The Expectations Gap: An Alternative Measure of Economic Slack

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Abstract

The output gap hinges on estimates of potential GDP that can vary widely and are ultimately unobservable. To circumvent these issues, historical surveys of professional forecasters' nominal GDP projections can be used to construct an "expectations gap," which shifts the benchmark for economic performance to what GDP was expected to be. We (1) extend the expectations gap to a higher-frequency survey and assess its sensitivity to alternative forecast horizons; (2) capture its range using forecaster disagreement; (3) compare nominal and real measures of the expectations gap against conventional output gap measures; and (4) produce real-time forward-looking estimates and assess their performance near business-cycle turning points. Although the expectations gap is highly correlated with existing output gap measures, unlike other measures it detects overheating during the housing boom and bust cycle of the mid-2000s and increasing slack during the "invisible recession" of 2015–2016.

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> *Navigating by the stars can sound straightforward. Guiding policy by the stars in practice, however, has been quite challenging of late because our best assessments of the location of the stars have been changing significantly.*
>
> —Jerome Powell, Federal Reserve Board Chair, August 18, 2018

1 Introduction

The output gap—the percentage difference between actual and potential GDP—is widely used to forecast inflation and inform economic policy about the state of the economy. However, the ascendance of financial stability concerns, along with the unobservability of and sizeable revisions to potential GDP, have reduced the reliability of the output gap as a measure of economic slack.[1] In addition, the various methods to estimate potential GDP can produce very different results. For example, between 2012 and 2017, the Congressional Budget Office (CBO) reported a negative output gap, while the method by Laubach and Williams (2003) consistently reported a positive output gap.

Beckworth (2020) proposes the concept of "neutral" GDP, which he defines as "the public's expected growth path of nominal income" (p. 2). He measures neutral GDP as the average of 5 years of professional forecasts for a particular quarter's nominal GDP. Since professional forecasts are captured by the central tendency from surveys, they do not depend on any single model and reflect what actual expectations were at the time. The gap between nominal and neutral GDP is interpretable as a measure of slack, which shifts the emphasis from "navigating by the stars" to navigating by what agents *expect*.

[1] See Powell 2020: "Before the Great Moderation, expansions typically ended in overheating and rising inflation. Since then[,] . . . a series of historically long expansions had been more likely to end with episodes of financial instability."

However, this *expectations gap* has several limitations. First, it is constructed using forecasts that are only updated on a quarterly basis, and its sensitivity to the inclusion of both short- and long-term forecast horizons is unclear.[2] Second, it is difficult to assess the strength of its signal about the economy since it does not account for forecaster uncertainty. Third, estimation of the expectations gap in nominal terms complicates a direct comparison with conventional output gap measures, which are typically formulated in real terms. Fourth, it does not fully leverage the availability of real-time and forward-looking data to assess the performance near turning points.

We make the following contributions in this paper: First, using the Blue Chip Economic Indicators (BCEI) surveys, we estimate an expectations gap time series that corresponds to Beckworth's (2020) estimates using the Survey of Professional Forecasters, which are only available quarterly. A key advantage of the BCEI is that it is monthly and enables estimates of the expectations gap further back in time without additional assumptions. Moreover, we vary the forecast horizon used to estimate neutral GDP and find this can substantially affect the expectations gap, particularly for longer horizons. Second, we analyze forecaster disagreement and show there is considerable uncertainty surrounding the expectations gap, which is consistent with traditional measures of the output gap (see Berge 2020). Despite the uncertainty, the expectations gap unambiguously signals economic overheating or underperformance in 4 distinct episodes. Third, we evaluate how the nominal and real expectations gaps compare against the nominal and real output gap produced by the CBO, Quast and Wolters (2020), and the nominal and real expectations gaps derived from the Federal Reserve Board (FRB) Greenbook forecasts. We find meaningful differences between the nominal and real gaps, which contrasts sharply with

[2] For example, Coibion, Gorodnichenko, and Ulate (2018) consider a measure based purely on long-term growth forecasts.

the CBO's nominal and real output gaps that are identical by design. Fourth, we construct real-time and forward-looking estimates of the expectations gap and evaluate their performance around business-cycle turning points. Though significant revisions occur—mostly due to comprehensive GDP revisions—these are comparable in size to revisions made over time to the CBO's output gap. Finally, the forward-looking estimates outperform simple forecasting benchmarks and occasionally provide a leading indicator of business-cycle turning points.

The expectations gap can be used to track business-cycle developments, gauge financial instability risks, and serve as an input into policy decision rules. For example, in the classic Taylor (1993) rule, if the weights attached by a central bank to the output and inflation gaps are equal, the expectations gap is a proxy measure of the combination of the two gaps. Another possible application is to use the expectations gap to determine the appropriate magnitude of fiscal support measures (e.g., see Taylor 2000 and Kumhof and Laxton 2013).

The paper is organized as follows. The next section describes the methodology and intuition of neutral GDP and the expectations gap. Section 3 estimates the expectations gap and explores the sensitivity to alternative surveys, forecast horizons, and forecaster disagreement. Section 4 compares the nominal and real expectations gaps with other output gap estimates. Section 5 derives real-time, forward-looking expectations gaps and evaluates their performance around business-cycle turning points. Section 6 provides a conclusion.

2 Background and Methodology

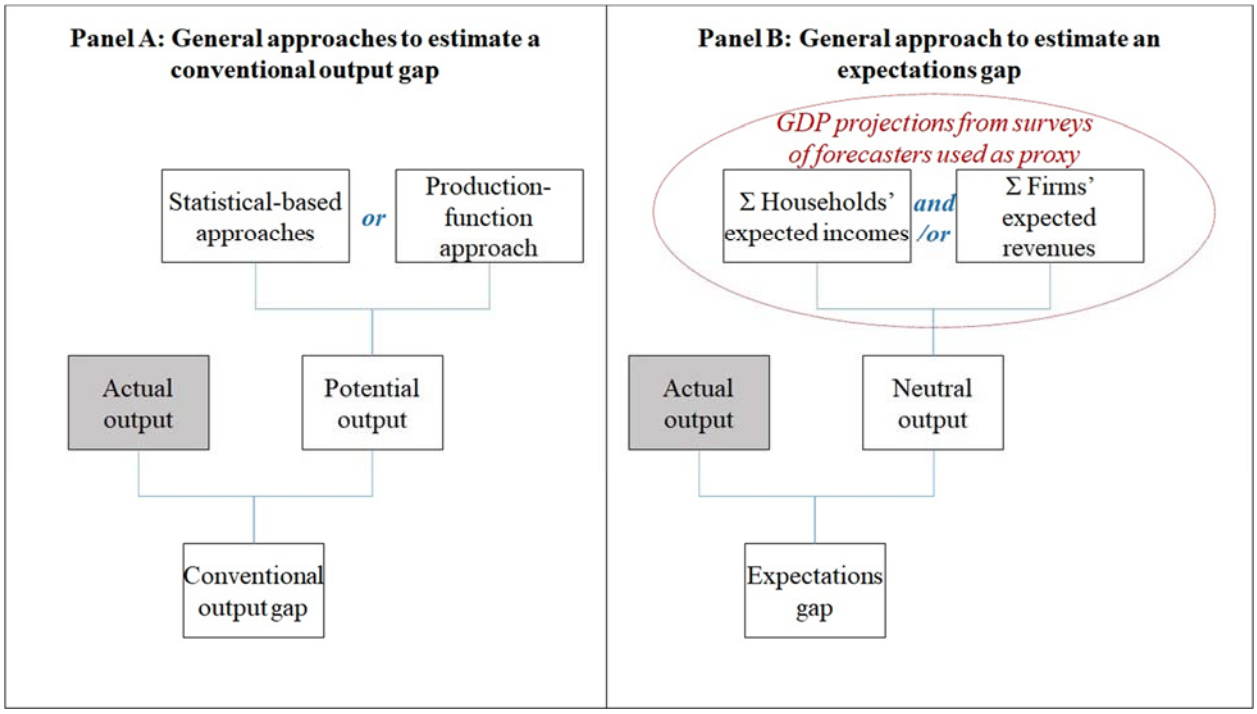
Measures of the output gap depend on the concept of potential GDP, which are estimated using production functions, statistical approaches, or some other structural variant.[3] In contrast, the expectations gap relies on the concept of neutral GDP, which Beckworth (2020, p. 2) defines as

[3] For example, see Ball and Mankiw 2002, Berge 2020, Coibion, Gorodnichenko, and Ulate 2018, Fleischman and Roberts 2011, Laubach and Williams 2003, and Williams, Abdih, and Kopp 2020, among others.

"the public's expected growth path of nominal income." Figure 1 illustrates the key differences between the formulation of conventional output gaps and the expectations gap.

Potential GDP corresponds to the concept of long-run aggregate supply—which, in production-function type approaches such as the CBO's (see Shackleton 2018), depends on estimates of the sustainable employment of labor, the capital stock, and the state of technological knowledge, all of which are independent of the nominal price level. Observed real output is determined by the realized equilibrium between aggregate demand and short-run aggregate supply. The output gap, therefore, is the percentage difference of the realized aggregate demand and short-run aggregate supply equilibrium from long-run aggregate supply.

Figure 1. Schematic Illustrating Different Components of Gap Measures



Negative output gaps are generally associated with disinflation or deflation. However, a negative short-run aggregate supply shock, holding aggregate demand constant, would lead to lower real output (a negative output gap) but higher inflation. Thus, a negative output gap might be

mistakenly attributed to a negative demand shock, even though a negative supply shock was the cause. This can be problematic for forming an appropriate economic policy response.

