Unconventional Monetary Policy Surprises: Delphic or Odyssean?*

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Abstract

Central bank communication could be interpreted in two ways, either as central bank's commitment to a future action, known as Odyssean guidance, or its forecast of future economic conditions, known as Delphic guidance. The empirical literature has identified the Delphic and Odyssean components of forward guidance policies. I show that another unconventional policy tool, large-scale asset purchases, can also be empirically decomposed into Delphic and Odyssean components, and these two components have opposing impacts on macroeconomic expectations in the US along with other advanced and emerging market economies. Finally, I estimate the asset price responses to Delphic and Odyssean policies.

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1 Introduction

The conventional policy tool of the Federal Reserve (Fed) effectively hit the zero lower bound (ZLB) in December 2008 during the Great Recession. Consequently, the communication about the future path of the policy rate, i.e. forward guidance (FG), gained more importance although it had been an active policy tool since the Fed had started to issue detailed statements after Federal Open Market Committee (FOMC) announcements. Another unconventional monetary policy (UMP), large-scale asset purchases (LSAPs), was initiated in March 2009 to further stimulate the economy by lowering the long-term interest rates.

While the primary goal of these accommodative UMPs was to loosen the financial conditions to further stimulate the economy through promising lower medium to long term interest rates, newly emerging empirical studies document the surprising implications these accommodative policies had on private macroeconomic expectations (e.g. Nakamura and Steinsson (2018)). Campbell et al. (2012) coined the terms Delphic and Odyssean in reference to Homer's epic, Odyssey. A Delphic policy refers to the component of a policy announcement where the public learns the central bank's perception of the macroeconomic outlook while an Odyssean policy is the commitment of the central bank to a particular path for the policy rate, independent of future macroeconomic conditions. This theoretical decomposition of a central bank communication has crucial implications for monetary policy. If the central bank is intended to stimulate the economy by committing itself to an interest rate path, the Delphic interpretation creates unintended consequences as macroeconomic expectations, such as inflation or growth, are adjusted downwards.

This paper first shows that both FG and LSAP surprises could be decomposed into

Delphic and Odyssean components. This is a novel identification for the LSAP surprise. Thus, this paper argues that central bank communication of purchasing more assets than anticipated by market participants could either signal a "bad" macroeconomic outlook or looser financial conditions in the future by committing to lower long rates. In particular, the Delphic components of FG and LSAP surprises are identified as the fraction of a UMP, which is correlated with the difference between the Fed's and market participants' macroeconomic expectations, following a methodology similar to the one proposed by Campbell et al. (2016).

Then, this paper documents the plausibility of the proposed Delphic and Odyssean decomposition. In particular, the Delphic and the Odyssean components have the opposite impact on macroeconomic expectations of unemployment, growth and inflation in the US over various horizons, along with growth and inflation expectations in other advanced and large emerging market economies for the following year. Bauer and Swanson (2020) recently pointed out the relevance of macroeconomic news revealed before the FOMC announcements in understanding the response of macroeconomic expectations to monetary policy surprises. I conduct a robustness check on the sign and the significance of my results. I show that the economic and statistical significance of the Delphic components are robust to taking the most recent economic news revealed before the FOMC announcement into account.

Furthermore, I document the high frequency responses of US Treasury yields, the US dollar and the S&P 500 to Delphic and Odyssean components. While the yield curve and exchange rate are very responsive with the expected signs, the stock market is not responsive to UMPs during the ZLB period. I also estimate the daily responses of the stock market and yield curve volatility measures, and corporate spreads. I find that the riskier bonds are more sensitive to Delphic policies.

Related Literature This paper is related to a number of different lines of literature. Following Kuttner (2001), the event study literature identified the conventional monetary policy surprise, the target surprise, as the change in the current month or one-month-ahead Fed funds futures rate. At the ZLB, the variation in this monetary policy surprise is clearly zero. Gürkaynak et al. (2005) extend this methodology by identifying a second significant monetary policy factor, the future path of the policy rate, in other words, FG. They further show that these two factors almost fully explain the movement of the term structure around FOMC announcements. After the initiation of the LSAPs, a new line of research that separates the surprise effects of different UMPs emerged. Rogers et al. (2018) and Swanson (2019) disentangle the effects of FG and LSAP surprises, extending the methodology in Gürkaynak et al. (2005) to the ZLB period. Swanson (2019) shows that FG and LSAP surprises almost fully explain the movement of the term structure around FOMC announcements during the ZLB. I use the approach in Rogers et al. (2018) to identify UMPs in the US.

An empirical body of research provides evidence that macroeconomic expectations might improve following a monetary policy tightening (or vice versa) to the contrary of what standard theory would suggest. Romer and Romer (2000) show that inflation expectations are adjusted on the opposite direction at certain time periods. This work is followed by Campbell et al. (2012) and Nakamura and Steinsson (2018) who document similar opposite responses of unemployment and growth expectations to FG communication, respectively. Coiobon et al. (2019) document how different forms of communication influence the inflation expectations of individuals empirically. They propose policy prescriptions for central banks about how to communicate to the public. For the same purpose, empirically decomposing an FG surprise into its Delphic and Odyssean components is essential for future policy actions.

Campbell et al. (2016) propose an empirical methodology to disentangle the Delphic component of an FG surprise. This method uses the difference between the Fed's and private macroeconomic expectations. Assuming that the Fed's perception of the macroeconomy is inferred by the FOMC announcement, which was particularly detailed in the last decade, Campbell et al. (2016) label the fraction of the FG surprise that is explained by the Fed's distinct perception of the macroeconomy, i.e. the deviation of their macro expectations from private expectations, the Delphic component. As one would expect in theory, they further show that private expectations respond to the Delphic component with an opposite sign (e.g. a Delphic easing lowers growth expectations). Similarly, Jarocinski and Karadi (2020) separate the information conveyed by the Fed into monetary policy and the Fed's assessment of the economic outlook. Andrade and Ferroni (2018) identify the Delphic and Odyssean components of FG communication in the Euro Area. In particular, they assume that an FG tightening has a Delphic component if it raises the slope of the term structure of interest rates and generates a positive variation in inflation expectations. I follow a methodology similar to the one suggested in Campbell et al. (2016).

Apart from the empirical identification of these components, there is a newly emerging line of theoretical literature that discusses whether the central banks should employ Odyssean or Delphic policies. Andrade et al. (2019) construct a structural framework in a standard New Keynesian model where agents have heterogenous beliefs with regards to the nature of an FG communication in a liquidity trap. They show a crucial FG trade-off between the optimism of those who believe the central bank can commit and the induced excess pessimism of non-believers. In related work, Barthelemy and Mengus (2016) argue that signaling Odyssean FG cannot take place after a liquidity trap begins. Bassetto (2019)

discusses the cheap talk aspect of an FG communication. I document that a mixture of Delphic and Odyssean policies has opposing implications on macroeconomic expectations without taking a stance on the optimality of either policy.

