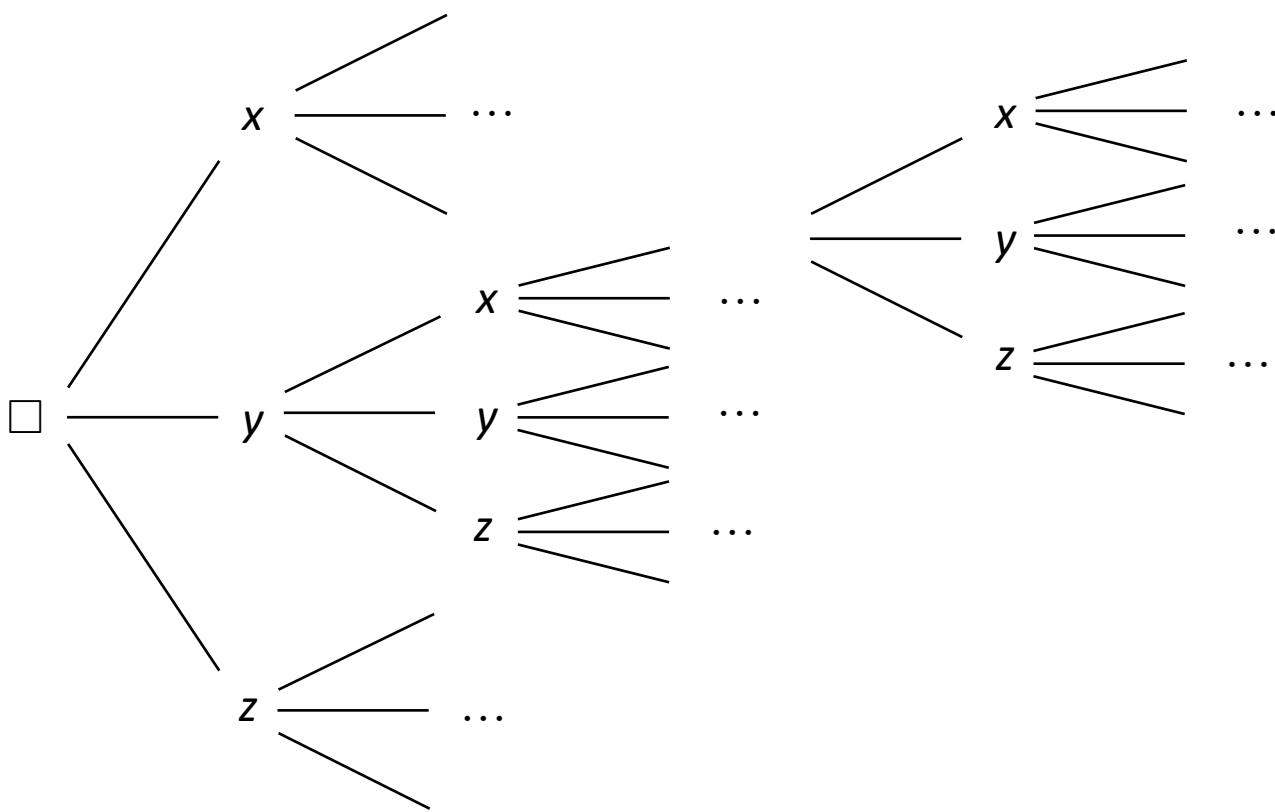
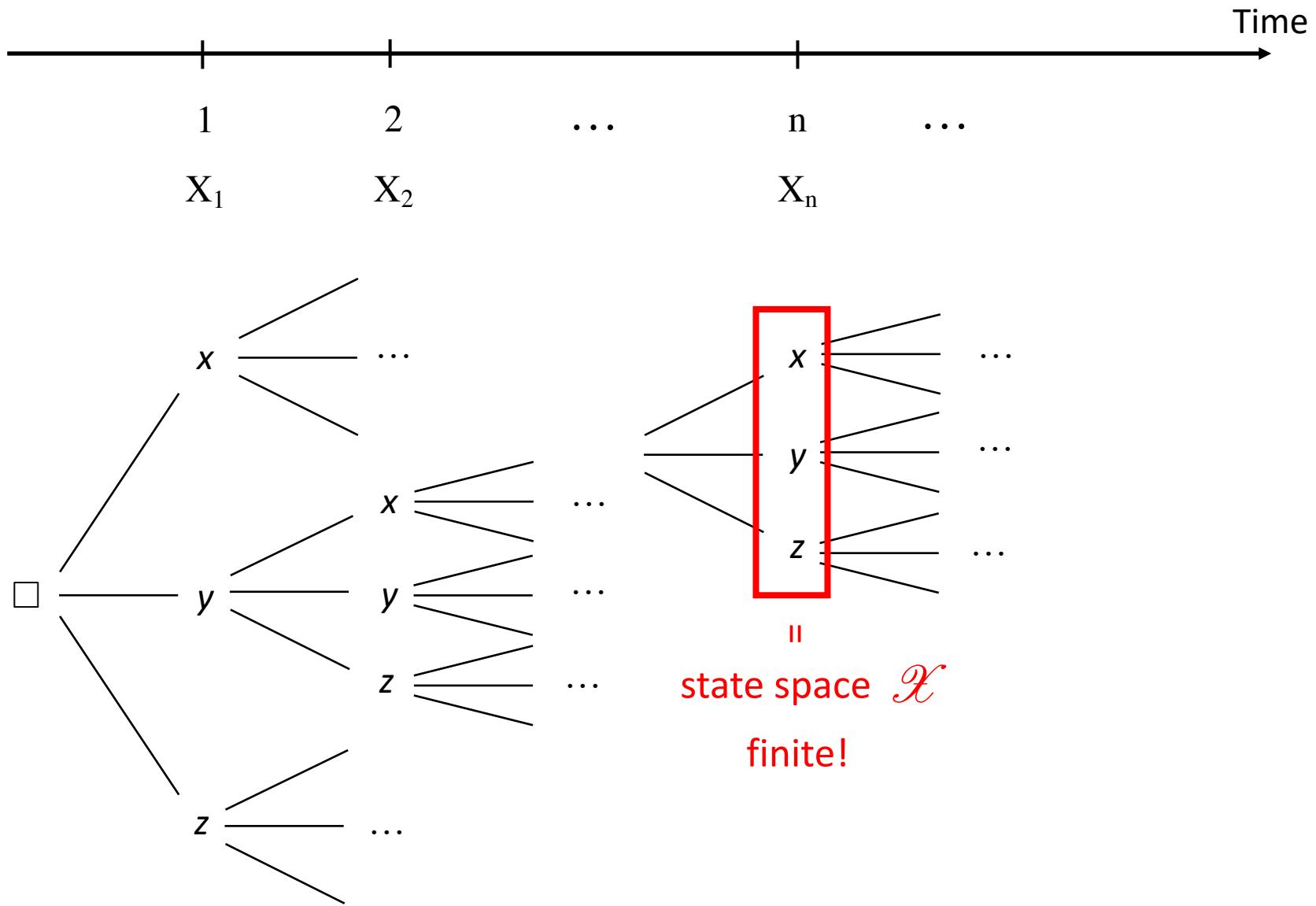


