Learning with Noiseless Information and Payoff-Relevant Signals: Theory and and Application to Clearance Sales

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In models of active learning or experimentation, agents modify their actions to affect the distribution of a signal that provides information about future payoffs. A standard result in the experimentation literature is that agents experiment, if at all, to *increase* information. This finding is a direct consequence of Blackwell's theorem: one experiment is more informative than another if and only if all expected utility maximizers prefer to observe the first. Blackwell's theorem presupposes, however, that the observed signal only conveys information and does not directly affect future payoffs. Often, however, signals are directly payoff relevant, a phenomenon that we call *signal dependence.* For example, if a firm is uncertain about its demand and uses today's sales as a signal of tomorrow's demand, then that signal may also *directly* affect tomorrow's profit-if the good is durable or if consumers form consumption habits. Datta, Mirman and Schlee (1998) and Bertocchi and Spagat (1998) show that if the signal is payoff relevant, experimentation may indeed reduce information. Here we show that, despite the inapplicability of Blackwell's Theorem, agents always experiment to increase information if the information structure is *noiseless:* given the true value of the unknown parameter the signal realization is deterministic. We then apply our framework to analyze Lazear's (1986) model of retail clearance sales, a model with both signal dependence and noiseless information.

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