

## Answers to Questions: Chapter 16

1. The Friedman model assumes that workers do not accurately perceive changes in the price level. Suppose that the price level rises, which induces firms to produce more, but in order to do so they need more workers. So firms offer workers a nominal wage increase that, in terms of percentage changes, is less than the price increase. Employers are willing to do so since the real wage they are paying workers has declined. But since workers do not accurately perceive changes in the price level, they view a rise in the nominal wage as representing an increase in the real wage and they agree to work more.

There are a couple of Phelps models. In one, firms and workers see the price of their products increasing, and not realizing that other firms are experiencing similar price increases, offer to hire more labor and workers accept those offers of employment. In the other model, it is workers who don't realize that all firms are offering the same wage increase as their employer. Therefore, some workers who would normally quit their jobs to seek work at other firms don't and stay with their current firms. As a result, turnover unemployment declines.
2. According to Friedman, expansionary monetary policy would lead to an increase in prices. Assuming imperfect knowledge by workers, the price rise would lead to increased employment and output in the short run. In the Lucas model, people are aware that monetary expansion has led to higher prices in the past. Therefore, the announcement of expansionary monetary policy will lead workers to increase their expected price levels. Thus, they cannot be "fooled" as in the Friedman model. Therefore, according to the Lucas model, output would not rise, even in the short run, in response to the monetary expansion.
3. In both the Keynesian model and the Friedman model it is possible for expansionary fiscal or monetary policy to increase price *and* output in the short run. The major difference is that the Keynesian model is a nonmarket-clearing model. The Friedman model, on the other hand, is a market-clearing model in the sense that workers willingly supply the amount of labor firms wish to hire.
4. Both the Friedman model and the Lucas model share the assumptions of continuous market clearing and imperfect information. Also, in each model expansionary fiscal or monetary policy causes an increase in price *and* output. The conditions under which this occurs are different, however. In the Friedman model, workers form their expectations "adaptively" based on past information. Also, workers are "fooled" into supplying more labor when their perceived real wage is greater than the actual real wage. In the Lucas

model, workers form their expectations “rationally” based on all past and current information available. Output can only deviate from the natural level if workers are “surprised” or incorrectly guess the price level. The errors in price expectations are related to each other in the Friedman model. They are totally random and independent of each other in the Lucas model.

5. In deciding whether to hire temporary or permanent employees to produce the additional output caused by expanding sales, the firm must estimate how long the expansion will last. If it lasts long enough, then the cost saving resulting from paying permanent workers a lower wage offsets the severance costs that it would have to pay if it had to lay off a permanent worker. Therefore, the firm must look at how soon it expects the Fed will raise interest rates enough to reduce its sales. Its expectations of how soon the Fed would apply a Taylor Rule to change interest rates depend on where the inflation rate and the output ratio are relative to the Fed’s targets.

If the economy is just coming out of a recession, then the firm knows that the Fed is not likely to be worried about inflation. Therefore, the firm can expect that the Fed will allow the economy to expand for some time. That would tip the firm’s decision toward hiring permanent workers. On the other hand, if the economy has been expanding for a number of years, then the firm would have to evaluate where it sees inflation and output heading in the future in order to decide whether to hire temporary or permanent workers. These evaluations would have to be done relative to what the firm thinks are the Fed’s goal for the inflation rate and where the Fed thinks real output is relative to natural real GDP.

6. The policymaker wants to adopt monetary policies that stabilize the economy. The policy ineffectiveness proposition asserts that anticipated monetary policy cannot change real GDP in a regular or predictable way; it does not assert that monetary policy cannot affect real GDP. In particular, if monetary policy were to change in a way that businesses and firms did not anticipate, then the price level would diverge from what businesses and workers expected, resulting in a change in output. Therefore, the policymaker would want monetary policy to be predictable so as to avoid such price surprises, resulting in a more stable economy.
7. The force driving the Friedman-Phelps-Lucas models is imperfect information. Markets will clear at natural real GDP and the natural rate of unemployment as soon as workers and firms are able to correctly estimate how nominal wages have changed relative to the price level. There are three reasons why misperceptions do not last long enough to explain the fluctuations in the output ratio that have occurred in modern economies. First, consumers and business experience many price changes continuously, and it does not take them long to understand the difference between changes in some price relative to

