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Monetary Policy Report: Using Rules for Benchmarking

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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 (NKDSGE) 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.

Economic Overview

The hard data continues to suggest that the economy is on solid footing. The unemployment rate remains low, and job gains have exceeded expectations. Disinflation continues at a gradual though uneven pace. Exclusive of international trade effects, the demand side of the economy remains healthy and household balance sheets have been strengthened by rebounding financial markets. However, the soft data continue to show signs of weakness. Consumer sentiment has been ratchetting down, and surveys of economic activity indicate households and firms are becoming cautious about spending and investment. Uncertainty about trade policy remains a wild card for the economic outlook. Though worst-case scenarios have abated somewhat, it remains to be seen just how high and extensive tariffs will be over the medium term—as well as how immigration-related policies might play out.

Most forecasters expect GDP growth to show a rebound in the second quarter from -0.2 percent in the first quarter, when net exports made a large negative contribution to growth. For the second quarter, the Atlanta Fed GDPNow real-time forecast is at 3.4 percent and the New York Fed Nowcast is at 1.9 percent. On the labor market front, job gains for May came in at 139,000 and over the last three months have averaged 135,000 per month. The unemployment rate held steady at 4.2 percent in May and has moved in a narrow range of 4 to 4.2 percent since May of last year. On a year-over-

[1] The views expressed in this report are those of the authors and do not necessarily reflect those of the Federal Reserve Bank of Philadelphia or the Federal Reserve System. We thank Anna Benoit, Jack G. Bunge, and Riley E. Thompson for their assistance.

year basis, growth in average hourly earnings has remained near 4 percent since the beginning of the year. Generally, this level of wage inflation is a bit higher than what is thought to be consistent with 2 percent average annual inflation.

Survey data are showing some weakness. The ISM Composite Index moved down to 49.7 percent in May, a level that edges into contraction territory. The Philadelphia Fed's Manufacturing Business Outlook Survey improved in May but remained in negative territory, indicating that more firms experienced contraction than expansion last month. The Conference Board's Consumer Confidence Index improved in May compared with April but remains below where it was in January 2025. Similarly, the University of Michigan Consumer Sentiment Index rose in May compared with April but is well below where it stood in January of this year. On balance, firms and households appear cautious about current and future economic prospects, though perhaps less cautious than in April.

The latest readings on inflation come from the May Consumer Price Index report, which showed headline inflation at 2.4 percent on a year-over-year basis and core inflation at 2.8 percent. Both readings were little changed from April but are down from their January readings. Personal consumption expenditures (PCE) inflation data is more dated—the most recent numbers are from April. Year-over-year, headline PCE ran at a 2.1 percent pace and core PCE ran at 2.5 percent. Most forecasts anticipate that inflation will rise modestly over the second half of the year in response to higher tariffs.

In the Summary of Economic Projections (SEP) for June, projections for growth in 2025 were revised down (compared with March) and inflation projections were revised higher. The unemployment rate is expected to be about 0.1 percentage point higher over the horizon compared with March. The median projection for the path of the federal funds rate under appropriate monetary policy was revised up slightly for 2026 and 2027.

On balance, the economy appears to be robust, but there are some warning signs in the soft data. Disinflation continues at an uneven pace, but inflation may get a boost from higher tariffs in the months ahead. Uncertainty about the near-term future of the economy remains high but appears to have diminished since April.

The Benchmark Model

To create our forecast, we use a structural forecasting model based on the 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 in which firms and households engage in search-and-matching behavior, which allows 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 has returned to a prepandemic state. Although some economic effects of the pandemic linger through the lens of our model, this forecast is largely based on the economy's prepandemic structure. 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

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

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 PCE inflation (the one-year-average inflation rate), $ygap_t$ is a measure of the output gap, $\mathrm{T\_year\_}\bar{\pi}_t$ is the year-average inflation rate at an annual rate, and ε_t^R is a monetary policy shock.[2] The parameters ρ, Ψ_π, Ψ_y, and

[2] The model calibration implies that the long-run equilibrium value of the federal funds rate is 3 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.