The body of literature that documents the real and financial impacts of an FG surprise without segregating the Delphic and Odyssean components is vast. Campbell et al. (2019) show the limits of an FG shock in a structural model of imperfect communication. Bundick and Smith (2017) document the dynamic effects of an FG shock. In particular, they match the empirical effects of an FG shock, measured by a structural VAR, with the impulse responses implied by a standard model of nominal rigidity. The studies that employ a standard model of nominal rigidity introduce a discount framework to address the FG puzzle, i.e. the overestimation of the effects of an FG shock by a standard model.[1] Aksit (2020) discusses how to model an FG shock and address the implied FG puzzle in detail.

The rest of this paper is organized as follows: Section 2 describes the identification of the Delphic and Odyssean components of UMP surprises. Section 3 presents the responses of domestic and international private expectations. Section 4 discusses the response of asset prices to decomposed UMPs. Section 5 shows the robustness of the identified Delphic components to macroeconomic news revealed before the FOMC announcements. Section 6 concludes.

[1] Other examples include: Del Negro et al. (2015) who introduce probability of dying, Gabaix (2016) who defines a discount parameter due to cognitive myopia, McKay et al. (2016) who employ uninsurable income shocks and borrowing constraints, Angeletos and Lian (2018) who remove common knowledge, Campbell et al. (2016) who introduce preferences for government bonds, Campbell and Weber (2018) who introduce imperfect credibility, and Farhi and Werning (2019) who employ bounded rationality and incomplete markets simultaneously.

2 Delphic and Odyssean UMP Surprises

2.1 Identification of FG and LSAP Surprises in the ZLB Period

First, I identify FG and LSAP surprises following a similar methodology as in Rogers et al. (2018). I construct FG surprises as the 120-minute change (from 15 minutes before the FOMC announcement to 1 hour and 45 minutes after the announcement) in the 8th Eurodollar futures rate, i.e. the market expectations of what the short rates in the US will be roughly in two years.[2] I assume that term premia do not change over this small interval following the literature (e.g. Piazzesi and Swanson (2008), Cochrane and Piazzesi (2005), Evans and Marshall (1998)).[3] This factor is highly correlated (88%) with the path factor obtained through rotating the first two principle components of asset price movements as in Gürkaynak et al. (2005).[4] Note that the Fed funds futures rate, i.e. the market expectations of what the Fed funds rate will be at the end of the current month, and its surprises were practically zero during the ZLB period.

The asset price movements around FOMC announcements at the ZLB can be explained by the two principal components of the changes in interest rate expectations at different

[2]The choice of Eurodollar futures to capture the interest rate expectations is due to the liquidity of these assets. Their high frequency response to FOMC announcements within a 120-minute window is highly volatile. One might argue that the interest rate expectations in the US are better captured by the OIS rates. However, the OIS futures are less volatile. In order to control for the difference between the interest rate implied by Eurodollar futures (the LIBOR rate) and the OIS rate, I check the daily response of the LIBOR-OIS spread to an FG surprise and find no economic significance. The spread moves a basis point in response to an FG surprise that moves the 8-quarter-ahead interest rate expectations by 25 basis points.

[3]I also find that the term premium component of the two year rates do not significantly move at daily frequency around FOMC announcements during the ZLB period.

[4]I employ this method instead of rotating the first two principle components of asset price movements as in Gürkaynak et al. (2005) because of the ZLB during which the short-term interest rate expectations were very low. While the Gürkaynak et al. (2005) approach is linked to a combination of interest rates spanning various maturities, most of which were unusually low at the ZLB, this approach directly links the FG surprise to the two-year rate.

horizons as shown in Swanson (2019). These principal components can be rotated to have the structural interpretation of an FG and LSAP surprise. Following Rogers et al. (2018), I identify LSAP surprises using the high frequency change in the 10-year Treasury yields and the FG surprise since LSAP surprises target long rates directly while FG also influence long rates through changes in shorter term interest rate expectations. Formally, I regress the 120-minute change in the 10-year Treasury yields around FOMC announcements on the FG surprise and label the residuals as the LSAP surprise. Thus, the high frequency response of the high end of the yield curve is explained by the combination of FG and LSAP surprises by construction. Figure 1 shows the identified empirical FG and LSAP surprises during the ZLB period.

2.2 Extracting the Delphic Component of a UMP

Woodford (2012) and Campbell et al. (2012) discuss the ambiguous implications of committing to a lower interest rate in the near future for macroeconomic expectations. In particular, when a central bank is constrained by the ZLB, a communication that the policy rate will stay at the ZLB for longer than the public expected could either be interpreted as "bad news" about the macroeconomic outlook or "good news" as financial conditions will be looser for a longer period of time.

Campbell et al. (2012) define Delphic FG as the component of a monetary policy announcement where the public learns the macroeconomic expectations of the central bank and infers possible future policy actions. On the other hand, an Odyssean FG surprise is the commitment of the central bank to a particular path for the policy rate regardless of

the future macroeconomic conditions. Formally, Campbell et al. (2016) identify the Delphic FG as the fraction of an FG surprise that is correlated with the difference between the macroeconomic expectations of the Federal Reserve and the market participants.

Similar to the ambiguous implications of the future path of the policy rate for macroeconomic expectations, a monetary policy announcement which is intended to lower long rates through asset purchases could have the same opposing impact on private expectations in principal. For instance, a larger than expected asset purchase could either be interpreted as "bad news" about the macroeconomic outlook or "good news" as long rates will be lower. Thus, I apply a methodology, which is similar to the one proposed by Campbell et al. (2016) to extract the Delphic component of an FG surprise, to identify the Delphic component of an LSAP surprise.

First, I take the difference between the Greenbook forecast and the most recent Bluechip forecast[5] of GDP growth and CPI inflation before every scheduled FOMC announcement from January 2008[6] to December 2014.[7] Unlike Campbell et al. (2016), I do not include unemployment forecasts due to the very high correlation between GDP growth and unemployment expectations. I consider the nowcast and the forecast for the next four quarters of GDP growth and CPI inflation due to the limit on the Bluechip forecast horizon. Thus, I create a dataset of 10 variables. Then, as in Gürkaynak et al. (2005), I take the short and the long factor of each macro variable forecast by taking their first two principal compo-

[5]Following Campbell et al. (2016), I match a Greenbook forecast, which is dated a week before the FOMC announcement, with the most recent Bluechip forecast, which is published on the 10th of every month. If the Greenbook is dated on the 10th of a month, I match it with the Bluechip forecast of the same date.

[6]Scheduled FOMC meetings of 2008 are included in my sample since the target Fed funds rate surprises, i.e. 120-minute change in the current or one-quarter-ahead Fed funds futures rate around FOMC announcements, were very small (around 2.5 basis points on average in absolute magnitude).

[7]The dataset is not yet extended to October 2015, the end of the ZLB period, as the Greenbook data becomes available with a 5 year lag.

nents and rotating them such that the short component moves one-to-one with the nowcast. Hence, my dataset of the differences between the Greenbook and Bluechip forecasts for the next year is reduced to four variables: the short and long factors of GDP growth and CPI inflation.