The expectations gap is agnostic when it comes to supply shocks. Aggregate demand depicts the combinations of price levels and real output consistent with a given level of nominal spending,[4] for which nominal GDP roughly serves as a measure. Neutral GDP depends on previous expectations of nominal GDP for a particular time. Therefore, the difference between nominal GDP and neutral GDP measures how much aggregate demand deviates from what it was expected to be. This is independent of what happens to short- or long-run aggregate supply. In other words, allowing for supply shocks but holding aggregate demand constant, the expectations gap indicates whether nominal income and spending flows have met past expectations.

A key rationale of the expectations gap is that deviations of income from expectations that informed the accumulation of past debt obligations alter debt burdens, which can impinge on current and future spending decisions. Thus, while the conventional output gap measured in inflation-adjusted terms is geared toward predicting inflation vis-à-vis a Phillips curve, the expectations gap in nominal terms is more focused on risks to financial stability. Greater-than-expected income growth can lead to greater debt accumulation and leave agents more susceptible to negative shocks when lower-than-expected incomes occur, whereas, if actual GDP equates to neutral GDP, then, on average, households' and firms' expectations are validated by outcomes.

2.1 Intuition and Simplifying Assumptions

A household's expected income stream influences its spending decisions.[5] If, for example, a household expects an annual income of $60,000 indefinitely and finances the purchase of a home

[4] This can be extended to growth rates: aggregate demand shows the combinations of inflation rates and real GDP growth rates consistent with a given rate of nominal spending growth (see Cowen and Tabarrok 2010).

[5] For example, see Romer (1990) for an argument of how collapsing future income expectations led to declines in purchases of durable goods during the Great Depression.

through a 30-year mortgage amortized by fixed payments of $2,000 per month, 40 percent of the household's monthly income is tied up by this fixed debt obligation. If an economywide shock leads the household's realized income to fall 10 percent below expectations, its monthly mortgage payments will encumber 44.4 percent of its income. This forces the household to reduce current spending, savings, or both, until the debt is paid off or restructured.[6] The deviation of actual outcomes from past expectations can influence both current and future spending via sticky nominal debt obligations. Analogously, a firm's allocation of resources can be affected when actual revenues deviate from expectations. The incorporation of these dynamics into macroeconomic models suggests sticky debt burdens play a more important role than sticky prices (e.g., see Sheedy 2014 and Bullard and DiCecio 2019).

Aggregated household income expectations or aggregated business revenue expectations represent the neutral level of income in the economy wherein expectations, in the aggregate, are consistent such that past spending and borrowing decisions prove to have been ideal. Since aggregate private agents' individual income projections do not exist, Beckworth (2020) uses the GDP projections from surveys of professional forecasters as a proxy to estimate neutral income.[7] Though some households and firms may fare better or worse than expected, if actual GDP remains near the neutral level, these differences cancel out. In contrast, if actual GDP falls short of neutral GDP, this signifies that households' and firms' expectations were, *on average*, overly optimistic.

[6] This may especially be the case if the income loss is expected to be permanent.

[7] This equates aggregate income, spending, and output with GDP, which implies that changes in business inventories are irrelevant. This should be satisfied when (1) the expected contribution to GDP growth from business inventories is minimal over longer forecast horizons and (2) the average historical contribution of changes in business inventories to GDP growth is 0 percent.

2.2 Description of Survey Forecasts

The Survey of Professional Forecasts (SPF) is a quarterly survey of about 40 mostly academic and business forecasters. It was first published in Q4-1968 as the ASA/NBER (American Statistical Association / National Bureau of Economic Research) Economic Outlook Survey. Management of the survey was transferred to the Federal Reserve Bank of Philadelphia in 1990. In total, 443 unique forecasters have participated in the SPF since 1968.

The SPF is published near the middle of the second month of every quarter. Forecasts are reported for fixed-horizons, extending 4 quarters ahead. In 1990, the SPF began including a forecast of the average annual real GDP growth rate over the next 10 years and the average annual CPI inflation rate over the next 10 years.[8] While the latter is updated every quarter, the longer-run real GDP forecast is updated only in the first SPF survey of every year.

The Blue Chip Economic Indicators (BCEI), maintained by Wolters Kluwer, is a monthly survey of more than 50 business forecasters that began in 1976. More than 115 unique forecasters have participated in the survey since 1980.

The survey is published on the tenth business day of every month with quarterly fixed-event forecasts that shrink from 8 to 4 quarters ahead as a given year progresses (e.g., the monthly short-run forecast surveys for 2020 have a fixed endpoint of Q4-2021). Longer-run forecasts are updated twice per year in the March and October surveys. Initially only the 2–6- and 6–11-year average forecasts of variables were available. Since October 1982, the surveys have included annual growth forecasts for 2 to 6 years ahead and a 5-year average forecast for 6–11 years ahead. Before 1990, only the average—"consensus forecast"—of variables was

[8] The SPF and BCEI surveys before 1992 reported forecasts for GNP rather than GDP. We refer to GNP as GDP where applicable for simplicity.

reported; however, since then, the average forecasts of the top 10 and bottom 10 forecasters have also been reported.

2.3 Estimating Neutral GDP and the Expectations Gap

Following Beckworth (2020), the neutral level of GDP at time t is measured as the average of the forecasts of period t's GDP submitted over the past 20 quarters, including the nowcast:

$$\bar{Y}_{t,v} = \frac{1}{20}\sum_{h=0}^{19} Y_{t|t-h,v}\,, \tag{1}$$

where $Y_{t|t-h,v}$ is the aggregate forecast of GDP at time t and data vintage v based on expectations at time $t-h$. The aggregate forecast represents the central tendency of professional forecasters' expectations for the level of GDP at time t. Beckworth (2020) uses the SPF-reported median while we focus instead on the BCEI-reported consensus (i.e., mean) forecast.[9]

This formulation does not impose restrictions on how forecasts are generated; that is, it is not dependent on any one method or model. For example, Quast and Wolters (2020) use a modified Hamilton filter to estimate potential GDP, which is a special case of equation (1) where $Y_{t|t-h,v}$ represents the forecasts from an autoregressive model with 4-quarter lags (an AR(4)). This provides a statistical justification for equation (1) and implies that neutral and potential GDP estimates would be aligned if all forecasters used the same model to filter the observations.[10]

As the expected path of actual GDP can deviate from potential GDP, especially in the short run, neutral GDP will differ from estimates of potential GDP. To illustrate, consider the

[9] Although the BCEI forecasts are released monthly, for simplicity we do not change the notation. Since 3 months of BCEI forecasts are released in a given quarter, they can be converted from monthly to quarterly by averaging the monthly forecasts.

[10] Quast and Wolters (2020) focus on the log of the level of GDP, whereas here we emphasize the level of GDP so that this special case requires that the exponential of the autoregressive model with 4 lags (an AR(4)) forecasts of the log level are a good approximation of forecasts of the level of GDP. Depending on how forecasters generate their expectations, the estimate of the neutral level of GDP could also align with other estimates of potential GDP.

Beveridge-Nelson (BN) decomposition in Morley (2002, 2011), which decomposes an optimal forecast from a general class of models into a deterministic drift component, $\boldsymbol{d}$, the estimated BN trend, BN_t, and a discounted estimate of the BN cycle, c_t.[11] Since neutral GDP is the average of forecasts made at various horizons through H, it contains averages of the deterministic drift, the BN trend, and the discounted BN cycle regardless of which forecast horizons are included:

$$\overline{Y}_{t,v} = \frac{1}{H}\sum_{h=0}^{H-1} Y_{t|t-h,v} = \overline{\boldsymbol{d}} + \overline{BN}_{t,v} + \frac{1}{H}\sum_{h=0}^{H-1} A^h c_{t-h,v} \quad (2)$$

However, the importance of the BN cycle in neutral GDP depends on the persistence, A, forecasters assume is in the data and the forecast horizon. Its influence fades quickly when short horizons are excluded or when the persistence is expected to be small.

An important difference between statistical measures and the expectations gap is the choice of forecast horizons. Neutral GDP estimates are centered on 10-quarters-ahead forecasts with horizons between 0 and 20 quarters ahead. This is considerably wider than the Quast and Wolters (2020) potential GDP estimates, which are centered on the 8-quarters-ahead forecast with horizons ranging from 4 to 12 quarters ahead. However, Quast and Wolters (2020) note that centering estimates on the 10-quarters-ahead forecast effectively allows for the inclusion of longer financial and credit cycles into the standard business cycle (e.g., see Beaudry, Galizia, and Portier 2020). This is consistent with the intuition underpinning the calculation of neutral GDP. The inclusion of longer horizons captures the rigidities stemming from fixed nominal debt obligations, which are assumed to be sticky for 5 years.

In practice, the GDP-level forecast for a particular horizon is not always available, and when it is, it is associated with a particular data vintage. Following Beckworth (2020), we construct the forecast in levels based on the underlying GDP growth rate forecasts so that

[11] This interpretation also follows from the robust forecast devices in Martinez, Castle, and Hendry (2021).

$$Y_{t|t-h,v} = \prod_{j=0}^{h}\left(1 + g_{t-h+j|t-h-1}\right)Y_{t-h-1,v}, \quad (3)$$

where $g_{t-h+j|t-h}$ is the expected quarterly GDP growth rate for period t that is formulated at time $t-h$, and $Y_{t-h-1,v}$ is the initial level of GDP, which can vary with each vintage v.