T determine how monetary policy reacts to economic conditions. We run forecast simulations under five different versions of the basic rule shown here:

Table 1

Rule	ρ	Ψ_π	Ψ_y	T
Baseline	0.8	2.5	0.5	0.0
Taylor (1993)	0.0	1.5	0.5	0.0
Taylor (1999)	0.0	1.5	1.0	0.0
Inertial Taylor (1999)	0.85	1.5	1.0	0.0
Average Inflation Targeting	0.85	1.0	1.0	2.0

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.

Model Forecasts Under the Baseline

The forecast, shown in Figures 1–4, is generated using observed data through the first quarter of 2025, together with an assumption of how output growth, inflation, the federal funds rate, and unemployment will fare in the second quarter of 2025.[3] The forecast then begins in the third quarter of 2025 and extends through the fourth quarter of 2027. In each figure, the baseline forecast corresponds to the median of the predictive distribution and is represented by a dark solid line. The colored bands around the baseline forecast represent 10 percent confidence intervals of the predictive distribution.[4]

The key features of the baseline forecast are as follows:

- Real output growth is forecast to be 1.0 percent in 2025 on a fourth quarter over fourth quarter (Q4/Q4) basis. In the next two years, growth is forecast to run at 1.9 and 2.0 percent, respectively. This outlook represents a 1.1 percentage point downward revision in the forecast for 2025 and a small downward revision in the forecast for 2026 and 2027 compared with the March forecast (Figure 5a).

- Core PCE inflation is forecast to be 3.3 percent in 2025, 2.2 percent in 2026, and 1.8 percent in 2027, on a Q4/Q4 basis. The forecast has been revised up by nearly a full percentage point in 2025 and 0.2 percentage point in 2026 compared with the March forecast (Figure 5b).

- The unemployment rate is expected to be 4.5 percent at the end of 2025 and 2026, decreasing to 4.1 percent at the end of 2027. The forecast has been revised up by 0.3 percentage point for 2025 and by about 0.5 percentage point for the next two years compared with the March forecast (Figure 5c).

[3] Our forecast was made prior to the most recent Federal Open Market Committee (FOMC) meeting.

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

- The federal funds rate is expected to decrease by an average of 3.8 percent in the last quarter of 2025 before falling further to 3.3 percent in the fourth quarter of 2026 and 2.7 percent at the end of 2027. The forecast is little changed for 2025, and slightly higher for 2026 and 2027, than it was in the March forecast (Figure 5d).

The forecast for output growth in 2025 is noticeably weaker compared with the March forecast, as annualized output growth in the first quarter of 2025 came in 2.5 percentage points below the model's projection. In addition, after surging in March in anticipation of tariffs, April data on private consumption have been somewhat soft. The forecast for the federal funds rate for the current quarter is determined by nowcasts and is in line with the Federal Funds Futures market. From the third quarter of 2025 onward, the federal funds rate forecast is completely data determined according to the model's policy-reaction function. The model-implied federal funds rate over the fourth quarter of 2025 (on average) is 3.8 percent, consistent with two 25-basis-point interest rate cuts during the second half of this year. This projection is similar to the median June SEP projection for the end of 2025, which is 3.9 percent, and 20 basis points below the value implied by the Federal Funds Futures market (as of mid-June) for the fourth quarter of 2025, on average. The model calls for additional interest rate cuts in both 2026 and 2027 so that the federal funds rate averages 3.3 percent in the last quarter of 2026 and 2.7 percent in the last quarter of 2027. The median SEP projection sees rates at 3.6 percent at the end of 2026 and 3.4 percent at the end of 2027, about 30 and 70 basis points higher than the model, respectively. Uncertainty about how the economy will evolve over the near term remains elevated due to several factors, including uncertainty about the size and effects of federal policy changes concerning spending, taxes, tariffs, and immigration.