others and a change in the general price level. Second, not only does the government produce a lot of data concerning economic conditions, but the development of the Internet, the expansion of business sections of newspapers, and the existence of business channels on cable TV all mean that those data are more widely disseminated than ever. Finally, if it were the case that specific changes in prices were always associated with specific changes in economic conditions, then firms and workers would come to interpret one change in the economy to soon be followed by another change. An example would be that if there were no supply shocks and if real GDP and natural real GDP were equal, then business and workers would know that any increase in output beyond that point would be followed by rises in prices and wages.

8. An adverse supply shock pivots the production function down because firms can now produce less with the same amount of labor. As a result, the slope of the production function flattens and the demand for labor shifts down.
9. In a real business cycle (RBC) model, fluctuations in output are due to supply shocks, not demand shocks. Therefore the price level and output move in opposite directions as the aggregate supply curve moves along the aggregate demand curve. The movement of the price level and output in opposite directions is not consistent with what happened in the Great Depressions when both the price level and output declined. The price level was essentially unchanged during the Global Economic Crisis despite the fact that output fell more than in any other post-World War II recession. Other problems that the Great Depression and the Global Economic Crisis present for an RBC model is first, for there to be the long and sustained declines in output that occurred during those two periods there would have had to have been sustained negative supply shocks, which seem unlikely. But the largest problem for an RBC model as an explanation of the either the Great Depression or the Global Economic Crisis is that during the Great Depression, there was rapid technological change and during the Global Economic Crisis, productivity growth accelerated, either of which would be associated with positive technology or supply shocks.
10. Intertemporal substitution refers to substitution that takes places over time, such as when a couple switches the days that they pick-up their kids from an after-school program. In the context of the labor market, intertemporal substitution occurs when changes in real wages rates cause workers to switch when they engage in non-work related activities in order to work more or less as the real wage rate rises or falls, respectively.

For a real business cycle (RBC) model to explain why the real wage rate does not vary much over the business cycle, the labor supply curve must be relatively flat. This is because technology or supply shocks, which are the driving force in an RBC model, shift the demand for labor curve, causing a movement along the supply of labor curve. If the

labor supply curve were steep, then those shifts in the demand for labor curve would result in large changes in the real wage rate, which is not what the real-world data show. Finally, for an RBC model to explain the pro-cyclical movement in employment, the labor supply curve cannot be vertical.

11. The New Classical theory has made four positive contributions to macroeconomics. First, the assumption of rational expectations is based on the notion that people do not repeat their mistakes and is consistent with the microeconomic concepts of utility and profit maximization. Second, the theory of efficient financial markets is based on continuously clearing markets and rational expectations, both of which seem most applicable to a theory of how financial markets work. Third, the New Classical theory has provided macroeconomists with a greater understanding of economic policy, particularly in terms of how anticipated changes in policy after a smaller impact than unanticipated policy changes in policy. Finally, the analytical techniques introduced by the New Classical theorist have had a major influence on how economists study some macroeconomic variables.
12. Input growth varied much more in the United States than it did in Japan over the entire period. Input growth fell in Japan until the mid-1970s, after which it stabilized until the early 1990s. Inputs have grown very slowly in Japan since the early 1990s; in fact, they fell in 1999, 2001–02, and 2008–09.

Output growth in both the United States and Japan were similar to input growth in the two countries in that first, output growth varied more in the United States than it did in Japan over the entire period, and second, output growth in both countries tended to vary more than input growth did. That meant that in both countries, multifactor productivity rose when output growth accelerated and fell when output growth declined. However, multifactor productivity growth was even more pro-cyclical in Japan because input growth was more stable in Japan than in the United States.

