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## **The problem of backward dynamics in economics and inverse limits**

We provide a framework for calculating expected utility in economic models with chaotic equilibria and consequently a framework for ranking chaos. Suppose that a dynamic economic model's equilibria correspond to orbits generated by a chaotic dynamical system  $f$  from a compact metric space  $X$  to itself, where  $f$  is continuous. The map could represent the forward dynamics or the backward dynamics. If  $f$  represents the forward/ backward dynamics, the set of equilibria forms a direct/inverse limit space. We use an  $f$ -invariant measure on  $X$  to induce a measure on the direct/inverse limit space and show that this induced measure is invariant relative to the shift operator. Moreover, we show that if the  $f$ -invariant measure is a natural invariant measure, then the induced measure on the direct/inverse limit space will also be a natural invariant measure. We utilize this framework in the cash-in-advance model of money where  $f$  is the backward map to calculate expected utility when equilibria are chaotic.

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\*This is a joint work with Brian Raines, David R. Stockman, James A. Yorke