It is possible to obtain the quarterly growth rate forecasts directly from forecaster surveys for up to 4 quarters ahead for the SPF and between four to eight quarters ahead for the BCEI. To extend the SPF forecasts out 5 years ahead beyond the fixed horizon of 4 quarters, Beckworth (2020) uses the latest 10-year real GDP growth rate forecast as a proxy for growth rates beyond 4 quarters ahead. For the BCEI, we use the latest long-run annual nominal GDP growth rate forecasts to forecast GDP out to 5 years ahead.

While the neutral level of GDP can be constructed in either nominal or real terms, we focus on the nominal measure following Beckworth (2020). Short-run nominal GDP growth and level forecasts are available from both the SPF and BCEI; however, the SPF only produces long-run real GDP growth forecasts. Therefore, Beckworth (2020) constructs a proxy long-run nominal GDP growth forecast using the long-run real GDP growth forecast and the CPI inflation forecast adjusted to conform to the GDP deflator. This step is not necessary in our case since the BCEI produces long-run nominal GDP forecasts.

The choice of the initial value of output—that is, $Y_{t-h,v}$—is important for ensuring that a consistent GDP level is applied over time. For example, Beckworth (2020) focuses primarily on the latest vintage of GDP data, $v = T$. However, since real-time estimates are subject to substantial revisions over time, they may exhibit additional volatility beyond the underlying business-cycle fluctuations (see Orphanides and Norden 2002). We explore this in section 5.

Finally, the expectations gap is constructed as the percentage difference between the observed level of GDP at time t and the estimate for neutral GDP at time t where the choice

$$GAP_{t,v} = \left(\frac{Y_{t,v} - \bar{Y}_{t,v}}{\bar{Y}_{t,v}}\right) * 100, \quad (4)$$

of data vintage—for example, first estimate or latest estimate of GDP—can affect the estimates both in the numerator and the denominator (see Sinclair and Stekler 2013).

3 The Sensitivity of the Expectations Gap

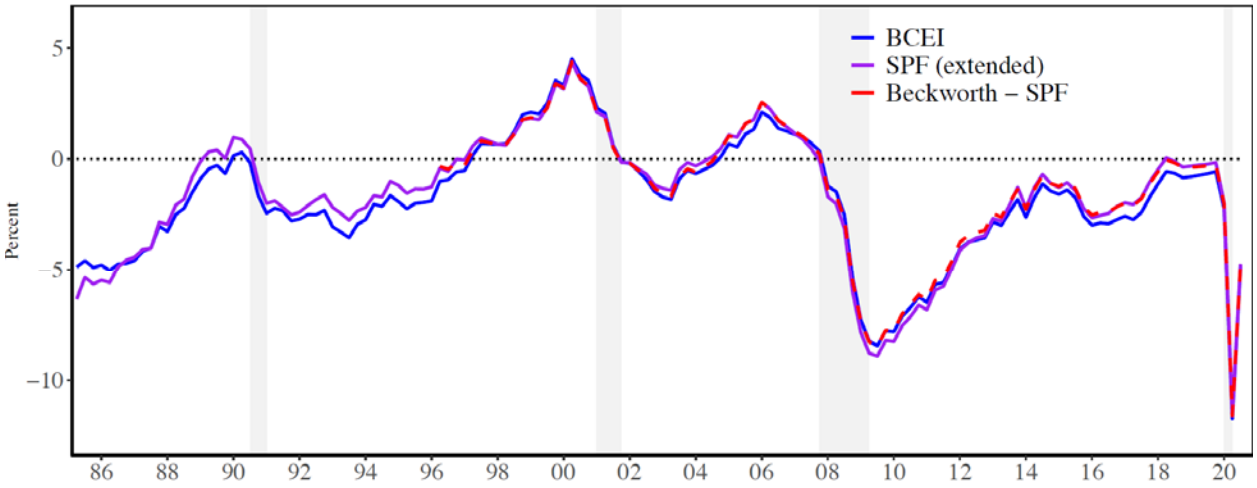
This section evaluates the sensitivity of the nominal expectations gap along 3 dimensions: first, the sensitivity to the choice of forecaster survey; second, varying the forecast horizons; and third, accounting for forecaster disagreement. Ultimately, regardless of whether the SPF or BCEI survey is used, the expectations gap estimates exhibit little difference. In contrast, expectations gap estimates are sensitive to the selected forecast horizons and the weights assigned to forecasts, particularly at longer horizons. Forecaster disagreement quantifies the range of uncertainty surrounding the expectations gap and highlights the 4 distinct episodes in which the expectations gap gave an unambiguous signal about the state of the economy.

3.1 An Alternative Forecaster Survey

We start by calculating the expectations gap from Q1-1985 to Q3-2020 using the BCEI and SPF forecasts. To extend the latter back to Q1-1985, when long-run forecasts were not available, we use the last published growth rate forecast for the 4 quarters beyond the current quarter as a proxy for the long-run growth rate up to 5 years ahead. (This is referred to as "SPF (extended)" in figure 2.)

Except for minor deviations around 1991–1997, figure 2 illustrates that the BCEI and SPF nominal expectations gaps are very similar, which implies that they capture features of the economic cycle rather than features specific to the surveys. Given the minor differences between the SPF and BCEI measures, the remaining analysis in this paper focuses on the BCEI measure.

Figure 2. Measures of the Nominal Expectations Gap (Q1-1985–Q3-2020)



Sources: Authors' calculations based on data and forecasts from BEA, SPF, BCEI, and Beckworth (2020).

Figure 2 also illustrates that using the one-year-ahead growth rate forecasts as a proxy for longer-horizon SPF forecasts is tenable since there are no large discrepancies from the BCEI-derived measure between 1985 and 1990. Thus, it is possible to extend the SPF-derived expectations gap measure back to the early 1970s using this approach.

3.2 Alternative Forecast Horizons

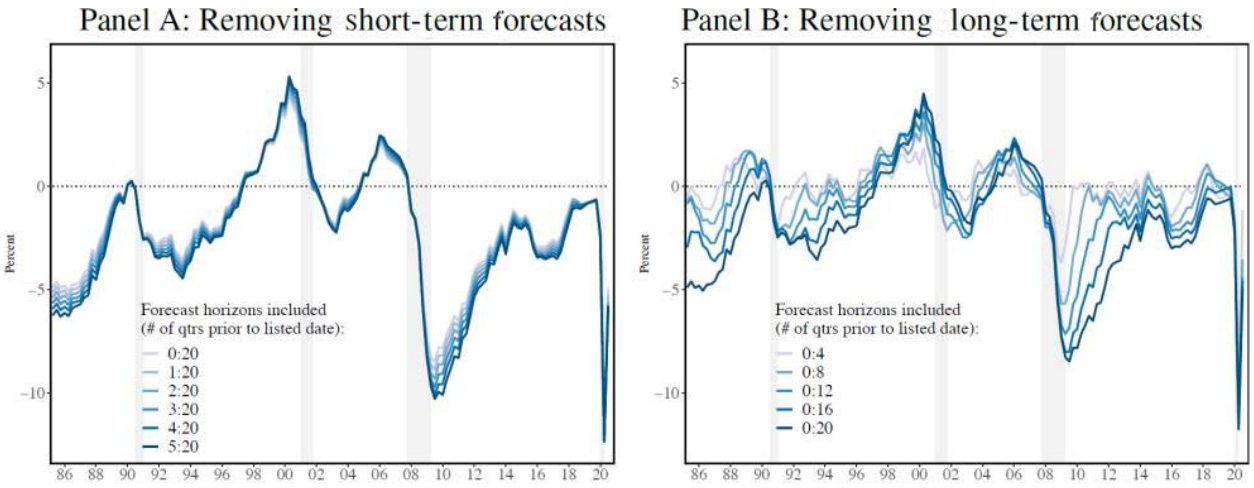
Isiklar and Lahiri (2007) show that professional forecasters can capture both the trend and cycle in economic growth up to one year ahead. This is also consistent with the Beveridge-Nelson interpretation of forecasts. Therefore, including short-term forecasts in the measure of neutral GDP may produce a more muted expectations gap. By removing the short-term forecasts from the estimates of neutral GDP, we can observe the consequent impact on the expectations gap.

In panel A of figure 3, lines go from light to dark as short-term forecasts are excluded from estimates of neutral GDP. The removal of short-term forecast horizons from the calculation of neutral GDP puts greater weight on the more distant forecasts of GDP made for a particular quarter. Differences tend to arise around peaks and troughs in the expectations gap series. This is

especially pronounced following the trough in the expectations gap in 1985–1988 and in 2009–2012, where removing the short-term forecasts exacerbates the gap. This indicates that following recessions, when cyclical fluctuations dominate, including short-term forecasts in neutral GDP can dampen the expectations gap. However, in general, the inclusion of the short-term forecasts does not limit the ability of neutral GDP to capture the expected trend.

Conversely, removing forecasts made in the more distant past from a particular quarter's neutral GDP estimates signifies that debts are less sticky. At the limit, were neutral GDP derived solely from the nowcast, it would imply that debt obligations are fully flexible and are adjusted from quarter to quarter keeping the distribution of debt burdens unchanged. Panel B of figure 3 shows the consequences of removing the more distant forecasts and depicts a faster convergence of the expectations gap to zero.

Figure 3. Sensitivity of the Expectations Gap to Alternative Forecast Horizons



Sources: Authors' calculations based on data from BEA and forecasts from BCEI.

