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Surveying the survey: What can we learn about the effects of monetary policy on inflation expectations?*

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Abstract

The replies to a questionnaire that was sent to the participants in the Chilean Financial Traders Survey (FTS) reveal heterogeneity in how they make their forecasts. There are also differences in how the traders understand questions regarding the future monetary policy rate (MPR); some of them answer what they think the central bank will do, while others what they think it should do. The FTS is distinctive from similar surveys in the sense that it is conducted immediately before and after the monetary policy meetings. This study employs a novel dataset that consists of FTS micro observations to assess the extent to which heterogeneity in the replies to the questionnaire affects how agents take into account MPR surprises when updating their inflation expectations.

While the should-do traders incorporate MPR surprises in their one-year-ahead inflation expectations, it is not evident that will-do respondents do so. This could imply that the "model" traders have in mind includes an endogenous MPR path, which is not necessarily in accordance with what they think the central bank is going to do in the short run. The baseline estimates suggest that agents that merely base their forecasts on models do not seem to factor in MPR surprises in their inflation expectations updates, but small sample corrected standard errors indicate that the should-do traders might. On the other hand, for those that use information only from financial markets, only the will-do traders adjust inflation expectations in response to MPR surprises, which could be because asset prices incorporate what the market thinks the central bank is going to do. Two-years-ahead inflation expectations are not affected by MPR surprises. The results help to understand heterogeneity in forecasters' inflation updates and stress the importance of understanding on what basis survey respondents answer the questions.

Resumen

Las respuestas a un cuestionario que fue enviado a los participantes de la Encuesta de Operadores Financieros (EOF) de Chile revelan heterogeneidad en la forma en que realizan sus pronósticos. También existen diferencias en la forma en que los operadores entienden las cuestiones relativas a la tasa de política monetaria (TPM) futura; algunos responden lo que creen que hará el banco central, mientras que otros responden lo que creen que debería hacer. La EOF se distingue de encuestas similares en el sentido de que se realiza inmediatamente antes y después de las reuniones de política monetaria. Este estudio emplea un nuevo conjunto de datos que consiste en observaciones micro de

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la EOF para evaluar hasta qué punto la heterogeneidad en las respuestas al cuestionario afecta la forma en que los agentes toman en cuenta las sorpresas de la TPM al actualizar sus expectativas de inflación.

Mientras los "debería-hacer" traders incorporan sorpresas de la TPM en sus expectativas de inflación de un año adelante, no es evidente que los "va-a-hacer" encuestados así lo hagan. Esto podría implicar que el "modelo" que los operadores tienen en mente incluye una trayectoria de TPM endógena, que no necesariamente está de acuerdo con lo que ellos creen que el banco central va a hacer en el corto plazo. Las estimaciones base sugieren que los agentes que simplemente basan sus pronósticos en modelos no parecen tener en cuenta las sorpresas de la TPM en sus actualizaciones de expectativas de inflación, pero los errores estándar corregidos por muestra pequeña indican que los "debería-hacer" traders lo podrían hacer. Por otro lado, para aquellos que usan información solo de los mercados financieros, únicamente los "va-a-hacer" traders ajustan las expectativas de inflación en respuesta a las sorpresas de la TPM, lo que podría deberse a que los precios de los activos incorporan lo que el mercado cree que va a hacer el banco central. Las expectativas de inflación a dos años no se ven afectadas por las sorpresas de la TPM. Los resultados ayudan a comprender la heterogeneidad en las actualizaciones de inflación de los forecasters y enfatizan la importancia de comprender sobre qué base los encuestados responden las preguntas.

1. Introduction

Monetary policy effectiveness depends on, among other things, the reactions of financial markets in response to actions, which in turn depend on the expectations of the market participants. Acknowledging this fact has motivated central banks to ask financial agents about their expectations on the evolution of certain economic variables. This is the case of the Federal Reserve Bank of New York, which initiated a survey on the expectations of primary dealers in 2011 and another of market participants in 2014. Similarly, the European Central Bank launched a survey of market participants' expectations in 2019. The Central Bank of Chile (CBC) has since the end of 2009 conducted a survey of financial traders and the present study is the first to assess the replies to this survey.

Survey questions on expectations of the future monetary policy rate (MPR) are often formulated as what the rate will be in a specific horizon. This formulation can, however, be interpreted differently by the respondents, as some may answer what they think the central bank *is going to do* and others what they think it *should do*. A questionnaire that was forwarded to the respondents to the Financial Traders Survey (FTS) in Chile, reveals that about half of them reply with reference to what the CBC will do and the other half as what they think it should do. This paper investigates whether this affects how agents adjust inflation expectations in response to MPR announcements. It turns out that it affects the medium-term expectations.

Whether or not inflation expectations react to monetary policy announcement depends on how agents form these expectations,[1] but also on the general communication of the central bank and, particularly, the forward guidance.[2] Earlier literature has found that monetary policy decisions (conventional and unconventional) affect investor sentiment (Kurov (2010); Lutz (2015); Galariotis et al. (2018)) and that central bank communication has impact on expectations (Neuenkirch, 2013). Coibion et al. (2018) argue that expectations of households

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[1] Existing literature on inflation expectation formation includes the studies of e.g. Blanchflower and MacCoille (2009), Ueda (2009), Galati et al. (2011), Łyziak (2013), Fritzer and Rumler (2015), and Łyziak and Paloviita (2018).

[2] Blinder et al. (2008) present a survey of the literature on central bank communication and monetary policy. De Haan and Sturm (2019) discuss recent advances with a particular focus on forward guidance regarding policy rates and management of inflation expectations.

and firms do not respond much to monetary policy announcements in periods of low inflation rates. Oinonen et al. (2018) employ micro observations of the European Survey of Professional Forecasters to analyze how monetary policy decisions affect expectations and their uncertainty. With respect to the first mentioned, they find that expectations (inflation and growth) are sensitive to policy actions and that they are heterogeneous across agents.

The research question in this paper is similar to the one in Oinonen et al., but the approach to answer it differs in several dimensions. Firstly, the survey data are from the Chilean FTS, which has the advantage that it is conducted just before *and* after the monetary policy meetings (MPM). In this sense, it is particular amongst surveys of financial markets participants and allows for an analysis of expectations in response to policy surprises, which are affected little by other economic news. Secondly, the analysis is made conditional on replies to a questionnaire that aims at understanding on what basis the respondents answer the survey questions. Particularly, one of the questions is about how they answer with respect to the future MPR.[3] It turns out that there are differences in how respondents understand this question and the discrepancy influences how monetary policy surprises affect their inflation expectations. The other questions in the questionnaire inquire how the predictions are made. Differences in this respect also produce some heterogeneity in the updating of the expectations.

