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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

Incoming data suggest that economic growth is moderating relative to the pace we saw in the second half of last year. While overall growth remains solid, data on consumption, sales, and sentiment are indicative of retrenchment. Uncertainty is elevated in response to ongoing shifts in expectations surrounding trade and fiscal policies.

Real gross domestic product (GDP) grew at a 2.4 percent pace in the fourth quarter of 2024. Real consumption expenditures are the driving force for growth but came in particularly weak for January, and retail sales for February disappointed. However, this may be attributed in part to colder than usual weather, and in part to personal consumption expenditures (PCE) growth having been outsized in December. Consequently, it is unclear how much signal to take from the latest readings on spending. Another disconcerting sign for spending is that consumer sentiment has been deteriorating for at least the last two months. On the upside, single-family housing starts rebounded more than expected in February after dropping sharply in January. And existing home sales came in stronger than expected.

The Institute for Supply Management (ISM) manufacturing and services purchasing managers indexes (PMIs) continue to show moderate business sector expansion, as does the Philadelphia Fed Manufacturing Business Outlook Survey index.

[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 and Riley E. Thompson for their assistance.

Labor market indicators remained stable in February, with payroll employment growth at 151,000 jobs gained. Over the last three months, payroll growth has averaged 200,000 jobs per month—a healthy number—and the unemployment rate has remained in a narrow range of 4 to 4.2 percent since May of last year. Wage growth remains robust at 4 percent year-over-year in February but is somewhat higher than what is thought to be consistent with a 2 percent inflation rate.

Although the level of inflation remains elevated, the underlying trend of disinflation appear to remain in place. The January inflation reports tended to surprise on the upside, but the February Consumer Price Index (CPI) inflation reading was more reassuring—it came in a bit lower than expected at 2.8 percent on a year-over-year basis. Core CPI inflation ran at a 3.1 percent year-over-year pace in February, a tick down from its January reading. Shelter inflation remains elevated but continues to cool. Somewhat less encouraging is that core goods inflation has begun moving up. Looking ahead, inflation over the near term appears more uncertain as the effect of tariff policies on prices is difficult to forecast.

In the Summary of Economic Projections for March, projections for growth in 2025 were revised down (compared to December) and inflation projections were revised higher. The median projection for the path of the federal funds rate under appropriate monetary policy was unrevised over the next three years. The Federal Open Market Committee (FOMC) slowed the pace of its balance sheet runoff beginning in April.

On balance, the economy continues to exhibit moderate growth and a healthy labor market. Inflation remains elevated though, and progress toward the Federal Reserve's 2 percent inflation goal remains uneven. Uncertainty about economic outcomes in the coming months is elevated as new trade and fiscal policies are being introduced.

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

[2] The model calibration implies that the long-run equilibrium value of the federal funds rate is 2.8 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	0.8	2.5	0.5
Taylor (1993)	0.0	1.5	0.5
Taylor (1999)	0.0	1.5	1.0
Inertial Taylor (1999)	0.85	1.5	1.0
Average Inflation Targeting	0.85	1.0	1.0

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 fourth quarter of 2024, together with an assumption of how output growth, inflation, the federal funds rate, and unemployment will fare in the first quarter of 2025.[3] The forecast then begins in the second 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 2.1 percent in 2025 on a fourth quarter over fourth quarter (Q4/Q4) basis. In the next two years, growth is also forecast to run between 2.0 and 2.2 percent. This represents a small downward revision in the forecast compared with the December forecast (Figure 5a).

- Core PCE inflation falls from a 2.8 percent pace in 2024 to 2.4 percent in 2025, 2 percent in 2026, and 1.8 percent in 2027, on a Q4/Q4 basis. The forecast has been revised up by 0.4 percentage point in 2025 and 0.1 percentage point in 2026 (Figure 5b).

- The unemployment rate is expected at 4.2 percent at the end of 2025, decreasing to 3.9 percent at the end of 2026 and 3.7 percent at the end of 2027. The forecast has been revised up by about 0.3 percentage point compared with the December forecast (Figure 5c).

- The federal funds rate averages 3.9 percent in the last quarter of 2025 before falling to 3.1 percent in the fourth quarter of 2026 and 2.7 percent at the end of 2027. The forecast is slightly higher for the near term than it was in the September forecast and little changed for 2027 (Figure 5d).