Figure 3 illustrates that the expectations gap—and the amount of economic slack it implies—depends on which forecasts are included. Averaging 5 years of forecasts to estimate a quarter's level of neutral GDP is a plausible starting point if the average debt contract is assumed to be

refinanced within 5 years from the contract date. However, if leverage is driven at times by an increase in shorter-term debt contracts, the 5-year average may artificially exacerbate the cyclicality of the expectations gap. This is especially pertinent if long-term debt obligations are less likely to be contracted during periods of high and volatile inflation.

In addition to the optimal range of forecast horizons, the equal weighting scheme for each forecast horizon merits consideration, as this assumes debts are contracted continuously and uniformly over time. Debts are accrued at different rates across the business cycle such that more lending takes place during an expansion than a recession. To better align neutral GDP estimates with actual debt burdens, forecasts made during a recession should receive less weight than those made during an expansion. Future research could endogenize the optimal range and weighting of forecasts to vary over time and in response to economic variables, such as when debt burdens are accrued and the debt maturity structure.

Another concern is that many of the forecasts used to estimate the neutral level of GDP are derived from less frequently updated longer-term growth rate projections. Thus, the actual forecast path of GDP over longer horizons may be more variable than the intermittently updated longer-run forecasts permit. However, this issue may be mitigated since the longer-run forecast GDP level path is heavily influenced by the short-term forecasts that are updated with every survey release. This is demonstrated by the SPF (extended) measure in figure 2, which is constructed by extrapolating the one-year-ahead growth rate forecast out over 5 years, very closely tracking the measures based on the less frequently updated long-term forecasts.

3.3 Measuring Uncertainty through Forecaster Disagreement

The expectations gap uses measures of central tendency to construct the neutral level of GDP, which ignores disagreements between individual forecasters that can be persistent and linked to

the business cycle (see Patton and Timmermann 2010 and Bürgi and Sinclair 2020). A large dispersion around the central tendency indicates that aggregate expectations about the neutral level may be more uncertain. To quantify this uncertainty, we estimate the forecaster disagreement around the expectations gap.

There are two different ways to measure forecaster disagreement: disagreement between individual forecaster measures of the neutral level and disagreement between the underlying forecasts of GDP. Adapting equation (1) to allow for individual forecasters allows us to focus on the first source:

$$\bar{Y}_{i,t,v} = \frac{1}{20}\sum_{h=0}^{19} Y_{i,t|t-h,v}, \quad (5)$$

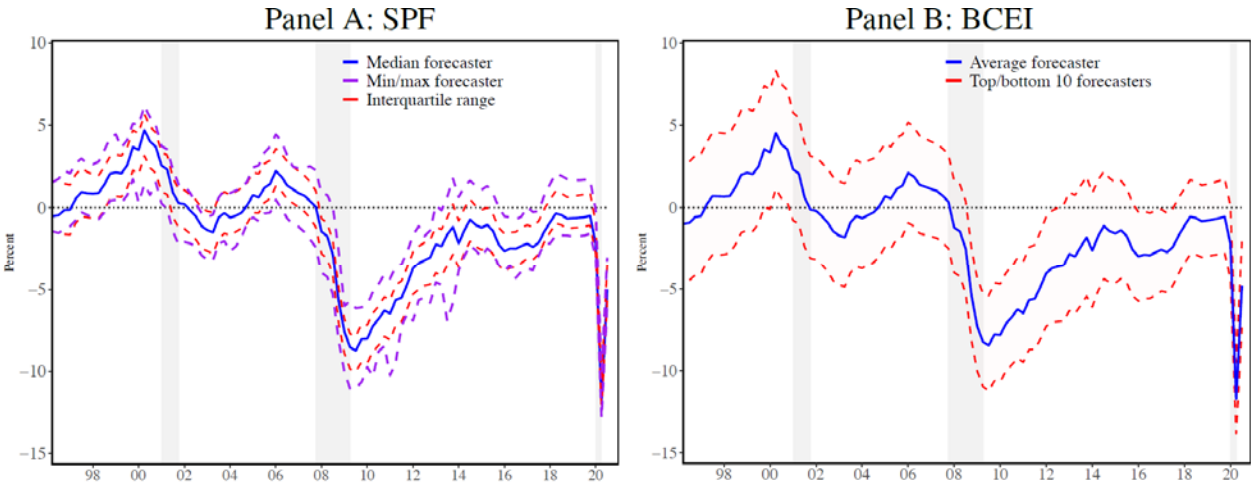
where the index i represents an individual forecaster. This illustrates that a measure of the neutral level for each individual forecaster can be constructed at each point in time. However, to do so, forecasters must have generated at least one forecast for period t per quarter for 20 consecutive quarters (i.e., a forecaster is in the sample continuously for 5 years). In practice, we relax this restriction by allowing forecasters to miss up to 3 consecutive surveys and interpolate between the missing forecasts to ensure retention of a sufficiently large sample over time.

While the BCEI does not release individual forecasts publicly, the SPF does. In total, 79 unique SPF forecasters satisfy the requirements (out of the full sample of 186 since 1990). We construct an expectations gap for each of these forecasters and then calculate the minimum and maximum individual expectations gaps at each point in time. This captures the full range of disagreement between forecasters and measures the uncertainty around aggregate expectations at each point in time (see Lahiri and Sheng 2010).

Panel A of figure 4 plots this range (in purple) along with the median derived from the individual measures. The median of the individual expectation gaps is very similar to the

expectations gap constructed from the median forecaster. This suggests that focusing on the subset of 79 forecasters does not bias our analysis. The dispersion between individual expectation gaps is fairly stable over time, ranging approximately 3 to 4 percentage points with an increase during the dot-com boom in 2000 and a prolonged increase during the housing boom and bust in 2005–2010. Only in recent years has it gradually declined.

Figure 4. Measures of Expectation Gap Uncertainty Using Forecaster Disagreement



Sources: Authors' calculations based on data from BEA and forecasts from SPF and BCEI.

An alternative approach for measuring forecaster disagreement is to consider the interquartile range of forecasts, which does not rely on individual expectations gap estimates that could be biased by the entry and exit of individual forecasters over time. Conversely, it is not necessarily representative of any individual forecaster's views since the upper/lower quantiles will vary across variables, horizons, and time. It does not capture the full range of forecaster dispersion, but each horizon corresponds analogously to a plus/minus one standard deviation in forecaster disagreement.[12] Panel A plots the interquartile range for the SPF in dashed red lines, which is much smoother relative to the minimum/maximum measure.

[12] Reifenschneider and Tulip (2019) use a similar approach to calculate forecast uncertainty.

It is not possible to construct an interquartile range for the BCEI since individual forecasters' projections are not available. However, panel B of figure 4 plots measures based on the top/bottom 10 forecasters. The dispersion is larger than either of the SPF measures, which indicates that individual forecasts in the BCEI survey are more diffuse than those in the SPF survey.

The measures of forecaster disagreement illustrate that there are 4 episodes during which the economy clearly performed significantly above or below most individual forecasters' expectations. The first episode corresponds with the dot-com boom, when the economy grew faster than expected; the second episode was during and after the 2008–2009 recession, when the economy grew much slower than expected; the third episode was during the so-called invisible recession[13] of 2015–2016; and the fourth episode occurred during the recession in 2020 induced by the COVID-19 pandemic. Each of these episodes corresponds to important turning points in the economy and so support the interpretation of the expectations gap as an indicator of business-cycle turning points.

4 Comparing Nominal and Real Gaps

While this paper focuses on the nominal expectations gap, this section applies the methodology described in section 2.3 to produce a real expectations gap from real GDP data and BCEI real GDP forecasts. In contrast to the nominal expectations gap, which offers clearer indications of aggregate demand shocks regardless of aggregate supply shocks, the real expectations gap compares forecasters' expected aggregate supply and aggregate demand outcomes to realized outcomes. Consequently, the real expectations gap—like conventional output gap estimates—does not indicate

[13] See Neil Irwin, "The Most Important Least-Noticed Economic Event of the Decade," *New York Times*, September 29, 2018, https://www.nytimes.com/2018/09/29/upshot/mini-recession-2016-little-known-big-impact.html.

whether supply shocks or demand shocks are dominant. Despite a high degree of correlation, the nominal expectations gap provides additional information about the state of the economy.