After expanding at a pace of 2.5 percent in 2024 (Q4/Q4), output contracted by a seasonally adjusted annual rate of 0.2 percent in the first quarter of 2025, driven by swings in the data related to tariffs policy. We assume output growth at 1.1 percent in the second quarter of 2025. Thereafter, the model anticipates that output growth will remain below trend in the second half of this year before converging to an about 2 percent pace by mid-2026. On an annual average basis, the forecast for output growth in 2025 is in line with the 1.4 percent growth projected by the median Survey of Professional Forecasters (SPF) participant. On an annual average basis, the model forecast for 2026 is slightly stronger than the latest SPF forecast, with growth in 2026 projected to be 0.1 percentage point above the latest SPF forecast of 1.6 percent, while for 2027 the model forecast is 0.2 percentage point weaker than the SPF forecast of 2.2 percent.[5]

The labor market is predicted to soften a tad. We impose a nowcast for the unemployment rate of 4.3 percent for the current quarter, unchanged from the March forecast. Thereafter, the model predicts that the unemployment rate will edge up to 4.6 percent in the first half of 2026 before declining gradually to 4.1 percent at the end of 2027. Thus, in the near term the unemployment rate is expected to increase a tad above the model's natural rate of unemployment—i.e., the level of unemployment that the model returns to in the long run, which is 4.3 percent—which is consistent with a weaker outlook for output relative to the March forecast. The model near-term projection is broadly similar to the latest median SPF projection, which sees the unemployment rate rising to 4.5 percent in 2026.

Inflation edged up in the first quarter of 2025 and is expected to tick up once more in the current quarter. Even so, based on historical data, the model anticipates that inflation will gradually ease back down to 2.8 percent at the end of this year. This puts inflation at 3.3 percent for the year as a whole (Q4/Q4). In 2026 and 2027, the model sees inflation at 2.2 and 1.8 percent, respectively. Thus, inflation is expected to return to levels consistent with the Federal Open Market Committee (FOMC) target of 2 percent average inflation. The SPF's core PCE inflation forecast is 3.3 percent (Q4/Q4) for 2025, edging down to 2.5 percent in 2026 and 2.1 percent in 2027. Thus, on inflation, the SPF forecast is slightly above the model baseline forecast from 2026 onward.

The June 2025 SEP by FOMC participants shows the median projection for output growth at 1.4 percent in 2025, 1.6 percent in 2026, and 1.8 percent in 2027. The median forecast of the unemployment rate is 4.5 percent in 2025 and 2026, and 4.4 percent in 2027. Core PCE inflation is projected to be 3.1 percent in 2025 before stepping down to 2.4 percent in

[5] The model features long-run real per capita output growth of 1.6 percent. We assume that population growth equals 0.9 percent in 2025, 0.7 percent in 2026, and 0.5 percent in 2027, on a Q4/Q4 basis. This projection is roughly in line with the Congressional Budget Office's "Demographic Outlook: 2024–2054."

2026 and 2.1 percent in 2027. The median FOMC member forecast anticipates that the federal funds rate will decline to 3.9 percent at the end of 2025, 3.6 percent at the end of 2026, and 3.4 percent at the end 2027.

Alternative Policy Rules

With this edition of the Monetary Policy Report, we continue to analyze traditional alternative policy rules from the literature as prescriptions for the course of monetary policy over the next few years, as well as the average inflation targeting (AIT) rule (described in Arias, Bodenstein, Chung, Drautzburg, and Raffo [2020]) under a two-year symmetric window, which we have included since the June 2023 Report.

As indicated in Table 1, the alternative rules are forms of the monetary policy rule described above, with differing weights on the inflation gap, the output gap, and the lagged interest rate. Relative to the baseline, the Taylor 1993 and 1999 rules imply lower unemployment and higher interest rates, inflation, and output growth. The inertial Taylor 1999 rule leads to a gradual decline of inflation to target within one year, followed by below-target inflation in 2026 and 2027, with output growth and the unemployment rate broadly similar to the baseline. Interest rates run a little above the baseline in 2025. The AIT rule implies that interest rates remain unchanged this year along with weaker real activity and higher unemployment in 2025; inflation returns to the 2 percent inflation target faster than under the baseline rule.