The forecast for output growth in 2025 is a bit weaker compared with the December forecast, as output growth in the last quarter of 2024 came in close to expectations, but incoming data on private consumption has 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 2025 onward, the federal funds rate forecast is completely data determined according to the

[3] Our forecast was made prior to the most recent 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.

model's policy reaction function. The model-implied federal funds rate over the fourth quarter of 2025 (on average) is in line with the median March SEP projection for the end of 2025 and merely 10 basis points below the value implied by the Federal Funds Futures market in mid-March. The model calls for about one 25-basis-point interest rate cut more in both 2026 and 2027 compared with the latest SEP projection: The median SEP projection sees rates at 3.1 percentage points at the end of 2027, 40 basis points higher than the model. Uncertainty about how the economy will evolve over the near term remains high due to several factors, including uncertainty about the size and effects of federal policy changes concerning spending, taxes, tariffs, and immigration.

After increasing at a pace of 2.5 percent in 2024 (Q4/Q4), output growth slowed to about 2.3 percent in the last quarter of 2024. We assume output growth at 2.2 percent in the first quarter of 2025. Thereafter, the model anticipates that output growth will remain in the 2.0 to 2.2 percent range throughout the forecast horizon. For 2025, the forecast for output growth is in line with the 2.2 percent growth projected by the median Survey of Professional Forecasters (SPF) participant. On an annual average basis, the model forecast is somewhat stronger than the latest SPF forecast, with growth in 2026 0.1 percentage point above the latest SPF forecast of 2.2 percent, and growth in 2027 0.3 percentage point stronger than the SPF forecast of 1.8 percentage point growth for the annual average.[5]

The labor market is predicted to remain strong. We impose a nowcast for the unemployment rate of 4.2 percent for the current quarter, unchanged from the December forecast. The model predicts that the unemployment rate will remain at about 4.2 percent through the first quarter of 2026 before declining gradually to 3.7 percent at the end of 2027. This is noticeably below the model's natural rate of unemployment—i.e., the level of unemployment that the model returns to in the long run, which is 4.4 percent—and it is consistent with a more accommodative monetary policy stance relative to the previous forecasts. However, the latest median SPF projection sees the unemployment rate at 4.2 percent in 2026, followed by a small uptick to 4.3 percent in 2027.

Inflation edged up slightly in the last quarter of 2024 and is expected to tick up once more in the current quarter. Even so, based on historical data, which excludes information on the possible effects of tariffs enacted in the current quarter, the model anticipates that inflation will ease back down to 2.2 percent by the end of the year. This puts inflation at 2.4 percent for the year as a whole (Q4/Q4). In 2026 and 2027, the model sees inflation between 1.8 and 2.0 percent. Thus, inflation is expected at or slightly below the FOMC target of 2 percent average inflation for most of the forecast horizon. The SPF's core PCE inflation forecast, which may reflect information on tariffs, is 2.4 percent (Q4/Q4) for 2025, edging down to 2.3 percent in 2026 and 2.1 percent in 2027. Thus, on inflation, the SPF forecast is slightly higher than the model baseline forecast from 2026 onward.

The March 2025 SEP by FOMC participants shows the median projection for output growth in 2025 at 1.7 percent and at 1.8 percent in 2026 and 2027. The median forecast of the unemployment rate is 4.4 percent in 2025 and 4.3 percent in 2026 and 2027. Core PCE inflation is projected at 2.8 percent in 2025 before stepping down to 2.2 percent in 2026. The median SEP participant expects core inflation at 2.0 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, 3.4 percent at the end of 2026, and 3.1 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.

[5] The model features long-run real per capita output growth of 1.6 percent. We assume that population growth equals 1.2 percent in the second half of 2024, 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."

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 call for an abrupt fall in the federal funds rate, leading to faster real near-term GDP growth and lower unemployment. They are also associated with inflation that runs significantly above target in 2025 and 2026 and averages around 1.9 to 2 percent only in 2027. 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 an unemployment rate similar to the baseline. Interest rates decline slightly faster than in the baseline. The AIT rule implies a slightly slower decline in interest rates and slightly weaker real activity in 2025, and inflation that remains closer to 2 percent than under the baseline rule.

The noninertial rules call for a much lower level of interest rates in mid-2025, but then they call for interest rate increases as the output gap closes more than under the alternative rules and as inflation rises temporarily. These rules peak in late 2025 and subsequently call for gradual rate cuts.

By the end of 2025, all rules considered are remarkably close together: The alternative rules call for a funds rate between 3.7 percent and 4.0 percent, compared with 3.9 percent under the baseline rule. By the end of 2027, the noninertial rules as well as the inertial Taylor 1999 rule call for interest rates around 2.5 percent. In contrast, the AIT rule is close to the baseline rule with its 2.8 percent interest rate call.

