MULTIPLE-SCHEDULE PERFORMANCE IN CLOSED ECONOMIES

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ABSTRACT

Experimental preparations may be divided into two categories, called open and closed economies. In an open economy, the extent to which the subject is deprived of the scheduled reinforcer, most commonly food, is controlled by the experimenter. This is usually done by manipulating the amount of free food given to the subject after each experimental session. Consumption of the reinforcer is thus independent of behaviour during the session. By contrast, in a closed economy, no alternative source of the reinforcer is available outside the session. Consumption of the reinforcer is thus completely determined by the subject's interaction with the experimental environment. This may be done by having the subject live permanently within the experiment and receive all its food as reinforcers for responding on continuously available schedules. Most research in the experimental analysis of behaviour has been carried out within open economies, but it can be argued that the natural environment, as a whole, is better represented by a closed economy. Several experimental findings obtained within open economies have been shown not to be replicable within closed economies.

In the present series of experiments, three pigeons received their total daily intake of food as reinforcers for responding on continuously available multiple variable-interval schedules. The relation between the allocation of responding between components of a multiple schedule and the distribution of reinforcers can be conveniently described by the generalised matching law, which states that the ratio of component response rates is a power function of the ratio of component reinforcer rates. In an open economy, the power, called sensitivity, is typically less than

1.0. This is called undermatching. Experiment 1 of the present series found sensitivity values substantially greater than 1.0. This is called overmatching.

One procedural variable known to control sensitivity in open economies is level of deprivation. Experiments 2 to 5 examined the effect of deprivation in a closed economy. In Experiments 2 and 3, increasing deprivation by means of decreasing session duration produced decreases in sensitivity. In Experiment 4, increasing deprivation by decreasing overall reinforcer rate in continuous sessions had no effect on sensitivity. In Experiment 5, deprivation was held constant by changing session duration and overall reinforcer rate in opposite directions. Sensitivity increased with increasing session duration and decreasing overall reinforcer rate.

Taken together, these results suggest that multiple-schedule sensitivity increases with decreasing deprivation, with decreasing overall reinforcer rate, and as the economy for reinforcers other than those arranged by the experimenter (extraneous reinforcers) becomes more closed. A quantitative model of multiple-schedule performance, elaborated from that of McLean and White (1983), was developed to account for these effects. In this model, response allocation is governed by the concurrent choice between scheduled- and extraneous-reinforcer rates within each component. The total rate of extraneous reinforcement is affected by both deprivation and economy, and the distribution of extraneous reinforcers between components depends inversely on the distribution of scheduled reinforcers. Unlike other published models, this model predicts overmatching in the present experiments. Quantitatively, the model accounts for both the present closed-economy data and published data from open-economy multiple schedules as well as does the generalised matching law, and better than does its most influential competitor, Herrnstein's (1970) equation.

Finally, it is proposed that, while the economy for scheduled reinforcers is important to understanding total response output on multiple schedules, the economy for extraneous reinforcers has much more influence on the allocation of that responding between components.

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PREFATORY NOTE

The results of Experiment 1 of the present thesis, together with parts of those obtained in Experiments 3 and 4, were also reported by Elliffe and Davison (1985), in the Journal of the Experimental Analysis of Behavior.

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