News About the Future and Economic Fluctuations*

BY KEITH SILL

I n the late 1990s, as tech-stock prices were surging, we often heard discussion about a "new economy" in which advanced communications technologies would lead to higher future productivity growth and greater economic efficiency. But the boom times largely came to a halt after August 2000, and in March 2001, the economy entered a recession that lasted eight months. Economist A.C. Pigou argued that news about the future or changes in expectations are important drivers of the business cycle. His theory seems to offer a plausible explanation of what happens in boom-bust cycles. But is his theory consistent with how modern macroeconomic models account for business cycles? In this article, Keith Sill investigates some of the empirical evidence for the economic importance of news shocks, discusses the failings of the standard macroeconomic model in accounting for the role of news in business cycles, and touches on what the news view of business cycles means for the conduct of monetary policy.

Our expectations about how the future will unfold can have important implications for the choices we make today. An expectation of future unemployment might result in reduced consumption and higher savings today. Or an expectation of a future promotion and higher salary may induce higher consumption and lower saving today, even before the higher salary is realized. This rather obvious feature of individual behavior may have important implications for the economy as a whole. Macroeconomic aggregate variables such as consumption and investment could rise in response to a collective belief that the economy will experience higher productivity in the future.

A recent example of how collective beliefs can influence economic variables is the dot-com boom and bust of the late 1990s. In the late 1990s, as tech-stock prices were surging, we often heard discussion about an impending "new economy" in which advanced Internet and communications technologies would lead to higher future productivity growth and greater economic efficiency. We could argue that those collective beliefs about the future became embedded in stock prices and led to dramatic gains in the equity prices of technology-related companies. In turn, higher stock prices made households feel wealthier, which induced increased consumption. Businesses began investing in the emerging technologies in the hopes of generating higher future profits.

These boom times, seemingly driven at least in part by overly optimistic expectations about the future, largely came to a halt after August 2000. After the fact, expectations proved to be optimistic. Over the next three years, the stock market declined on the order of 40 plus percent. In March 2001, the economy entered a recession that lasted eight months. The level of real private nonresidential fixed investment (business fixed investment) declined 16 percent from the fourth quarter of 2000 to the first quarter of 2003. The boom was followed by a bust.

Keith Sill is an assistant vice president and director of the Real-Time Data Research Center in the Research Department of the Philadelphia Fed.

In 1927, A.C. Pigou, an economics professor at Cambridge University who studied business cycles, wrote a book called *Industrial Fluctuations*. In that book, Pigou argued that news about the future or changes in consumers' and businesses' expectations are important drivers of the business cycle and economic fluctuations. In particular, when firms and suppliers of capital are optimistic about the future, they decide to invest more today in order to accumulate capital to meet higher expected future demand. If it turns out that expectations are overly optimistic, firms pull back on investment and consumers retrench, leading to an economic downturn or recession.

This seems to be a plausible explanation of what happens in boom-bust cycles like the dot-com episode. But do the data really support this story, and are Pigou cycles pervasive features of modern economies? Also, is Pigou's theory consistent with how modern macroeconomic models account for business cycles? An emerging body of empirical evidence supports the view that news about the future is an important factor in explaining fluctuations in output and employment. However, the standard workhorse model used by macroeconomists predicts that good news about the future leads to what looks a lot like a recession today! If good news about the future results in booms today, the standard macroeconomic model needs some modification if it is to explain such behavior.

We will investigate some of the empirical evidence for the economic importance of news shocks and how they affect the economy. We will also discuss the failings of the standard macroeconomic model when it comes to accounting for the role of news in business cycles. A recent line of research explores this issue and examines the features necessary to get models to predict booms in response to good news about the future economy. Finally, we will touch on what the news view of business cycles means for the conduct of monetary policy.

stock market is a key component of the analysis because it is generally perceived to be forward-looking in the sense that news that people receive about future prospects for the economy should be reflected right away in stock prices, since participants trade on that information.

Is there any hard evidence that changes in expectations about the future lead to significantly large changes in economic activity today?

EMPIRICAL EVIDENCE ON EXPECTATIONS AND FLUCTUATIONS

Is there any hard evidence that changes in expectations about the future lead to significantly large changes in economic activity today? The key problem that must be addressed when deciding whether news about the future affects the economy is separating the scenario "economic booms lead to changes in expectations" from the scenario "changes in expectations lead to economic booms." That is, we have to account for the fact that changes in current economic activity also give rise to changes in expectations about the future economy. Once we control for that possibility, we can investigate the extent to which changes in expectations can drive economic fluctuations.

A recent paper by Paul Beaudry and Franck Portier provides some evidence of the importance of news about the future to fluctuations in economic variables such as consumption and hours worked. Beaudry and Portier undertake a statistical analysis of data on productivity and stock market prices to investigate this question. The

Beaudry and Portier are able to tease shocks out of the data on stock prices and productivity that give insight into how expectations about the future affect today's economy.[1] They find that their shocks contain information about future productivity growth that is also reflected in current stock prices. In addition, they find that long-run changes in productivity are reflected in stock prices before these changes show up in near-term productivity. These findings are consistent with the view that financial market participants can anticipate productivity improvements, perhaps because there is a long delay between receiving news about a new productivity-enhancing technology and the realization of higher productivity once the technology is implemented. Beaudry and Portier call this the "news view."

We can interpret the shocks that Beaudry and Portier identify as news shocks because they represent unpredicted or unexpected information that shows up in productivity and stock prices. This

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[1] For our purposes, a shock can be thought of as the difference between a predicted outcome and the actual outcome.

is what news is: information that wasn't previously available that tells us something about final outcomes.