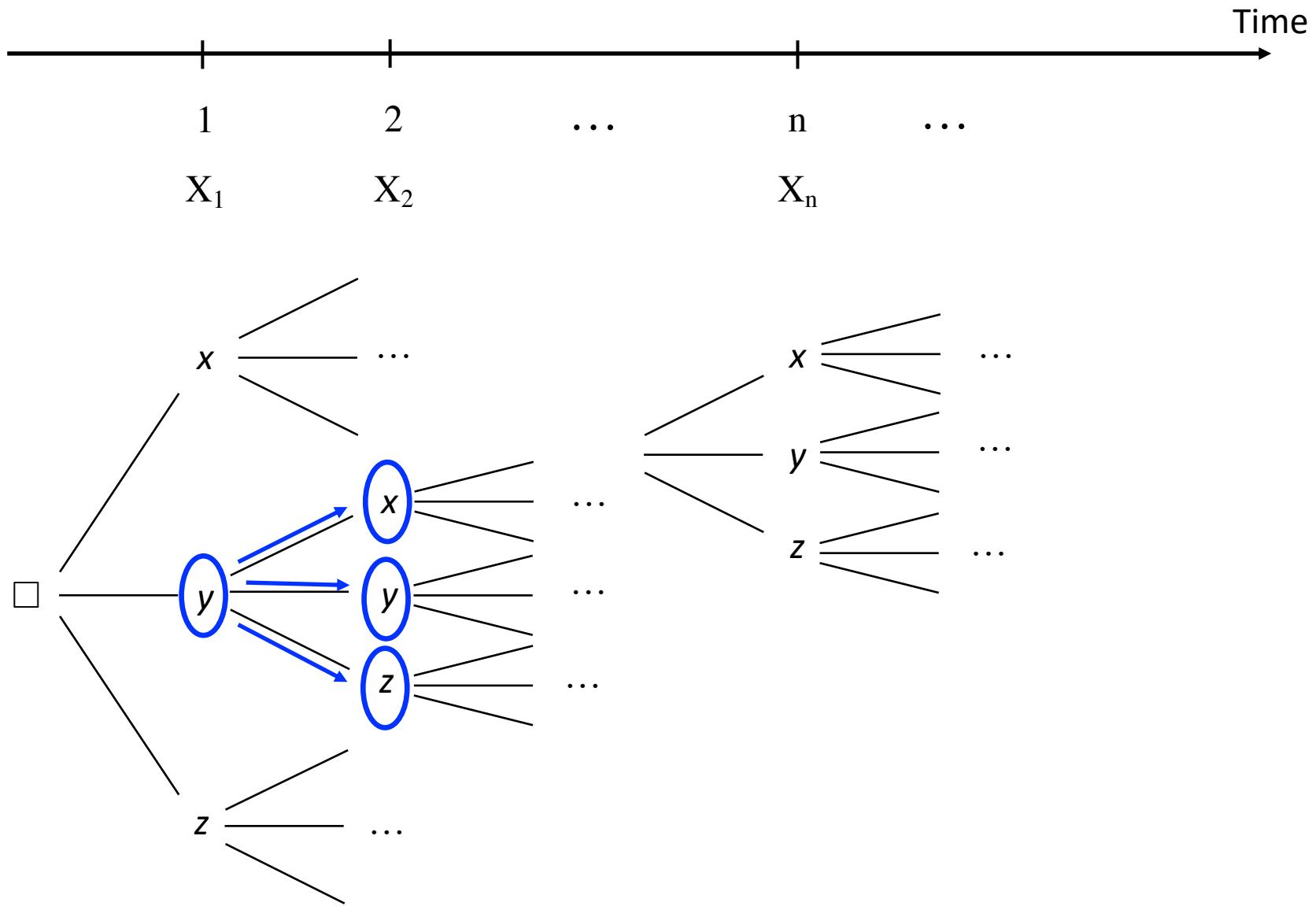
# In Search of a Global Belief Model for Discrete-time Uncertain