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# Central bank information and private-sector Expectations

by

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# Central bank information and private-sector expectations*

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**Abstract**

Jarocinski and Karadi (2020) disentangle a pure information from the interest rate component of monetary policy surprises. This note quantifies the information revealed in FOMC announcements using forecast revisions from Blue Chip Economic Indicators. In response to a positive central bank information shock, survey participants revise their now- and short-term forecasts of real GDP growth upwards, while the corresponding revisions in the growth rate of the GDP deflator are mostly statistically insignificant.

**Keywords:** Blue Chip Economic Indicators, Central bank information shocks, Forecast revisions

**JEL classification:** E32, E52, E66

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# 1 Introduction

This note quantifies the information revealed in Federal Open Market Committee (FOMC) announcements. Based on the structural estimates of central bank information shocks from Jarocinski and Karadi (2020), I show that commercial forecasters tend to revise their now- and short-run forecasts of real GDP growth *upwards*, when the FOMC announces an unexpected *increase* in the federal funds rate. While this seems at odds with the popular notion that interest rate hikes have a contractionary effect on real economic activity, it is consistent with prior evidence in Campbell et al. (2012, 2016), Nakamura and Steinsson (2018), and Lakdawala (2019) as well as the interpretation in Jarocinski and Karadi (2020) that monetary policy announcements are informative about the central bank's internal forecasts.[1]

Instead of relying on (the conditional comovement of U.S. interest rates and) stock prices as a proxy for the optimism induced by positive central bank information shocks, I consider now- and forecast revisions in Blue Chip Economic Indicators, a monthly survey of more than 50 economists employed by some of America's largest manufacturers, banks, insurance companies, and brokerage firms. While the variables of interest, such as U.S. real GDP, are observable only at the *quarterly* frequency, revisions between adjacent survey rounds permit identifying the effects of information shocks at the *monthly* frequency, which is not possible for the Survey of Professional Forecasters, for example.

I focus on the Blue Chip consensus (i.e. average) now- and forecasts of real GDP and the GDP deflator in quarter-on-quarter growth rates as measures of private-sector expectations about U.S. economic fundamentals. Regressing consensus now- and forecast *revisions* on the central bank information shocks, I find that a typical information shock indeed leads to a statistically and economically significant upward revision of survey participants' expectations about current and future real GDP growth, while consensus now- and forecast revisions in the GDP deflator are positive, yet mostly statistically insignificant. My results complement thus the empirical evidence in Jarocinski and Karadi (2020) and support their interpretation of the shock series as revealing Federal Reserve private information.

[1] While Nakamura and Steinsson (2018) conclude that FOMC announcements lead the private sector to update its beliefs about economic fundamentals in general rather than the future path of monetary policy, Campbell et al. (2012, 2016) and Lakdawala (2019) interpret their results more narrowly as evidence for so-called "Delphic" forward guidance.

Romer and Romer (2000) pioneer the research on asymmetric information between the Federal Reserve and the public by comparing Greenbook and Blue Chip inflation forecasts. Regressing the latter on an indicator of Federal Reserve actions, they find that commercial forecasters raise rather than lower their inflation expectations in response to a contractionary action during 1980:1–1991:11. In order to isolate the causal effect of FOMC announcements on asset prices, Gürkaynak et al. (2005) propose identifying monetary policy shocks from high-frequency changes in federal funds futures rates in a thirty-minute window around every announcement since 1990. The authors argue that these effects are adequately captured by a two-factor structure, where the factors can be interpreted as the "current federal funds target" and a "future path of policy" that is typically associated with significant changes in FOMC statements. Campbell et al. (2012) show that the results in Gürkaynak et al. (2005) remain valid during the financial crisis of 2007–2009, and that a positive innovation to federal funds futures rates is associated with a fall in Blue Chip consensus unemployment forecasts for the next three quarters and higher CPI inflation forecasts for the current and the next quarter during 1994–2007, concluding that high-frequency monetary policy surprises have a substantial "Delphic" component. Similarly, Nakamura and Steinsson (2018) find that Blue Chip consensus forecasts of GDP growth and inflation increase in response to an interest rate hike during 1995–2014, in contrast to what standard models imply for a monetary tightening. Campbell et al. (2016) argue that these puzzling results can be explained by the difference between Greenbook and Blue Chip forecasts as a direct measure of Federal Reserve private information. The authors interpret this as the "Delphic" component of forward guidance and call for a better measure of the latter. Lakdawala (2019) and Jarocinski and Karadi (2020) propose alternative approaches to decomposing high-frequency monetary policy surprises into a conventional federal funds rate change and a forward guidance or central bank information shock, respectively.[2] I merge these approaches by investigating the effects of a central bank information shock on Blue Chip consensus now- and forecasts.

