Monetary Policy Report:
Using Rules for Benchmarking

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September 2020

Introduction

This special report highlights ongoing work to benchmark the stance of monetary policy using a range of policy rules that are widely employed in studies of monetary economics.[1] We perform this exercise with a structural forecasting model based on the New Keynesian dynamic stochastic general equilibrium methodology. We then employ this model to explore the expected behavior of economic variables, including the policy rate, under alternative policy rules. The policy rules help to benchmark the current stance of the federal funds rate, and they provide guidance on how the path of policy is likely to evolve in the context of the model. Such an exercise as part of a more comprehensive quarterly monetary policy report would enhance communication and promote a more systematic approach to monetary policy

We begin with an overview of the economy and then discuss the benchmark model we use to generate our forecasts. The forecasts are generated with the federal funds at its effective lower bound (ELB) throughout the forecast horizon.

Economic Overview

Economic activity plunged by 31.8 percent at an annual rate in the second quarter after declining by 5.0 percent in the first quarter. However, most forecasters are expecting a robust bounce back this quarter that may approach a 30 percent gain in economic activity. The second quarter's

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historic decline was induced by a health crisis and the economic lockdowns that occurred in response to the rapid increase in cases, hospitalizations, and deaths due to the SARS-CoV-2 virus. Worries related to the coronavirus have also led to a large voluntary retrenchment in consumer activity, as people reduced expenditures in various sectors such as airline travel and leisure and hospitality. Indeed, the decline in consumption was responsible for a sizeable share of the decline in second-quarter GDP. The declines in consumption largely occurred in goods and services associated with activities that involve person-to-person contact. And even though lockdowns have been relaxed, passenger throughput at airports remains more than 70 percent below its level compared to a year ago, and the number of seated diners remains 48 percent below the level seen at this time last year. It is unlikely that these sectors will fully recover anytime soon, if at all.

There are, however, a number of recent bright spots indicating that the economy is recovering faster than most forecasters thought. Consumption activity has picked up noticeably, as evidenced by recent retail sales numbers, which grew by 0.6 percent in August after increasing by 0.9 percent in July. The strength was led by a 4.7 percent rise in food services and drinking places. As well, the sale of light vehicles has been steadily increasing, and coupled with strong housing demand, may reflect growing confidence among consumers. People don't buy houses and cars if they expect to lose their jobs. While consumption remains fairly robust, its growth rate is well below what we witnessed in late spring. While the growth in consumer spending is currently historic, it does appear that some of the momentum is waning a bit. Overall, though, the recent data on retail sales is pointing to annualized third-quarter growth in consumption of around 30 percent. The use of credit and debit cards confirms the strong uptick in consumption. As of the week ending August 26th, one of our sources showed debit card spending 15.2 percent above its year-ago level and credit card spending beginning to approach its year-ago level. As well, households have been saving at historic rates and have accumulated significant precautionary balances for future use. Those balances are largely concentrated in high-income households, with lower-income households being the hardest hit by the pandemic. The expiration of the CARES Act is definitely a cause for concern, and although it is too early to tell, it may in part be responsible for the declining momentum in consumer spending.

The labor market has also bounced back significantly, with nearly 1.4 million net new jobs added in August after a gain of 1.7 million jobs in July and 4.8 million in June. These gains have led to a fall in the unemployment rate from 13.3 percent in May to 8.4 percent in August. The gains have not been evenly distributed, as African Americans have not been returning to work as fast as whites and Asians. As with consumption, the gains have been slowing as sectors that are recovering are beginning to approach their pre-pandemic levels of activity. Other sectors are experiencing more difficulty, and it will take time for the economy to reallocate workers. That feature is reflected by the fact that more people are seeking work than there are jobs being posted by firms, just the opposite of what we saw pre-pandemic. Additionally, around 30 million people continue to receive

some form of government assistance, and many people are declining to reenter the labor market. Fear of catching Covid and the challenges in child care are the key reasons given.