The empirical analysis is carried out for changes in inflation expectations for the medium term (one-year-ahead) and the long term (two-years-ahead) and, hence, studies on the anchoring of inflation expectations are related to the one at hand too.[4] Employing pre- and post-MPM surveys in panel estimations, it is analyzed how surprises to the monetary policy rate affect changes in the expectations when controlling for short-term news and possible herd effects. It turns out that the latter is an important component in the formation of financial

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[3] There are other studies based on replies to questionnaires such as that of Hayo and Neuenkirch (2018) on central bank predictability. In a recent analysis, Bauer and Swanson (2020) asked Blue Chip respondents how they revise forecasts in response to FOMC announcements.

[4] A large strand of literature is concerned with anchoring of inflation expectations. Some recent examples are those of Kumar et al. (2015), Ehrmann (2015), Nautz and Strohsal (2015), Fracasso and Probo (2017), and Łyziak and Paloviita (2017). Sudies for Chile (Gürkaynak et al. (2007); De Pooter et al. (2014); Medel (2018)) suggest that inflation expectations, in general, are well anchored.

traders' inflation expectations in the sense that it turns out to be statistically significant in all of the regressions estimated. MPR surprises seem to affect only the update of medium-term expectations and only those of respondents that answer the MPR survey question as what they think the CBC should do. This, however, is not the case when the respondents only base their inflation projections on models. Amongst those that use information from financial markets to forecast inflation, only the will-do agents update medium-term expectations in response to MPR surprises. Short-term economic news generally, but with some notable exceptions, imply changes in the inflation expectations for longer horizons.

The road map for the rest of the paper is as follows: The next section presents the Chilean FTS and the main results of the questionnaire. Section 3 outlines a simple theoretical framework to fix ideas of the econometric model, which is also presented in this section together with the estimation results. The last section offers some concluding remarks.

2. The survey of financial traders and the questionnaire

This section presents the Chilean FTS and discusses its timing with respect to the MPMs. In the second subsection, the questionnaire is described and the replies are reported.

2.1. The Survey

The Chilean FTS is conducted both before and after the MPM. It was initiated by the CBC in December 2009 and contains replies on the MPR, inflation and exchange rates[5] by local banks, local other financial institutions (OFI - insurance companies, brokers, securities dealers, and mutual funds), and offshore banks operating actively in Chile. The survey is aimed at those responsible for financial decisions.

Until 2017, MPMs in Chile were held every month, hence 24 surveys were conducted every year and the results were published the second and the fourth Wednesday of the month. In 2018 the frequency of the MPM was altered to eight times a year. The FTS is now conducted

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[5] The horizons of the questions have changed twice during the existence of the survey, but without affecting the answers analyzed in the present paper.

16 times every year and the results are published three working days before the MPM and two working days after the publication of the minutes of the same meeting.[6]

The database contains observations of individual replies from the second fortnight of December 2009 (the first survey conducted) to the post-MPM survey of the eighth meeting of 2019. This accounts for more than 13,000 observations, which cover pre- and post-surveys of 111 policy meetings. As reported in table 1, there are 6,058 replies for both pre- and post-MPMs divided among 105 different institutions. The survey is responded mainly by local OFI, followed by local banks and offshore banks. There were fewer answers in the beginning of the survey, but from the twentieth survey onwards, more than 40 institutions have replied each time.

[Table 1]

This study applies the answers to the question about the MPR after the next MPM and inflation rates one and two years ahead.[7] Figure 1 shows in the first column the median replies and the deciles first and ninth, which are the ones published by the CBC, and in the second column the percentage of the answers that are the same as the mode answer and the standard deviations of the replies. There is a lot of heterogeneity in the inflation replies, more so for the rate one year ahead than for the one two years ahead. In the first case, more than half of the answers are different from the mode in every survey. With respect to the MPR after the next policy meeting, there is generally more homogeneity but, more often than not, there is disagreement among the respondents.

[Figure 1]

Figure 2 shows scatterplots, weighted by the number of observations, of MPR surprises and updates of inflation expectations one- and two-years ahead. Surprises are concentrated between plus / minus half a basis point, while inflation updates most frequently span in the

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[6] The minutes are published eleven banking days after the MPM.
[7] The inflation questions are formulated as the annual inflation rate twelve months ahead (1 to 12) and 24 months ahead (13 to 24).

range from minus one to plus one percentage point. From the pictures, it is not possible to draw conclusions about whether MPR surprises tend to imply (unconditionally) positive negative updates of inflation expectations, but simple linear regression points towards slightly positive slopes.

[Figure 2]

The next subsection presents the answers to the questionnaire that was sent to the survey respondents.

2.2. Answers to the questionnaire

To understand better how traders make their forecasts, a questionnaire was sent to the respondents together with the pre-MPM survey of the fifth meeting in 2019 (July). The questions, which are included in appendix A,[8] were with respect to whether expectations are based on models, external projections, financial markets information or other. For the MPR, an additional question was included of whether the respondent answer what they think the CBC *will do* or what they think it *should do*. Fifty-nine institutions replied the questionnaire, of which 14 were local banks, 37 OFIs, and eight offshore banks, as reported in table 1. The relative number of answers to each of the options to questions one to four are shown in figure 3.

[Figure 3]

The first thing to note is that most institutions base their projections on more than one of the included options, which suggests that judgment plays an important role in the formation of their expectations. This is the case for approximately two thirds of the replies related to inflation and the MPR, while more than half report only one answer to the exchange rate question.[9]

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[8] The questionnaire was formulated in Spanish to local institutions and in English to those offshore.
[9] As reported in appendix A, the questionnaire also contained a question regarding the exchange rate. The replies to this question are examined in another paper.

Concerning the questions on the inflation rate, models seem to play an important role, particularly for the short-run forecasts where 85% answered that the forecasts are, among other things, based on models. For the projections of the longer horizons, information extracted from the financial markets appears to be the most important source. More than half of the OFIs use external projections in the formation process, for short- as well as medium-term projections. Two thirds of those that replied state that they use the same methods for making short- and medium-term inflation forecasts.

When the agents are asked what their MPR projections are based on, four answer that it is both what they think the CBC *will do* at future meetings and what they think it *should do*. Of the rest, 55% state in their answers what they think the central bank is going to do and 45% what they think it should do. In the latter case, models is the main source of information, but not for the local banks, as half of them use information from financial markets. The next section contains an empirical analysis to assess the extent to which changes in inflation expectations are affected by these differences.