Note that the inertial Taylor 1999 rule yields lower inflation and lower interest rates than in the baseline. 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.

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 about its trend pace over the forecast horizon and that inflation will continue to ease, despite an uptick in current-quarter inflation, toward the FOMC target of 2 percent in early 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

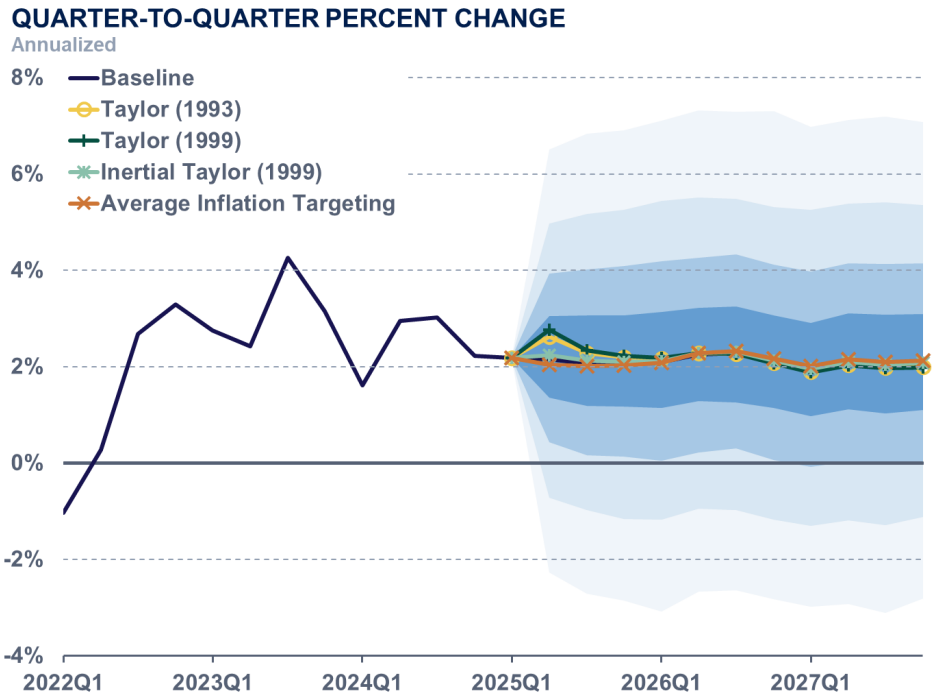


Figure 2: Core PCE Inflation

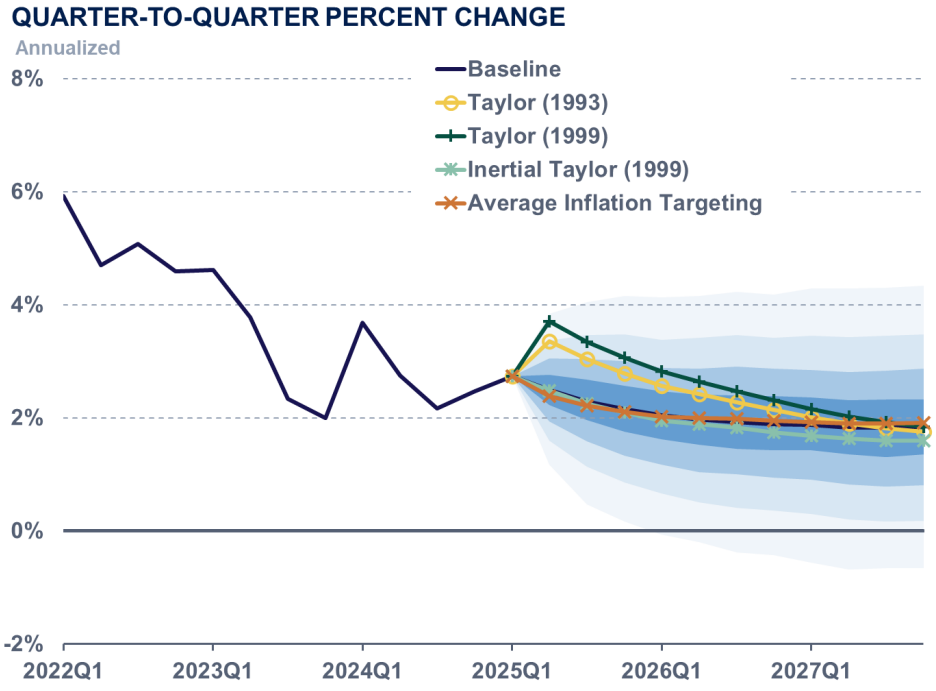