There are some other differences between the growth rates of input, output, and multifactor productivity between the United States and Japan. First, unlike the United States, where output declined during the recessions of 1974–75, the early 1980s, and 1991, output in Japan fell only once prior to 1998. Second, while multifactor productivity (MFP) growth in Japan was consistently positive between 1976 and 1991, it was quite volatile in the United States over that same time frame, including years when MFP fell. Since 1992, the patterns have been reversed, with negative MFP growth in Japan from 1992–94, 1998–99, 2001, and 2009, while MFP growth in the United States has been positive in every year since 1992 except for one.

13. In the original Keynesian model, nominal wages were assumed to be rigid downward. The new Keynesian approach abandons the *arbitrary* assumption of a fixed nominal

wage. It explains the microeconomic foundations for the existence of sticky wages. Sticky wages are insufficient to explain why *nominal* prices do not fully adjust to movements in nominal demand. Hence, the new Keynesian model also provides explanations for barriers to fully flexible prices, including nominal rigidities and real rigidities. New Keynesian explanations for nominal rigidities include menu costs and long-term contracts. New Keynesian explanations for real rigidities include the theory of efficiency wages.

14. Unlike the classical and new classical models, the *nonmarket-clearing model* used in the new Keynesian approach does not insist that all markets clear continuously. Classical and new classical firms are assumed to operate within perfectly flexible auction markets where they are forced to be *price-takers*. Given the price established in the market, classical and new classical firms choose only the profit-maximizing output level. New Keynesian explanations for firm behavior borrow the assumptions of rational behavior and profit maximization. They recognize, however, that many modern firms operate in imperfectly competitive markets. Consequently, new Keynesian models stress that firms are likely to be *price-setters* and *quantity-takers*.
15. With long-term, staggered contracts, the economy is not able to respond as quickly to changing conditions. For example, in response to a beneficial supply shock, wages cannot fall quickly. This is so because only part of the wage package can be negotiated under the new conditions. Wages adjust slowly, and with a longer lag, to shifts in aggregate demand and supply. Therefore, much of the adjustment to shocks takes the form of fluctuations in output and employment, rather than in prices and wages.
16. A macroeconomic externality occurs when the profit-maximizing behavior of firms prevents prices from fully adjusting to demand and supply shocks. This creates the social costs of lost output, employment, and consumer surplus. As explained in question 15, with long-term, staggered contracts, the economy cannot respond as quickly to changing conditions. For example, in response to a beneficial supply shock that would lower inflation expectations, wages will not respond quickly. This is so because only part of the wage package can be negotiated under the new conditions. Wages adjust slowly, and with a long lag, to shifts in aggregate demand and supply. Hence, much of the adjustment to shocks must take the form of fluctuations in output and employment, rather than in prices and wages. The chapter identifies other sources of macroeconomic externalities. They are menu costs, coordination failures, and real rigidities in labor and product markets. Any factor that prevents full adjustment of prices to changes in nominal GDP can cause macroeconomic externalities.
17. Both models use the concepts of disequilibrium and non-clearing markets. Consequently, prices and wages do not change instantly in response to shifts in aggregate demand and

supply. As a result, it is likely that there will be business cycles in output and employment in response to demand or supply shocks. The two models differ primarily in their explanation of *why* wages and prices are sticky and *why* markets do not continuously clear. Unlike the original model, which merely assumed the stickiness of nominal wages, the new Keynesian model explains the microeconomic foundation for slow adjustment. The new Keynesian model adopts both the rational behavior and profit-maximizing postulates of classical and new classical theory. The original Keynesian model used historical and institutional accounts to make the point. The new Keynesian model, unlike its predecessor, provides symmetrical explanations for both nominal and real rigidities in both wages and prices. It posits a microeconomic explanation for why firms and workers will be off their demand and supply curves. The new Keynesian model also explains why individual firms and workers would be reluctant to rely on indexing nominal prices to nominal aggregate demand. This explanation counters new classical claims, such as instantaneous adjustments.