By the end of 2025, the level of the federal funds rate implied by the rules under analysis differed noticeably: The noninertial alternative rules (Taylor 1993 and Taylor 1999) call for a federal funds rate of about 4.8 percent while the inertial Taylor 1999 and AIT rules see the funds rate between 4.0 and 4.4 percent, compared with 3.8 percent under the baseline rule. By the end of 2027, the forecasts of the alternative rules are between 2.5 percent and 3 percent, close to the baseline of 2.7 percent.

The Taylor 1993 and Taylor 1999 rules call for a higher level of interest rates in 2025 and 2026 relative to the baseline. These rules are noninertial and place more weight on the output gap. As a consequence, they support output growth, leading the output gap to close faster than in the baseline. Higher output growth is consistent with lower real rates, as the nominal rate rises less than inflation. The federal funds rate under these rules peaks in late 2025, and subsequently the rules call for gradual rate cuts.

Throughout the forecast horizon, the inertial Taylor 1999 rule yields lower inflation than in the baseline even though the interest rate path under this rule is only slightly above the baseline for about a year. This is because of the expectations channel: Households act on the expectation that monetary policymakers will keep rates higher for longer compared with the baseline. All else equal, the inertial Taylor rule implies that interest rates would remain high even after inflation has been brought down. Instead, forward-looking households and firms adjust their demand and prices immediately, lowering the output gap and inflation, allowing the monetary authority to not have to follow through on the threat of persistently higher rates. The AIT rule operates by committing to holding higher rates for longer until inflation averages 2 percent over a two-year window. Consequently, inflation returns to the baseline more quickly than under the baseline at the cost of higher output and unemployment.

Summary

The baseline NKDSGE model uses historical correlations in the data to generate its forecasts and does not incorporate significant judgmental adjustment. The NKDSGE model also does not explicitly account for any structural changes to the economy that may have been induced by the pandemic. The model projects that output will expand at a below-trend pace over the forecast horizon and that inflation will gradually ease, despite an uptick in current-quarter inflation, toward the FOMC target of 2 percent in the second half of 2026. Forecast uncertainty remains high due to several factors, including the uncertainty about the specifics of possible changes in federal policies affecting spending, taxes, tariffs, and immigration. These factors are not directly incorporated into the model forecast.