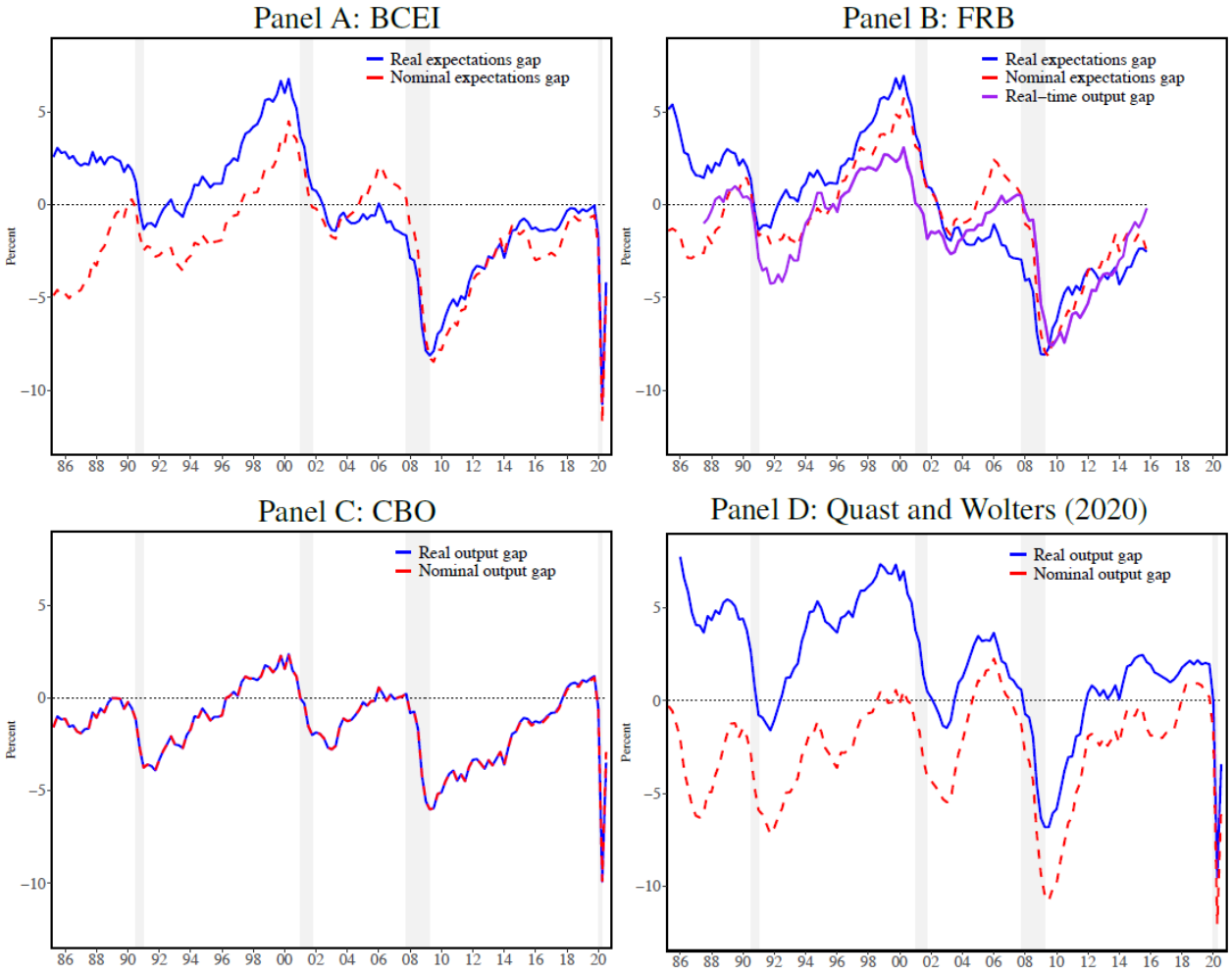
We compare the BCEI-based nominal and real expectations gaps with 3 sources of alternative measures: (1) real-time output gaps from the Federal Reserve Board staff's Greenbooks[14] and the nominal and real expectations gap estimates that we derive from their forecasts; (2) the CBO's nominal and real output gap; and (3) the nominal and real output gap generated using the modified Hamilton filter of Quast and Wolters (2020). There are similarities between the measures; however, based on our preliminary analysis, the nominal expectations gap appears to produce a more holistic measure of the financial/business cycle.[15]

Panel A of figure 5 plots the nominal and real expectations gaps derived from the BCEI surveys. From the mid- to late 1980s, the real gap was positive while the nominal gap was negative, which is consistent with the disinflation of that period. The differences between the real and nominal gaps were broadly stable throughout the 1990s even as both measures increased. Since the 2001 recession, the nominal and real measures have followed broadly similar patterns except for two episodes. First, during the mid-2000s, when home prices and construction were rapidly rising, the nominal gap indicates overheating, whereas the real gap does not. The second episode occurs in 2015–2016, when the nominal gap drops more sharply than the real gap, thus better capturing the invisible recession that was associated with declines in energy, agriculture, and manufacturing activity. These episodes suggest the nominal expectations gap better detects certain business-cycle features.

[14] Since mid-2010 the Greenbook has been replaced by the Tealbook.

[15] The nominal expectations gap differs considerably from the inflation cycle produced by the ECRI and is much more closely related to conventional measures of the output gap.

Figure 5. A Comparison of Nominal versus Real Gaps



Sources: Authors' calculations using data and forecasts from BEA, CBO, the Real-Time Data Set for Macroeconomists, FRB, and BCEI.

A comparison of the nominal and real expectations gap estimates with conventional output gap measures is complicated since they are derived from different sources. To provide a more "apples-to-apples" comparison of the expectations and output gaps, we construct the nominal and real expectations gaps from the Federal Reserve Board staff's Greenbook forecasts and compare these to their real-time output gap measures.[16] Panel B of figure 5 plots all 3 measures up through 2016, which corresponds to the last publicly accessible Greenbook. Moreover, the Greenbook output gap was only released beginning in 1987. The Greenbook expectations gap

[16] While the Greenbook does not explicitly contain long-term forecasts, we extrapolate long-term forecasts out 5 years ahead by using the last quarterly growth rate forecast (typically between four to eight quarters ahead) as a proxy for the long-run growth rate.

estimates are similar to the BCEI expectations gaps. Notably, the real-time output gap is more closely correlated with the nominal expectations gap (0.92) than it is with the real expectations gap (0.81). The Greenbook output gap shows a larger decline following the 1990–1991 recession but suggests less overheating during the late 1990s and more quickly turns negative in 2000. It exhibits much less overheating in the mid-2000s than the nominal expectations gap but tracks both expectations gaps closely after 2008. Overall, the expectations gap for an individual forecaster can be thought of as a proxy for the implicit output gap used to construct the forecasts.

To explore how sensitive measures of the output gap are to being conveyed in nominal or real terms, we look at 2 alternative approaches for constructing the output gap. The first, shown in panel C, is the measure by CBO that uses a production-function approach to estimate potential GDP and assumes the real and nominal measures of the output gap are identical. The measures do not indicate any overheating associated with the housing price boom in the mid- to late 2000s; nor do they capture the slowdown in 2015–2016.

Another statistical approach is the real-time measure by Quast and Wolters (2020) that employs a modified Hamilton filter to estimate potential GDP, which we replicate using both real and nominal GDP. The resulting output gap estimates are plotted in panel D of figure 5. Unlike the CBO's output gap, the Quast and Wolters (2020) nominal and real measures have large and persistent differences. While the real output gap remains positive, with only occasional dips into negative territory around recessions, the nominal output gap is almost always negative except for at the peak of a cycle. Both versions suggest the economy was overheating during the mid-2000s but diverge in 2015–2016 with the real output gap rising and the nominal output gap falling sharply.

Our analysis suggests that the real and nominal gaps can convey different information. While the CBO assumes away these differences, the episodes in the mid-2000s and 2015–2016 suggest that including nominal fluctuations provides a clearer picture of overheating and underperformance associated with episodes of broader price changes. Conversely, both the real expectations gap and conventional output gaps missed or downplayed these economic developments. Thus, the nominal expectations gap is more informative for analyses of business cycles in these instances.

However, there is a notable oddity in both the nominal and real expectations gap around the 2001 recession: these do not turn negative until near the end of that recession. A positive expectations gap during a recession seems odd as it implies that actual GDP is still greater than expected, on average. A potential explanation is that proportionally more debts were accrued during the dot-com boom just before the 2001 recession.[17] Thus, if more distant forecasts prior to the dot-com boom are excluded—to more closely represent the rapid accumulation of debt during the boom—the gap turns negative more quickly. This interpretation is corroborated by panel B of figure 3, which shows that the expectations gap turns negative earlier near the 2001 recession when longer forecast horizons are excluded from the estimation of neutral GDP and the expectations gap.

5 Real-Time and Forward-Looking Estimates

This section shows (1) how the expectations gap changes between vintages of GDP estimates, (2) how a forward-looking expectations gap measure can be derived, and (3) how forward-looking

[17] We initially hypothesized the comprehensive updates by the BEA over time may have biased the neutral GDP estimates downward, thus overstating how large the expectations gap was in 2001. (This would arise if actual GDP estimates were revised up from the addition of new, higher-growth spending categories while the real-time BCEI growth rate projections would be unchanged and would tend to underestimate growth.) However, as our real-time analysis in the next section shows, the expectations gap estimates derived from the latest GDP estimates are smaller than the real-time gap estimates.

gap estimates perform near business-cycle turning points. The real-time exercise illustrates the measures that would have been observable at given moments of time. This section focuses exclusively on nominal measures. Therefore, any mention of the expectations gap, GDP, or neutral GDP refers to the nominal measures thereof.

5.1 Real-Time Estimates

As outlined in section 2, forecasted GDP growth rates are combined with initial actual GDP levels to generate forecasts for the level of GDP. The average of these forecasts over a 5-year horizon yields a neutral GDP estimate, and the percentage difference between actual GDP and neutral yields the expectations gap. Even though the GDP growth rate forecasts submitted in a given month's BCEI survey are fixed once published, the level forecasts are tied to a GDP estimate that is subject to revisions over time. Consequently, this can lead to sizeable changes in the expectations gap by altering the estimates of the actual level of GDP, the estimate of the level of neutral GDP, or both.