With news shocks in hand, we can now investigate whether changes in news about the future have an impact on current variables such as consumption, investment, and hours worked. Figure 1 shows how stock prices, per capita consumption, and hours worked per capita respond to a positive news shock. The figure shows the response of these variables over time to two different measures of the news shock, though we see that it makes little difference which shock we focus on, since they both imply the same paths for stock prices, consumption, and hours worked. If there were no response to the news shocks, the lines in the figure for stock prices, consumption, and hours would stay near zero. What we see instead is that stock prices, consumption, and hours worked all jump up right away in response to positive news. Consumption and hours worked continue to rise for about five quarters and then give up some of their gains in apparent recession-like behavior. Eventually, consumption resumes its general upward trend. Hours worked flatten out because hours per capita tend not to rise over time. (People do not work more and more hours as productivity increases — leisure is valuable, too!)

Beaudry and Portier also investigate how much of the variation in consumption and hours worked can be explained by their identified news shocks.[2] This is a measure of how economically important such shocks might be. They find that news shocks

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FIGURE 1

Response of Stock Prices, Consumption, and Hours Worked to Two Measures of Positive News About the Future
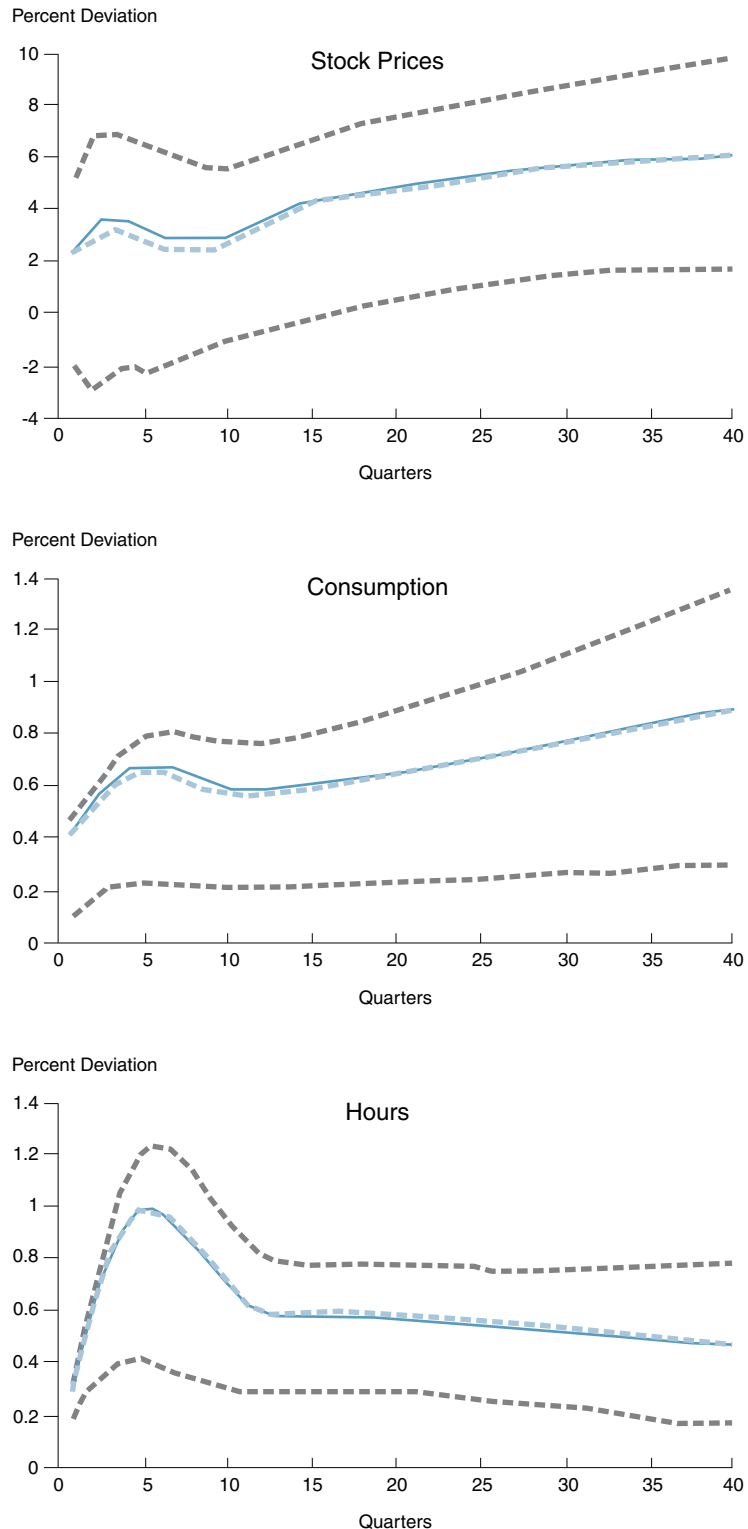
From Beaudry & Portier (2006). Used with permission. Dotted gray lines indicate 95 percent confidence interval

account for 40 to 80 percent of the variation in consumption, investment, and hours worked over the postwar period. This is a huge number and suggests that news about the future may be an important determinant of the economy's fluctuations.