Figure 1: Real GDP Growth

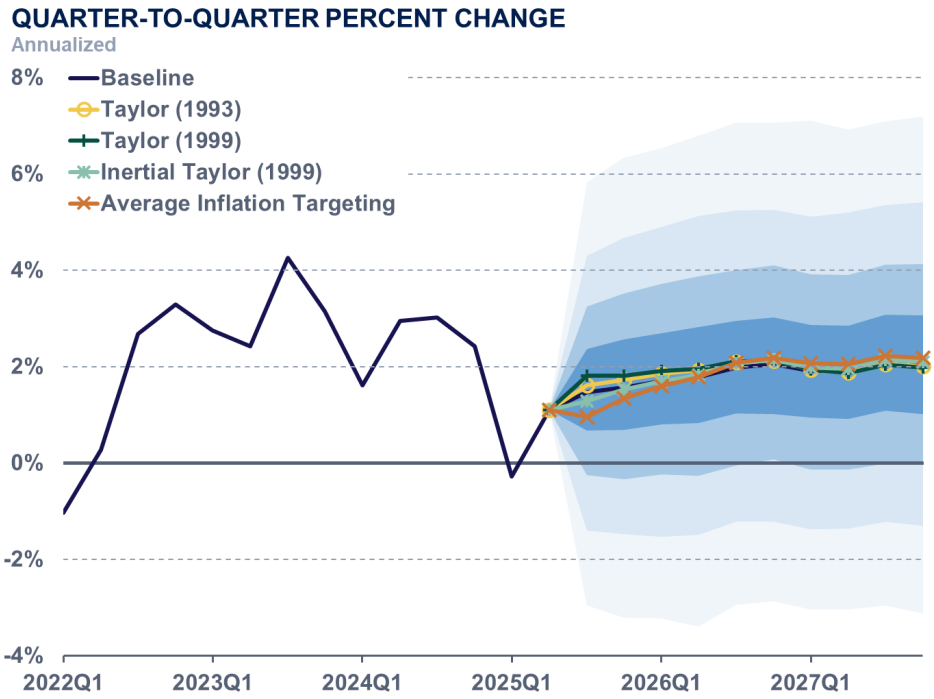


Figure 2: Core PCE Inflation

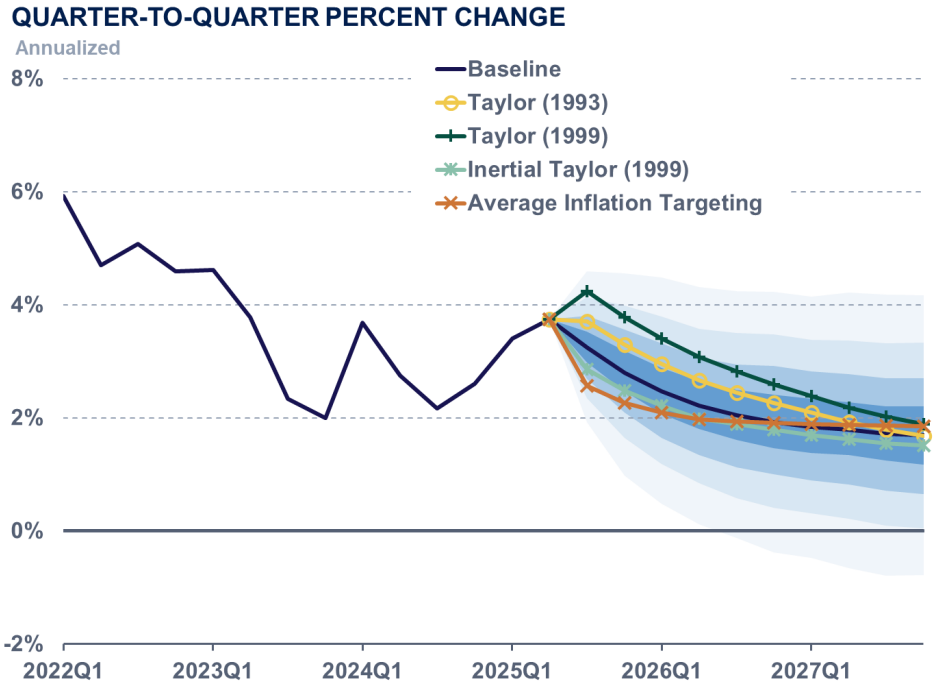


Figure 3: Unemployment Rate