18. Nominal and real rigidities refer to factors that prevent complete and rapid adjustment of wages, prices, and costs to changes in aggregate demand and supply. Nominal rigidities inhibit the flexibility of the nominal price level. The nominal price level cannot adjust due to factors—such as menu costs and long-term, staggered contracts—that make it unprofitable for firms to change the nominal price or wage level. Real rigidities make firms and workers reluctant to alter either real or relative wages. That is, neither firms nor workers want to index wages to changes in nominal aggregate demand. Real rigidities result in part from the fact that not all *local* firms and workers can count on economy-wide changes that will leave them equally well off as before the change. Input–output approaches also explain the unwillingness of firms and workers to take the risks associated with full indexing. The collection of goods and services used by a firm or worker is unlikely to be the same collection used for indexation purposes.
19. It is possible that fluctuations in aggregate demand and supply could have their entire impact absorbed by price and wage fluctuations, rather than output fluctuations. Indeed, both the old and new classical models assert that this is the expected outcome of continuous market-clearing models of the economy. The new classical models assert that both firms and workers voluntarily cut back employment and production during recessions. It is this contention that is countered by new Keynesian economics.
20. The chief similarities among the three models are their assumptions that economic agents behave rationally and have rational expectations. There are a number of important differences among the models. Both the new classical and real business cycle models assume continuous market clearing, whereas the new Keynesian model assumes that markets are not in continuous equilibrium because firms and workers may find it in their

best interest not to alter prices and wages when demand or supply changes occur. The new classical and real business cycle models assume that anticipated policy changes will be ineffective at changing output and employment because workers and firms will quickly adjust their expected price level. New Keynesians do not share this view because they believe that even if the expected price level changes quickly, actual prices and wages change only slowly, so that anticipated policy changes can lead to changes in output and employment. Another major difference is that the real business cycle model attributes all output and employment fluctuations to supply shocks that change the level of  $Y^N$ ; the new Keynesians, on the other hand, believe that demand shocks also influence output and employment by causing  $Y$  to fluctuate around  $Y^N$ .

21. The new Keynesian model argues that because undesirable fluctuations in output and employment impose costs on society (a macroeconomic externality) which individual decision-makers have no incentive or power to avoid (coordination failure), government stabilization policy can play a beneficial role. Stabilization policy presents an alternative solution to the problem of coordinating wage and price changes among firms so that shocks impact only prices and wages and not output and employment. New classicalists disagree. In their market-clearing models, coordination failure problems are nonexistent, and in addition, the policy ineffectiveness proposition renders predictable stabilization policies impotent to affect output and employment.
22. Dynamic means that any Dynamic Stochastic General Equilibrium (DSGE) model explicitly incorporates the passage of time into the model. Stochastic means that any DSGE model has random variables as part of the model. General equilibrium means that any DSGE model provides an explanation of the behavior of the entire economy rather than just a part of economy.

A DSGE model is based on the New Classical assumptions that individuals maximize their well-being and that expectations are rational. However, DSGE models include the New Keynesian features that wages and prices adjust slowly.

23. The first equation of the three equation DSGE model discussed at the end of this chapter is based on the rational expectations theory of consumption discussed in chapter 15 which allows consumption expenditures to depend on the interest rate. This is referred to as the *IS* equation of the DSGE model. The second equation of the DSGE model is based on a version of the Phillips curve presented in Chapter 9 where expectations are rational and forward looking. Actual inflation in this equation depends on expected future inflation and the output or unemployment gap. The third equation is a version of the Taylor rule discussed in Chapter 14, where the short-term interest rate depends on the deviation of the actual inflation rate from the Fed's inflation target and the output gap.

A stochastic shock to the Taylor rule or third equation would be necessary for the short-term interest rate to be as low as it was for the period 2002–04.

24. The simple DSGE model presented in this chapter lacks an investment equation that would explain the construction of more housing from 2001–06 than the housing market could absorb. There is no financial sector in the model that would explain the development of the housing asset bubble from 2001–06. Finally there is no government sector in the model that would allow for a fiscal policy response to the Global Economic Crisis.