Models

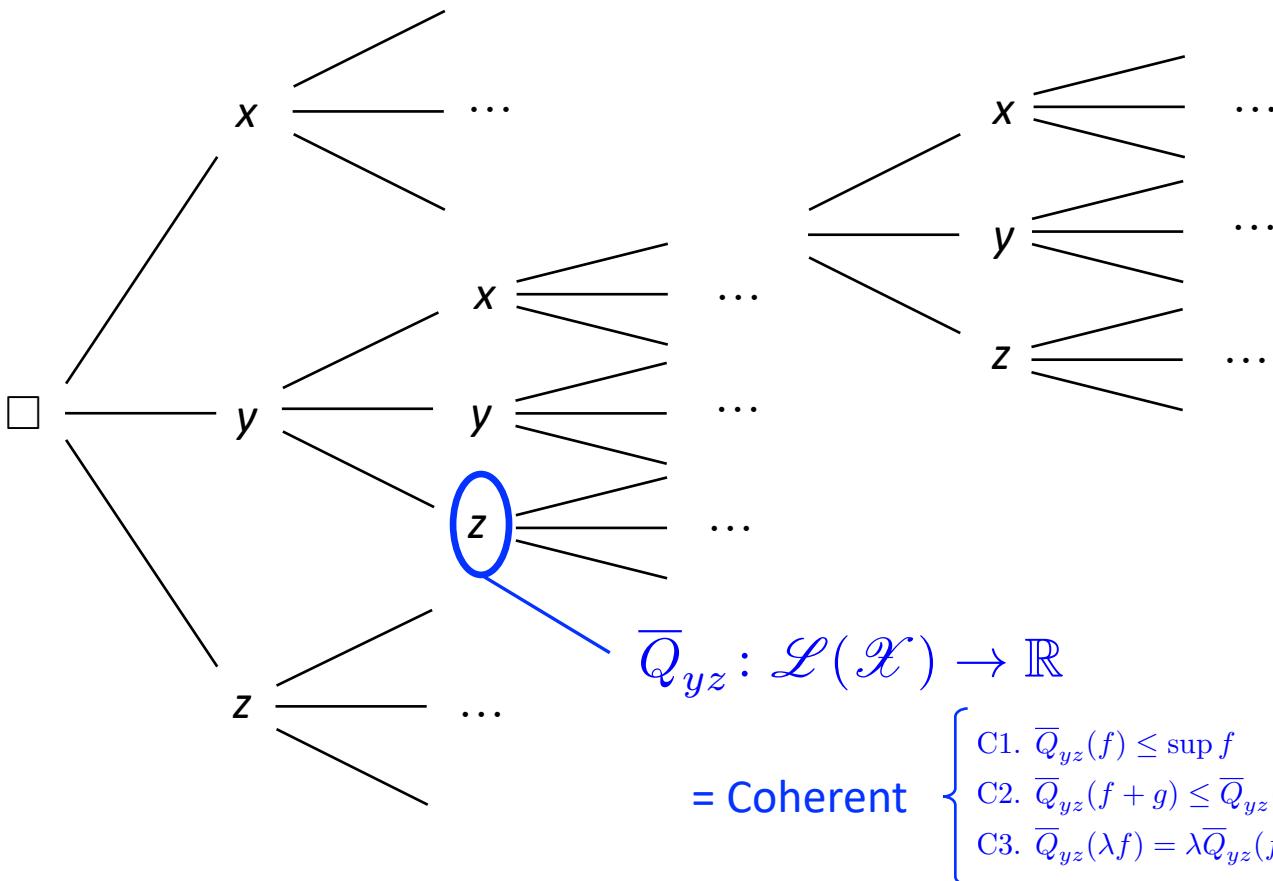
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