The rest of this note is structured as follows. Sections 2 and 3 present the data and the econometric methodology. Section 4 discusses the empirical results, and Section 5 concludes.

[2]While Lakdawala (2019) largely follows the approach and interpretation in Campbell et al. (2012, 2016), Jarocinski and Karadi (2020) extends the high-frequency identification of monetary surprises in Gürkaynak et al. (2005) to two structural shocks.

# 2 Data

Blue Chip Economic Indicators is a monthly survey of about 50 economists employed by some of America's largest manufacturers, banks, insurance companies, and brokerage firms. While the survey was first conducted in August 1976, data on so-called consensus now- and forecast (i.e. simple averages across all survey participants) are available from May 1984. I focus on consensus now- and forecast *revisions* in quarter-on-quarter growth rates of real GDP and the GDP deflator between adjacent survey rounds, where quarter-on-quarter growth rates are based on the corresponding now- and forecasts *in levels*. Given that the forecast period in the Blue Chip survey, which contains the previous, current, and next calendar year, shifts by a full calendar year at the end of each year, consistent forecasts of quarter-on-quarter growth rates can be constructed for the current and the subsequent four quarters.[3] Accordingly, I obtain consensus now- and forecast *revisions* for the current and up to four quarters ahead by taking the difference between two adjacent survey rounds.

The time series of central bank information shocks for January 1990 through April 2019 is from Jarocinski and Karadi (2020).[4] Building on Gürkaynak et al. (2005), the authors distinguish between conventional monetary policy shocks and central bank information shocks based on the high-frequency co-movement of changes in 3-month federal funds futures and the S&P500 stock index in a thirty-minute window around FOMC announcements since 1990. According to economic theory, an (unexpectedly large) increase in the federal funds rate represents a monetary policy tightening, which reduces the present value of future dividends and thus the stock market valuation of U.S. enterprizes. Negative comovement of interest rates and stock prices therefore identifies a conventional monetary policy shock. However, a policy rate hike may also reveal that the Federal Reserve was unexpectedly optimistic about economic conditions and induce thus financial investors to become more optimistic, as well. Positive comovement of interest rates and stock prices therefore identifies a central bank information shock. No restrictions are imposed on low-frequency variables such as real

[3]It is important to note that Blue Chip Economic Indicators report the consensus now- and forecasts of *year-on-year* growth rates of real GDP and the GDP deflator, while *quarter-on-quarter* growth rates must be derived from the consensus now- and forecasts *in levels*.

[4]The shock series and further results can be replicated using MATLAB code made available through the American Economic Journal: Macroeconomics.

GDP, for example.[5]

In the empirical analysis, I regress the Blue Chip consensus now- and forecast revisions of U.S. real GDP and the GDP deflator in quarter-on-quarter growth rates on the mean of the central bank information shock series across all admissible candidate models from Jarocinski and Karadi (2020). The start of the sample period, January 1990, is dictated by the availability of the shock series, while the end of the sample period, December 2015, is due to the commercial nature of Blue Chip Economic Indicators. Table 1 reports the sample means and standard deviations of the consensus now- and forecast revisions.