A sector that is experiencing a strong third-quarter recovery is manufacturing; this is reflected in both hard and soft data. Through July, orders for manufactured goods had recovered 73 percent of their March/April decline, and shipments had reversed 81 percent of their March/April decline. Discussions with contacts in the region confirm the numbers, and most contacts are cautiously optimistic. Looking through to August, there does appear to be a slowing in this sector's activity. Industrial production increased by 0.4 percent in August, led by a 0.9 percent gain in manufacturing production, which in turn was led by very strong growth in vehicle assemblies. However, that represents a marked decline in the rate of growth that occurred in June and July. Survey data is consistent with the improvement. The ISM manufacturing survey came in at 56 in August, up from its recent April low of 41.5. Various regional surveys are consistent with the national survey. In particular, the Philadelphia Fed's manufacturing business outlook survey has been in expansionary territory for the last four months.

Another area of strength has been housing, with some measures now surpassing their pre-pandemic levels. Single-family permits have rebounded by an incredible 370,000 units over the last four months and are at their highest level since May of 2007. As well, single-family starts have been steadily increasing, rising by nearly 261,000 units since May. Strength occurred in all regions of the country. A contact who builds high-end homes indicated that many homebuyers were upsizing due to the increase in working from home. As a result of spending so much time at home, people are looking to add offices to the houses they live in, thus needing additional rooms. Low mortgage rates are likely contributing to the ability to upgrade.

On the inflation front, we are witnessing a steady firming, although inflation is still running below the Fed's 2.0 percent target and has yet to overshoot the target. The desire to engineer an overshoot is something that is called for in the new framework statement issued by the FOMC in August. Market-based measures of inflation are also on the rise but remain near historic lows. Survey data from the SPF indicate that long-run inflation expectations remain well anchored and consistent with the FOMC's inflation objective. However, most forecasters do not see inflation going above 2 percent anytime soon.

To conclude, the economy appears to be recovering robustly after the health risks posed by the virus dramatically shut down the economy. Cases and deaths have been declining after the marked increase during the summer. There is still significant uncertainty regarding the future trajectory of economic activity, and the risks are decidedly to the downside. Although recent information concerning the development of a vaccine appear promising, there is still uncertainty over its effectiveness. The lack of agreement on a new stimulus package poses risks to the recovery, and the labor market impediments associated with virtual schooling are preventing

many from returning to the job market. Coupled with the flu, a winter outbreak of the virus remains a possibility, and if that leads to a return to many lockdown provisions, the economy could face another large fall in demand. That is a long list of downside possibilities, and each has a significant chance of occurring. But, for now, it looks like the economy is recovering at a robust rate, and although the momentum may have waned, the fourth quarter will very likely experience above-trend growth.

The Benchmark Model

To create our forecast, we use a structural forecasting model based on the New Keynesian dynamic stochastic general equilibrium (NKDSGE) methodology, which is at the forefront of macroeconomic modeling and forecasting. Our model features households and firms that are forward-looking and that make decisions while facing resource constraints. The model includes a labor market where firms and households engage in search-and-matching behavior—allowing us to model the unemployment rate in a meaningful way. The model features a rich menu of shocks as well as adjustment costs that make wages and prices less than fully flexible in responding to changes in economic conditions. We have added additional shocks to the model to account for the pandemic—but we have not changed the model's structural equations in response to the pandemic. Implicit in this view is that the structure of the economy will return to a pre-pandemic state once the virus is mitigated. There is of course a high degree of uncertainty surrounding that assumption. This forecast might then best be described as having two parts: a judgmental estimate of pandemic dynamics and their persistence, and a model-based forecast for the aftermath of the pandemic. Detailed documentation on the model structure is available from the authors upon request.

The underlying baseline policy rule in the model is a response function of the form

$$R_t = \rho R_{t-1} + (1-\rho)[\Psi_\pi(\pi_{t|t-4} - \pi^*) + \Psi_y ygap_t] + \varepsilon_t^R,$$

where R_t is the deviation of the effective federal funds rate from its long-run equilibrium value, $\pi_{t|t-4}$ is the four-quarter change in core personal consumption expenditure (PCE) inflation, $ygap_t$ is a measure of the output gap, and ε_t^R is a monetary policy shock.[2] The parameters ρ, Ψ_π, and Ψ_y determine how monetary policy reacts to economic conditions.