3. Monetary policy actions and inflation expectations

To fix the ideas of the empirical analysis, the first subsection presents a small theoretical framework, which is followed by an outline of the econometric model in subsection 3.2. The last subsection presents the results of the empirical analysis.

3.1. Theoretical considerations

To schedule the theoretical framework, consider a simple monetary reaction function of the central bank:[10]

$$mpr_t = g(S_t) + \mu_t,$$

where mpr_t is the monetary policy rate at time t, which depends on that state of the economy S_t that influences how the central bank sets the interest rate via the function g. The last term, μ_t, represents an exogenous monetary shock, i.e. deviations from the normal policy rule. Let

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[10] The framework is similar to the one presented by Bauer and Swanson (2020).

$E_{t\text{-}\delta}$ denote the *ex-ante* expectations of the relevant economic agents formed at some time δ before the central bank sets the MPR. Since agents do not expect deviations from the normal reactions, $E_{t\text{-}\delta}(\mu_t) = 0$, a monetary policy surprise occurs if

$$E_{t-\delta}(mpr_t) = E_{t-\delta}\big(g(S_t)\big) \neq mpr_t.$$

In their high-frequency framework, Bauer and Swanson (2020) discuss three possible reasons for a surprise. (1) An exogenous monetary shock, $\mu_t \neq 0$, (2) central bank information effect, $E_{t\text{-}\delta}(S_t) \neq S_t$,[11] and (3) the agents' *ex-ante* perception of the reaction function is wrong, $E_{t\text{-}\delta}(g(.)) \neq g(.)$. If δ is small, i.e. the expectation is formed just before the MPM, (2) captures the central bank information effect; but if it is large, there may be extra information accumulated during the period of reporting the expectation and the MPM such that $E_{t\text{-}\delta}(S_t) \neq E_t(S_t)$.

If incorporating heterogeneity in the expectation formation processes of, say, agents j and l such that $E_{j,t\text{-}\delta} \neq E_{l,t\text{-}\delta}$, this can be another source of "surprise" for some agents. As documented in the previous section, there are differences in the way the agents surveyed in the FTS make their inflation forecast, as well as differences in how they understand the MPR question.

In the present context, agent i of type k makes two inflation predictions at time t, i.e. in connection with an MPM. The type of the agent refers, for example, to how s/he makes the forecast and / or how s/he answers the MPR question, i.e. if it is answered as what s/he thinks the CBC will do or rather what s/he thinks it should do. The first forecast is made before the MPM at time t_1 and the prediction is updated at time t_2 after knowing the decision of the central bank. With this notation, the inflation expectation update of agent i_k is:

$$E_{i_k,t}^{upd}\big(\pi_{t+h}|I_{i_k,t}\big) = E_{i_k,t_2}\big(\pi_{t+h}|I_{i_k,t_2}\big) - E_{i_k,t_1}\big(\pi_{t+h}|I_{i_k,t_1}\big),$$

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[11] This is referred to as the Fed information effect. See Romer and Romer (2000), Campbell et al. (2012) and Nakamura and Steinsson (2018).

where h is the forecast horizon and $I_{i_k,t}$ denotes the agent's information set at time t. Let $f_{i_k,t}(\cdot)$ be the function that transforms available information into the forecast. At time t_1 the arguments of this function is the expectation to the policy rate after the next meeting, $E_{i_k,t_1}(mpr_t)$, and other information available to the forecaster, which is collected in two matrices: X_{i_k,t_1} that contains the idiosyncratic information and Y_{t_1} which includes commonly available information. At time t_2 the outcome of the MPM is known to the agent and s/he has accumulated information that may make her/him change the projection. Hence, the update of the forecast is:

$$E_{i_k,t}^{upd}(\pi_{t+h}|I_{i_k,t}) = f_{i_k,t_2}(mpr_t, X_{i_k,t_2}, Y_{t_2}) - f_{i_k,t_1}(E_{i_k,t_1}(mpr_t), X_{i_k,t_1}, Y_{t_1}).$$

In the next subsection, this expression is translated into an econometric model that takes into account the information available at the time of making the forecast.

3.2. Econometric model

The econometric model considers for each point of time the inflation expectations made before and after the MPM. It includes individual fixed effects and idiosyncratic information—which is extracted from the FTS—, as well as common information.[12] The model reads:

$$E_{i_k,t_2}(\pi_{t+h}) - E_{i_k,t_1}(\pi_{t+h}) = \alpha_{i_k} + \delta_k \left(mpr_t - E_{i_k,t_1}(mpr_t) \right)$$
$$+\beta_k' X_{i_k,t} + \gamma_k' Y_t + D_t + \varepsilon_{i_k,t},$$

where the general notation is as presented in the previous subsection a_{i_k} denotes individual fixed effects, δ_k is the coefficient for monetary surprises, which will be estimated together with β_k and γ_k that denote type-specific coefficients. Finally, D_t contains annual time dummies and $\varepsilon_{i_k,t}$ is the error term. The matrices $X_{i_k,t}$ and Y_t contain two terms each:

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[12] Observations of the MPR and inflation rates are extracted from the web page of the CBC. The exchange rate is from Bloomberg and is measured as Chilean pesos per 1 US dollar. The oil price is from the FRED database of the St. Louis Fed and it measures the price of a WTI barrel in US dollars.

$$X_{i_k,t} = \begin{bmatrix} E_{i_k,t_2}(\pi_t) - E_{i_k,t_1}(\pi_t) \\ E_{t_1}(\pi_{t+h}) - E_{i_k,t_1}(\pi_{t+h}) \end{bmatrix}, \quad Y_t = \begin{bmatrix} fx_{t_2} - fx_{t_1} \\ p^{oil}_{t_2} - p^{oil}_{t_1} \end{bmatrix},$$

where the first term in the *X* matrix shows changes in the inflation nowcast, which is intended to capture contemporaneous inflation news that may affect the longer-horizon inflation forecast. For when the MPM was monthly, i.e. until December 2017, the measure is as stated in the vector because the surveys were conducted the same month. From 2018 onwards, inflation nowcasts made at t_1 and t_2 are not always comparable. When this is the case, and when the previous month's inflation rate is available at t_2, the news are measured as the surprise in the current month's inflation prediction, $\pi_t - E_{i_k,t_1}(\pi_t)$. In the other cases, the term is set to zero. The second term in the *X* matrix is the difference between the initial forecast and the median prediction of the previous survey, which captures possible herd effects.[13]

Changes in the logarithms of the exchange rate (*FX*) and the oil price (*P^oil*) are included in the *Y* matrix. Financial traders may regard these changes as passing through to inflation at longer horizons, while not necessarily affecting the contemporaneous rate.[14,15] Contemporaneous inflation news and changes in the exchange rate and the oil price will henceforth be referred to as short-term news.