A second piece of evidence on the importance of news shocks for economic fluctuations can be found in recent research I conducted with Sylvain Leduc. We use data from the Philadelphia Fed's Livingston Survey and the Survey of Professional Forecasters (SPF) to identify news shocks and to assess their effect on variables such as the unemployment rate, stock prices, and inflation. Both the Livingston and the SPF are surveys of professional forecasters who are asked to make forecasts of a range of macroeconomic variables. The Philadelphia Fed then tabulates and publishes the forecasts.[3]

Survey data give us a unique insight into expectations of the future, since they are a direct measure of such expectations. Since we know the time at which the surveys are conducted, we can use that information to help us identify news shocks. That is, broadly speaking, we know which realizations of economic variables the forecasters already knew or had in hand when they made their forecasts. So forecasters for a June survey would know May unemployment rates but not June unemployment rates, since those data would not have been released yet. We can use that type of information to identify news shocks and assess their impact on economic variables. More specifically, we analyze a statistical model that contains forecasts of future unemployment rates, current

unemployment rates, interest rates, and inflation. We align the data in such a way as to help us identify shocks to forecasts of future unemployment that are not driven by the other variables in the system. We interpret these shocks as news about the future that changes people's expectations because the shocks are the difference

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between what we expect the predicted unemployment rate to be and what the prediction actually turns out to be. In this context, a positive shock is bad news because it implies that forecasts of future unemployment rates were higher than we would have predicted them to be.

Once we have these news shocks, we can examine how they affect the other variables in the model, such as the unemployment rate, CPI inflation, and interest rates.[4] Figure 2 presents a set of responses from such a shock. The two columns from the figure show which survey measure was used in the model: The left side shows the Livingston Survey and the right side, the Survey of Professional Forecasters. Each row represents the response of a different variable to a news shock that decreases the expected unemployment rate (what economists call impulse responses). The top row of the figure shows how forecasts of six-month-ahead unemployment rates evolve when there is a news shock that leads forecasters to expect lower future

unemployment. The second row shows how actual, or current, unemployment responds to the shock. We see that the unemployment rate falls, so that in response to expectations of future bad times, current times turn better. The third row shows the response of inflation to the news shock. Consistent with the current upturn story, near-

term inflation rises. The next row shows the response of stock returns, measured using the S&P 500, to the news shock. Here we see that when news about expected good times arrives, the current stock market rises. Finally, the last row shows the response of short-term interest rates to the news shock. Here, we see that monetary policy tightens as the economy booms in the near term in response to the good news shock.
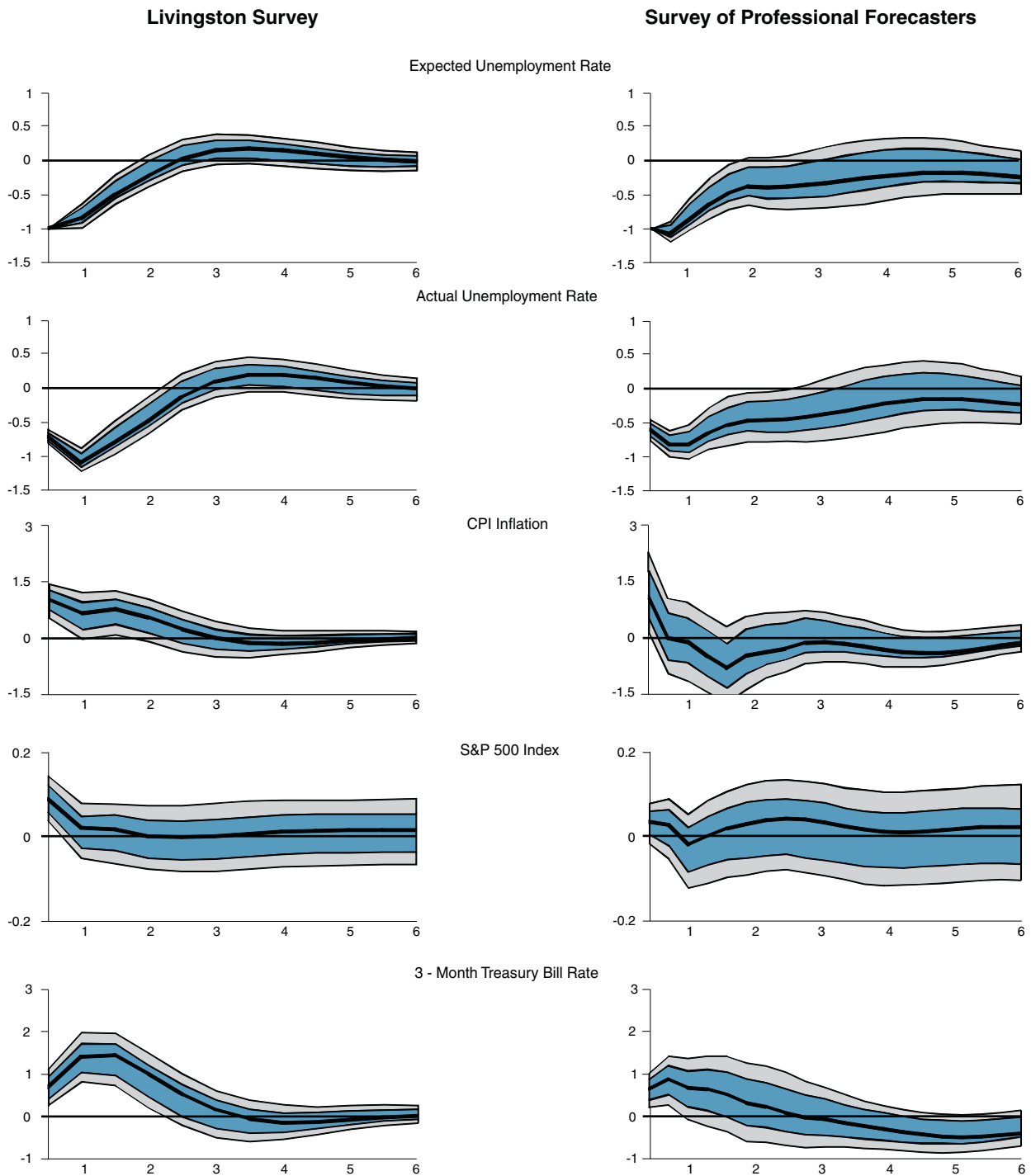
The impulse responses in Figure 2 suggest that the current economy surges when the future economy is expected to be better. But how strong are the results? Plotted around the impulse responses are confidence bands that indicate how sure we are that a response is different from zero. We see from the figure that the responses of all the variables are significantly different from zero. To further assess the strength of the results, we performed variance decompositions similar to those in the Beaudry and Portier paper described above. We find that about 50 percent of the variability of forecast errors for our variables can be explained by news shocks, a result that is in line with the findings in Beaudry and Portier. So, in