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[2] The model calibration implies that the long-run equilibrium value of the federal funds rate is 3.5 percent. The output gap is calculated using the flexible-price version of the model. The gap is then measured as the log difference of realized output from its flexible-price counterpart. For the baseline rule, the output gap is a growth gap—the deviation of realized output growth from its longer-run trend.

Table 1

Rule	ρ	Ψ_π	Ψ_y
Baseline	0.85	2.62	0.53

The baseline rule uses parameter values that are estimated from the data using the full NKDSGE model. That is, the baseline rule depicts the historical behavior of monetary policymakers. On its own, the baseline rule predicts a sharply negative federal funds rate over the forecast horizon. We add policy shocks to the model, which bring the funds rate up to the effective lower bound over the next three years. Note that this is tantamount to adding contractionary monetary policy shocks to the model.

Model Forecasts Under the Baseline

We generate a forecast assuming that monetary policy follows the baseline policy rule but that policy shocks pin the rate at the ELB. The forecast is generated using observed data through the second quarter of 2020 together with an assumption on how output growth and unemployment will fare in 2020Q3. The forecast then begins in the fourth quarter of 2020 and extends through the fourth quarter of 2023. The forecast under the baseline is shown in Figure 1. The baseline forecast is represented by the dark solid line. The colored bands around the baseline forecast represent 10 percent confidence intervals of the predictive distribution around the median of the baseline forecast.[3]

The key features of the baseline forecast are as follows:

- Real output is forecast to grow at about a 5.5 percent annual rate in 2020Q4, and a 2.7 percent pace in 2021.

- Core PCE inflation runs at a 1.6 percent pace in 2020Q3, falling to -0.5 percent in 2021Q1. Inflation then rises very gradually over the forecast horizon, reaching only 1.7 percent by the end of 2023.

- The unemployment rate averages 8.3 percent in the fourth quarter of 2020, falling gradually to 5.3 percent at the end of 2023.

- By assumption, the federal funds rate remains at the ELB through the end of 2023.

The baseline forecast calls for output growth of 5.5 percent in the fourth quarter, falling to 1.9 percent in 2021Q1 and then rising to 3.3 percent by the middle of 2021. The model pegs 2020Q3 log-growth at 26 percent. This is lower than the Federal Reserve Bank of Atlanta's GDPNow

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[3] The forecast simulations are generated using Bayesian methods. The fan charts show 10 percent quantiles around the median of the posterior predictive distribution.

forecast of 32 percent and somewhat above the Federal Reserve Bank of New York's Staff Nowcast of 14.3 percent. As mentioned above, the NKDSGE model output forecast is made using quarterly data from the second quarter of 2020 and earlier. The incoming data since June has largely been stronger than initially expected, though more recent data has indicated a slowing in the underlying pace of growth.

The baseline model shows output growth running at a pace that is above its longer-term trend over the forecast horizon.[4] The unemployment rate averages 8.3 percent in the fourth quarter of 2020 and then falls slowly to 7.5 percent in 2021Q4 and 6.1 percent in 2022Q4. By the end of 2023, the unemployment rate is forecasted at 5.3 percent.

Healthy growth and anchored long-run inflation expectations lead to an acceleration of core PCE inflation, from a low of -0.5 percent in 2021Q1 to 1.7 percent at the end of 2023. Thus, the model anticipates that inflation will run well below the FOMC target of 2 percent average inflation over the forecast horizon. Under the baseline policy parameterization, the output growth and inflation outcomes are consistent with a federal funds rate that remains at the ELB over the next three years.