# 3 Econometric Methodology

To investigate the effects of central bank information shocks on consensus now- and forecast revisions, I estimate impulse response functions using so-called local projections proposed by Jorda (2005). The main advantage of local projections relative to a VAR model, for example, is that they do not impose the dynamic restrictions inherent in the latter. While this leads to a loss of efficiency, if the VAR structure is adequate, the impulse response function estimates are robust to the pitfall of specification error.[6]

Constructing impulse response functions based on local projections requires estimating a series of regressions,

$$rev_{t+h,f,i} = \alpha_{f,i} + \beta_{h,f,i} cbis_t + \Gamma_{f,i}(L) rev_{t,f,i} + \varepsilon_{t+h,f,i}, \quad h = 0, 1, \ldots, H, \tag{1}$$

where $rev$ denotes consensus now- and forecast revisions, $cbis$ the central bank information shock, subscript $f = 0, 1, \ldots, 4$ the forecast horizon in Blue Chip, and $i = \{GDP, GDPD\}$ the forecasted variable in quarter-on-quarter growth rates. $\alpha_{f,i}$ denotes a variable- and forecast horizon-specific intercept, while the lag polynomial $\Gamma_{f,i}(L) \equiv \gamma_{1,f,i}L + \gamma_{2,f,i}L^2 + \ldots + \gamma_{p,f,i}L^p$

[5] Jarocinski and Karadi (2020) investigate the effects of conventional monetary policy and central bank information shocks in a (Bayesian) structural vector autoregressive (VAR) model featuring standard macroeconomic variables and a proxy for financial-market surprises around FOMC announcements. The assumption of their high-frequency identification is that only conventional monetary policy and central bank information shocks are reflected by financial-market surprises within a narrow time window around these announcements (see also Gürkaynak et al., 2005; Gertler and Karadi, 2015; Nakamura and Steinsson, 2018).

[6] For a discussion of the respective merits of VAR models and local projections, see Ramey and Zubairy (2018). As a robustness check, I replicate all results using an autoregressive distributed-lag regression.

controls for serial correlation in consensus now- and forecast revisions of real GDP and the GDP deflator, respectively.[7]

Coefficient $\beta_{h,f,i}$ measures the effect of a central bank information shock in period $t$ on the revision of the $f$-quarter-ahead consensus forecast of (the quarter-on-quarter growth rate of) variable $i$ in period $t+h$. Accordingly, the corresponding impulse response functions are given by the sequence of $\beta_{h,f,i}$'s estimated in a separate regression in (1) for each horizon $h$.[8] Approximate 32% and 5% confidence intervals are constructed using 10,000 replications of a wild block bootstrap with block size 12.

# 4 Empirical Results

Figure 1 plots the *cumulated* impulse response functions of Blue Chip consensus now- and forecast revisions in real GDP growth for the current quarter and up to four quarters ahead to a one-standard-deviation central bank information shock from Jarocinski and Karadi (2020). Broken and dotted lines indicate one- and two-standard-error bootstrap confidence intervals.

If the FOMC announcements revealed *new* information on Federal Reserve expectations about current and future economic conditions, we would expect a revision of average private-sector expectations in response to the former. The first panel of Figure 1 illustrates that, indeed, the Blue Chip consensus nowcast of real GDP growth is revised upwards both on impact and in the survey rounds following a positive central bank information shock. Twelve months after the announcement, nowcast revisions have accumulated to about 0.25% or half a sample standard deviation of a consensus nowcast revision in real GDP growth in Table 1. The response is statistically significant at the approximate 32% level throughout and at the approximate 5% level from the third month onward.

The same shock has qualitatively and quantitatively similar effects on revisions in the one- and two-quarter-ahead Blue Chip consensus forecasts of real GDP growth. In either case, the

[7] To account for the possibility of *seasonality* in consensus now- and forecast revisions, a set of monthly dummies is included in all regressions but suppressed in equation (1) for notational convenience.

[8] Since Jorda (2005) local projections do not impose any dynamic structure between the coefficients $\beta_{h,f,i}$ for a given forecast horizon $f$ and variable $i$, the resulting impulse response functions often appear erratic. For this reason, I present the *cumulated* responses of consensus now- and forecast revisions to a central bank information shock in what follows, i.e. the sum of coefficients on $cbis_t$ up to horizon $h = 0, \ldots, H$, $\sum_{j=0}^{h} \beta_{h,f,i}$.

cumulated forecast revisions after twelve months amount to at least half a standard deviation in Table 1, while the corresponding impulse response functions are statistically significant at the approximate 5 or 32% level throughout. For the three- and four-quarter-ahead forecasts, in contrast, the cumulated impulse response functions in Figure 1 are quantitatively smaller and mostly statistically insignificant at conventional levels.