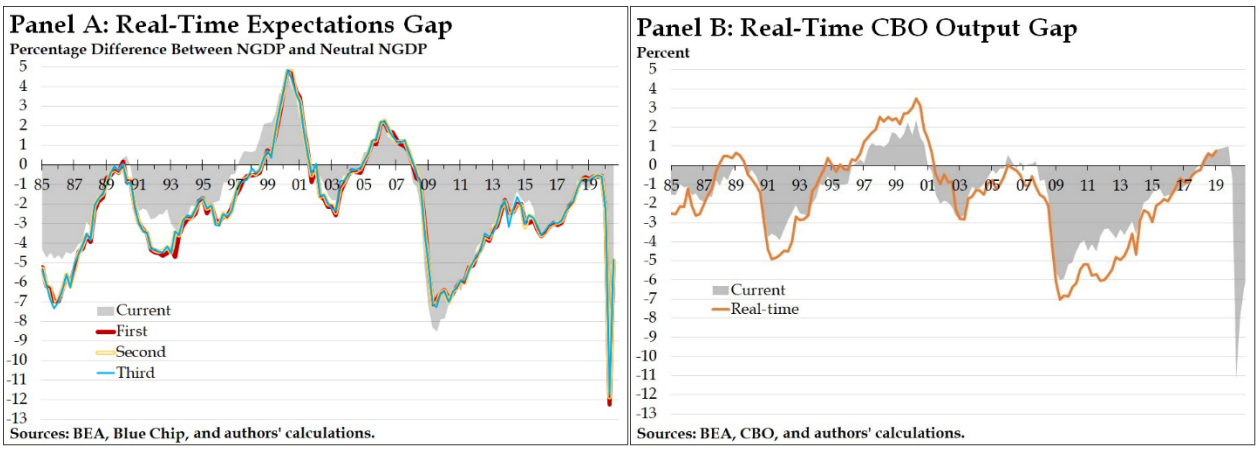
Estimating a real-time expectations gap involves taking the percentage difference between the real-time estimate of GDP and the real-time estimate of neutral GDP. The first aspect is simple, as historical vintages of GDP estimates are readily available (see Croushore and Stark 2001). For example, for Q1-1997, the first, second, and third estimates of that quarter's GDP were released in April, May, and June 1997.

The second aspect, estimation of real-time neutral GDP, is more intensive. Each monthly vintage of GDP data must be combined with the 60 BCEI GDP growth rate forecasts that are needed to estimate neutral GDP in Q1-1997. For example, the first estimate of neutral GDP Q1-1997 uses the GDP series that became available in April 1997 when the first estimate of Q1-1997's GDP was released. The percentage differences between the first, second, and third

estimates of GDP are then taken against the first, second, and third estimates of neutral GDP that would have been available at each point in time.

Panel A of figure 6 shows the first, second, and third estimates of the expectations gap that would have appeared when a given quarter's GDP numbers became available. For example, the Q1-1997 first, second, and third estimates (released in April, May, and June of 1997) indicated an expectations gap of about –2 percent. Since then, comprehensive updates made to the GDP estimates as of December 2020 indicate that the actual expectations gap (titled "Current" in figure 6) for Q1-1997 GDP was only about –0.5 percent. Differences between the first, second, and third estimates of the expectations gap are very small. In contrast, comprehensive updates do lead to substantial revisions, especially in the late 1980s, 1990s, and 2014–2018. At those times, the latest expectations gap estimates tend to have a smaller absolute value than the real-time estimates. Exceptions occurred in 1997–1999 and 2008–2011 when the latest estimate was revised up and down respectively compared to the real-time estimates.[18]

Figure 6. Real-Time Gap Estimates



[18] The BEA's comprehensive benchmark revision in 1999 to include spending categories on software, intellectual property products, and research and development is likely behind many of the larger revisions in the late 1980s and 1990s as these categories were growing faster than average over this period so that their inclusion would imply a more positive (less negative) expectations gap.

Panel B of figure 6 computes a real-time CBO output gap series that we generated by combining reported GDP data with CBO's estimates of potential GDP that were published near the charted quarters. For example, the real-time output gap around late 2008 to early 2009 is derived from Bureau of Economic Analysis (BEA) data from June 2009 and CBO's "August 2009 Update to the Budget and Economic Outlook." The methodology used in figure 6 combines the CBO's various outlook publications (generally 2 per year) with the vintage of BEA data that was used to make their forecasts. The results show that the CBO's revisions to the output gap are just as large or even larger at times than those observed in the expectations gap.

Though GDP vintages are generally revised downward around recessions, this does not imply the same results for output gap estimates. In particular, if the revisions to potential GDP exceed those to actual GDP, the current output gap estimate will be smaller than the real-time output gap estimates as occurs around the 2008–2009 recession shown in panel B of figure 6.

5.2 A Forward-Looking Expectations Gap

Here we illustrate how a forward-looking expectations gap can be derived from incomplete survey data, using Q4-2021 as an example. As outlined in section 2, calculating the expectations gap requires calculating the percentage difference between actual GDP and neutral GDP. The Q4-2021 neutral GDP estimate would be the average of forecasts for GDP in that quarter that were submitted between January 2016 and December 2021. If survey data are only available through September 2020 (Q3-2020), with 15 quarterly forecasts in hand and 5 to be submitted, there are 2 ways to derive a forward-looking neutral GDP estimate.

One approach is to average all forecasts that have been published to date:

$$\bar{Y}_{t+j|t,v} = \frac{1}{20-j}\sum_{h=0}^{19-j} Y_{t+j|t-h,v}, \quad (6)$$

which gives them all equal weight. This implies that each previous level forecast is equally likely to occur going forward. An alternative approach gives the most recently published forecast additional weight by assuming that it will be repeated for the 5 forecasts that have yet to be submitted for the quarter of interest. Averaging the forecasts available to date and the last-published forecast repeated for the j missing quarters between the present and the future quarter of interest yields

$$\bar{Y}_{t+j|t,v} = \frac{1}{20}\sum_{h=0}^{19-j}\left(Y_{t+j|t-h,v} + jY_{t+j|t,v}\right) \quad (7)$$

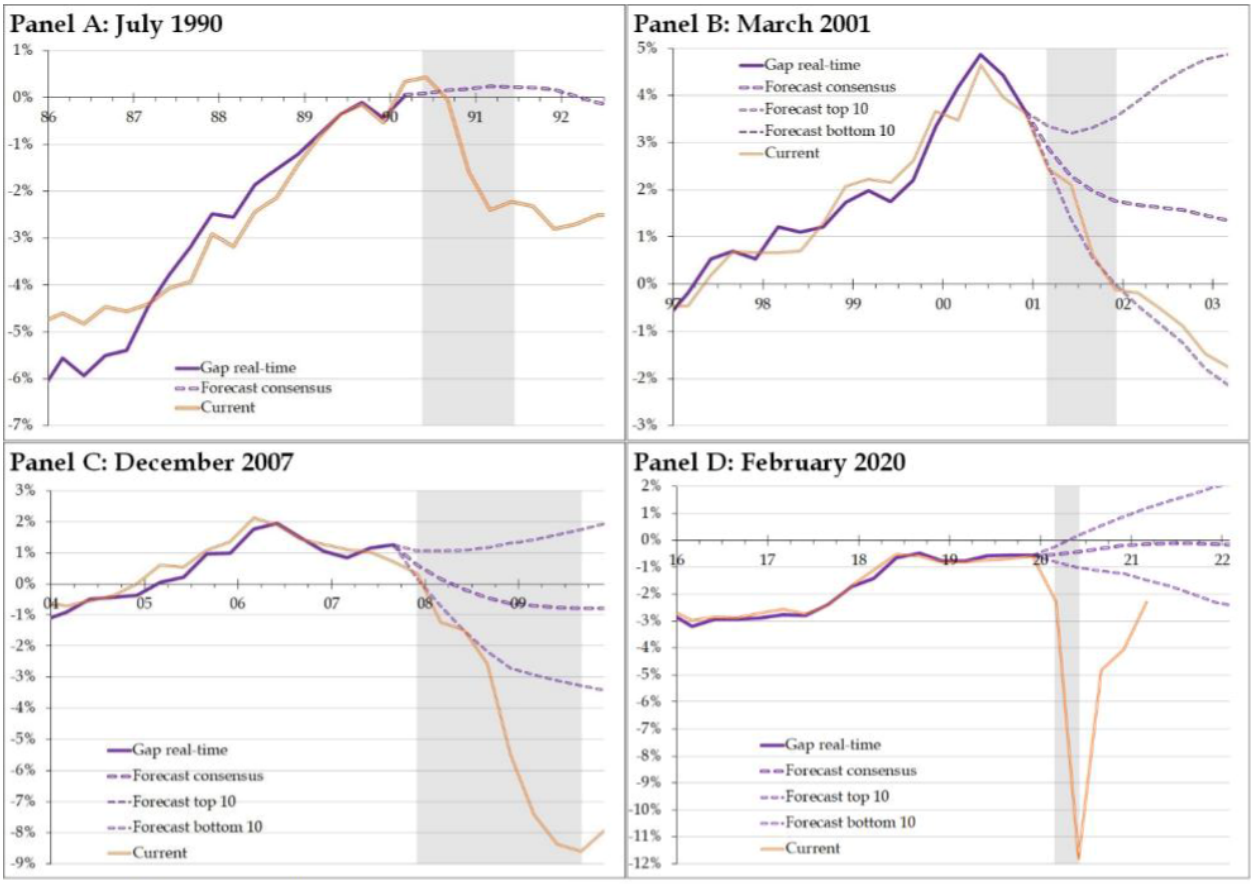
This approach assumes that the future forecasts of GDP are more likely to be represented by what is the latest forecast than by the forecasts made in any period prior. We focus on this latter approach.

Taking the percentage differences between the latest forecast path of nominal GDP and a series of forward-looking neutral GDP estimates derived according to equation (6) or (7) yields a forward-looking nominal expectations gap. The consensus forward-looking expectations gap series converges to 0 at the 5-year-ahead horizon regardless of whether equation (6) or (7) is used.[19] Since this drives the movements in all forward-looking expectations gap estimates at longer horizons, we focus on the forward-looking estimates only up to 2 years ahead.