Figure 3: Unemployment Rate

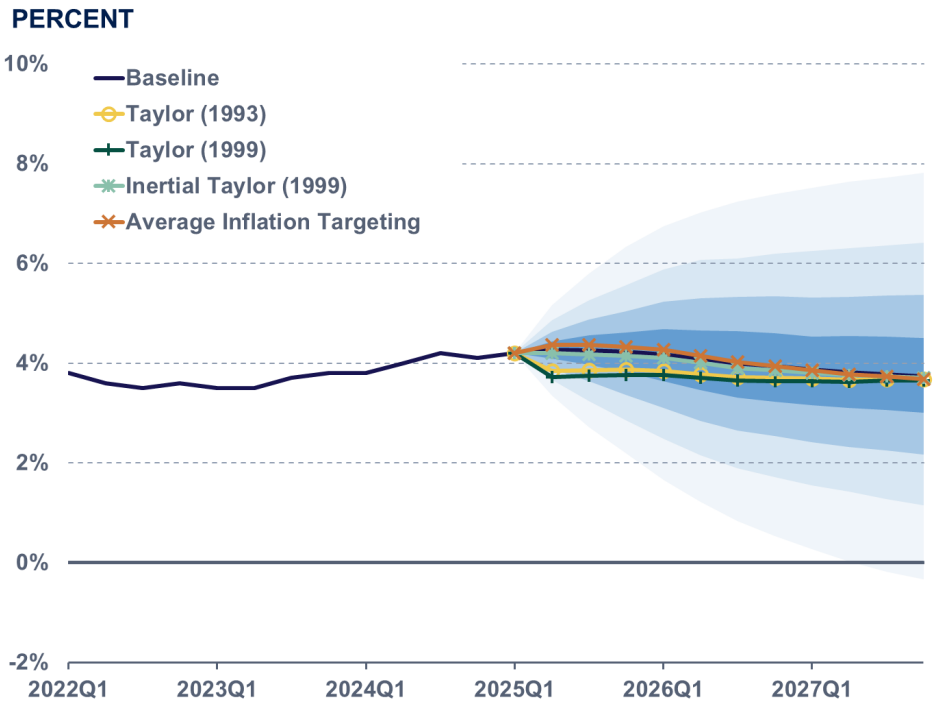


Figure 4: Federal Funds Rate

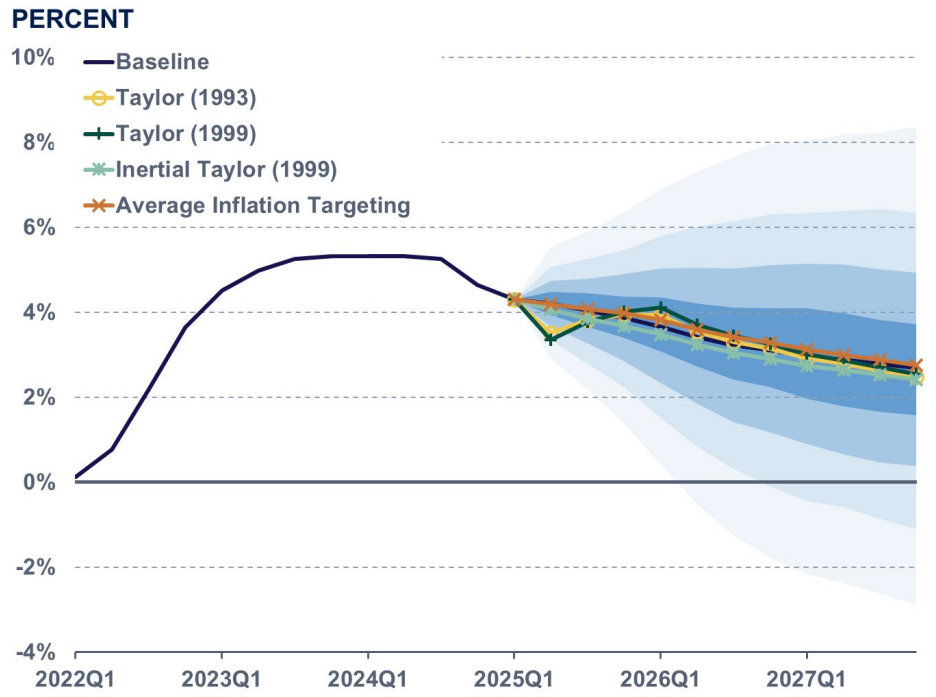


Figure 5: Baseline Forecast Comparisons

Figure 5a: Real GDP Growth

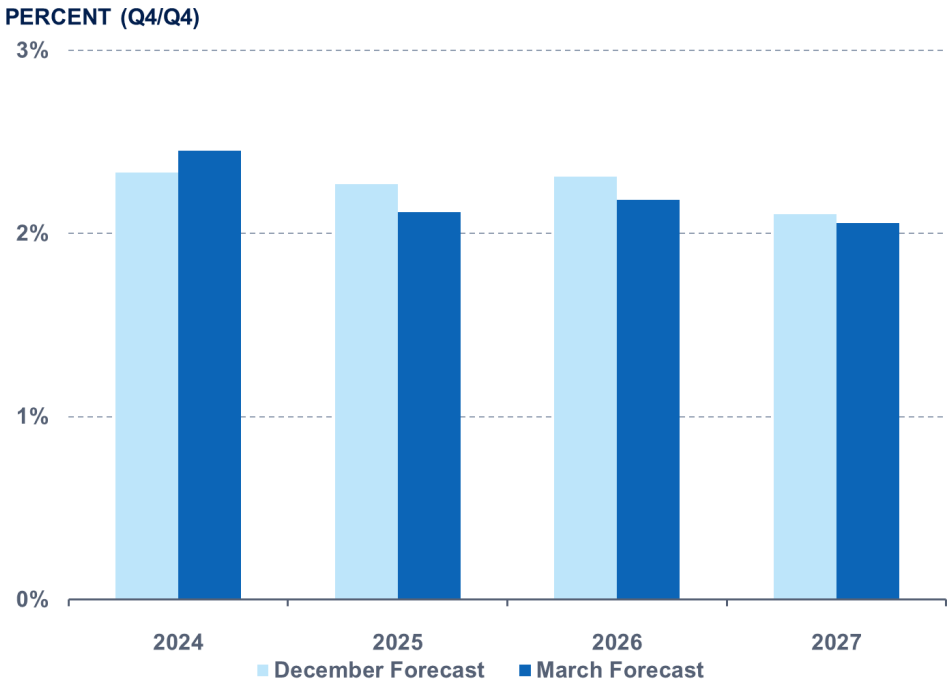