I regress both the LSAP surprise and the FG surprise as identified in Section 2.1 on these four factors, which show the difference between the Fed's and private agents' perception of the macroeconomic outlook, and their lags.[8]

$$UMP_t = \beta_0 + \beta_y^s y_t^s + \beta_y^l y_t^l + \beta_\pi^s \pi_t^s + \beta_\pi^l \pi_t^l + \beta_{y,-1}^s y_{t-1}^s + \beta_{y,-1}^l y_{t-1}^l + \beta_{\pi,-1}^s \pi_{t-1}^s + \beta_{\pi,-1}^l \pi_{t-1}^l + \varepsilon_t \quad (1)$$

where UMP_t is the LSAP surprise or FG surprise, y_t is the GDP factor and π_t is the CPI inflation factor. s superscript refers to the short factor while the l superscript is the long factor.

Table 1 shows the results of both regressions. I use the Bayesian information criterion (BIC) to select the model that best explains the UMPs. While the BIC selects the model with all four factors with their lags for the FG surprise, it chooses the model with only the long growth factor and its lag for the LSAP surprise. Given the best model for each UMP, I use the fitted values to identify the Delphic components. I conduct this analysis for the ZLB period with 56 observations.[9]

The main novelty of this identification is the decomposition of the LSAP surprise into its Delphic and Odyssean components. Besides, I employ BIC to pick the model that best

[8]Following Campbell et al. (2016), the lags are added since the Fed could be revealing its perception about the state of the economy with a lag.

[9]There are 8 scheduled FOMC announcements over 7 years.

describes the Delphic components. Since I can observe the difference between the Fed's and private macroeconomic expectations up to a year, I assume the difference between the two expectations is zero after a year.[10] Thus, I label the residuals of each regression as the Odyssean component, which is orthogonal to the Delphic component by construction.

Figures 2-3 plot the decomposed LSAP and FG surprises respectively. Delphic components of both policies are larger in absolute magnitude in the earlier years of the ZLB, when the uncertainty regarding the state of the economy was higher. As the Fed gained more experience with communicating its UMPs, the Delphic component of both UMPs became smaller. Note that the size of the Odyssean component is larger than the size of the Delphic component for both UMPs at the ZLB period.

The decomposed UMPs plotted in Figures 2-3 support the plausibility of the employed methodology. A clear example of a policy rate commitment was announced in August 2011 when the FOMC communicated that the policy rate will stay at the ZLB until mid-2013. Figure 2 shows that this FG communication is purely interpreted as an Odyssean FG surprise as one would expect. Likewise, Figure 3 illustrates that the initiation of the LSAP policies in March 2009 is mostly identified as a commitment to keeping long rates lower than the public expected. However, there is a Delphic component to this LSAP easing since this unconventional policy was being introduced for the first time, simultaneously implying "bad news" about the state of the economy.

[10]This assumption implies that there is no longer run Delphic component. The next section discusses the plausibility of this assumption.

3 Response of Expectations to Decomposed UMPs

3.1 Domestic Private Expectations

Table 2 shows the response of private macroeconomic expectations to FG and LSAP surprises, and their Delphic and Odyssean components. First two columns report the baseline regressions in which the monthly changes in the Bluechip forecasts of unemployment, GDP growth and inflation around FOMC announcements are regressed on the UMPs in the US between January 2008 and December 2014.

$$\Delta BC_t^{h,i} = \beta_0^{h,i} + \beta_{FG}^{h,i} FG_t + \beta_{LSAP}^{h,i} LSAP_t + \varepsilon_t \tag{2}$$

where $\Delta BC_t^{h,i}$ is the monthly change in the Bluechip forecast of macro variable i for h quarters ahead, where $h \in \{0, 1, ..., 4\}$, around FOMC announcements. FG and LSAP surprises are as described in Section 2.1. $t \in T$ where $T = 56$, the number of FOMC announcements.

The following four columns report the results of the decomposed regressions in which the monthly Bluechip forecast changes are regressed on the Delphic and Odyssean components of FG and LSAP surprises.

$$\Delta BC_t^{h,i} = \beta_0^{h,i} + \beta_{DFG}^{h,i} DFG_t + \beta_{OFG}^{h,i} OFG_t + \beta_{DLSAP}^{h,i} DLSAP_t + \beta_{OLSAP}^{h,i} OLSAP_t + \varepsilon_t \tag{3}$$

where DFG and DLSAP stand for the Delphic components of FG and LSAP surprises respectively while OFG and OLSAP refer to the Odyssean components. All components are

constructed as described in Section 2.2.

The hypothesis is that a Delphic easing, whether FG or LSAP, should increase unemployment expectations, and decrease growth and inflation expectations since it signals "bad" news about the macroeconomy. On the other hand, the Odyssean component should have the opposite sign as it signals that the financial conditions will be looser.

In the top panel, the baseline regressions show that the unemployment expectations respond to an FG surprise with a negative sign at shorter horizons.[11] Counterintuitively, this means that an FG easing increases the unemployment expectations in the US. These inverse signs are consistent with the findings of Campbell et al. (2016) who were motivated by these findings and hypothesized that the inverse sign should be due to the Delphic component of an FG surprise. The next four columns show the results of the decomposed regression. As expected, the inverse sign of an FG surprise is due to the Delphic component of an FG surprise. Moreover, the estimated impact of a Delphic FG surprise on unemployment expectations is economically significant. The Delphic component of an FG easing[12] increases the current and one-quarter-ahead unemployment expectations by around 50 basis points (bps) during the ZLB period.

As for the LSAP surprise, the baseline regression of unemployment expectations does not report any significant coefficients. However, the decomposed regression shows that the Delphic components of an LSAP easing, which signals bad news about the macroeconomy, also increases the unemployment expectations at all horizons with one standard error significance. Thus, while the estimated coefficients of the Delphic FG are similar to the findings

[11] These results are marginally insignificant at 10%.

[12] The unit of FG surprises is standardized to a 25 basis point change in 2-year-ahead interest rate expectations in the US around FOMC announcements. Note that the average size an FG surprise plotted in Figure 1 is 22 basis points in absolute value.

of Campbell et al. (2016), the marginal significance of the Delphic LSAP coefficients with the expected sign is a complementary finding which supports the hypothesis of extending the Delphic interpretation of a monetary policy surprise to LSAPs. Moreover, over longer horizons, an Odyssean LSAP easing lowers the unemployment expectations. This finding is consistent with the assumption that the residuals of Equation (1) mostly contain information about Odyssean FG rather than longer-run Delphic FG.

The findings in the other two panels of Table 2 are also consistent with the expected signs of the Delphic and Odyssean components of UMPs. The statistically significant coefficients are also economically significant. The baseline regressions of both growth and inflation expectations on any horizon report an expected sign, i.e. an easing policy increases growth and inflation expectations. Moreover, the estimated impact of UMPs on growth and inflation expectations during the ZLB period are large. While an LSAP easing[13] increases the growth expectations of the current quarter by around 1.5 percentage points, the same LSAP surprise increases the inflation expectations of next quarter by about half a percentage point. The relatively smaller influence on inflation expectations is consistent with the well-anchored inflation expectations in the US.

The decomposed regressions show that the conventional signs reported in the baseline regressions operate through the Odyssean component of FG and LSAP policies.[14] In particular, the positive impact of an LSAP easing on growth and inflation expectations are significant over various horizons. All of these coefficients are due to the Odyssean compo-

[13]Similarly, the unit of LSAP surprises is standardized to a 25 basis point change in the 10-year interest rate expectations in the US around FOMC announcements.

