



Inattentive agents and disagreement about economic activity[☆]



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ARTICLE INFO

JEL classification:

E3
E31
E32
E37
E21

Keywords:

Inattentive agents
Disagreement
Uncertainty
Bayesian estimation

ABSTRACT

This paper evaluates empirically the (in)consistency of disagreement in survey forecasts with the prediction of sticky information models à la Mankiw-Reis, in which only a fraction of agents update their information sets at every period. To address this issue, a dynamic stochastic general equilibrium (DSGE) model that features agents' infrequent information updating as well as nominal rigidities is fit to U.S. data. We find that the survey disagreement shares two pivotal characteristics with its model-based counterparts: (i) disagreement can be predicted by agents' average forecast revisions reflecting the arrival of shocks; and (ii) disagreement exhibits a U-shaped relationship against the deviation of output growth from its steady state. These features arise because the arrival of new information elevates disagreement among informed and uninformed agents. Our findings indicate a substantial degree of infrequent information updating in the survey disagreement. The existing literature often uses survey disagreement as a proxy for macroeconomic uncertainty, but our finding suggests that it is unlikely to be an appropriate measure.

1. Introduction

In recent years, disagreement in the Survey of Professional Forecasters (SPF) has received growing attention for its role in understanding business cycle dynamics. A prominent exercise is to use the survey disagreement as a proxy for macroeconomic uncertainty [see, for example, Lahiri and Sheng, 2010; Sill, 2012, and Nimark, 2014], which has critical impacts on the business cycle (Bloom, 2009).¹ In a similar vein, survey-measured disagreement is also considered to be a good measure for ambiguity (Knightian uncertainty) as in Ilut and Schneider (2014). They point out that ambiguity adverse agents lose their confidence in the probabilities of all economic events when they observe experts disagree about the course of the economy. The agents make economic decisions under a worse case belief drawn from a set of

experts' point forecasts of economic activity. Thus, a rise in disagreement induces agents to behave more cautiously, yielding a contraction in economic activity.

One of the popular uncertainty proxies is survey-measured disagreement (Lahiri and Sheng, 2010). However, the validity of disagreement as a proxy for uncertainty is an empirical question. Lahiri and Sheng (2010) investigate this issue and find that disagreement is an appropriate measure for uncertainty in a stable period, while it is less appropriate in a period of high volatility. Abel et al. (2016) build uncertainty measures from survey respondents' density forecasts, and find that the measures do not show a reliable relationship with disagreement. In this line of research, this article assesses the validity of disagreement as a proxy for uncertainty.

One of the justifications for the applications is that survey-

[☆] Earlier versions were circulated under the title "Sticky Information and Disagreement about Economic Activity." We are grateful to Sushanta Mallick (the editor) and two anonymous referees whose comments were particularly helpful. We would like to thank Taeyoung Doh, Yuriy Gorodnichenko, Eric Leeper and Todd Walker for helpful comments. We also thank seminar participants at the Federal Reserve Bank of Kansas City for comments. This work is supported by Hankuk University of Foreign Studies Research Fund of 2017 and by the National Research Foundation of Korea Grant funded by the Korean Government (NRF-2014S1A5B8060964).

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¹ Notice that Bloom constructs policy uncertainty measure using three underlying components. "One component quantifies newspaper coverage of policy-related economic uncertainty. A second component reflects the number of federal tax code provisions set to expire in future years. The third component uses disagreement among economic forecasters as a proxy for uncertainty" (see <http://www.policyuncertainty.com/methodology.html>).

measured disagreement about real GDP exhibits a countercyclical pattern. This, however, seems at odds with the perspective of sticky information models as in Mankiw and Reis (2002), in which only a fraction of agents are able to update their information sets each period. Sticky information models predict that the arrival of a shock, no matter whether it is positive or negative, increases agents' disagreement about economic activity. This is because the shock is likely to yield different forecasts about the same economic variable among informed and uninformed agents.² If positive and negative economic outcomes are equally plausible with similar magnitudes, disagreement is unlikely to be countercyclical as it increases both in booms and recessions.

This paper attempts to evaluate empirically the (in)consistency of disagreement in survey forecasts with the prediction of sticky information models. To this end, we estimate a dynamic stochastic general equilibrium (DSGE) model associated with inattentive private agents and nominal rigidities. In the model, consumers, workers, and firms update their information sets in a sluggish manner à la Mankiw and Reis (2002), while only a fraction of firms and workers are allowed to adjust their prices and wages in a given period under monopolistically competitive goods and labor markets, respectively. By introducing sticky information, the degree of each agent's information stickiness can deviate from zero, and therefore the model is able to generate disagreement. The model is estimated by using a Bayesian approach with U.S. quarterly data from 1954:Q3 to 2008:Q4. We then compare the model-implied disagreement with readily available disagreement from the SPF in order to explore to what extent the sticky information framework is relevant for fluctuations in the survey disagreement.³ Two main findings emerge from the empirical analysis.

First, the estimates of information stickiness vary considerably by agent type. We find that firms update information quite frequently, while consumers and workers are subject to a substantial amount of information rigidity. The posterior mean estimates indicate that firms update their information sets every 3.4 months, whereas consumers and workers do so once a year and every 6 months, respectively. Notice that the estimated degrees of sticky information of consumers and firms are broadly consistent with the existing microeconomic evidence as in Carroll (2003) and Anderson et al. (2013).

