaps, and the Welfare Costs of Business Fluctuations." *The Review of Economics and Statistics* 89(1): 44–59.

Kroszner, Randall S. 2007. "Creating More Effective Consumer Disclosures." Speech delivered May 23 at the George Washington University School of Business, Financial Services Research Program Policy Forum, Washington, DC. Available at http://www.federalreserve.gov/newsevents/speech/kroszner20070523a.htm.

Lacko, James J., and Janis K. Pappalardo. 2007. "Improving Consumer Mortgage Disclosures." Federal Trade Commission, Bureau of Economics Staff Report (June). Available at http://www.ftc.gov/os/2007/06/P025505MortgageDisclosureReport.pdf.

Lucas, Robert E., Jr. 1987. *Models of Business Cycles*. Oxford: Basil Blackwell.

Lucas, Robert E., Jr. 2003. "Macroeconomic Priorities." *American Economic Review* 93(1): 1–14.

Mankiw, N. Gregory. 2001. "The Inexorable and Mysterious Tradeoff between Inflation and Unemployment." *The Economic Journal* 111(471): 45–61.

Mankiw, N. Gregory, and Ricardo Reis. 2002. "Sticky Information versus Sticky Prices: A Proposal to Replace the New Keynesian Phillips Curve." *Quarterly Journal of Economics* 117(4): 1295–1328.

Reis, Ricardo. 2007. "The Time-Series Properties of Aggregate Consumption: Implications for the Costs of Fluctuations." Manuscript, Princeton University.

Shiller, Robert. 1997. "Why Do People Dislike Inflation?" In *Reducing Inflation: Motivation and Strategy*, ed. Christina D. Romer and David H. Romer, 13–69. Chicago: University of Chicago Press.

Tobin, James. 1972. "Inflation and Unemployment." *American Economic Review* 62(1–2): 1–18.

Wolfers, Justin. 2003. "Is Business Cycle Volatility Costly? Evidence from Surveys of Subjective Well-Being." *International Finance* 6(1): 1–26.

Yellen, Janet, and George Akerlof. 2006. "Stabilization Policy: A Reconsideration." *Economic Inquiry* 44(1): 1–22.