[14]Campbell et al. (2016) report only one significant coefficient in their baseline regressions for growth expectations and three significant Delphic FG coefficients with the expected signs. They do not report significant findings for the response of inflation expectations.

nent of an LSAP surprise. Likewise, an FG easing is associated with an increase in inflation expectations at shorter horizons, which is explained by the Odyssean component.[15]

3.2 Foreign Private Expectations

The Bluechip economic indicators report growth and inflation expectations in some advanced and large emerging market economies for the following year. I conduct the same regression analysis described in Equations (2)-(3) for this dataset. Table 3 shows that the response of growth and inflation expectations for the Eurozone, the U.K., Japan, Canada, China and Brazil are also consistent with the expected signs of the Delphic and Odyssean components of FG and LSAP surprises. This is a novel finding in this line of literature. Besides, the magnitudes of the estimated coefficients suggest that the markets expected significant spillovers of the US UMPs to other advanced and large emerging market economies. The responses of growth and inflation expectations to the US UMPs are mostly homogenous across these six countries both under baseline and decomposed regressions.

A Delphic interpretation of a UMP easing in the US is expected to lower growth and inflation expectations in other advanced and emerging market economies unambiguously since it signals "bad" news about the US economy, and thus the global economic outlook. On the other hand, an Odyssean interpretation of a UMP easing in the US could imply higher or lower growth for other advanced and emerging market economies. While the looser financial conditions could help economic activity, a depreciated dollar against the local currency can hurt the competitiveness of domestic goods against the US goods. However,

[15] Although the Delphic LSAP surprise is significant with the wrong sign for a quarter ahead inflation expectations, the Odyssean components of that regression are also significant with the correct signs.

foreign central banks often respond to lower competitiveness caused by the depreciated dollar through lowering their policy rates.[16] The responsiveness of foreign central banks to US monetary policy is consistent with the empirical documentation of the global financial cycle induced by the US monetary policy in Miranda-Agrippino and Rey (2019). The results in Table 3 indicate that an Odyssean UMP in the US is interpreted as "good" news in other advanced and large emerging market economies.

An important finding in the baseline regressions is that the FG surprise influence the growth and inflation expectations with the expected sign, i.e. an easing increases the expectations. Thus, when the Fed communicates that the policy rate will remain at the ZLB for longer than market participants expected, it is interpreted as "good" news about the global economic outlook. Due to Fed's commitment to looser financial conditions for a longer time period, market participants are optimistic about the growth prospects in the upcoming year. While an FG easing significantly increases growth and inflation expectations in China, it also increases inflation expectations in Canada and growth expectations in Brazil at a 10% significance level. All growth expectations increase in response to an FG easing at one standard error significance.

On the other hand, an LSAP easing decreases growth and inflation expectations in other advanced and large emerging market economies. Thus, the asset purchase program is interpreted as a negative signal about the current state of the US economy, and thus the global economy. While the growth expectations of Brazil are adjusted downwards very significantly following an LSAP easing, the inflation expectations are also decreased significantly in the Eurozone, the UK, Canada and China. Decomposed regressions show that these inverse signs

[16] If the foreign economy is constrained by the ZLB, the foreign central bank can undertake a UMP easing.

are due to the Delphic LSAP surprises. Moreover, the negative impact of a Delphic LSAP easing is much stronger on the growth expectations of the foreign economies in the sample. For instance, the Delphic component of an LSAP easing decreases the growth expectations more than a percentage point in the UK and around 80 bps in the Eurozone.

The decomposed regression results show that the Delphic and the Odyssean components of FG and LSAP surprises have the expected signs. The expectation increasing impact of an FG surprise is due to the Odyssean component of an FG surprise.[17] Likewise, the expectation lowering impact of an LSAP easing is very significantly explained by the Delphic LSAP surprise for all countries in the sample. Furthermore, the estimated impact of the Delphic LSAP surprise is economically large on growth expectations in other advanced and large emerging market economies.

4 Response of Asset Prices to Decomposed UMPs

In this section, I present the responses of asset prices in the US to the Delphic and Odyssean components of the FG and LSAP surprises. In particular, I present the high frequency response of the US Treasury yields with maturities ranging from 3 months to 30 years, 5 and 10-year TIPS yields, the stock market index, and the EUR/USD exchange rate. Moreover, I report the daily responses of corporate yields and spreads of firms with different investment grade ratings. The baseline and decomposed regressions are conducted as described in Equations (2)-(3) in which the dependent variable is replaced by the intraday and daily changes of these asset prices.

[17] The results are only insignificant for Japan.

4.1 Response of the Yield Curve

Table 4 reports the response of the yield curve to the UMPs. The baseline regression shows that both the FG and LSAP surprises very significantly impact the risk-free rates at different maturities. Not surprisingly, the FG surprise is more effective in moving the short to medium term maturities while the LSAP surprise is more effective at longer maturities. Likewise, both UMPs are effective in moving the TIPS rates at 5 and 10 year horizons.

While both UMPs are moving the yield curve in the expected direction, i.e. an easing lowers the risk-free rates while a tightening increases them, I do not argue for a particular distinction between the Delphic and the Odyssean channels of these policies. Consistent with this prior, the decomposed regression results presented in the next four columns show that two components always have the same sign and their magnitudes are not statistically different from each other. Thus, UMPs influence the yield curve due to both components, neither of which is more influential than the other.

4.2 Response of Stock Prices and the US Dollar

Table 5 presents the high frequency response of the S&P 500 index and the EURUSD exchange rate, the US dollar value of a Euro, around the FOMC announcements. The 120-minute response (from 15 minutes before the announcement to 1 hour and 45 minutes after the announcement) of the stock market index does not significantly respond to UMPs, and their Delphic and Odyssean components. On the other hand, the baseline regression of the US dollar shows that half of the variation in the EURUSD exchange rate in a two-hour window around an FOMC announcement is explained by the two UMPs. Thus, the systematic

relationship between the UMPs and the exchange rate is higher than the one between the UMPs and stock prices. The direction of this relationship is as expected; an easing depreciates the USD. The EURUSD exchange rate moves almost a percentage point in response to an FG or LSAP easing.

In theory, the direction of the impact of Delphic and Odyssean components on the exchange rate should be the same. While a Delphic easing, signaling "bad" economic conditions in the US, should depreciate its currency through lower international demand for US financial securities, an Odyssean easing, signaling commitment to lower interest rates in the US, should also depreciate the currency for the same reason. The decomposed regression results are consistent with this prior. All components have significant coefficients with the same signs and similar magnitudes.

4.3 Response of Volatility Measures

Table 6 illustrates the responses of volatility measures of the stock market and the yield curve to UMPs along with their Delphic and Odyssean components. I employ the Volatility Index (VIX) of the Chicago Board Options Exchange, which is derived from the options implied volatility of the S&P 500 index, and the Merrill Lynch Options Estimate (MOVE) index, which is based on the options implied volatility of US Treasury yields of various maturities. The regressions present the daily responses of the VIX and MOVE.