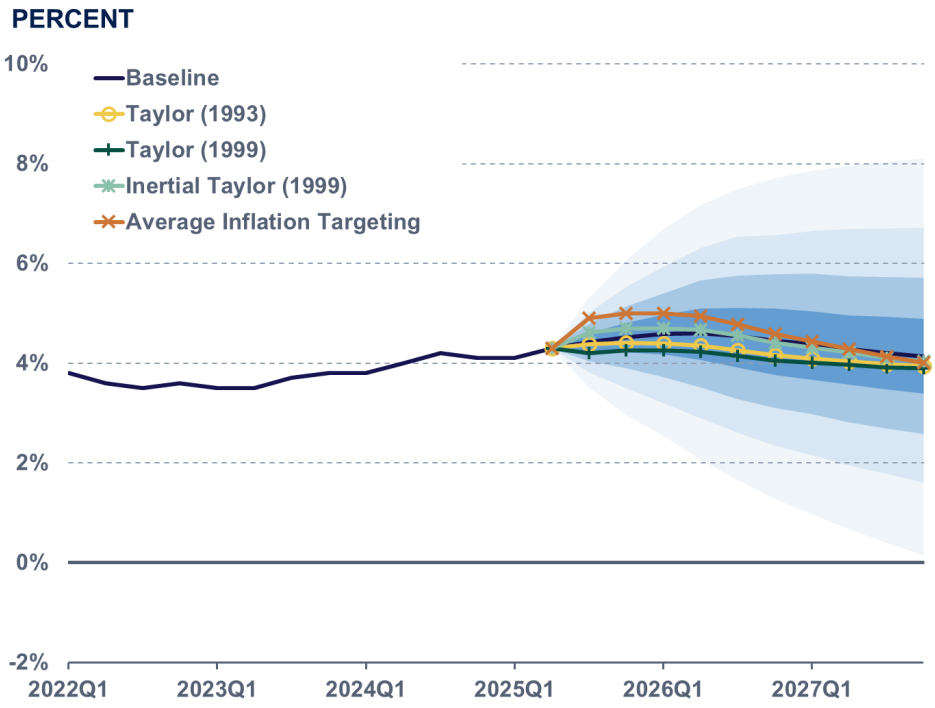


Figure 4: Federal Funds Rate

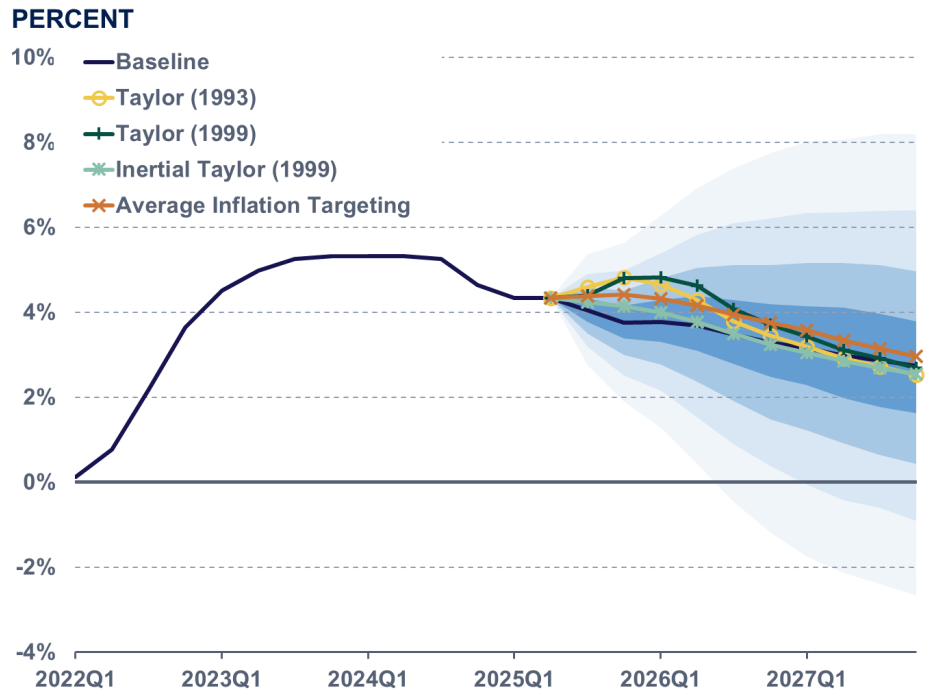


Figure 5: Baseline Forecast Comparisons

Figure 5a: Real GDP Growth