3.3. Empirical results

This subsection employs unbalanced panel estimation[16] to investigate the extent to which inflation expectations are updated differently by different types of agents. Estimations are made with expectations one and two years ahead, i.e. fixed horizon forecasts. The two-year

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[13] While herding in financial markets has been well documented, the results for economic forecasts are more mixed (see Batchelor (2007) and the references therein). A study concerned with herding of inflation forecasts is that of Pierdzioch et al. (2016) who employ data from South Africa and find that herding is strong in times of high inflation volatility.

[14] The correlation coefficients with the median contemporaneous inflationary news is 0.05 for the exchange rate and 0.04 for the oil price. Between the two variables it is -0.19.

[15] For robustness, the copper price was also included, but it had no effect. See Pedersen (2019) for a recent analysis of the importance of the copper price for the Chilean economy.

[16] The MCAR test of Little (1988) indicates that missing data are random with a *p*-value of 0.08.

horizon is to some degree related to the credibility of the CBC, as this is the horizon of the inflation target in Chile.[17] Standard errors are heteroscedastic robust and clustered on respondents and, to correct for possible small sample effects, they are also estimated with leave-one-institution-out jackknife replications, which limit the influence of answers from a particular institution.[18]

3.3.1. Inflation expectations one year ahead

Table 2 presents the results for the one-year-ahead expectations. In general terms, the subsample of respondents that answered the questionnaire is fairly representative (column 2) of the whole sample (column 1) in the sense that the estimates' coefficients are similar. Contemporaneous inflation news affects medium-term expectations: If they are inflationary in the short run, they also affect one-year-ahead expectations upwardly.[19] However, the effect is limited, as current-month expectations are formulated in monthly rates, while the one-year-ahead expectations are in annual terms. Changes in oil prices and the exchange rate also affect one-year-ahead inflation expectations positively and so does herding, for which the estimated coefficients suggest an adjustment towards the median expectation of the last known survey. These results apply for both types of agents, i.e. those who have given different answers to how they perceive the MPR question in the FTS (question 3 in appendix A). The point estimates suggest, however, that will-do agents (column 3) react a bit more strongly to contemporaneous inflation news and herd less than the should-do agents (column 4).

[Table 2]

With respect to MPR surprises, it is not evident that will-do agents incorporate MPR surprises into their medium-term inflation expectations, while the should-do respondents do.[20] In general, heterogeneity in the effects of the MPR on inflation expectations can be due to

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[17] See Central Bank of Chile (2007).

[18] As a caveat it should be noted that jackknife calculated variance estimates tend to be upward biased and, hence, implies a less frequently rejection of the null hypothesis (Efron and Stein, 1981). For robustness, the standard errors were also calculated with leave-one-observation-out jackknife replications and 1,000-replications bootstrap, which, unless noted otherwise, confirm the results reported.

[19] This is in line with the results of Pedersen (2015), who considers median expectations of Chilean private forecasters.

[20] The results are robust to excluding the answers of the respondents that replied yes to both 3a and 3b.

different perceptions of the monetary transmission mechanism. In this specific case, the results may indicate that the inflation projections include an endogenous MPR path, which is not necessarily in accordance with what the agents think the central bank will do in the short run. This is partly supported by regressions that explain the update of twelve- and 24-months-ahead MPR expectations with MPR surprises (appendix B). They suggest that about 20 to 25% the surprise is passed on to longer-horizon expectations when including possible herd effects. It is interesting to note that agents anti-herd medium- and long-term MPR expectation, i.e. they diverge their projection from the median forecast the month before. This is in line with evidence for forecasters of US interest rates provided by Pierdzioch and Rülke (2013).

The positive coefficients for MPR surprises in table 2 suggest that an unexpected contractionary monetary policy leads agents to believe that the medium-term inflation is going to be higher. This indicates that they think the CBC has privileged information pointing towards higher inflation rates, the so-called Fed information effect, which has been documented for the US economy by e.g. Romer and Romer (2000), Campbell et al, (2012) and Nakamura and Steinsson (2018).

As reported in table 3, if considering only those agents that use, among other things, models (columns 1 to 3) or information from the financial markets (columns 4 to 6) in their forecast exercise, the results are basically the same as reported above. When estimating the standard errors with jackknife replications, however, it is not evident that the should-do agents adjust their medium-term expectations to contemporaneous inflation news, but bootstrapped calculated standard errors do suggest that the coefficients are statistically different from zero.

[Table 3]

As an additional exercise, the regressions are estimated with agents that use models, but not information from financial markets, and those that employ information from financial markets, but not models, respectively. This implies that few observations are available for the estimations and a small-sample caveat is particularly appropriate for these exercises. The

results are reported in table 4. Those that use only models (columns 1 to 3) do not adjust medium-term expectations to MPR surprises and contemporaneous inflation news do not matter for their projections. This may suggest that the forecasts of this type of traders include an endogenous MPR path. However, when standard errors are estimated with either leave-one-observations-out jackknife replications or bootstrap, the coefficient for the MPR in column 3 appears to be statistically significant when applying a 1% and a 5% significance level, respectively, which indicates that the will-do model traders do adjust inflation expectations to MPR surprises. The agents that do not use models, but rather extract information from financial markets, react to short-term news, as do financial markets, and in this case, the inflation expectations of the will-do agents are influenced by MPR surprises, while those of the should-do traders are not. This can probably be explained by the fact that financial markets have "will-do" expectations factored into the prices.

[Table 4]

The main results of the analysis presented in this subsection suggest that: (1) Reactions to MPR surprises depend on how agents understand the survey questions about the future MPR. (2) Heterogeneity in inflation expectations can to some extent be explained by the methods the agents apply to make the predictions. (3) Chilean financial traders herd one-year-ahead inflation expectations. The next subsection discusses the results for two-years-ahead expectations.

3.3.2. Inflation expectations two years ahead

The formation of long-term inflation expectations may be related to the credibility of the central bank, especially if it targets inflation, as does the CBC. This subsection analyzes the expectations with a horizon of two years, which coincides with the policy horizon of the CBC. As shown in table 5, herding is also an important component in the update of these expectations and the estimated coefficients are similar to those for the one-year-ahead predictions. The respondents also seem to react to contemporaneous inflation news and exchange rate changes, but it is not obvious that this is the case for the should-do agents. Contemporaneous oil price changes seem to affect financial traders' long-run expectations,

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which is in line with Celasun et al. (2012), who argue that commodity prices have some impact on long-term inflation expectations. The fact that these expectations react to short-term news may suggest that they are not anchored,[21] which is in contrast to other Chilean studies on anchoring of inflation expectations. No evidence indicates that MPR surprises affect the long-run inflation expectations of the Chilean financial traders.