The results point out a striking difference between the impact of FG and LSAP policies on the volatility measures which reflect the uncertainty associated with the stock market and yield curve. Both baseline regressions suggest that FG and LSAP surprises have the

opposite impact on the uncertainty measures.[18] While an FG easing decreases the stock market and yield curve uncertainty, an LSAP easing increases both uncertainty measures. The decomposed regressions show that both channels operate through commitment to lower rates, i.e. the Odyssean components. The volatility decreasing impact of an Odyssean FG easing is consistent with the findings of Bekaert et al. (2013), who find that a lax conventional monetary policy decreases the volatility implied by the VIX. Thus, the uncertainty increasing impact of an Odyssean LSAP easing is a distinct result compared to conventional policies and the FG. This could be due to the uncertainty associated with the introduction of LSAPs as a novel policy tool.

4.4 Response of Corporate Yields and Spreads

Table 7 shows the response of corporate yields and spreads of firms with different investment grades, namely AAA, BAA and BBB. Since both FG and LSAP surprises decrease the risk-free rates at different horizons, the corporate yields also go down as shown in the first three lines of the baseline regressions. This decrease in the corporate yields are not particularly due to the Delphic or the Odyssean components. The decomposed regression results show that yields at different investment grade ratings are affected by the Delphic and Odyssean components similarly.

A more interesting exercise is to assess the corporate spread responses of firms with different risk levels. Baseline regressions show that a UMP easing increases the spread between the risky and risk-free bonds. Thus, a UMP easing decreases the risky yields less than the risk-free yields. There are two main mechanisms through which this could be

[18] The impact of LSAPs on the MOVE index is significant at 20%.

true. The first channel is mechanical: since the Fed is operating its LSAP policies mostly through the 10-year Treasury bonds, it impacts the yields of these bonds more than other type of bonds. Alternatively, the risk associated with the corporate bonds might be going up, especially for low investment grade bonds.

The decomposed regressions are consistent with both mechanisms as the Delphic and Odyssean components are both significant with a negative sign. However, the magnitude of their impact varies across bond spreads with different levels of risk. The riskier bond spreads are more sensitive to the Delphic component of an LSAP surprise since these bonds are more sensitive to aggregate risks. In particular, the absolute magnitude of the impact of a Delphic LSAP surprise is statistically larger than the impact of the Odyssean component for BBB-10Y spreads.[19] Similarly, the safer bond spreads are more responsive to Odyssean FG surprises. The size of the impact of an Odyssean FG surprise is statistically larger than the impact of a Delphic FG for AAA-10Y spreads.[20]

5 Robustness Check: News Announcements

A recent concern on the existence of a Delphic FG is proposed by Bauer and Swanson (2020) who build their argument on the availability of new public information about the state of the economy between the Bluechip forecast and the FOMC announcement dates. They argue that if market participants *systematically underestimate* (in absolute magnitude) the Fed's response to this new public information, the opposite relationship between private macroe-

[19]Note that there is no statistical difference between the impact of Delphic and Odyssean components of LSAP surprises on safer bond spreads.

[20]The only exception to these set of results is reported in the decomposed regression for BBB-10Y spreads: The magnitude of the impact of an Odyssean FG is larger than that of a Delphic FG. However, the statistical significance of the difference between these two coefficients is weaker.

conomic expectations and monetary policy surprises is explained. However, this argument is valid only if market participants systematically underestimate the Fed's response to news on average.

To empirically support their argument, Bauer and Swanson (2020) cite a finding from earlier work: prior economic news are correlated with upcoming monetary policy surprises.[21] Since economic news also influence private expectations, Bauer and Swanson (2020) point out a possible omitted variable bias problem. After adding an economic news variable, which captures information about the macroeconomy before the FOMC announcement, as a control variable, they conclude that the opposite relationship between private expectations and the policy surprise disappears. However, the implications of the relationship between private expectations and policy surprises (a baseline regression) are not conclusive since Delphic and Odyssean components could be canceling each other out (or one component could be dominating the another).

As a robustness check, I include the most recent non-farm payrolls, industrial production and CPI inflation news surprises (the difference between the actual release and survey expectations) announced before the FOMC announcements as control variables in the regressions presented in Table 2. Table 8 shows the responses of private expectations to monetary policy surprises in the presence of macroeconomic news surprises as control variables. The results show that both the significance and the magnitude of the estimated coefficients are robust to adding macroeconomic news surprises as control variables.

[21] Miranda-Agrippino (2017) explains this by a risk premium required by investors to compensate themselves for the interest rate risk around FOMC announcements while Cieslak (2018) interprets this as the lack of full information regarding Fed's reaction function. The authors follow the latter explanation.

Following the empirical methodology described in Section 2 provides a direct evidence on the presence of a Delphic component for both FG and LSAP policies in the US. The argument presented by Bauer and Swanson (2020) is built on the assumption that the Fed and the market participants have the same information set about the macroeconomy (but market participants underestimate Fed's reaction function). However, I first extract the difference between the ex-ante macroeconomic expectations of market participants and the Fed. Then, I show that this difference is correlated with the upcoming UMPs, and the opposite relationship between private macroeconomic expectations and monetary policy surprises is explained by the fraction of UMPs that is correlated with the difference in expectations.

6 Conclusion

I decompose FG and LSAP surprises into their Delphic and Odyssean components. This is a novel identification for the LSAP surprise. While the Delphic components convey information about the Fed's perception of the current and the future states of the macroeconomy, the Odyssean components inform agents about the additional commitment the central bank makes to keep the medium and long rates low for a longer period of time. I identify the Delphic component of a UMP surprise as its fraction which is correlated with the difference between the Fed's and market participants' macroeconomic expectations.

I show that the Delphic and Odyssean components of FG and LSAP surprises have the opposite impact on macroeconomic expectations of unemployment, growth and inflation during the ZLB period in the US over various horizons. Besides, they also have the opposite impact on the growth and inflation expectations of the following year in other advanced and

large emerging market economies. Moreover, I document the high frequency responses of the yield curve, the US dollar and the stock market to the Delphic and Odyssean components. While the first two respond very significantly with the expected signs, I find that the stock market is not responsive to UMPs. Lastly, I study the daily responses of volatility measures and corporate spreads, and find riskier bonds to be more sensitive to Delphic policies.

7 Tables and Figures

Table 1: Interaction of UMPs with the Fed's Different View of the Macroeconomy

	LSAP	FG
Growth Short Factor	0.02	0.15**
	(0.04)	(0.06)
Growth Long Factor	0.15**	-0.01
	(0.07)	(0.09)
Inflation Short Factor	-0.03	0.01
	(0.03)	(0.05)
Inflation Long Factor	0.03	−0.15
	(0.06)	(0.09)
Growth Short Factor Lag	-0.01	0.05
	(0.04)	(0.06)
Growth Long Factor Lag	−0.11*	0.01
	(0.06)	(0.08)
Inflation Short Factor Lag	0.01	-0.003
	(0.02)	(0.05)
Inflation Long Factor Lag	0.001	0.20**
	(0.05)	(0.09)
Constant	-0.01	0.001
	(0.03)	(0.05)
N	56	56
R^2	0.29	0.18

Note: White standard errors are given in parentheses. ***, ** and * denote 1%, 5% and 10% level of significance respectively. The sample size spans all scheduled FOMC announcements between January 2008 and December 2014. The LSAP and FG surprises are identified as described in Section 2.1. The long and short factors are constructed as described in Section 2.2.