Second, the survey disagreement shares two pivotal characteristics with the model-implied one, suggesting that fluctuations in the survey disagreement are consistent with the prediction of sticky information models. The first characteristic is related to whether disagreement can be predicted by agents' forecast revisions associated with the arrival of new information. If only a fraction of agents update their information sets at every period, the arrival of new information elevates disagreement among informed and uninformed agents. This is because the former revise their forecasts, while the latter keep their forecasts unchanged. Therefore, agents' revisions of their economic activity forecasts have explanatory power for the fluctuations in disagreement if agents update their information sets in a staggered fashion. As sticky information models predict, we find that forecast revisions contribute significantly to fluctuations in the survey disagreement, which is also

² In this article, disagreement is defined as the cross-sectional dispersion in agents' predictions of current output, as in Mankiw and Reis (2011), page 23. More specifically, the measure of disagreement about current output implied by sticky information models, σ_t^d , has a form of $\sigma_t^d = \sqrt{(1 - \gamma^{st}) \sum_{k=0}^{\infty} (\gamma^{st})^k [E_{t-k}(Y_t - f_t^Y)]^2}$ where the parameter $\gamma^{st} \in [0, 1]$ denotes a fraction of randomly chosen agents who update information each period and f_t^Y denotes the model-based average forecast of current output defined as $f_t^Y = (1 - \gamma^{st}) \sum_{k=0}^{\infty} (\gamma^{st})^k E_{t-k} Y_t$. Notice that γ^{st} is equal to $1 - \lambda$ in Mankiw and Reis (2011), and that a fraction of agents who update information at time $t - k$ and keep their information sets unchanged until time t is $(1 - \gamma^{st})(\gamma^{st})^k$ when agents update their information sets according to the Calvo scheme. By construction, the disagreement measure is perfectly symmetric with respect to the performance of the economy.

³ An important point to stress is that, even though professional forecasters are not explicitly considered in the model, the agents' information stickiness can be viewed as a model-based analog to that of professional forecasters as long as the model and actual entities display a similar degree of information stickiness. We provide a detailed discussion about this issue in Section 5.1.

confirmed from the model-implied disagreement. In addition, controlling for forecast revisions in the disagreement-output growth regression attenuates the countercyclicality in disagreement, as output growth becomes insignificant in explaining disagreement.

We then explore the cyclical property of the survey disagreement and find that it is consistent with the prediction of sticky information models. The model-implied disagreements of economic agents, regardless of agent type, exhibit a U-shaped pattern against the deviation of output growth from its steady state that proxies the current economic performance. This pattern is confirmed by the Nadaraya-Watson kernel regression as well as by the quadratic regression. More importantly, the U-shape is also observed in the SPF disagreement about current output, as it tends to rise both during booms and economic downturns. This is because shocks deviating output growth from its steady state, regardless of their signs, increase disagreement among informed and uninformed agents. The U-shape summarized by the quadratic relationship indicates that disagreement is associated negatively with output growth, but positively with its squared term. This suggests that the negative correlation between the survey disagreement and output growth should be interpreted with care. It could be a consequence of inattentive agents who update information infrequently, rather than evidence for countercyclical disagreement.

Our finding has an implication for the ongoing debate about whether disagreement is a good proxy for macroeconomic uncertainty, along with two alternative measures often employed in the existing literature: the volatility of stock market returns in Bloom (2009) and the uncertainty measure constructed by Jurado et al. (Jurado et al., 2015, hereafter JLN). We find that the empirical results based on the alternative series contrast sharply with those of the survey disagreement. The explanatory power of forecast revisions for the stock market volatility series and JLN's measure of uncertainty is quite limited and statistically insignificant. In addition, the U-shape is not observed with the alternative uncertainty measures. This suggests that, in contrast to the two alternative uncertainty measures, survey disagreement may be an inappropriate proxy for macroeconomic uncertainty.

2. The model economy

We employ a model embedded with both nominal and information rigidities as follows: (1) firms and workers set prices and wages infrequently in monopolistically competitive goods and labor markets; and (2) consumers, firms and workers are subject to information stickiness. Households often choose the optimal level of consumption and bond holding with outdated information due to costs of updating information. There are two types of producers: a representative final goods producer and intermediate goods producers. The labor sector also has two types of agents: the labor aggregator and workers. The labor aggregator purchases and combines differentiated labor services provided by workers, and sells each unit of labor to intermediate goods producers.

2.1. Households

The economy is endowed with a continuum of households, and each household consists of a consumer $j \in [0, 1]$ and a worker $\ell \in [0, 1]$, as in Carrillo (2012). Each worker supplies a differentiated labor service and sets wages in a monopolistically competitive labor market. Households with up-to-date information maximize their objective function defined as

$$\sum_{s=0}^{\infty} \beta^s E_t \left(\frac{1}{1 - \sigma} C_{j,t+s}^{1-\sigma} - \frac{1}{1 + \eta} N_{\ell,t+s}^{1+\eta} \right) \tag{1}$$

subject to the budget constraint

$$C_{j,t+s} + \frac{J_{t+s} B_{j,t+s}}{P_{t+s}} = \frac{W_{\ell,t+s} N_{\ell,t+s}}{P_{t+s}} + \frac{B_{j,t+s-1}}{P_{t+s-1}} + \Pi_{t+s} \tag{2}$$

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