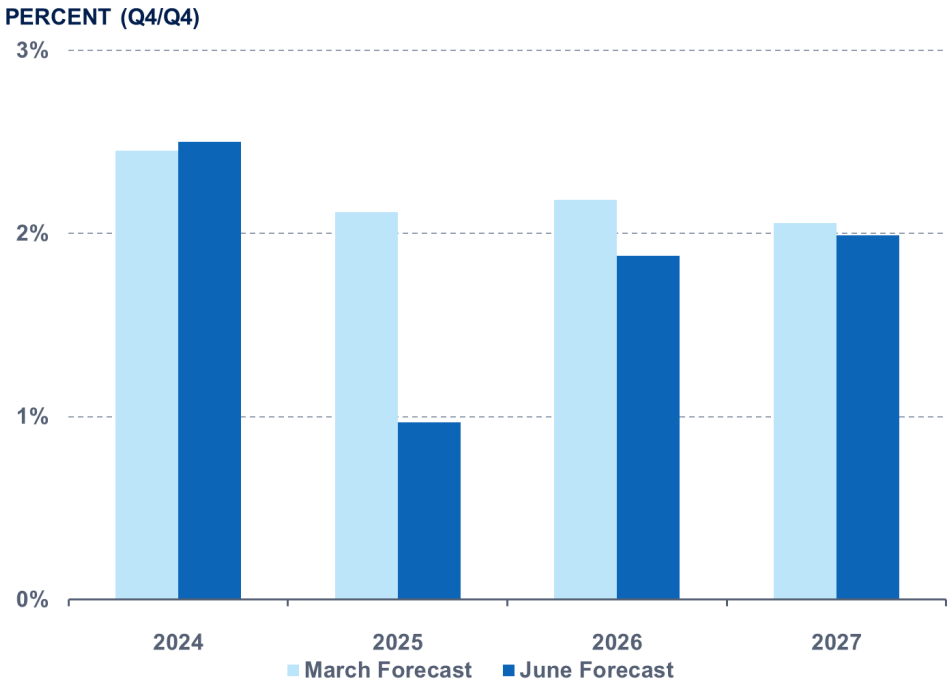


Figure 5b: Core PCE Inflation Growth

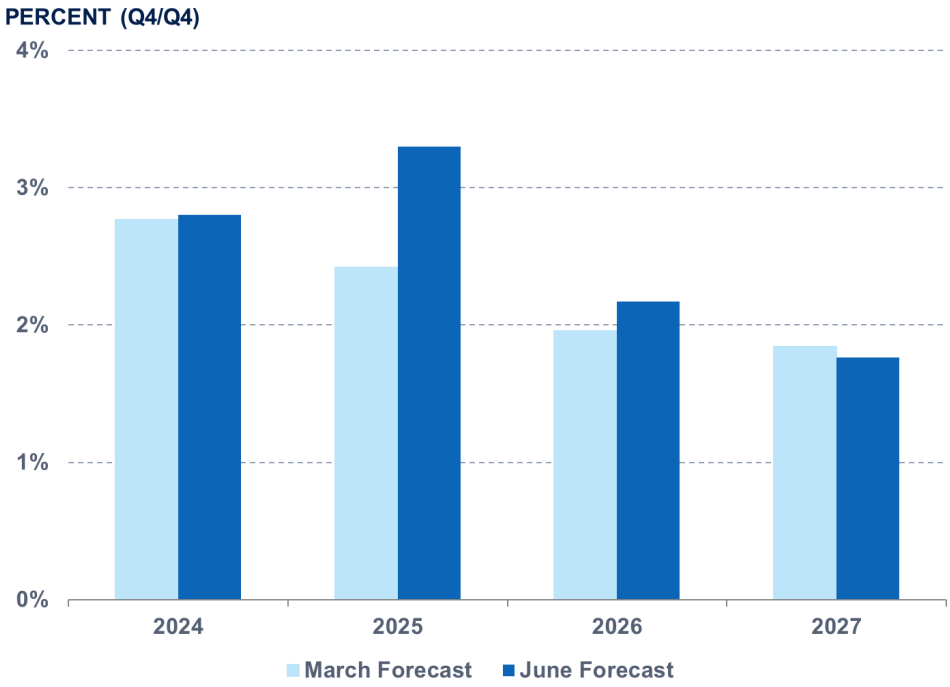


Figure 5c: Unemployment Rate