[3] A description of the surveys and survey data are available on the Philadelphia Fed's website at http://www.philadelphiafed.org/research-and-data/real-time-center/.

[4] We chose these variables because they are not generally subject to data revisions over time.

FIGURE 2

Economic Response to Good News About the Future

Livingston Survey   **Survey of Professional Forecasters**

Expected Unemployment Rate

Actual Unemployment Rate

CPI Inflation

S&P 500 Index

3 - Month Treasury Bill Rate

The responses were generated from a VAR with expected unemployment percent, actual unemployment, inflation, equity prices, the 10-year T-bill rate, the 3-month T-bill rate, and dummy variables for oil and fiscal shocks. All of the responses are expressed in percentage terms. The x-axis denotes years. In each chart, the darker area represents the 68 percent confidence interval, while the sum of the darker and lighter areas denotes the 90 percent confidence interval.

sum, we find that the economy surges in response to expectations of better times ahead and that the response of the unemployment rate, inflation, and the short-term interest rate are different enough from zero and explain enough of the variance of the series that we can be pretty confident that it is not a statistical fluke.[5]

THE PIGOU CYCLE

We have seen some of the empirical evidence that suggests that changes in expectations about the future can alter aggregate economic outcomes today. That is, news about the future seems to be a significant driver of current economic fluctuations. What does economic theory have to say about how we might interpret the statistical evidence?

In the early 1900s, A.C. Pigou wrote: "The varying expectations of businessmen ... constitute the immediate cause and direct causes or antecedents of industrial fluctuations." In other words, Pigou believed that changes in expectations about the future were a principal cause of business cycles in the economy. If people were optimistic about the future, current consumption, investment, and output would rise. If they were overly optimistic, once they realized that their expectations were too rosy, the economy would go into recession as businesses and households pulled back on their spending. A Pigou cycle then can arise when

output, consumption, investment, and hours worked jointly increase in response to an anticipated rise in productivity. When the anticipated increase fails to materialize, a recession ensues.

This view of booms and busts seems consistent with the way events unfolded during the dot-com bubble. Expectations about higher future productivity driven

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by Internet-related technologies led to an investment boom in products such as fiber-optic cable. The stock market value of technology stocks rose to unprecedented highs. The rationalization for such high valuations was that the economy was entering a new era of high productivity that should be reflected in future stock earnings and dividends. After the fact, these expectations turned out to be overly optimistic, and the dot-com bust dovetailed into the recession that began in 2001.

Anecdotal evidence suggests that people receive and process news about the future and that such news can affect behavior. For example, stock prices and consumer confidence measures are thought to lead the business cycle. We can tell stories that seem consistent with the Pigou cycle theory of booms and busts. However,

it turns out that this view of the world does not work particularly well in the standard workhorse model of modern macroeconomics.[6] In fact, in the standard model, good news about the future in the form of higher expected productivity can lead to a drop in hours worked, output, and investment today. In the standard model, expected booms lead to what look a lot like recessions today!

To develop some insights into why the standard model gives this result, consider first a case in which households observe an increase in current productivity that they expect will persist into the future. With persistently higher productivity, households are wealthier, since their current and expected future real incomes are higher (for example, real wages rise with productivity in the standard model). In this case, output, employment, consumption, and investment all rise today.

Two forces are at work behind this result. The first is a wealth effect. Higher productivity means higher real income in the standard model. Thus, household wealth increases, and being richer induces more consumption today, since households like to smooth out their consumption over time. But higher wealth also means that households want to consume more leisure; so the wealth effect predicts that hours worked will fall. Offsetting the impact of the wealth effect on work effort is a substitution effect. The substitution effect says that households

[5] See also the paper by Robert Barsky and Eric Sims. They examine how output and consumption respond to innovations using responses from the Michigan Survey. They also find that changes in people's expectations about the future lead to significant changes in current output, consumption, and productivity. Stephanie Schmitt-Grohe and Martin Uribe estimate an equilibrium model with news shocks and find that news about the future can account for a substantial fraction of economic fluctuations.

[6] By a standard macroeconomic model I am referring to the neoclassical growth model. That model is one of a representative household that maximizes its consumption and leisure, subject to the constraint that consumption and investment are no greater than what can be produced with capital on hand and labor effort. For a very accessible discussion of the neoclassical growth model, see the *Business Review* article by Satyajit Chatterjee.

work harder when productivity is higher and then invest the proceeds to attain higher consumption in the future when productivity is lower. Thus, the substitution effect indicates that in response to higher productivity today, households work harder, consume less, and save more.