Table 2: Response of Bluechip Forecasts to Decomposed UMPs

	Baseline Regressions			Decomposed Regressions				
	FG	LSAP	R^2	DFG	OFG	DLSAP	OLSAP	R^2
Unemployment								
Nowcast	-0.21	-0.17	0.1	-0.49**	-0.14	-0.52	-0.04	0.16
	(0.14)	(0.28)		(0.23)	(0.12)	(0.36)	(0.25)	
Q1	-0.2	-0.13	0.08	-0.49**	-0.13	-0.55	0.03	0.17
	(0.14)	(0.27)		(0.2)	(0.13)	(0.34)	(0.24)	
Q2	-0.15	0	0.04	-0.4*	-0.09	-0.44	0.17	0.12
	(0.14)	(0.26)		(0.22)	(0.13)	(0.35)	(0.24)	
Q3	-0.12	0.07	0.03	-0.44**	-0.05	-0.5	0.29	0.17
	(0.13)	(0.22)		(0.18)	(0.12)	(0.34)	(0.21)	
Q4	-0.07	0.11	0.02	-0.32*	-0.02	-0.51	0.35	0.16
	(0.14)	(0.22)		(0.18)	(0.13)	(0.36)	(0.21)	
Growth								
Nowcast	-0.45	-1.47**	0.16	-0.22	-0.5	-1.2	-1.57*	0.16
	(0.39)	(0.71)		(0.7)	(0.41)	(1.36)	(0.82)	
Q1	-0.26	-1.1**	0.17	-0.21	-0.27	-0.53	-1.32**	0.18
	(0.36)	(0.53)		(0.65)	(0.32)	(1.09)	(0.6)	
Q2	-0.41	-0.25	0.17	-0.43	-0.4*	0.46	-0.52	0.24
	(0.26)	(0.28)		(0.5)	(0.22)	(0.55)	(0.34)	
Q3	-0.21	-0.14	0.11	-0.31	-0.19	0.15	-0.26	0.14
	(0.18)	(0.14)		(0.31)	(0.15)	(0.32)	(0.19)	
Q4	-0.1	-0.19*	0.09	-0.23	-0.08	0.03	-0.27**	0.13
	(0.13)	(0.1)		(0.23)	(0.11)	(0.26)	(0.13)	
Inflation								
Nowcast	-1.46*	-0.99	0.2	-1.42	-1.46*	0.85	-1.7**	0.24
	(0.74)	(0.65)		(0.96)	(0.74)	(1.26)	(0.79)	
Q1	-0.47**	-0.46**	0.27	-0.85**	-0.38**	0.39	-0.8***	0.4
	(0.21)	(0.19)		(0.34)	(0.15)	(0.42)	(0.25)	
Q2	-0.16	0.1	0.08	-0.27	-0.13	0.02	0.13	0.09
	(0.11)	(0.16)		(0.22)	(0.12)	(0.25)	(0.16)	
Q3	0.03	-0.34***	0.15	0.14	0	-0.24	-0.38***	0.16
	(0.07)	(0.12)		(0.13)	(0.08)	(0.24)	(0.14)	
Q4	-0.06	-0.13**	0.09	-0.18	-0.04	-0.15	-0.12**	0.12
	(0.04)	(0.05)		(0.12)	(0.05)	(0.11)	(0.06)	

Note: White standard errors are given in parentheses. ***, ** and * denote 1%, 5% and 10% level of significance respectively. The sample size spans all scheduled FOMC announcements between January 2008 and December 2014. The dependent variables are the monthly updates of Bluechip forecasts around FOMC announcements. The LSAP and FG surprises are identified as described in Section 2.1. The Delphic and Odyssean components are constructed as described in Section 2.2.

Table 3: Response of International Forecasts for the Following Year to Decomposed UMPs

	Baseline Regressions			Decomposed Regressions				
	FG	LSAP	R^2	DFG	OFG	DLSAP	OLSAP	R^2
Eurozone								
Growth	-0.36	0.36	0.16	-0.32	-0.37*	0.81**	0.18	0.19
	(0.26)	(0.22)		(0.53)	(0.22)	(0.33)	(0.22)	
Inflation	-0.04	0.15**	0.07	0	-0.05	0.28*	0.1	0.1
	(0.04)	(0.06)		(0.1)	(0.04)	(0.16)	(0.08)	
United Kingdom								
Growth	-0.45	0.21	0.16	-0.48	-0.44*	1.15**	-0.15	0.25
	(0.32)	(0.29)		(0.65)	(0.24)	(0.43)	(0.23)	
Inflation	-0.06	0.16**	0.06	-0.14	-0.05	0.26*	0.12	0.07
	(0.06)	(0.08)		(0.17)	(0.06)	(0.15)	(0.09)	
Japan								
Growth	-0.33	0.27	0.15	-0.76	-0.23	0.84**	0.05	0.26
	(0.25)	(0.22)		(0.47)	(0.18)	(0.34)	(0.2)	
Inflation	0.05	0.09	0.01	0.11	0.03	0.19	0.05	0.02
	(0.06)	(0.15)		(0.18)	(0.07)	(0.22)	(0.18)	
Canada								
Growth	-0.43	0.27	0.19	-0.54	-0.4*	0.91***	0.02	0.25
	(0.3)	(0.19)		(0.57)	(0.23)	(0.33)	(0.18)	
Inflation	-0.14*	0.4*	0.23	-0.08	-0.15*	0.58**	0.33	0.25
	(0.08)	(0.2)		(0.16)	(0.09)	(0.27)	(0.2)	
China								
Growth	-0.18**	0.17	0.11	-0.25	-0.16*	0.65*	-0.01	0.2
	(0.07)	(0.11)		(0.21)	(0.08)	(0.34)	(0.17)	
Inflation	-0.27**	0.24**	0.14	-0.27	-0.27**	0.54	0.12	0.15
	(0.11)	(0.11)		(0.27)	(0.1)	(0.45)	(0.19)	
Brazil								
Growth	-0.34*	0.45***	0.23	-0.44	-0.31**	1.01***	0.24	0.29
	(0.18)	(0.16)		(0.35)	(0.14)	(0.27)	(0.16)	
Inflation	-0.72	6.4	0.04	-7.35	0.74	1.52	8.24	0.09
	(1.31)	(6.75)		(7.53)	(1.17)	(4.07)	(8.13)	

Note: White standard errors are given in parentheses. ***, ** and * denote 1%, 5% and 10% level of significance respectively. The sample size spans all scheduled FOMC announcements between January 2008 and December 2014. The dependent variables are the monthly updates of Bluechip forecasts around FOMC announcements. The LSAP and FG surprises are identified as described in Section 2.1. The Delphic and Odyssean components are constructed as described in Section 2.2.