Accordingly, a typical central bank information shock lifts private-sector expectations, as measured by Blue Chip consensus now- and forecasts of real GDP growth, both on impact and in the subsequent twelve months, albeit only for forecast horizons of up to two quarters. It is important to note that a positive information shock in Jarocinski and Karadi (2020) is identified by a simultaneous *increase* in U.S. interest rates and stock prices in a narrow time window around FOMC announcements. It is therefore unlikely that the upward revisions of consensus now- and forecasts in the first three panels of Figure 1 reflect the response of commercial forecasters to an unexpectedly *easy* monetary stance. Instead, this interest rate hike signals that the FOMC is more optimistic about current and future economic conditions than previously expected and leads thus commercial forecasters to also revise their beliefs about the state of the economy, as conjectured by Nakamura and Steinsson (2018).

Figure 2 plots the *cumulated* impulse response functions of Blue Chip consensus now- and forecast revisions in the GDP deflator to the same central bank information shock, where broken and dotted lines indicate one-and two-standard-error bootstrap confidence intervals.

Even though the cumulated revisions of the consensus nowcast in the first panel display a clear upward trend, they become statistically significant at the approximate 5% level only from month ten onward. Twelve months after the shock, the point estimate climbs to 0.14 or half a sample standard deviation in Table 1. While the cumulated revisions of the two- and three-quarter-ahead consensus forecasts in the third and fourth panel of Figure 2 follow a similar pattern, with a clear upward trend and a statistically significant response of about half a standard deviation after twelve months, the cumulated revisions of the one- and four-quarter-ahead consensus forecasts in the second and fifth panel are quantitatively smaller and mostly statistically insignificant even at the approximate 32% level.

The conditional comovement of the impulse response functions in Figures 1 and 2 provides suggestive evidence on the private sector's interpretation of central bank information shocks.

Qualitatively, the Blue Chip consensus now- and forecasts of (the quarter-on-quarter growth rates of) real GDP and the GDP deflator are revised upwards in response to a positive shock, indicating expectations of a shift of the aggregate demand curve along the aggregate supply curve. This interpretation is also consistent with the FOMC's announcement to unexpectedly raise interest rates to contain an expected current or future demand-driven expansion, for example. If the observed revisions were instead due to an unexpectedly easy monetary stance and thus a conventional interest rate shock of opposite sign, federal funds futures rates should *fall* rather than *rise* in a narrow time window around FOMC announcements. However, this is at odds with the identifying assumptions in Jarocinski and Karadi (2020).

Figures A.1 and A.2 in the Appendix illustrate that the above results are qualitatively and quantitatively robust to estimating an autoregressive distributed lag regression (ARDL) model with twelve lags of the respective forecast revision instead of the series of Jorda (2005) regressions in equation (1).[9]

# 5 Conclusion

In this note, I investigate the effects of the central bank information shocks identified by Jarocinski and Karadi (2020) on private-sector expectations in order to gauge the information revealed in FOMC announcements and its interpretation by the public.

Using survey data on *month-on-month revisions* in consensus now- and forecasts of U.S. real GDP and the GDP deflator from Blue Chip Economic Indicators, I find that private-sector expectations about current and future economic conditions are revised upwards in response to a positive central bank information shock. This explains the seemingly puzzling evidence for an expansionary effect of contractionary Federal Reserve actions on commercial forecasts of U.S. inflation, unemployment, and GDP growth in Romer and Romer (2000),

[9]The impulse response functions in Figures A.1 and A.2 are based on the following ARDL model:

$$rev_{t,f,i} = \delta_{f,i} + \sum_{h=0}^{H} \phi_{h,f,i} cbis_{t-h} + \Lambda_{f,i}(L) rev_{t,f,i} + \nu_{t,f,i}, \quad f = 0, \ldots, 4, \quad i = \{GDP, GDPD\}, \tag{2}$$

where $\delta_{f,i}$ denotes a variable- and forecast horizon-specific intercept, $\Lambda_{f,i}(L) \equiv \lambda_{1,f,i}L + \lambda_{2,f,i}L^2 + \ldots + \lambda_{p,f,i}L^p$ a lag polynomial of order $p$, and a set of monthly dummies has been suppressed for notational convenience. The *cumulated* responses correspond to the sum of coefficients on $cbis_t$ up to horizon $h = 0, 1, \ldots, H$, $\sum_{j=0}^{h} \phi_{h,f,i}$.

