# STANFORD UNIVERSITY
# DEPARTMENT OF STATISTICS
## FOUNDATIONS OF STATISTICS SEMINAR

3:15 p.m., Wednesday, November 21, 2007
Building 380, Room 380-C

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### Chaotic Probability: The Set of Measures Model

We are motivated by the success of a sets of measures approach to representing the state of belief of an individual, as expressed through upper and lower previsions/expectations, to ask whether such a model can also describe some objective frequentist data sources.

I report on joint work with Pablo I. Fierens and Leandro C. Rego on a probability model for sequences in which the conditional probability $\nu_i$ of the $i$-th random variable $X_i$, conditional upon all preceding random variables $X^{i-1} = x^{i-1}$, is chosen erratically from a set of measures $\mathcal{M} = \{\nu\}$, all being defined on the same finite sample space $\mathcal{X}$. Our interest is in the case where the function $F(x^{i-1})$ selecting the marginal $\nu_i$ is not effectively computable and not asymptotically estimable from the observed data $x^i$. We can think of this setup as arising from a game between two agents, although we are more interested in the possibility that the physical world provides examples of such erratic or highly irregular processes.

Our goal is to estimate $\mathcal{M}$ by $\hat{\mathcal{M}}$ based upon $x^n$, for large enough $n$. We show the existence of a family $\Psi = \{\varphi\}$ of causal place selection rules, chosen independently of $\mathcal{M}$, that produce subsequences of the given data whose time averages provide the desired information about the elements of $\mathcal{M}$. We have not been able to show the converse that $\mathcal{M}$ is all that can be estimated.