[Table 5]

Generally, the results do not change when conditioning on whether agents use models or information from financial markets to make their predictions, as demonstrated in table 6, but when making this separation it becomes clearer that the should-do agents' long-run expectations do not react to any of the short-term news except for the oil price.[22]

[Table 6]

The results presented in table 7 propose that the financial agents, with some exceptions, do not adjust long-run inflation expectations in response to short-term news, casting doubt about the possible de-anchoring for agents that employ only one method to make their predictions. Because the sample is relatively small, however, this result is rather weak and it is the exceptions (the statistically significantly coefficients) that draw the attention and they do suggest some de-anchoring of the two-years-ahead inflation expectations. In none of the estimations do agents appear to change long-run inflation expectations in response to MPR surprises.

[Table 7]

The evidence presented in this subsection indicates that financial traders' long-run inflation expectations do not react to MPR surprises. Short-term news, especially oil price changes,

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[21] E.g. Bernanke (2007) has suggested this definition of anchoring.
[22] Both leave-one-observation-out jackknife replications and bootstrapping suggest that the coefficient for the oil price in column 5 is statistically significantly different from zero when employing a 5% significance level.

seem to affect long-run expectations, and herding towards the median forecast is an important factor for these predictions.

4. Summary and concluding remarks

To extract useful information from surveys, it is crucial that the questions are formulated clearly without risking misinterpretation. One way of knowing if this is the case is to ask the respondents on what they base their answers. A questionnaire sent to the respondents of the Financial Traders Survey (FTS) in Chile revealed that about half of them reply questions about the future monetary policy rate (MPR) as what they think the Central Bank of Chile (CBC) is going to do and the other half as what they think it should do. To analyze if this affects how MPR surprises affect inflation expectations, unbalanced panel estimations were conducted for each type of agent. The results showed differences between them. While the will-do type does not incorporate MPR surprises into their medium-term inflation expectations, the should-do type seems to do so. This could imply that the "model" financial traders have in mind when making inflation forecasts include an endogenous MPR path, which does not necessarily coincide with what they think the CBC will do in the short run. If this is the case, it poses an important communication challenge for the central bank.

The questionnaire also asked how financial traders make their projections and when including this information in the estimations, the evidence suggested that for those that only use models, MPR surprises are not important when updating medium-term inflation expectations. For those that only employ information extracted from financial markets, only the will-do traders react to MPR surprises, which could be because prices of financial assets incorporate what the market thinks the central bank is going to do. When studying the two-years-ahead inflation expectations there is no strong evidence that MPR surprises matter.

Generally, contemporaneous inflation news affect medium- and long-term inflation expectations as do changes in the exchange rate and the oil price. There are, however, some exceptions, but the evidence from the estimations is not strong enough to draw firm conclusions about differences between agents in this respect.

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A strong result, which was present in all the regressions, is that financial traders herd inflation forecasts. Furthermore, the coefficients are remarkably similar across the two horizons of the inflation expectations considered and they imply that about 40 to 60% of the difference between the individual forecast and the median is incorporated in the next projection. This strong herd behavior may indicate a form of risk aversion, in the sense that the traders are reluctant to deviate too much from their equals.

For the interpretation of survey results, it is useful to communicate with the respondents to understand what is behind their answers. With respect to the FTS, two important lessons arise from the present analysis. The first one is with respect to the importance of being precise in the formulation of the questions such that the replies reflect what they are meant to. The second is with respect to the expectation formation process. Even within a relatively homogenous group, as the one in the FTS, there are important differences in the way agents make their projections.

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Appendix A: Questions in the questionnaire

1. Regarding short-term inflation (current month and the next two months). What are your answers based on?	a. Trader projections based on models b. Research area projections based on models c. External projections (consultants, etc.) d. Information extracted from financial markets e. Other. Please specify
2. Regarding medium-term inflation (12 months forward and the following 12 months). What are your answers based on?	a. Trader projections based on models b. Research area projections based on models c. External projections (consultants, etc.) d. Information extracted from financial markets e. Other. Please specify
3. Regarding expectations of MPR. Your answer is based on:	a. What you believe the central bank is going to do. b. What you think the central bank should do.
4. If your answer is b), please specify what your answer is based on:	a. Trader projections based on models b. Research area projections based on models c. External projections (consultants, etc.) d. Information extracted from financial markets e. Other. Please specify
5. With respect to the exchange rate expectations, what are your answers based on?	a. Trader projections based on models b. Research area projections based on models c. External projections (consultants, etc.) d. Information extracted from financial markets e. Other. Please specify

Appendix B: MPR regressions

[Table B1]

[Table B2]

Figures

Figure 1. Some descriptive statistics, pre-MPM replies
One-year-ahead inflation expectations

(a) Median (solid) and deciles 1 and 9 (punctuated)

(b) Pct. of answers in mode (solid, lhs) and standard deviation (dotted, rhs)