Campbell et al. (2012), and Nakamura and Steinsson (2018), respectively. While revisions in Blue Chip consensus now- and forecasts of real GDP growth are economically and statistically significant up to two quarters ahead, yet quantitatively smaller and statistically insignificant at longer forecast horizons, revisions in the forecast of the GDP deflator's quarterly growth rate are positive, yet mostly statistically insignificant at conventional levels, consistent with weaker evidence for a "Delphic" component of forward guidance in Campbell et al. (2016).

These findings justify three conclusions. First, FOMC announcements are an important driver of private-sector expectations about current and future economic conditions. Second, this is due to the information revealed by the Federal Reserve rather than the conventional interest rate effect of the announcements. Third, the conditional comovement of revisions in private-sector expectations about output and prices suggests that a positive central bank information shock is interpreted as an expected shift of the aggregate demand curve along the aggregate supply curve, consistent with the FOMC's announcement of an unexpectedly tight monetary stance.

# References


Campbell, Jeffrey R., Charles L. Evans, Jonas D. M. Fisher, and Alejandro Justiniano (2012). "Macroeconomic effects of Federal Reserve forward guidance." *Brookings Papers on Economic Activity*, Spring 2012, 1–80.

Campbell, Jeffrey R., Jonas D. M. Fisher, Alejandro Justiniano, and Leonardo Melosi (2016). "Forward guidance and macroeconomic outcomes since the financial crisis." in *NBER Macroeconomics Annual* 2016, Volume 31: University of Chicago Press.

Gertler, Mark, and Peter Karadi (2015). "Monetary policy surprises, credit costs, and economic activity." *American Economic Journal: Macroeconomics* 7(1), 44–76.

Gürkaynak, Refet S., Brian Sack, and Eric Swanson (2005) "Do actions speak louder than words? The response of asset prices to monetary policy actions and statements." *International Journal of Central Banking* 1(1), 55–93.

Jarocinski, Marek and Peter Karadi (2020). "Deconstructing monetary policy surprises — The role of information shocks." forthcoming in *American Economic Journal: Macroeconomics*.

Lakdawala, Aeimit (2019). "Decomposing the effects of monetary policy using an external instruments SVAR." *Journal of Applied Econometrics* 34(6), 934–950.

Jordà, Òscar (2005) "Estimation and inference of impulse responses by local projections." *American Economic Review* 95(1), 161–182.

Nakamura, Emi and Jon Steinsson (2018). "High-frequency identification of monetary non-neutrality: The information effect." *Quarterly Journal of Economics* 133(3), 1283–1330.

Ramey, Valerie A. and Sarah Zubairy (2018). "Government spending multipliers in good times and in bad: Evidence from U.S. historical data." *Journal of Political Economy* 126(2), 850–901.

Romer, David H. and Christina D. Romer (2000) "Federal Reserve information and the behavior of interest rates." *American Economic Review* 90(3), 429–457.