Figure 5b: Core PCE Inflation Growth

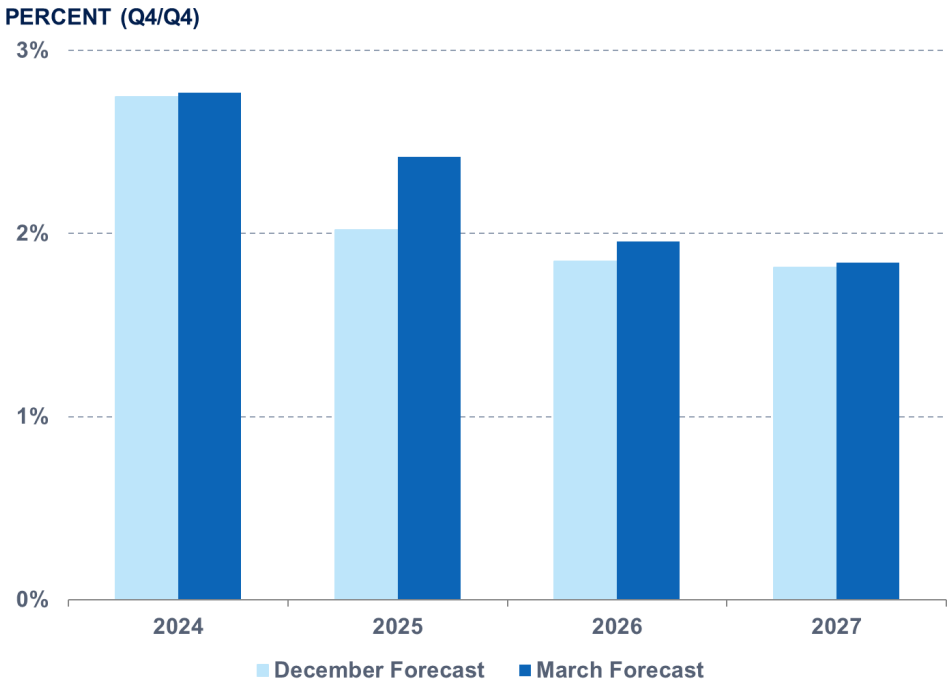


Figure 5c: Unemployment Rate

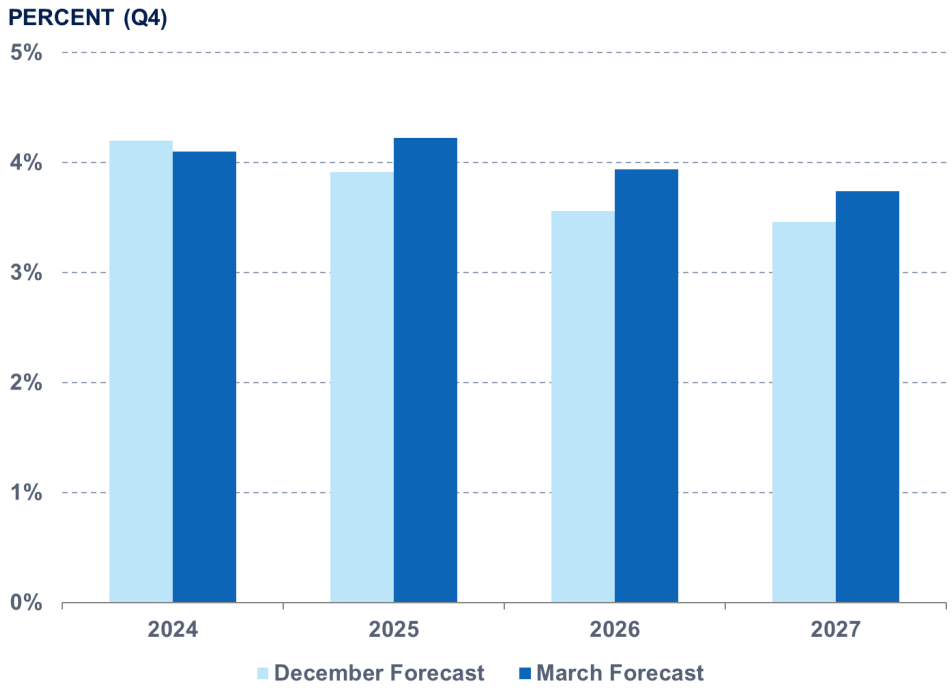
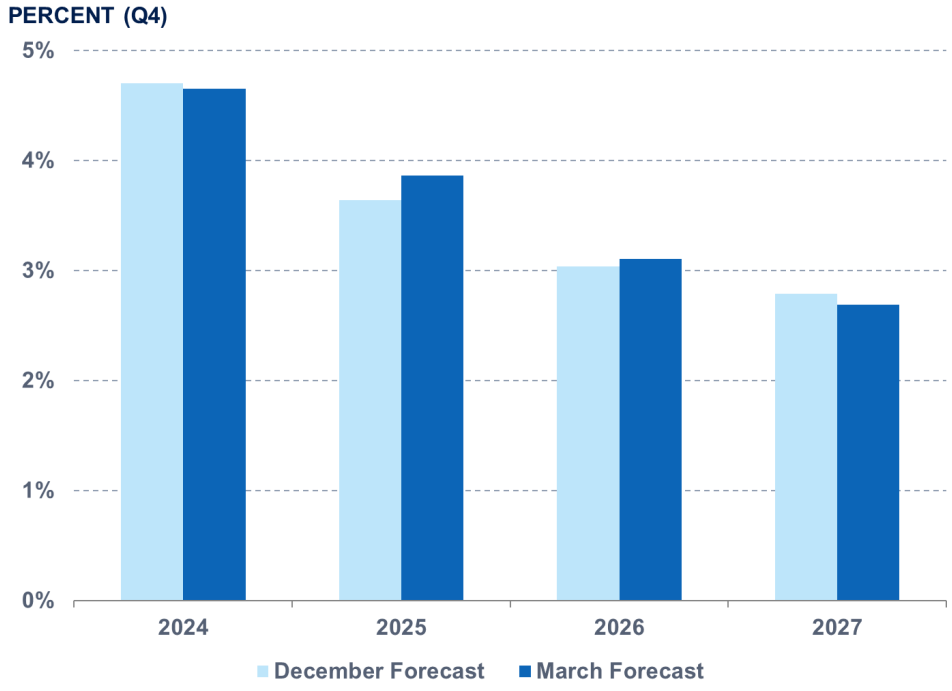


Figure 5d: Federal Funds Rate



Note: Historical data have been retrieved from Haver Analytics.