Two-years-ahead inflation expectations

(c) Median (solid) and deciles 1 and 9 (punctuated)
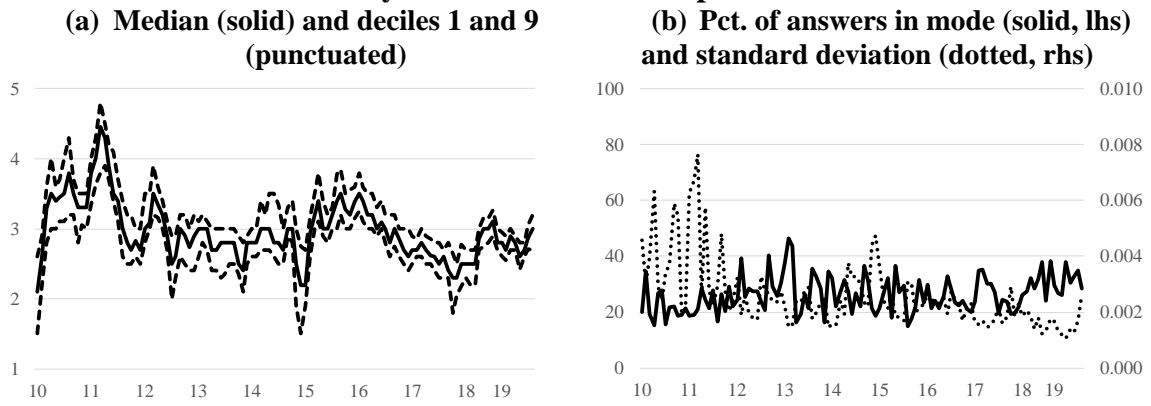
(d) Pct. of answers in mode (solid, lhs) and standard deviation (dotted, rhs)
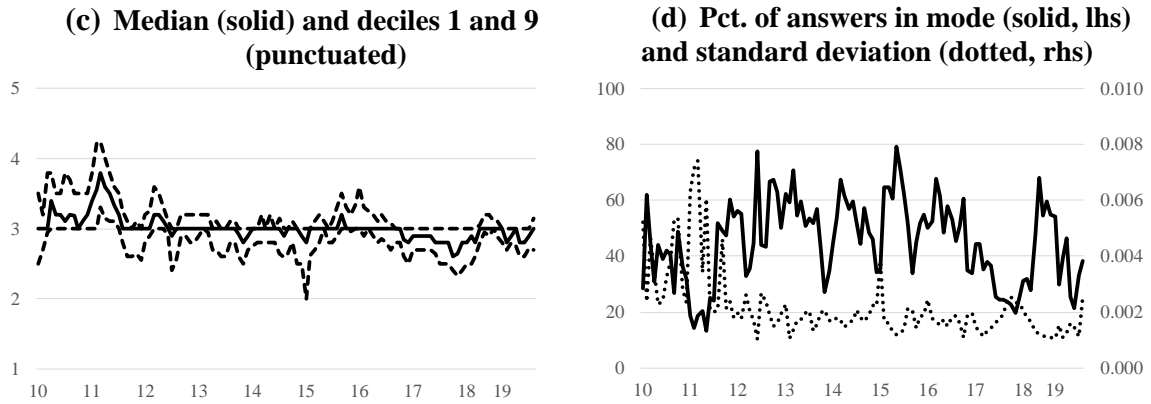
Expectation to post-MPM policy rate

(e) Median (solid) and deciles 1 and 9 (punctuated)

(f) Pct. of answers in mode (solid, lhs) and standard deviation (dotted, rhs)
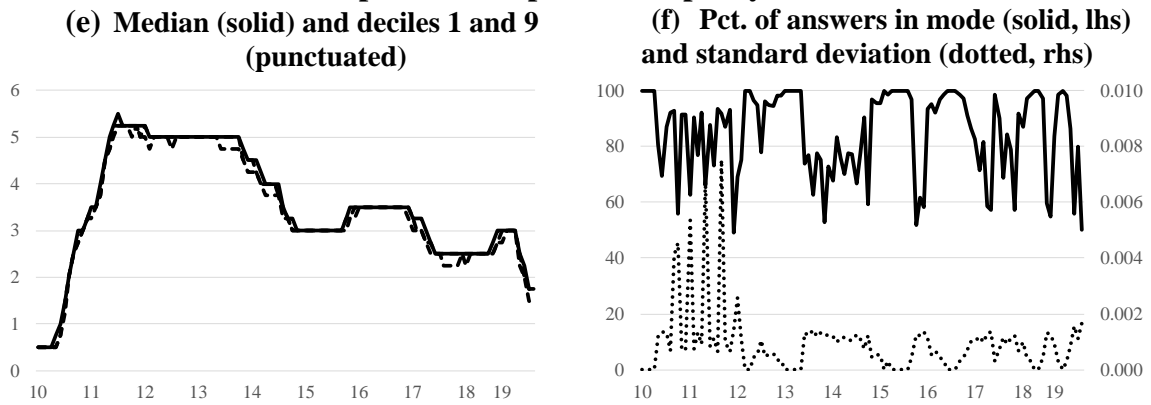
Note: The horizontal axes are the years and the vertical percentages.

Figure 2. Weighted scatterplots: MPR surprises and inflation expectations

(a) One-year-ahead expectations

(b) Two-years-ahead expectations
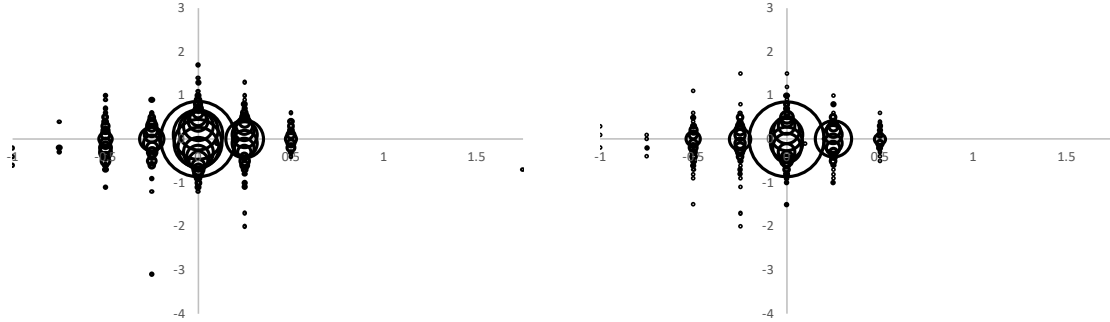
Note: The horizontal axes are the inflation updates (percentage points) and the vertical MPR surprises (basis points). The sizes of the circles show the number of observations at each point.

Figure 3. Answers to the first four questions of the questionnaire

(a) Q1: Short-term inflation

(b) Q2: Medium-term inflation
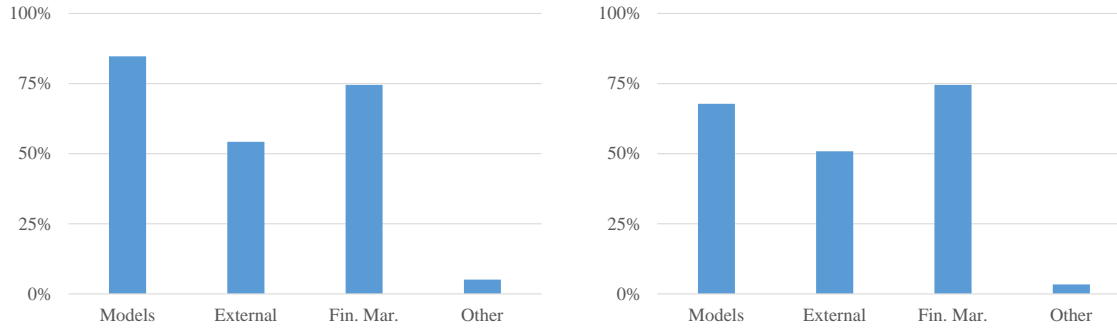
(c) Q3: MPR expectations