The baseline forecast is somewhat weaker than the median projections from the third-quarter 2020 Survey of Professional Forecasters (SPF) over the forecast horizon. The respondents expected real output growth of 3.2 percent in 2021, 3.5 percent in 2022, and 2.2 percent in 2023. (Note that the SPF reports GDP growth as annual average over annual average.) The SPF's core PCE inflation forecast is 1.5 percent (Q4/Q4) for 2021, rising to 1.7 percent in 2022. The forecasters' path for the unemployment rate is somewhat lower than in the baseline model: The median SPF forecast for the unemployment rate is similar to the baseline forecast, averaging 8 percent in 2021, 6 percent in 2022, and 5.3 percent in 2023.

The September 2020 Summary of Economic Projections (SEP) by FOMC participants shows the median projection for output growth at -3.7 percent in 2020, rising to 4 percent in 2021 and then edging down to 3 percent in 2022 and 2.5 percent in 2023. The median forecast of the unemployment rate is 7.6 percent at the end of 2020, 5.5 percent at the end of 2021, and 4.6 percent at the end of 2022. Core PCE inflation is projected at 1.5 percent in 2020, 1.7 percent in 2021, and 1.8 percent in 2022. For 2023, inflation reaches the target rate of 2.0 percent. Headline inflation is projected to run somewhat weaker than core in 2020 but then at the same rate as core over the remainder of the forecast horizon. The forecast model's baseline forecast for the federal funds rate (Figure 4) is at central tendency of the September 2020 SEP over the forecast horizon.

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[4] The model estimates long-run real per capita output growth of about 1.6 percent. We then assume that population growth averages 0.8 percent per year over the forecast horizon.

The baseline forecast is as well at the market expectations, which call for the funds rate to remain at the ELB over the next few years.

Summary

The baseline NKDSGE model uses historical correlations in the data to generate its forecasts and does not incorporate significant judgmental adjustment. To model the economic effects of the pandemic, we have introduced judgement via short-lived shocks tailored to explain the pandemic dynamics. The NKDSGE model also does not take account of data—besides the federal funds rate—after the third quarter of 2020, and it does not explicitly account for any structural changes that may be induced by the economic response to the pandemic. Based on staff judgement, the model predicts a quick rebound from the second-quarter downturn—note though that we have not built a "second wave" of the virus into the forecast scenario. Uncertainty surrounding the virus and the economic response to the pandemic remains extremely high. The exercise in this document is best thought of as what might happen if the virus is now tapering down and the economy is beginning its return to a pre-virus structure. Those assumptions, however, remain in question. The US is not making particularly strong gains against the spread of the virus, and the possibility of a second wave in the winter remains significant. As uncertainty remains high, social distancing will likely remain somewhat in place and economic interactions are likely to be hindered. As well, fiscal support is waning, and a new stimulus package remains only a prospect at this point.
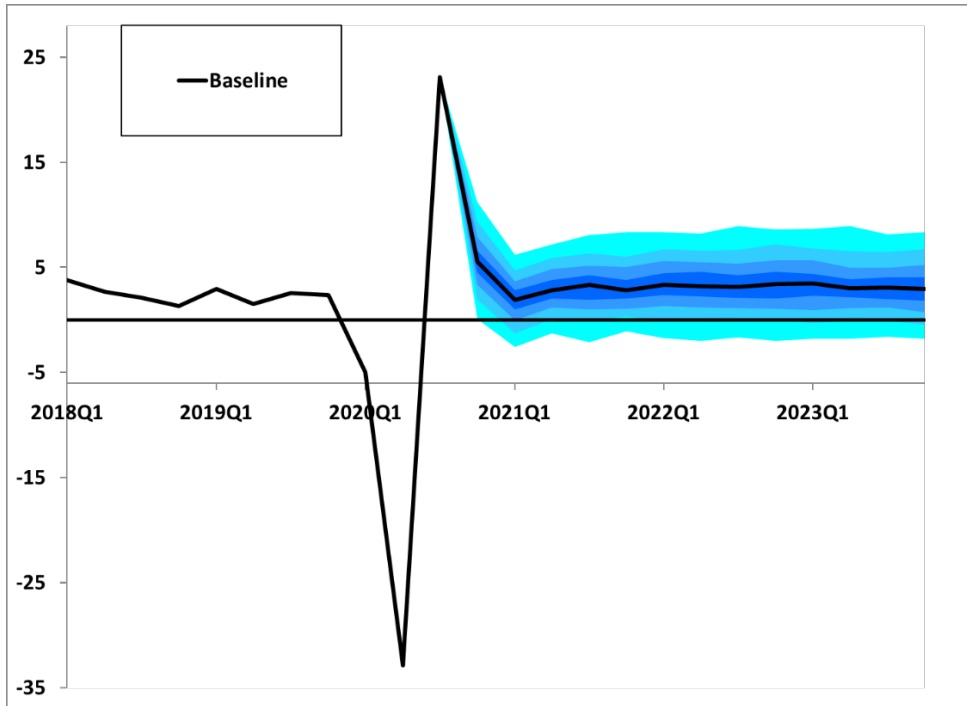
Figure 1: Real GDP Growth