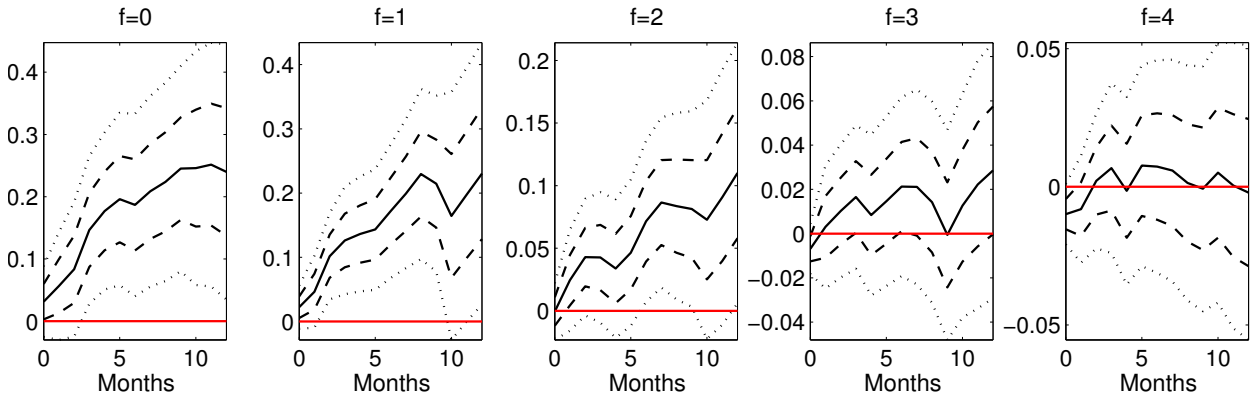
# Tables and Figures

**Table 1:** Sample moments of Blue Chip consensus now- and forecast revisions for 1990:1–2015:12

| | (a) real GDP | | | | | (b) GDP deflator | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $f = 0$ | $f = 1$ | $f = 2$ | $f = 3$ | $f = 4$ | $f = 0$ | $f = 1$ | $f = 2$ | $f = 3$ | $f = 4$ |
| $\mu$ | −0.040 | −0.075 | −0.041 | −0.032 | −0.013 | −0.029 | 0.001 | −0.030 | −0.020 | −0.025 |
| $\sigma$ | 0.448 | 0.349 | 0.210 | 0.130 | 0.099 | 0.250 | 0.242 | 0.217 | 0.199 | 0.334 |

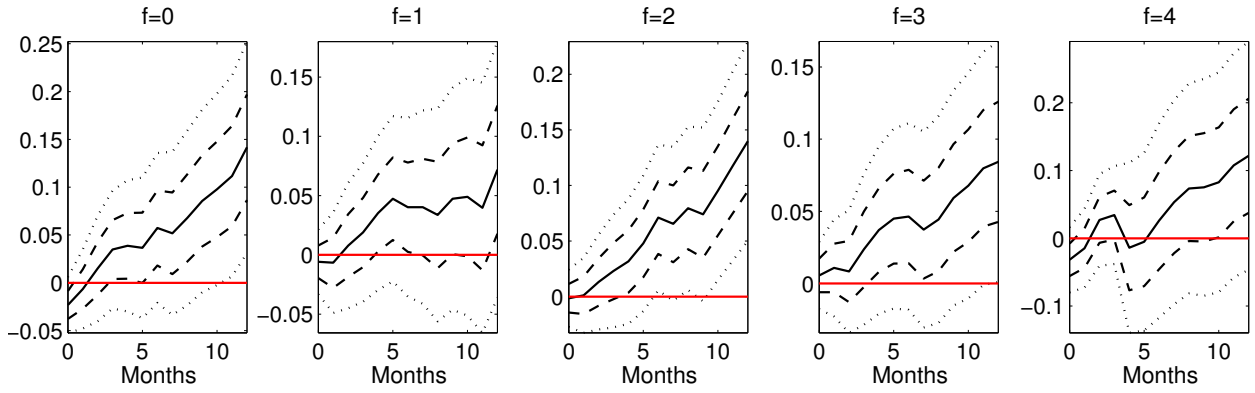
**Note:** Sample mean $\mu$ and standard deviation $\sigma$ of *month-on-month* revisions in Blue Chip consensus now- and forecasts of *quarter-on-quarter* growth rates in U.S. real GDP and the GDP deflator for forecast horizon $f$

**Figure 1:** Impulse response functions of Blue Chip consensus now- and forecast revisions in U.S. real GDP growth to a central bank information shock




**Note:** Cumulated impulse responses to a one-standard-deviation central bank information shock based on the local projection in (1) for forecast horizon $f$. Point estimates with one- and two-standard-error confidence intervals based on 10,000 replications of a block bootstrap