Which effect is dominant: wealth or substitution? It depends first on how persistent the increase in productivity is expected to be. The more persistent the rise in productivity, the stronger the wealth effect. Also important is how responsive labor supply is to changes in the real wage. If labor supply increases a lot in response to an increase in wages, the substitution

effect becomes stronger. Figure 3 shows how consumption, investment, output, and hours worked respond in the standard model to a productivity shock calibrated in the standard way — a fairly persistent shock. We see that for labor supply, the substitution effect dominates the wealth effect and hours worked increase. In addition, output, consumption, and investment all rise in response to a positive productivity shock.

Consider now what the model predicts if the productivity shock is expected to affect the economy in the future but not directly today. In anticipation of higher real wages in the future, households feel wealthier today

and so spend more on consumption and leisure. Because the productivity shock hits in the future, there is not a strong substitution effect today. (Households are not more productive today; they only expect to be in the future.) Consequently, households have little incentive to work harder today, since they are no more productive than before. Thus, in response to higher expected future productivity, current consumption rises and hours worked fall. With lower hours worked, output falls. Since output falls and consumption rises, investment must fall, since output equals consumption plus investment (we are ignoring net exports). Thus, an expected

FIGURE 3

Standard Model: Response to a Positive Productivity Shock
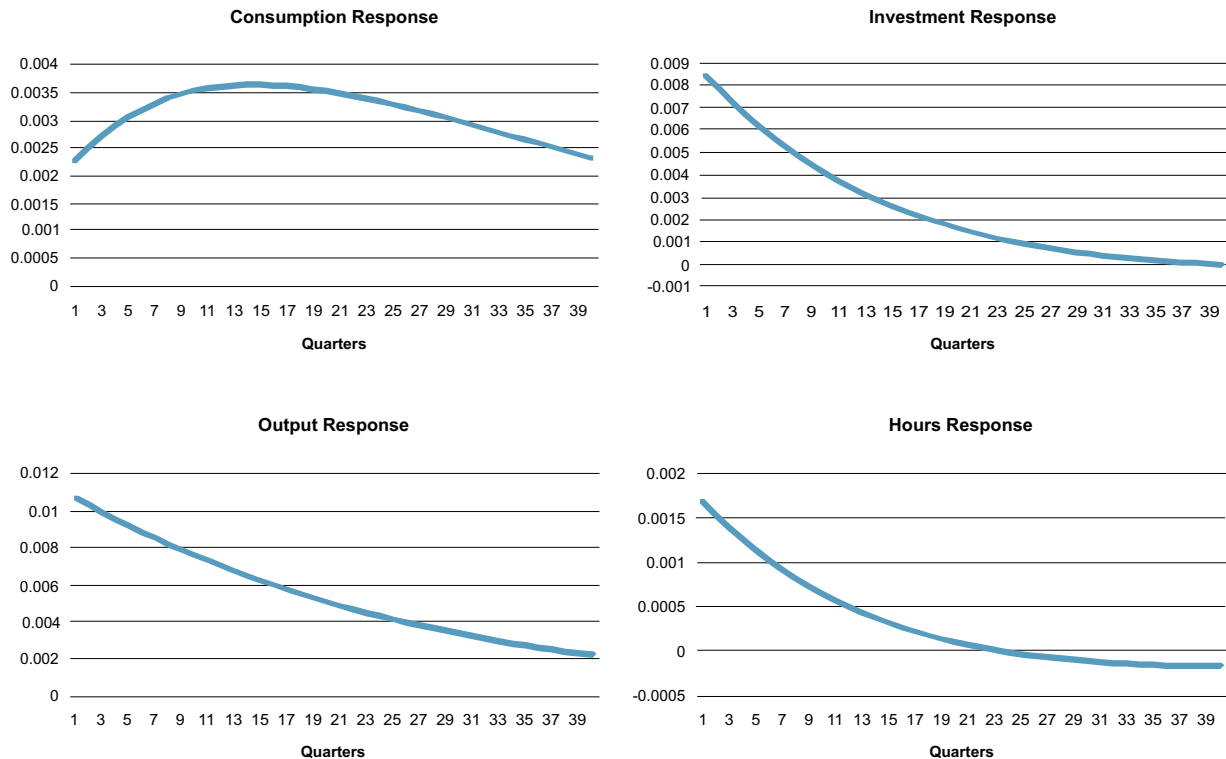
Panels show the response of consumption, investment, output, and hours to a percent increase in the productivity shock at time 1.

boom in productivity leads to lower output and hours worked today (but higher consumption). This intuition is revealed in the impulse responses shown in Figure 4. Here, we show the response of consumption, investment, hours worked, and output to a shock that signals that productivity will rise one year from now.

So it seems that the standard model does not deliver a result about the effect of news on the economy that agrees with the empirical evidence we presented earlier. Remember, that evidence suggested that in response to good news about the future economy, there is a boom today, with consumption, output, and investment all increasing. Is there a model whose predictions agree with that evidence?

It turns out that a modified version of the standard model can predict a boom in response to expectations of good times in the future. The standard model has to be modified so that the wealth effect on labor supply is not strong. In addition, various other frictions must be added to the model so that both consumption and investment respond positively to good news about the future. These modifications are detailed in a recent paper by Nir Jaimovich and Sergio Rebelo. They allow firms to vary the intensity with which they use capital, which is important because it increases the extent to which output can respond to news about the future. They also assume that it is costly for firms to adjust their stock of capital, which gives firms an incentive to respond immediately to future productivity changes in order to smooth out costs over time.