Table 4: Response of the US Treasury Yields and TIPS to Decomposed UMPs

	Baseline Regressions			Decomposed Regressions				
	FG	LSAP	R^2	DFG	OFG	DLSAP	OLSAP	R^2
3-Month	0.01	0	0.05	0.02	0.01	0	0	0.06
	(0.01)	(0.01)		(0.02)	(0.01)	(0.03)	(0.01)	
6-Month	0.04**	0	0.27	0.08***	0.03**	-0.03	0.01	0.33
	(0.02)	(0.01)		(0.02)	(0.02)	(0.03)	(0.01)	
2-Year	0.14***	0.02	0.75	0.17***	0.13***	0.01	0.03	0.77
	(0.02)	(0.02)		(0.02)	(0.02)	(0.03)	(0.02)	
5-Year	0.23***	0.16***	0.96	0.22***	0.23***	0.16***	0.16***	0.96
	(0.01)	(0.02)		(0.01)	(0.01)	(0.03)	(0.02)	
10-Year	0.18***	0.25***	1	0.17***	0.18***	0.26***	0.25***	1
	(0.002)	(0.002)		(0.004)	(0.002)	(0.005)	(0.003)	
30-Year	0.09***	0.21***	0.73	0.08**	0.09***	0.2***	0.22***	0.73
	(0.02)	(0.06)		(0.03)	(0.02)	(0.07)	(0.05)	
TIPS 5-Year	0.21***	0.16***	0.94	0.18***	0.22***	0.16***	0.15***	0.94
	(0.02)	(0.04)		(0.02)	(0.02)	(0.05)	(0.04)	
TIPS 10-Year	0.17***	0.26***	0.94	0.16***	0.18***	0.26***	0.26***	0.94
	(0.01)	(0.02)		(0.02)	(0.02)	(0.03)	(0.02)	

Note: White standard errors are given in parentheses. ***, ** and * denote 1%, 5% and 10% level of significance respectively. The sample size spans all scheduled FOMC announcements between January 2008 and December 2014. The dependent variables are the 120-minute changes around FOMC announcements. The LSAP and FG surprises are identified as described in Section 2.1. The Delphic and Odyssean components are constructed as described in Section 2.2.

Table 5: Response of Stock Prices and the USD to Decomposed UMPs

	Baseline Regressions			Decomposed Regressions				
	FG	LSAP	R^2	DFG	OFG	DLSAP	OLSAP	R^2
SPX	-0.35	-0.94	0.11	-0.74	-0.26	-0.56	-1.09	0.13
	(0.45)	(0.78)		(0.58)	(0.48)	(1.01)	(0.86)	
EURUSD	-0.94***	-0.86**	0.5	-1.2***	-0.89***	-0.87*	-0.86**	0.51
	(0.21)	(0.39)		(0.3)	(0.23)	(0.5)	(0.42)	

Note: White standard errors are given in parentheses. ***, ** and * denote 1%, 5% and 10% level of significance respectively. The sample size spans all scheduled FOMC announcements between January 2008 and December 2014. The dependent variables are the 120-minute changes around FOMC announcements. The LSAP and FG surprises are identified as described in Section 2.1. The Delphic and Odyssean components are constructed as described in Section 2.2.

Table 6: Response of Volatility Measures to Decomposed UMPs

	Baseline Regressions			Decomposed Regressions				
	FG	LSAP	R^2	DFG	OFG	DLSAP	OLSAP	R^2
VIX	2.84*	-4.02**	0.29	2.11	3.03*	-1.65	-4.93**	0.32
	(1.55)	(1.5)		(1.57)	(1.63)	(3.55)	(2.14)	
MOVE	6.67***	-4.27	0.2	8.38	6.33**	3.4	-7.22*	0.23
	(2.37)	(3.29)		(5.02)	(2.37)	(7.85)	(4.3)	

Note: White standard errors are given in parentheses. ***, ** and * denote 1%, 5% and 10% level of significance respectively. The sample size spans all scheduled FOMC announcements between January 2008 and December 2014. The dependent variables are the daily changes around FOMC announcements. The LSAP and FG surprises are identified as described in Section 2.1. The Delphic and Odyssean components are constructed as described in Section 2.2.

Table 7: Response of Corporate Yields and Spreads to Decomposed UMPs

	Baseline Regressions			Decomposed Regressions				
	FG	LSAP	R^2	DFG	OFG	DLSAP	OLSAP	R^2
AAA	0.09***	0.2***	0.55	0.13***	0.08***	0.2***	0.21***	0.56
	(0.02)	(0.03)		(0.05)	(0.02)	(0.04)	(0.03)	
BAA	0.09***	0.23***	0.61	0.12**	0.09***	0.22***	0.23***	0.61
	(0.02)	(0.04)		(0.05)	(0.02)	(0.06)	(0.04)	
BBB	0.14***	0.19***	0.75	0.15***	0.14***	0.15***	0.21***	0.76
	(0.01)	(0.03)		(0.03)	(0.01)	(0.05)	(0.03)	
AAA-10Y	-0.1***	-0.1**	0.5	-0.04	-0.12***	-0.12*	-0.09**	0.54
	(0.02)	(0.04)		(0.04)	(0.02)	(0.07)	(0.04)	
BAA-10Y	-0.1***	-0.08	0.47	-0.05	-0.11***	-0.1	-0.07	0.49
	(0.02)	(0.06)		(0.04)	(0.02)	(0.08)	(0.06)	
BBB-10Y	-0.05**	-0.11***	0.36	-0.02	-0.06**	-0.17***	-0.09***	0.4
	(0.02)	(0.02)		(0.02)	(0.03)	(0.03)	(0.03)	

Note: White standard errors are given in parentheses. ***, ** and * denote 1%, 5% and 10% level of significance respectively. The sample size spans all scheduled FOMC announcements between January 2008 and December 2014. The dependent variables are the daily changes around FOMC announcements. The LSAP and FG surprises are identified as described in Section 2.1. The Delphic and Odyssean components are constructed as described in Section 2.2.