Figure 7 illustrates how the BCEI-derived forward-looking expectations gap estimates would have appeared with the BCEI surveys released for July 1990 (panel A), March 2001 (panel B), December 2007 (panel C), and February 2020 (panel D)—the months a business-cycle peak was eventually declared by the NBER for the last 4 recessions.

[19] For example, in September 2020, the BCEI consensus forecast was that Q3-2025 GDP will be $26,410.5 billion and was the only forecast available for Q3-2025. Assuming, as equation (6) does, that the forecast of $26,410.5 billion will be repeated 19 times for the surveys that will be published between October 2020 and September 2025, the calculation becomes 20 * ($26,410.5 billion) / 20, an expectations gap of 0 percent. The underlying economic intuition for this assumption is that sticky debt obligations that enable potential inefficiencies ex ante are expected to be resolved after 5 years.

Figure 7. Forecasts of the Nominal Expectations Gap at Expansion Peaks



Sources: Bureau of Economic Analysis, Blue Chip, and authors' calculations.

The forward-looking expectations gap ranges are the percentage difference between the top 10 (bottom 10) nominal GDP projections and a forward-looking neutral nominal GDP estimate that is derived *only* from the consensus nominal GDP forecasts using equation (6). The approach used in figure 7 thus enables the observation of the most optimistic and most pessimistic forward-looking paths for the expectations gap ignoring the disagreement about neutral estimates discussed in section 3.3 and focusing only on the disagreement around the latest survey's forecast path for GDP.

We can evaluate the performance of the forward-looking expectations gap by computing the root mean square prediction errors (RMSE) across horizons. We compare the performance of

the forward-looking measures against a simple random walk that extends the last observed estimate of the expectations gap forward into the future. We also compare against forecasts of the expectations gap based on real-time estimates from an autoregressive model with 4 lags (i.e., an AR(4) as suggested by Beckworth 2020).[20]

Table 1. Expectations Gap Forecast Performance (Q1-1985–Q2-2020)

	First			Second			Third			Latest		
h	BCEI	RW	AR	BCEI	RW	AR	BCEI	RW	AR	BCEI	RW	AR
1	0.43	0.62	0.62	0.48	0.67	0.66	0.52	0.70	0.69	1.06	1.22	1.21
2	0.72	1.06	0.99	0.76	1.10	1.02	0.79	1.12	1.05	1.20	1.54	1.48
3	1.04	1.47	1.46	1.08	1.50	1.48	1.09	1.51	1.49	1.39	1.87	1.84
4	1.37	1.83	1.77	1.39	1.86	1.78	1.40	1.87	1.79	1.62	2.19	2.11

Table 1 shows that the real-time BCEI-based forward-looking measures consistently have smaller RMSEs than the random walk and the AR(4) model out through at least 4 quarters ahead. This is unsurprising as the forward-looking measures contain most of the same information as the actual estimates of the expectations gap. The forecasts are particularly useful through 2 quarters ahead with RMSEs less than 1 percent but become less so at longer horizons where the 4-quarter-ahead forecasts have RMSEs of around 1.5 percent. The performance at shorter horizons is less accurate when using the latest estimates of the expectations gap, which include large revisions in the underlying data.

Table 2. Expectations Gap Forecast Performance during NBER Recessions

	First			Second			Third			Latest		
h	BCEI	RW	AR	BCEI	RW	AR	BCEI	RW	AR	BCEI	RW	AR
1	0.57	2.77	2.55	0.63	2.72	2.50	0.62	2.68	2.47	1.29	3.14	2.87
2	2.63	3.62	3.45	2.58	3.56	3.39	2.55	3.53	3.36	2.89	4.04	3.82
3	3.45	4.07	3.98	3.39	4.02	3.93	3.35	3.99	3.90	3.73	4.53	4.39
4	3.78	4.28	4.23	3.73	4.24	4.19	3.69	4.21	4.17	4.11	4.75	4.62

[20] We start with an RW model in 1985 and then expand the lags up to four as the sample grows so that after 1987, all forecasts are generated using an AR(4) model.

Focusing on periods that were later defined to be recessions by the NBER (table 2), the forward-looking measure continues to outperform the other models, though performance deteriorates substantially at longer horizons. Now, only the one-quarter-ahead forecasts have RMSEs that are less than 1 percent, while the 4-quarter-ahead forecasts have RMSEs of at least 3.7 percent.

5.3 Forward-Looking Estimates near Business-Cycle Turning Points

Figures 8 and 9 show the evolution of the real-time estimates of the forward-looking expectations gap over 4 quarters near business-cycle turning points. The objective here is to see if there are any discernable patterns in the forward-looking expectations gap that indicate an oncoming recession (figure 8) or recovery (figure 9).

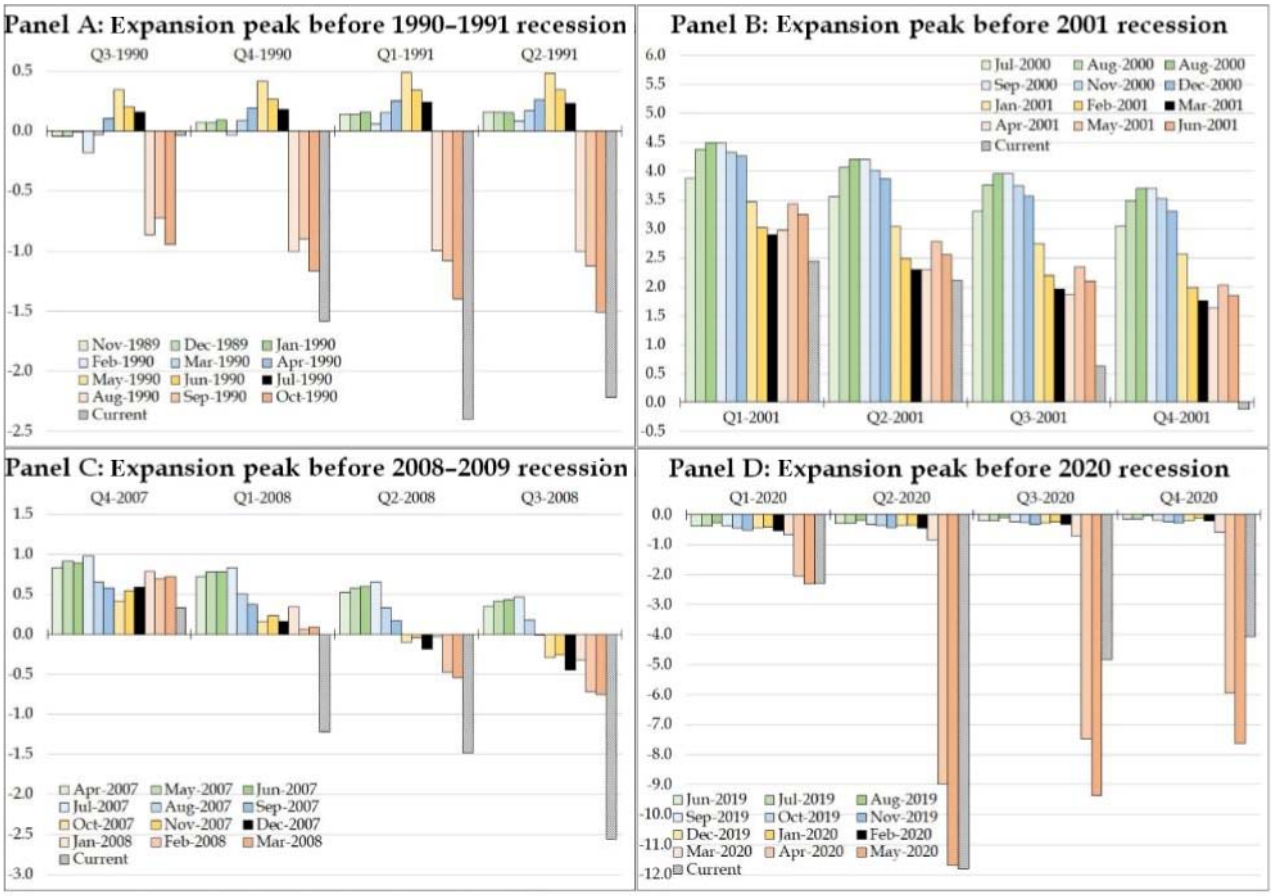
Within any given quarter, the bars show the real-time evolution of forward-looking expectations gap estimates over a sequence of consecutive BCEI surveys. The evolution of the bars within and across quarters mostly reflects updates to the forecast path of nominal GDP according to the information then available to forecasters when a given monthly BCEI survey was published.

For example, panel A of figure 8 shows the quarters around the 1990–1991 recession. Focusing in particular on Q3-1990, the BCEI surveys from November 1989 through March 1990 indicated a slightly negative expectations gap was forecast for Q3, the April through July 1990 BCEI surveys forecast a slightly positive expectations gap, and then, beginning with the August 1990 BCEI survey, the forecast expectations gap abruptly shifts into negative territory. Lastly, the right-most bar within a given quarter shows the expectations gap as estimated from the most current vintage of GDP data.

Another way to look at these figures is to compare the identically colored bars across quarters. For example, the darkest-colored bar in panel A of figure 8 shows the forward-looking expectations gap as it would have appeared when the July 1990 BCEI survey was published. The

darkest-colored bars within each panel represent the BCEI survey from the month the NBER eventually would declare as the peak of the business cycle. Thus, the forward-looking expectations gap according to the July 1990 survey was approximately 0.25 percent for Q3-1990, Q4-1990, Q1-1991, and Q2-1991. In sharp contrast, the forward-looking gap estimate as it would have appeared with the August 1990 BCEI survey's release turns markedly negative for all 4 quarters shown in the panel A.