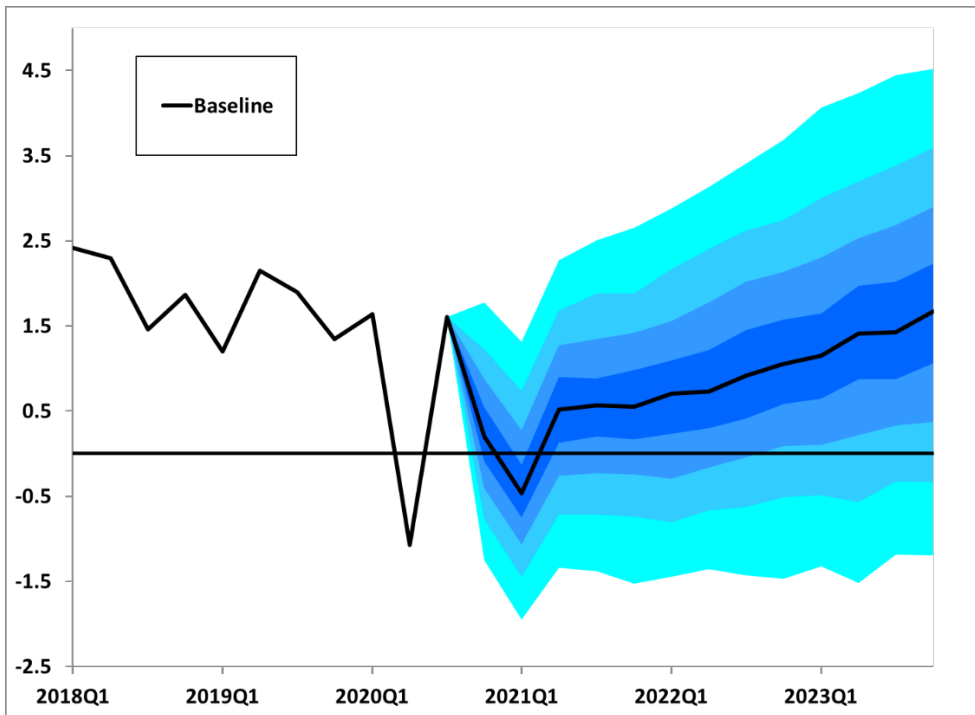

Figure 2: Core PCE Inflation
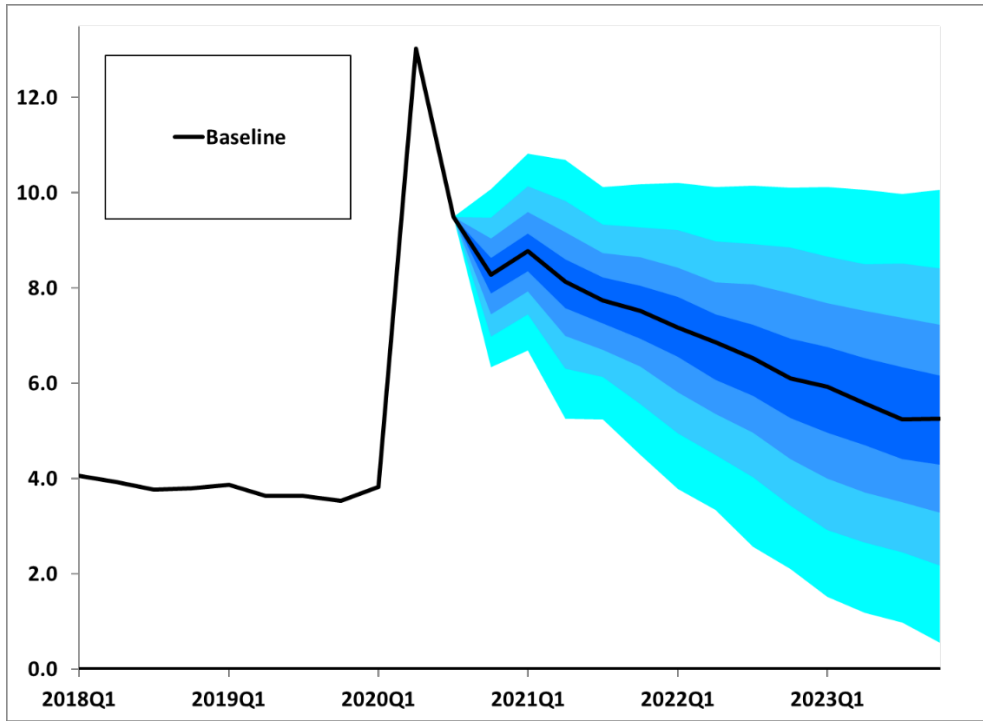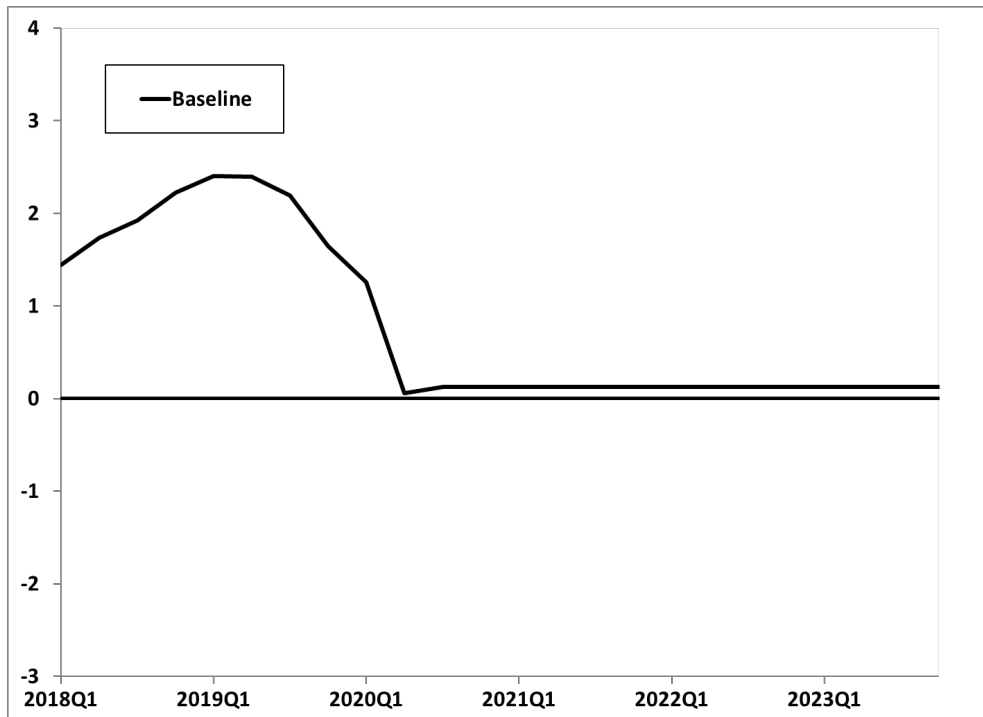
Figure 3: Unemployment Rate

Figure 4: Federal Funds Rate

Note: Historical data have been retrieved from Haver Analytics.