A somewhat different approach is taken in a recent paper by Wouter den Haan and Georg Kaltenbrunner. They postulate that in order to benefit from future productivity gains, firms and households have to invest resources today. In den Haan

Standard Model: Response to News Today That Productivity Will Increase in Four Quarters
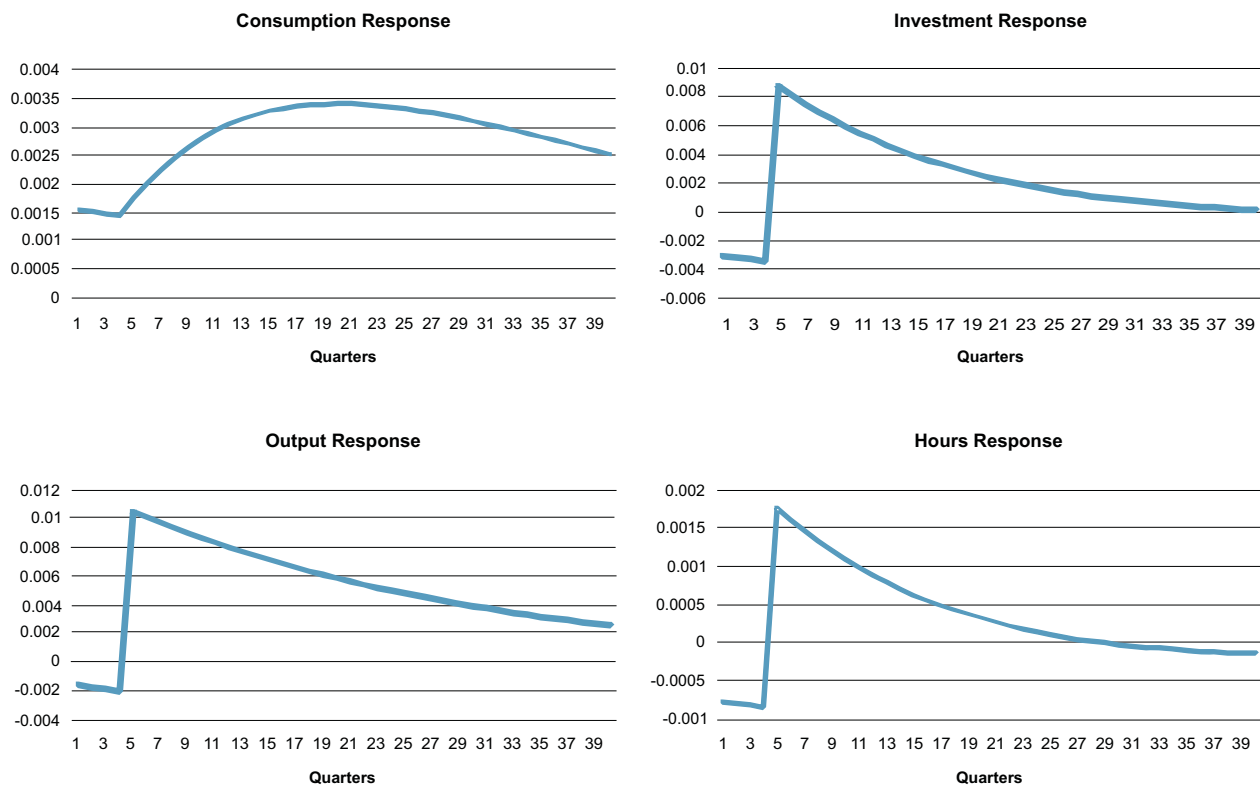
Panels show the response of consumption, investment, output, and hours to a 0.01 percent increase in the productivity shock at time 1 that is realized at time t=4.

and Kaltenbrunner's model, firms and workers that are not already engaged in production when news about higher future productivity is revealed need to get together today and form productive relationships. Since building productive relationships requires both time and resources, firms start investing in new projects right away and immediately begin looking for new workers with whom to build productive relationships. Thus, employment, investment, and output rise in response to expectations of higher future productivity growth in their model.

So we see that there are several reasonable approaches we might take in order to get a coherent theoretical model of the economy that has the feature that expectations of good times in the future lead to booms today. Discriminating among these alternative modeling strategies is only at the earliest stages in the economics profession. Time will tell which modeling strategy most closely aligns with the regularities found in the data.

EXPECTATIONS, BUSINESS CYCLES, AND MONETARY POLICY

If economic variables such as stock prices, output, employment, consumption, and investment do respond in a meaningful and important way to expectations about the future, what are the implications for policymakers? Recently, the economy has experienced an unusual amount of asset-price volatility whose source can perhaps ultimately be traced to overly optimistic expectations about continued increases in house prices. When house prices began falling instead of rising, financial markets began to perform badly, and a downturn in real economic activity ensued. This episode is not unique. Over the past 20 years or so, several

boom-bust cycles have unfolded around the world, including Japan in the late 1980s and East Asia in the late 1990s. These episodes have generated debate about the importance of the role played by monetary policy in booms and busts: Often the episodes were accompanied by heightened criticism of central banks for fueling the booms by keeping monetary policy too easy for too long.

Asset-price run-ups and asset-price

volatility seem to be key features of expectations-driven booms in practice. This raises a question about the extent to which monetary policymakers should take asset prices into account when setting policy. Unfortunately, it is difficult to determine the extent to which asset prices are aligned with "true fundamentals" or are being driven by nonfundamental factors. For monetary policymakers who are concerned with stabilizing inflation and employment growth, determining the "right" level of asset prices seems a tall order. However, it may be the case that by focusing on stabilizing inflation and employment growth, policymakers can stabilize asset prices as a byproduct. This is the message of a study by Ben Bernanke and Mark Gertler.