Table 8: Response of Bluechip Forecasts to Decomposed UMPs and Economic News

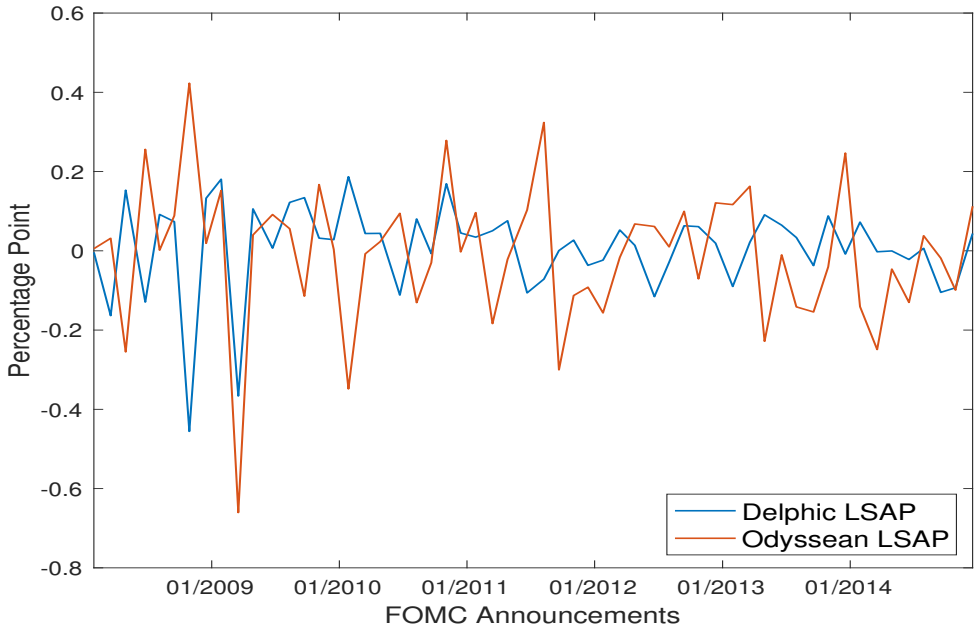
	Baseline Regressions			Decomposed Regressions				
	FG	LSAP	R^2	DFG	OFG	DLSAP	OLSAP	R^2
Unemployment								
Nowcast	-0.25*	-0.21	0.16	-0.53**	-0.18	-0.4	-0.13	0.2
	(0.14)	(0.25)		(0.21)	(0.13)	(0.35)	(0.27)	
Q1	-0.25**	-0.16	0.17	-0.5***	-0.18	-0.46	-0.04	0.22
	(0.12)	(0.24)		(0.18)	(0.12)	(0.33)	(0.26)	
Q2	-0.22*	-0.03	0.2	-0.38**	-0.17	-0.32	0.1	0.24
	(0.12)	(0.23)		(0.18)	(0.12)	(0.32)	(0.24)	
Q3	-0.2**	0.03	0.27	-0.44***	-0.13	-0.38	0.2	0.33
	(0.1)	(0.17)		(0.17)	(0.1)	(0.27)	(0.2)	
Q4	-0.16	0.06	0.25	-0.32*	-0.1	-0.36	0.24	0.3
	(0.11)	(0.16)		(0.17)	(0.11)	(0.28)	(0.2)	
Growth								
Nowcast	-0.25	-1.43*	0.38	-0.37	-0.22	-1.46	-1.41*	0.39
	(0.4)	(0.78)		(0.7)	(0.43)	(1.19)	(0.84)	
Q1	-0.16	-1.06*	0.3	-0.1	-0.19	-0.46	-1.31*	0.31
	(0.35)	(0.61)		(0.6)	(0.35)	(0.98)	(0.66)	
Q2	-0.35	-0.21	0.22	-0.39	-0.37	0.47	-0.51	0.28
	(0.26)	(0.33)		(0.46)	(0.25)	(0.55)	(0.37)	
Q3	-0.16	-0.1	0.2	-0.23	-0.15	0.08	-0.18	0.21
	(0.17)	(0.17)		(0.26)	(0.16)	(0.3)	(0.21)	
Q4	-0.07	-0.16	0.2	-0.14	-0.07	0	-0.23	0.21
	(0.11)	(0.11)		(0.18)	(0.11)	(0.24)	(0.14)	
Inflation								
Nowcast	-1.09*	-0.76	0.35	-1.11	-1.13*	0.34	-1.23	0.37
	(0.63)	(0.82)		(0.84)	(0.66)	(1.37)	(0.93)	
Q1	-0.4**	-0.41*	0.34	-0.84**	-0.33**	0.24	-0.69**	0.42
	(0.19)	(0.23)		(0.33)	(0.16)	(0.4)	(0.28)	
Q2	-0.11	0.13	0.22	-0.21	-0.07	-0.06	0.21	0.24
	(0.09)	(0.12)		(0.21)	(0.1)	(0.24)	(0.15)	
Q3	0.03	-0.35***	0.15	0.14	-0.01	-0.21	-0.4***	0.17
	(0.07)	(0.12)		(0.15)	(0.07)	(0.26)	(0.14)	
Q4	-0.05	-0.12**	0.1	-0.18	-0.02	-0.19	-0.1	0.13
	(0.04)	(0.05)		(0.12)	(0.05)	(0.13)	(0.06)	

Note: White standard errors are given in parentheses. ***, ** and * denote 1%, 5% and 10% level of significance respectively. The sample size spans all scheduled FOMC announcements between January 2008 and December 2014. The dependent variables are the monthly updates of Bluechip forecasts around FOMC announcements. The LSAP and FG surprises are identified as described in Section 2.1. The Delphic and Odyssean components are constructed as described in Section 2.2. The coefficients of economics news are not reported.

Figure 1: Empirical FG and LSAP Surprises during the ZLB Period

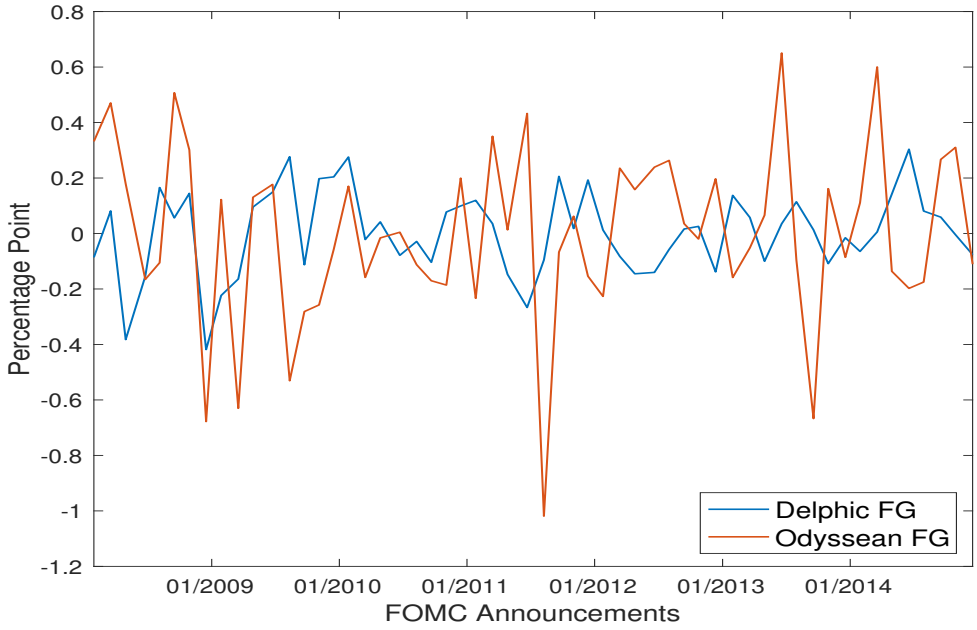
Notes: The blue line shows the FG surprise while the red line depicts the LSAP surprise for each scheduled FOMC announcement during the ZLB period. The empirical identification methodology is as described in Section 2.1. An FG surprise moves the 2-year interest rate expectations while an LSAP surprise moves the 10-year rate by the percentage point given on the vertical axis.

Figure 2: Decomposed LSAP Surprises during the ZLB Period



Notes: The blue line shows the Delphic LSAP surprise while the red line depicts the Odyssean LSAP surprise for each scheduled FOMC announcement during the ZLB period. The decomposition methodology is as described in Section 2.2.

Figure 3: Decomposed FG Surprises during the ZLB Period



Notes: The blue line shows the Delphic FG surprise while the red line depicts the Odyssean FG surprise for each scheduled FOMC announcement during the ZLB period. The decomposition methodology is as described in Section 2.2.

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