(d) Q4: MPR expectation (should do)
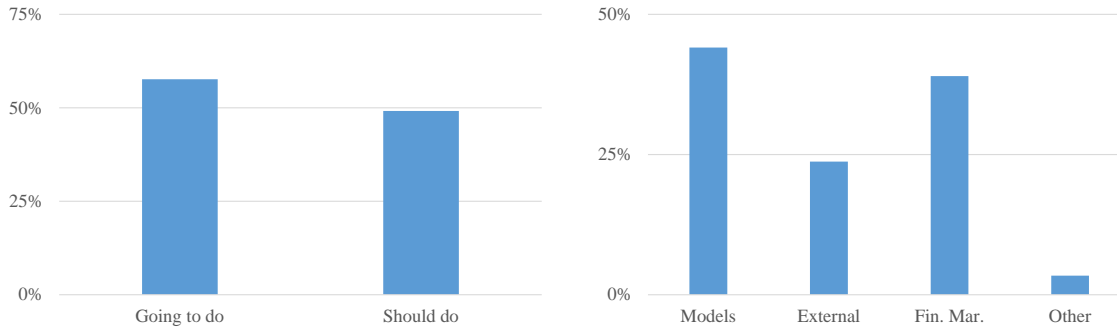
Note: The first bar in the figures a, b, and d represents those that replied that they use models to make the projections; either trader's projections based on models, research area projections based on models, or both.

Tables

Table 1. Observations in the Financial Traders Survey

	All inst.	Banks	OFI	Offshore
#obs	6,058	1,490	3,940	628
#inst	105	21	59	25
Average observations per survey	53.6	13.2	34.9	5.6
	(21 / 66)	(7 / 16)	(12 / 43)	(1 / 11)
Institutions that replied questionnaire				
#obs	4,282	1,131	2,894	257
#inst	59	14	37	8
Average observations per survey	37.9	10.0	25.6	2.7
	(11 / 58)	(3 / 14)	(7 / 37)	(1 / 7)

Notes: The rows #obs and #inst show the number of total observations and the number of institutions, respectively, for respondents who replied both pre- and post-MPM surveys. Numbers in parentheses are minimum and maximum of the monthly replies.

Table 2. Estimation results
Dependent variable: Change in one-year-ahead inflation expectations

	(1)	(2)	(3)	(4)
Surprise MPR	**0.08*****	**0.09*****	0.05	**0.12*****
	(0.03)	(0.03)	(0.04)	(0.04)
Cont. infl. news	**0.24*****	**0.20*****	**0.21*****	*0.18***
	(0.05)	(0.05)	(0.06)	(0.07)
Herding	**0.50*****	**0.53*****	**0.49*****	**0.57*****
	(0.02)	(0.03)	(0.03)	(0.04)
Exc. Rate$^{(a)}$	**1.08*****	**1.02*****	**0.98*****	**1.04*****
	(0.13)	(0.14)	(0.18)	(0.21)
Oil price$^{(a)}$	**0.50*****	**0.53*****	**0.51*****	**0.58*****
	(0.05)	(0.06)	(0.07)	(0.08)
#obs	5,992	4,232	2,331	2,158
#respondents	105	59	34	29
R^2	0.27	0.27	0.27	0.29
Answer Q3	No	Yes	Yes(3a)	Yes(3b)

Notes: Estimations include fixed effects and annual time dummies. Numbers in parentheses are heteroscedastic robust standard errors clustered on respondents. */**/***: $p > 10\%$ / 5% / 1%. Bold (italic) numbers indicate that the coefficients are statistical significantly different from zero when applying a 5% (10%) significance level and standard errors estimated with leave-one-respondent-out jackknife replications. The row "Answer Q3" indicates whether the estimations are made only with the respondents who have answered question 3 the questionnaire (see appendix A). 3a and 3b denote the answer to question 3. (a) Coefficients are multiplied by 100.

Table 3. Estimation results: Use of model and financial markets
Dependent variable: Change in one-year-ahead inflation expectations

	(1)	(2)	(3)	(4)	(5)	(6)
Surprise MPR	*0.08**	0.01	**0.14****	**0.09*****	0.07	**0.09*****
	(0.04)	(0.05)	(0.05)	(0.03)	(0.05)	(0.04)
Cont. infl. news	**0.19*****	**0.24*****	0.16**	**0.21*****	**0.22*****	**0.20****
	(0.06)	(0.07)	(0.07)	(0.07)	(0.06)	(0.08)
Herding	**0.53*****	**0.50*****	**0.57*****	**0.56*****	**0.51*****	**0.61*****
	(0.03)	(0.03)	(0.05)	(0.03)	(0.03)	(0.04)
Exc. Rate[(a)]	**0.99*****	**0.92*****	**1.08*****	**1.18*****	**1.14*****	**1.17*****
	(0.15)	(0.21)	(0.21)	(0.17)	(0.22)	(0.25)
Oil price[(a)]	**0.45*****	**0.46*****	**0.49*****	**0.60*****	**0.54*****	**0.68*****
	(0.06)	(0.09)	(0.09)	(0.07)	(0.09)	(0.09)
#obs	2,961	1,609	1,609	3,187	1,763	1,681
#respondents	40	23	21	44	25	23
R^2	0.28	0.29	0.28	0.29	0.29	0.30
Answer Q3	Yes	Yes(3a)	Yes(3b)	Yes	Yes(3a)	Yes(3b)
M / FM	M	M	M	FM	FM	FM

Notes: See table 2. M / FM: Agents who reply that they use models (M) and / or information extracted from financial markets (FM) to make the inflation forecasts.

Table 4. Estimation results: Use of model or financial markets
Dependent variable: Change in one-year-ahead inflation expectations

	(1)	(2)	(3)	(4)	(5)	(6)
Surprise MPR	0.12	-0.02	0.24	**0.13****	**0.19****	0.08
	(0.09)	(0.11)	(0.12)	(0.05)	(0.08)	(0.06)
Cont. infl. news	0.13	0.19	0.11	**0.22*****	**0.16****	**0.30*****
	(0.09)	(0.17)	(0.09)	(0.05)	(0.06)	(0.08)
Herding	**0.46*****	**0.46*****	**0.47*****	**0.54*****	**0.51*****	**0.57*****
	(0.05)	(0.06)	(0.09)	(0.04)	(0.06)	(0.05)
Exc. Rate[(a)]	**0.51****	*0.51***	0.55	**1.17*****	**1.36*****	0.96
	(0.19)	(0.20)	(0.35)	(0.34)	(0.40)	(0.62)
Oil price[(a)]	**0.30*****	**0.39****	*0.20**	**0.73*****	**0.67*****	**0.79*****
	(0.09)	(0.15)	(0.10)	(0.11)	(0.13)	(0.17)
#obs	911	434	477	1,137	588	549
#respondents	13	7	6	17	9	8
R^2	0.25	0.30	0.25	0.29	0.29	0.30
Answer Q3	Yes	Yes(3a)	Yes(3b)	Yes	Yes(3a)	Yes(3b)
M / FM	M	M	M	FM	FM	FM

Note: See table 2. M: Agents who reply that they use models and not information extracted from financial markets to make the inflation forecasts. FM: Agents who reply that they use information extracted from financial markets and not models to make the inflation forecasts.

