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Price reaction and disagreement over public signal☆

Pak Hung Au

Division of Economics, School of Humanities and Social Sciences, Nanyang Technological University, 14 Nanyang Drive, HSS-04-67, Singapore 637332, Singapore

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ABSTRACT

We develop a theory of endogenous disagreement over the interpretation of public news based on the optimal expectation model proposed by Brunnermeier and Parker (2005). In our model, each agent can form an optimal interpretation and agree to disagree with others. We find that endogenous disagreement and trade may arise following public news events. The model predicts that the market price overreacts to uninformative news and underreacts to informative news, thus providing a unified account for the drift in price following significant news events, and the excessive price volatility in response to noisy information.

1. Introduction

Standard models of rational expectation assume agents hold a common (and correct) belief about the underlying fundamentals and news interpretation. These models have a hard time explaining the following well-documented phenomena: (i) trading volume spikes immediately following a public news announcement[1]; (ii) price exhibits medium-run momentum following a public news announcement, such as an earnings report[2]; and (iii) price volatility is too high to be justified by changes in underlying fundamental variables.[3] As proposed by Hong and Stein (2007), a promising path to gain a better understanding of these phenomena is considering models of disagreement, which dispense with assumptions of a common prior and/or news interpretation, and allow agents to "agree to disagree." In this paper, we develop a novel theory of equilibrium disagreement over news interpretation which offers predictions on how price and volume reacts to public news announcements that are consistent with the empirical findings above.

Existing studies in disagreement models typically exogenously endow a number (usually two) of groups of agents with different prior beliefs about the distributions of the underlying state and the informative signals. For instance, the seminal

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E-mail address: phau@ntu.edu.sg

[1] See for example Kandel and Pearson (1995), Hong and Stein (2007), and Chae (2005).

[2] See for example Jegadeesh and Titman (1993), Bernard and Thomas. (1989), Fama and French (1988), and Barber et al. (2013).

[3] See for example Shiller (1981) and LeRoy and Parke (1992).

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work of Harris and Raviv (1993) and Kandel and Pearson (1995) exogenously specifies two groups of traders who hold different beliefs about the generation process of a public signal. After the public signal arrives, these two groups update their beliefs on the true state of the world differently. Therefore, they are willing to trade against each other, resulting in a jump in trading volume. These models are silent on pricing, because without additional assumptions on the asset market, the pricing outcome is almost completely determined by the exogenously specified disagreement pattern. We extend this line of work by endogenizing the traders' disagreement over news interpretation. This allows us to pin down the pattern of equilibrium disagreement, and offer testable predictions on the consequent mispricing.

We endogenize disagreement among agents by allowing each of them to "choose" their own interpretation of a public signal, in a spirit similar to the optimal expectations model proposed by Brunnermeier and Parker (2005). In their model, each agent (i) derives *anticipatory utility* from the optimism of enjoying high consumption levels in the future; and (ii) is able to choose to hold a subjective belief that differs from the objective distributions, and "agree to disagree" with other agents. The basic trade-off facing each agent is the benefit of optimism (higher anticipatory utility) versus the cost of making bad decisions (low consumption utility). As noted in their paper, the optimal expectations model can be viewed as a "theory for prior belief for Bayesian rational agents." They apply the model to a static asset pricing setting without news arrival, and show that in equilibrium, an asset can be mispriced relative to its expected value if its payoff distribution is skewed. We adapt their model to build *a theory for news interpretation for Bayesian rational agents*. Agents in our model face a similar problem and trade-off in deciding their subjective interpretation of a public news event. We show that if agents put high enough weights on anticipatory utilities, then a disagreement over news interpretation arises endogenously. Moreover, the equilibrium asset price may overreact or underreact to the news event depending on the news' objective informativeness.

Our contribution is twofold. First, on the theoretical front, we develop a novel model of endogenous disagreement over news interpretation with a solid psychological and economic foundation. Second, our model reconciles various stylized facts on price drifts and time-series predictability in a parsimonious way.

We briefly describe our model and results below. There is a single risky asset and three periods. The asset market is open for trading at the end of periods 0 and 1, and the asset's final payoff materializes in period 2. At the beginning of period 1, a piece of informative news concerning the asset's final payoff is publicly announced. Before any trading takes place (i.e., at the beginning of period 0), a continuum of agents independently choose their own interpretation of the forthcoming news with the objective of maximizing a weighted sum of anticipatory utilities and consumption utilities. The chosen subjective news interpretations are held fixed for the rest of the game. After choosing their beliefs, they then trade at the end of period 0. At the beginning of period 1, the news arrives and each agent updates her belief about the asset's payoff based on her chosen news interpretation. After the updating, there is another round of trading at the end of period 1. Finally, the asset pays off in period 2. Apparently, an agent's choice of subjective news interpretation affects both her anticipatory utility and her trading behavior in periods 0 and 1.

For analytical tractability, we assume the asset's payoff is normally distributed, and the public signal is the true payoff plus an independently and normally distributed white noise. Therefore, the public signal is fully characterized by its mean and precision. To simplify the exposition, we first consider two polar cases regarding the choice of news interpretation separately. In the first case, agents agree over the public signal precision, but are free to choose their beliefs over the signal mean. We find that the equilibrium prices always fully reflect the information content of the public signal. Although prices are fully rational, an endogenous disagreement can still arise if the agents put high enough weights on anticipatory utilities, and the public news is informative enough. In this case, one group of agents overestimates the signal mean, while the other group underestimates it (by the same magnitude). The two groups trade against each other in both period 0 and period 1.

The reason why we have an equilibrium with rational prices is as follows. Facing rational prices, if an agent overestimates the signal mean, she would believe that the expected price of the risky asset would go up in period 1 due to a news shock. The optimal strategy, given this belief, is therefore to buy some assets in period 0 and sell them in period 1. Overestimation of the signal mean contributes positively to the anticipatory utilities in periods 0 and 1 due to a perceived gain. However, it comes at the cost of making bad investment decisions, as the agent takes excessive risk by trading too much. The optimal extent of overestimation therefore balances the benefit and cost above. By symmetry, the optimal extent of underestimation is equal to that of overestimation, and the trading plan of an agent underestimating the signal mean is exactly the opposite of an agent who overestimates. Consequently, the market clears with equal masses of the two groups of agents.

Things get more interesting in the second case, in which agents agree over the signal mean but are free to choose their beliefs over its precision. We find that if agents put high enough weights on anticipatory utilities, an equilibrium disagreement arises and the market price does not fully reflect the signal content. In this case, one group of agents overestimates the signal precision, whereas the other group underestimates it, and the two groups trade against each other upon the arrival of the public news.[4] The former group overreacts to the news, while the latter group underreacts. The reaction of the market-clearing price lies between those of the two groups. The main result of this analysis is that if the objective signal precision is sufficiently high, then the equilibrium price underreacts to the signal; if the objective signal precision is sufficiently low, then the price overreacts. In other words, our model predicts that price exhibits momentum following an informative news event, and exhibits a reversal following an uninformative news event. This result is interesting because it provides a unified

[4] The optimal extent of overestimation and underestimation is determined by a similar trade-off above: the benefit of higher anticipatory utilities versus the cost of making bad investment decisions.