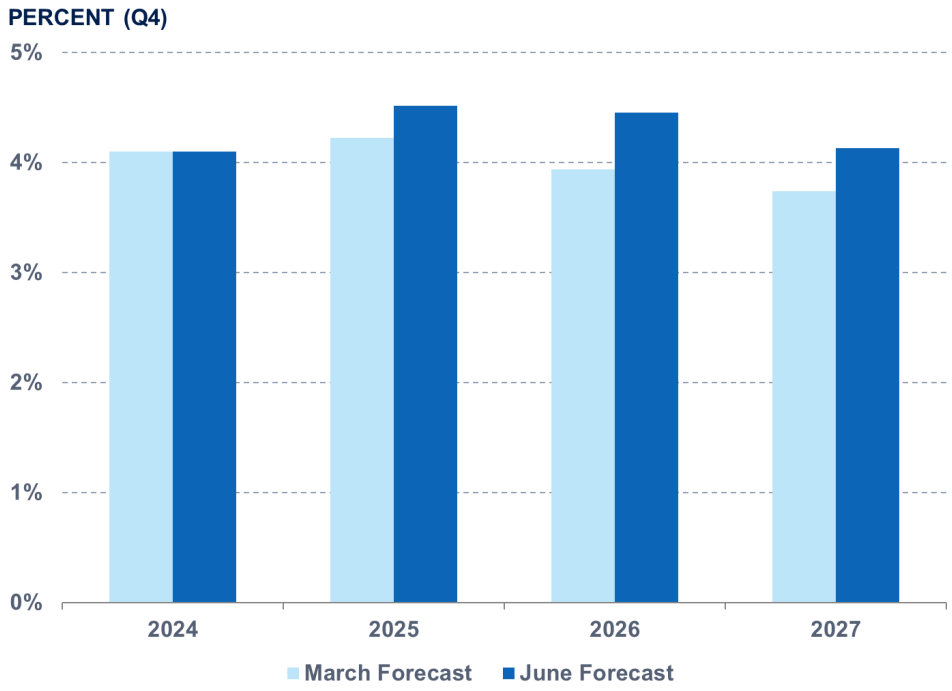
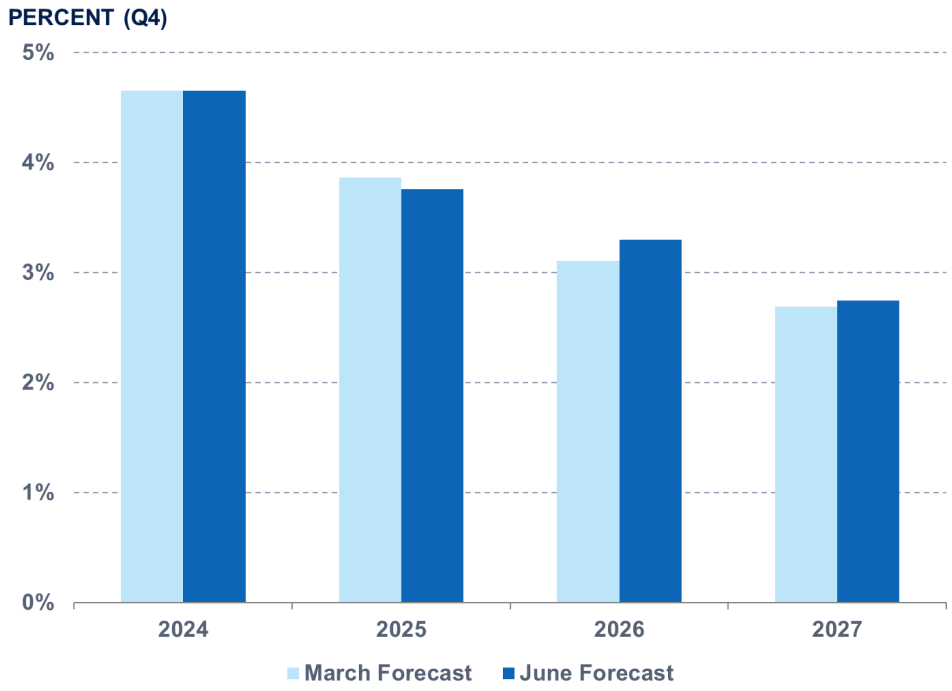


Figure 5d: Federal Funds Rate



Note: Historical data have been retrieved from Haver Analytics.