Consider the case of a central bank that operates monetary policy in such a way as to try to achieve an inflation target. That is, the central bank's mandate is to keep inflation

close to some level — say, 2 percent — over a suitably defined length of time. There is some reason to expect that such a monetary policy will act as a natural stabilizing force with respect to boom-bust cycles. The inflation-targeting approach to monetary policy dictates that monetary policy should be adjusted to offset emerging inflationary or deflationary pressures.[7] Bernanke and Gertler argue that by focusing on inflation, central banks

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in effect respond to the bad effects of booms and busts without having to take an explicit stand on whether asset prices are valued fairly (according to economic fundamentals) in booms. For purposes of the ensuing discussion, we will say that, in a boom, asset prices are rising, an assumption that agrees with most definitions of booms in the data.

How can inflation targeting end up "getting it right" with respect to policy and expectations-driven cycles?

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[7] Bernanke and Gertler actually argue for a regime of flexible inflation targeting, which, they contend, has three characteristics. The first is that monetary policy is committed to attaining a target level of inflation in the long run and price stability is the overriding goal of monetary policy. Second, within the constraints imposed by achieving a long-run inflation target, policymakers have some flexibility in the short run to achieve other objectives, such as stable output and employment. Third, there is a commitment to transparency and openness on the part of monetary policymakers so that private-sector expectations about policy and the economy are well grounded.

Bernanke and Gertler argue that inflation targeting leads policymakers to automatically adjust interest rates in such a way as to stabilize the economy in the face of booms. The idea is that booms are associated with increases in demand; that is, consumption, investment, and ultimately output rise. In Bernanke and Gertler's view, increases in demand are in turn associated with rising inflation. But an inflation-targeting central bank will raise the interest rate in response to rising inflation. In effect, the central bank leans against the wind. This reins in the increase in demand and stabilizes financial markets as well.

Financial markets are likely to stabilize for several reasons. The first is that the stability of the broader economy is, in itself, stabilizing for financial markets. Second, suppose the economy starts to go into recession and asset prices start to decline — which will tend to erode the balance sheets of banks (and other firms, as well). The falloff in demand and declining inflation call for policymakers to lower the interest rate, which can reduce the economy's vulnerability to further bad shocks. Finally, if financial market participants expect policymakers to act in this way, it may mean that the overreaction of asset prices might be moderated. Overreaction could occur if asset prices are in part driven by a market psychology or some other factor, such as poor regulatory practices, not directly fundamental to determining asset prices.

Bernanke and Gertler's paper is really about monetary policy and asset-price volatility. They note that financial stability is becoming an increasing concern for monetary policymakers because, over the past 25 years, a number of countries have experienced major boom-bust cycles in the prices of assets such as equities and real estate. Associated with the

bust part of the cycles, as asset prices are falling, real economic activity is declining significantly. We have presented evidence that changes in expectations that can influence real activity also show up in asset prices, such as stock prices. So expectations-driven cycles fit naturally into the asset-price boom-bust cycles with which Bernanke and Gertler are concerned.

> If asset prices fall, the amount of collateral falls, which raises the ratio of borrowing relative to assets, worsens balance-sheet positions, and makes it harder to borrow.

In the Pigou cycles story, the bust part of the cycle comes about when overly optimistic expectations are not realized and firms and households cut back on their consumption and spending. Bernanke and Gertler point out another negative force at work in the bust part of the cycle: negative balance-sheet effects on firms and households from declines in asset prices. This channel can be important because credit markets are characterized by problems such as differential information between parties to a contract, problems of contract enforcement, and misaligned incentives between lenders and borrowers, or managers and investors. Because these problems exist, credit is most widely available and on the best terms to institutions and households that have strong balance sheets (i.e., are in good financial shape with

respect to their assets and liabilities). So balance-sheet conditions become important determinants of borrowing and lending. But falling asset prices can have an adverse impact on balance sheets because firms and households may use the assets they own as collateral for borrowing. If asset prices fall, the amount of collateral falls, which raises the ratio of borrowing relative to assets, worsens balance-sheet positions, and makes it harder to borrow. In turn, the reduced borrowing lowers demand in the economy and may also adversely affect supply by reducing working capital for firms and inhibiting investment. These factors work to further slow down economic activity and worsen economic downturns.

Thus, it can be quite important for monetary policymakers to recognize the downside of an expectations-driven boom-bust cycle. If there is a significant decline in asset prices, households and firms face greater difficulty in financing their consumption and investment decisions, which lowers aggregate demand and can make economic downturns more severe. The good news is that in the Bernanke and Gertler story, central banks can help alleviate these policies not by focusing policy on movements in asset prices but rather by focusing on inflation. Asset prices stabilize as a consequence.

However, there may be circumstances in which inflation targeting does not lead to a good outcome in the face of asset booms. Lawrence Christiano, Roberto Motto, and Massimo Rostagno make this point in their paper. They look at asset price swings since the 1870s and argue that there were three significant boom-bust episodes: one that began in 1920 and ended with the Great Depression, one that began in the mid 1950s and ended in the 1970s,

and one that began in the mid 1990s and ended in the early 2000s. Their model includes inflation-targeting monetary policymakers in an economy with sticky wages and prices as well as adjustment costs to investment.[8] In that environment, boom-bust cycles can easily arise. A feature that distinguishes their paper is sticky wages, which means that nominal wages are not fully flexible in response to the shocks hitting the economy, but rather take time to adjust to the new equilibrium level. Some researchers have argued that this feature of the model is important for matching certain features of the data on the economy.[9]

Suppose then that nominal wages are sticky. How does this cause a problem for an inflation-targeting central bank? When the boom phase starts, it is typical in macroeconomic models for real wages (defined as the nominal wage divided by a general price index) to rise to induce people to work harder. But with sticky nominal wages, the only way that happens is if prices start to fall. An inflation-targeting policymaker sees the drop in inflation and so eases monetary policy by reducing interest rates in order to stimulate demand and push inflation back up to the target level. But this stimulative action ends up feeding the already-present optimism about the economy and generates even faster growth of consumption, investment, and output. Monetary policy ends up making the boom even bigger, and the eventual bust, worse.