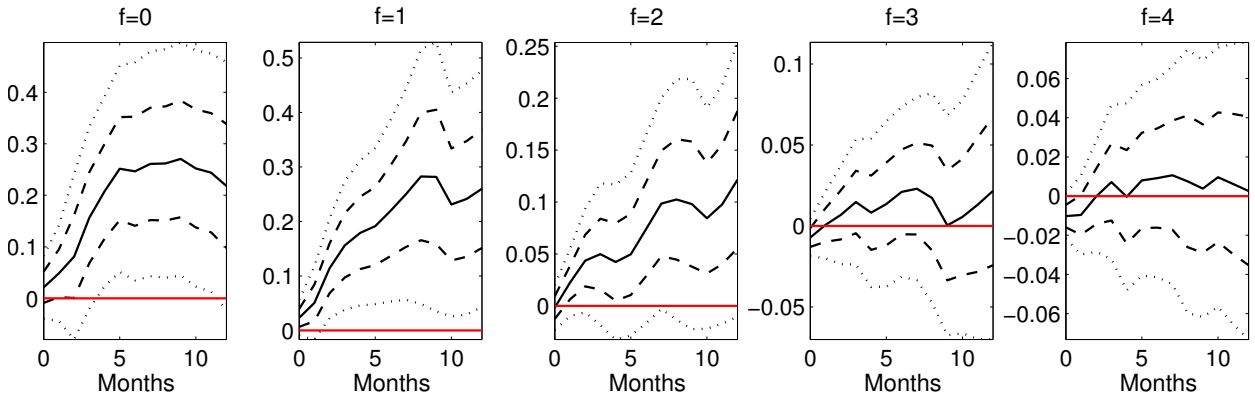
**Figure 2:** Impulse response functions of Blue Chip consensus now- and forecast revisions in the growth rate of the U.S. GDP deflator to a central bank information shock




**Note:** Cumulated impulse responses to a one-standard-deviation central bank information shock based on the local projection in (1) for forecast horizon $f$. Point estimates with one- and two-standard-error confidence intervals based on 10,000 replications of a block bootstrap

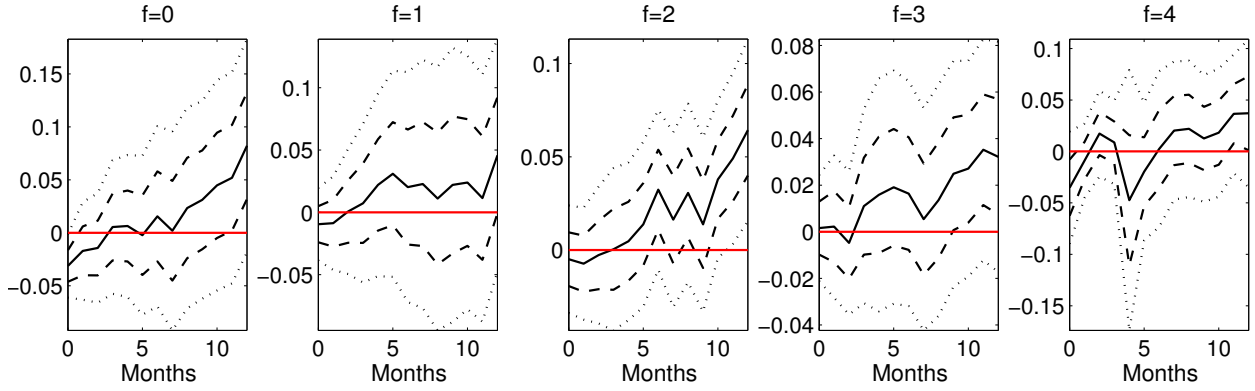
# Appendix

**Figure A.1:** Impulse response functions of Blue Chip consensus now- and forecast revisions in U.S. real GDP growth to a central bank information shock




**Note:** Cumulated impulse responses to a one-standard-deviation central bank information shock based on the ARDL model in (2) for forecast horizon $f$. Point estimates with one- and two-standard-error confidence intervals based on 10,000 replications of a block bootstrap

**Figure A.2:** Impulse response functions of Blue Chip consensus now- and forecast revisions in the growth rate of the U.S. GDP deflator to a central bank information shock




**Note:** Cumulated impulse responses to a one-standard-deviation central bank information shock based on the ARDL model in (2) for forecast horizon $f$. Point estimates with one- and two-standard-error confidence intervals based on 10,000 replications of a block bootstrap