Figure 8. Real-Time Forward-Looking Expectations Gap Estimates near Expansion Peaks

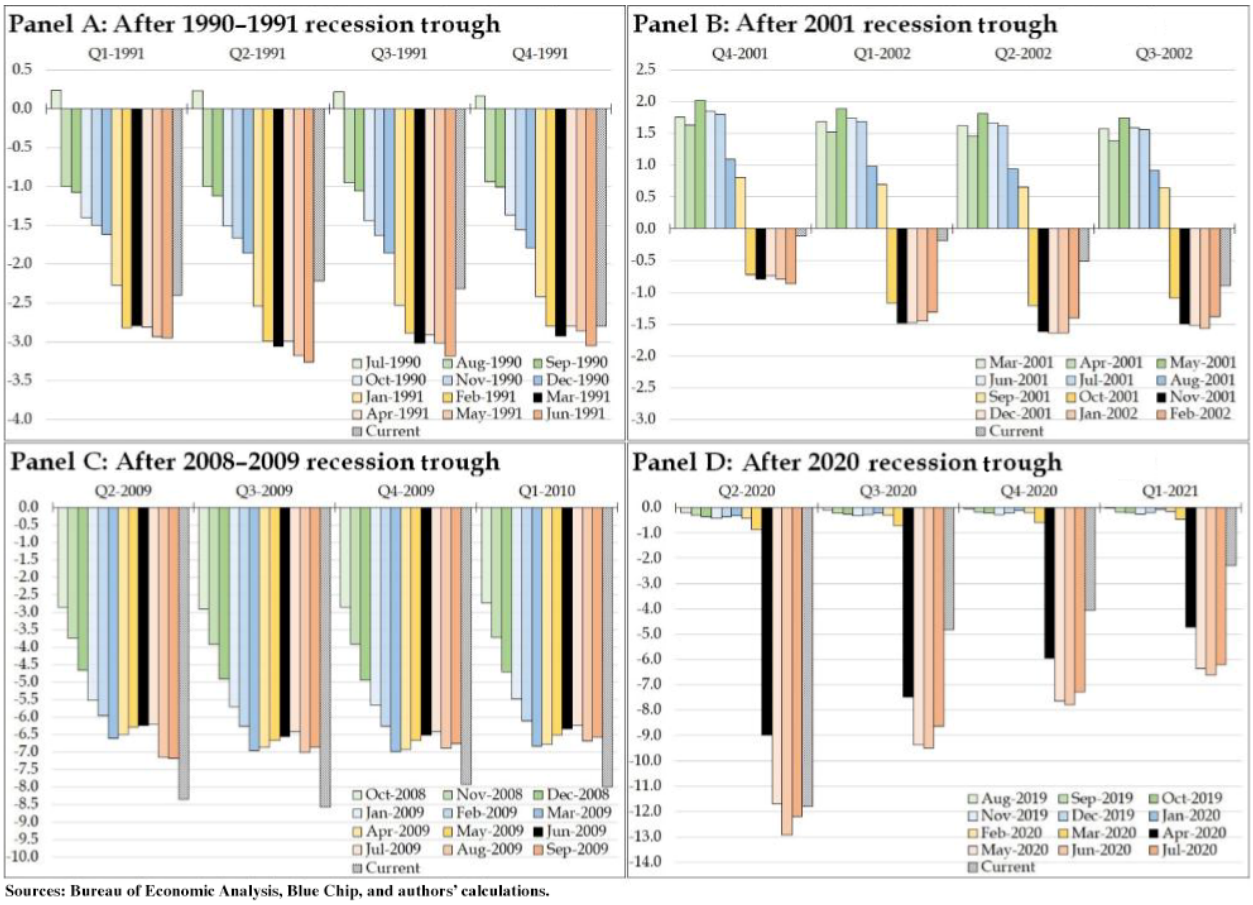


Sources: Bureau of Economic Analysis, Blue Chip, and authors' calculations.

In general, in each panel of figure 8, the dark-colored bars represent the forward-looking gap estimates from the BCEI survey published in the month that the NBER would eventually declare to be the peak (trough) of a given expansion. The 8 preceding bars within a given quarter

are from the BCEI surveys that were published prior to the expansion peak. The 3 bars immediately to the right of the darkest-colored bar are those forward-looking gap estimates from the 3 BCEI surveys that followed the expansion peak.

Figure 9. Real-Time Forward-Looking Expectations Gap Estimates near Troughs



Sources: Bureau of Economic Analysis, Blue Chip, and authors' calculations.

Before the 1990–1991 (panel A), 2001 (panel B), and 2008–2009 (panel C) recessions, the forward-looking gap estimates attain a high 2 to 5 months ahead of an expansions' peak month. Subsequent forward-looking gap estimates shrink from there. This does not apply to the 2020 recession (panel D), which underscores the sudden and unexpected nature of the COVID-19 pandemic. The 2001 recession is peculiar in that the forward-looking expectations gap estimates remain positive, as discussed above in section 4. Instead, a recession may be portended by

consistent downward revisions to a given quarter's forward-looking expectations gap. This is discussed further in section 6.

Figure 9 shows the evolution of the real-time estimates of the forward-looking expectations gap near the trough of recessions. In these panels, the darkest bars represent the estimates from the BCEI survey released during the month the NBER eventually declared to be the trough of a recession (March 1991, November 2001, June 2009, and April 2020).

A clear pattern of forward-looking expectations gap estimates near a recession trough is even less discernable relative to those near an expansion peak. In panel A, around the 1990–1991 recession, the forward-looking expectations gap for the 4 quarters charted cease being revised down by March 1991, which corresponds to the recession trough.

In panel B, the September 11, 2001, terrorist attacks have a sharp impact on forward-looking gap estimates. While the September 2001 survey (usually released the tenth day of the given month, i.e., in this case just before the attacks took place) signifies a positive forward-looking expectations gap, the subsequent measure based on the October survey drops sharply into negative territory. However, substantial downward revisions to the forward-looking expectations gap ceased with the November survey, which is the month the NBER declared to be the trough.

In panel C, for the 2008–2009 recession, the forward-looking expectations gap improved somewhat following the March 2009 survey until the June survey, which coincides with the month the NBER declared to be the trough.

For the 2020 recession (panel D), the forward-looking expectations gap estimates reached the lowest point in June. Since the forward-looking gap did not improve before and up to the April 2020 survey, it failed to serve as a leading indicator of the trough.

Thus, for the 1990–1991, 2001, and 2020 recessions, the real-time forward-looking expectations gap did not predict an eventual trough. However, in the 2008–2009 recession, a slight improvement in the forward-looking expectations gap did appear 2 months before the eventual trough.

Overall, persistent month-to-month differences between real-time forward-looking expectations gap estimates seems to predict business-cycle turning points, but not always. This is consistent with the findings of Isiklar and Lahiri (2007) that professional forecasts can capture the cyclical components of economic growth up to one year ahead. However, recessions and recoveries can often occur abruptly for reasons that were unforeseen by professional forecasters at the time. Therefore, a negative forward-looking expectations gap may be sufficient but is not necessary to signify a recession as illustrated by the 2001 recession.

6 Conclusion

In this paper, we assess the expectations gap proposed in Beckworth (2020). This measure of economic slack is derived from professional forecasters' historical expectations about the trajectory of the economy in contrast to conventional output gap estimates that are derived from model-specific measures of potential GDP. To overcome some of the limitations of Beckworth (2020), we develop and evaluate several alternative measures of the expectations gap using the BCEI survey, different forecast horizons, individual forecasters' estimates, nominal and real measures, and real-time and forward-looking estimates.

Although the expectations gap is not particularly sensitive to the choice of forecaster survey, it is sensitive to the range of forecast horizons over which neutral GDP is calculated. Moreover, there is considerable disagreement between individual forecasters about the future trajectory of the

economy. Despite this, we identify 4 distinct episodes in which the entire range of individual forecasters' expectations gaps provides an unambiguous signal about the state of the economy.

There are meaningful and informative differences between the nominal and real expectations gaps, which contrasts with conventional output gap measures. This is exemplified by the nominal expectations gap detecting overheating alongside the run-up in housing prices during the mid-2000s that preceded the 2008–2009 recession. Also, in 2015–2016 the nominal expectations gap detects the so-called invisible recession while the real expectations gap and conventional output gap measures do not. Furthermore, although there have been considerable historical revisions to the expectations gap due to comprehensive updates in GDP, these revisions are comparable to those observed in conventional output gap measures.

More broadly, while the output gap is often used as a guide for signals about inflation, the expectations gap shifts the emphasis toward financial stability concerns. In other words, while a rising or positive output gap is suggestive of rising inflation, the nominal expectations gap is more agnostic. It emphasizes deviations of aggregate demand from past expectations, which can affect inflation and real output, to varying degrees and with lags. We leave the analysis of the relationship between the expectations gap and inflation to future research.

Forward-looking measures of the expectations gap are generally informative up to 2 quarters ahead and are always more informative than assuming there will be no change. Although forward-looking measures of the expectations gap do not always signal an oncoming expansion peak or recession trough, the direction of updates to the forward-looking expectations gap occasionally precedes a business-cycle turning point.

Overall, we argue that the expectations gap is a useful measure of economic slack. Consequently, it may add value to shift the emphasis from "navigating by the stars" to navigating by what agents expect.

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