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[8] Sticky prices are prices that are slow to respond to changes in supply or demand. Similarly, sticky wages are wage levels that are slow to respond to changes in the labor market.

[9] See the paper by Lawrence Christiano, Martin Eichenbaum, and Charles Evans for a more detailed discussion of model features that lead to a better match with the data.

FIGURE 5

Log Stock Prices and Inflation
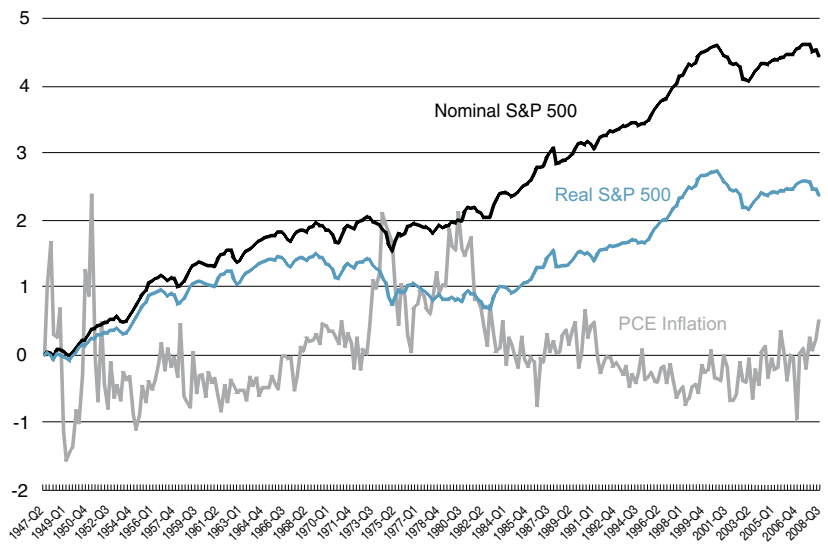
Each variable is normalized to 1 in 1947Q2. The chart shows 100 times the log of the resulting series.

If inflation targeting is counter-productive in this environment, what should a monetary policymaker do? Christiano, Motto, and Rostagno argue that policymakers also need to monitor credit market conditions as well as inflation because credit growth is correlated with booms. Consequently, if policymakers observe strong credit growth and declining inflation, they should still "lean against the wind" and raise interest rates to slow the economy and temper the boom.

Bernanke and Gertler and Christiano, Motto, and Rostagno have different takes on whether inflation targeting helps stabilize an economy that experiences a boom. The key difference between the conflicting accounts is how inflation behaves during the boom phase of the cycle. If inflation rises in the boom phase, Bernanke and Gertler's stabilization

argument holds and inflation targeting will be stabilizing for the economy. If inflation falls during the boom phase, Christiano, Motto, and Rostagno's argument holds and inflation-targeting policy is destabilizing for the economy. Unfortunately, the data do not give a clear-cut answer about the relationship between stock market booms and inflation. The big problem is defining what constitutes a boom in asset prices: There is no completely objective measure. Figure 5 plots the log of the S&P 500 index in both nominal and real terms and the rate of inflation measured by the personal consumption expenditures (PCE) index.[10] Clearly, the correlation between inflation and asset-price

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[10] Since the index is plotted in logs, a change in the level of the index gives the percent change in the index.

booms depends in part on how booms are identified. For example, we might try to define a boom as above-trend growth in the stock market index. But then we would have to decide how to measure trend growth in the stock price index. Deviations from a linear trend look different than deviations from a trend that varies smoothly over time or a linear trend that has breaks in it.

For a more general look at the data, we can go back to Figure 2. Here we have not defined booms or busts but instead relied only on the postwar data (although we have also made some identification assumptions as detailed above). The figure shows that in response to higher expectations of future unemployment, stock prices decline and inflation declines. Flipping

that around, we can say that when expectations for the future economy are unusually good, stock prices rise as does inflation. At least over the postwar period, the response of asset prices and inflation seems to line up better with the view in Bernanke and Gertler. Indeed, Figure 2 also shows that the Federal Reserve tended to tighten policy in booms and ease policy in bad times. That is not to say, though, that the Christiano, Motto, and Rostagno story is without merit. It is hard to argue against the view that monetary policymakers would be well served by monitoring credit market conditions as well as inflation in setting policy. Indeed, the Federal Reserve looks at a broad array of indicators when making decisions about the appropriate stance of

monetary policy, even if low and stable inflation is a principal goal of policy.

SUMMARY

Expectations play an important role in decision-making at the individual level, and there is increasing evidence that expectations about the future are important in accounting for fluctuations in economic aggregates. New economic models are attempting to explicitly model the expectations channel for business cycles. With the recent housing-related boom and bust in the U.S. and its manifestations across the globe, it seems even more important that macroeconomists develop models that can help us understand this episode and guide monetary policymakers in their decision-making. 🅱

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