Table 5. Estimation results
Dependent variable: Change in two-years-ahead inflation expectations

	(1)	(2)	(3)	(4)
Surprise MPR	-0.02	-0.004	-0.01	0.002
	(0.02)	(0.03)	(0.04)	(0.04)
Cont. infl. news	**0.10*****	**0.09*****	**0.13*****	0.07*
	(0.03)	(0.03)	(0.03)	(0.04)
Herding	**0.48*****	**0.46*****	**0.42*****	**0.50*****
	(0.02)	(0.02)	(0.02)	(0.02)
Exc. Rate[a]	**0.29*****	**0.32****	*0.22**	0.37
	(0.12)	(0.14)	(0.12)	(0.24)
Oil price[a]	**0.16*****	**0.18*****	**0.14****	**0.23*****
	(0.04)	(0.05)	(0.05)	(0.07)
#obs	5,992	4,232	2,331	2,158
#respondents	105	59	34	29
R^2	0.27	0.25	0.23	0.27
Answer Q3	No	Yes	Yes(3a)	Yes(3b)

Note: See table 2.

Table 6. Estimation results: Use of model and financial markets
Dependent variable: Change in two-years-ahead inflation expectations

	(1)	(2)	(3)	(4)	(5)	(6)
Surprise MPR	-0.005	-0.02	0.01	0.02	0.03	0.01
	(0.03)	(0.04)	(0.04)	(0.03)	(0.04)	(0.05)
Cont. infl. news	0.08**	**0.14*****	0.06	*0.10***	**0.13*****	0.08
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
Herding	**0.47*****	**0.43*****	**0.50*****	**0.48*****	**0.45*****	**0.50*****
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)
Exc. Rate[a]	**0.30****	*0.27**	0.27	*0.32**	*0.29**	0.28
	(0.14)	(0.14)	(0.23)	(0.18)	(0.15)	(0.31)
Oil price[a]	**0.17*****	**0.17****	**0.18****	**0.20*****	*0.13***	**0.28*****
	(0.05)	(0.07)	(0.08)	(0.06)	(0.06)	(0.09)
#obs	2,961	1,609	1,609	3,187	1,763	1,681
#respondents	40	23	21	44	25	23
R^2	0.25	0.24	0.27	0.27	0.26	0.29
Answer Q3	Yes	Yes(3a)	Yes(3b)	Yes	Yes(3a)	Yes(3b)
M / FM	M	M	M	FM	FM	FM

Note: See table 3.

Table 7. Estimation results: Use of model or financial markets
Dependent variable: Change in two-years-ahead inflation expectations

	(1)	(2)	(3)	(4)	(5)	(6)
Surprise MPR	-0.06	-0.10	-0.03	0.02	0.06	-0.02
	(0.04)	(0.07)	(0.02)	(0.06)	(0.07)	(0.10)
Cont. infl. news	0.06	0.11	0.04	**0.12**[**]	0.12	0.14
	(0.06)	(0.07)	(0.08)	(0.06)	(0.07)	(0.09)
Herding	**0.43**[***]	**0.35**[***]	**0.49**[***]	**0.47**[***]	**0.45**[***]	**0.49**[***]
	(0.06)	(0.03)	(0.08)	(0.04)	(0.04)	(0.05)
Exc. Rate[(a)]	0.28	-0.11	**0.63**[**]	0.36	0.12	0.65
	(0.19)	(0.23)	(0.18)	(0.36)	(0.30)	(0.68)
Oil price[(a)]	*0.11*[*]	0.15	0.07	*0.19*[*]	0.04	*0.36*[*]
	(0.05)	(0.08)	(0.07)	(0.09)	(0.05)	(0.18)
#obs	911	434	477	1,137	588	549
#respondents	13	7	6	17	9	8
R^2	0.21	0.20	0.24	0.27	0.24	0.30
Answer Q3	Yes	Yes(3a)	Yes(3b)	Yes	Yes(3a)	Yes(3b)
M / FM	M	M	M	FM	FM	FM

Note: See table 4.

Table B1. Estimation results
Dependent variable: Change in one-year-ahead MPR expectations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MPR surp.	**0.17**[***]	**0.22**[***]	**0.22**[***]	**0.28**[***]	**0.24**[***]	**0.28**[***]	**0.17**[***]	**0.25**[***]
	(0.03)	(0.03)	(0.04)	(0.04)	(0.06)	(0.06)	(0.04)	(0.04)
Herding		**-0.38**[***]		**-0.39**[***]		**-0.38**[***]		**-0.41**[***]
		(0.02)		(0.03)		(0.03)		(0.04)
#obs	6,002	6,002	4,237	4,237	2,336	2,336	2,158	2,158
#respondents	105	105	59	59	34	34	29	29
R^2	0.07	0.22	0.09	0.24	0.10	0.25	0.09	0.23
Answer Q3	No	No	Yes	Yes	Yes(3a)	Yes(3a)	Yes(3b)	Yes(3b)

Note: See table 2.

Table B2. Estimation results
Dependent variable: Change in two-years-ahead MPR expectations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MPR surp.	**0.15**[***]	**0.22**[***]	**0.13**[***]	**0.21**[***]	**0.24**[***]	**0.21**[***]	*0.11*[*]	**0.21**[***]
	(0.04)	(0.03)	(0.04)	(0.04)	(0.06)	(0.05)	(0.06)	(0.06)
Herding		**-0.37**[***]		**-0.36**[***]		**-0.33**[***]		**-0.39**[***]
		(0.02)		(0.03)		(0.03)		(0.04)
#obs	6,000	6,000	4,235	4,235	2,336	2,336	2,156	2,156
#respondents	105	105	59	59	34	34	29	29
R^2	0.04	0.19	0.05	0.20	0.05	0.19	0.05	0.20
Answer Q3	No	No	Yes	Yes	Yes(3a)	Yes(3a)	Yes(3b)	Yes(3b)

Note: See table 2.

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