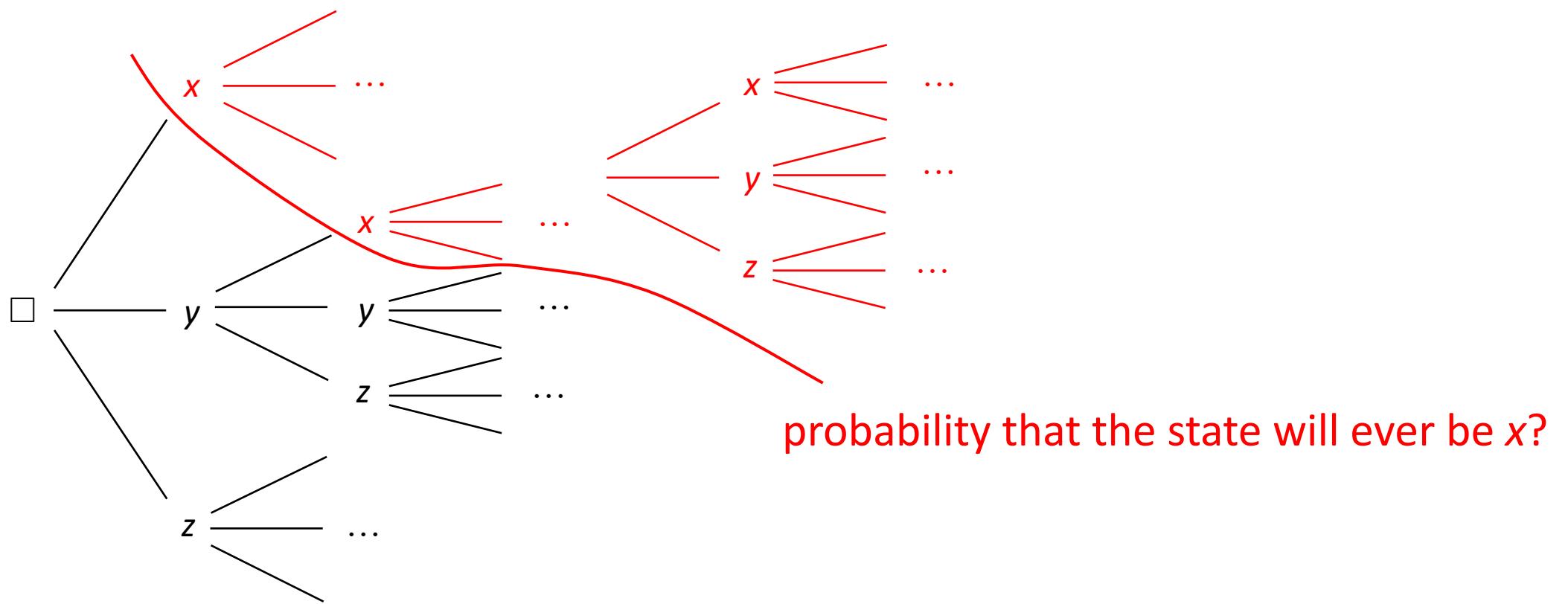
Natan T'Joens, Jasper De Bock, Gert de Cooman

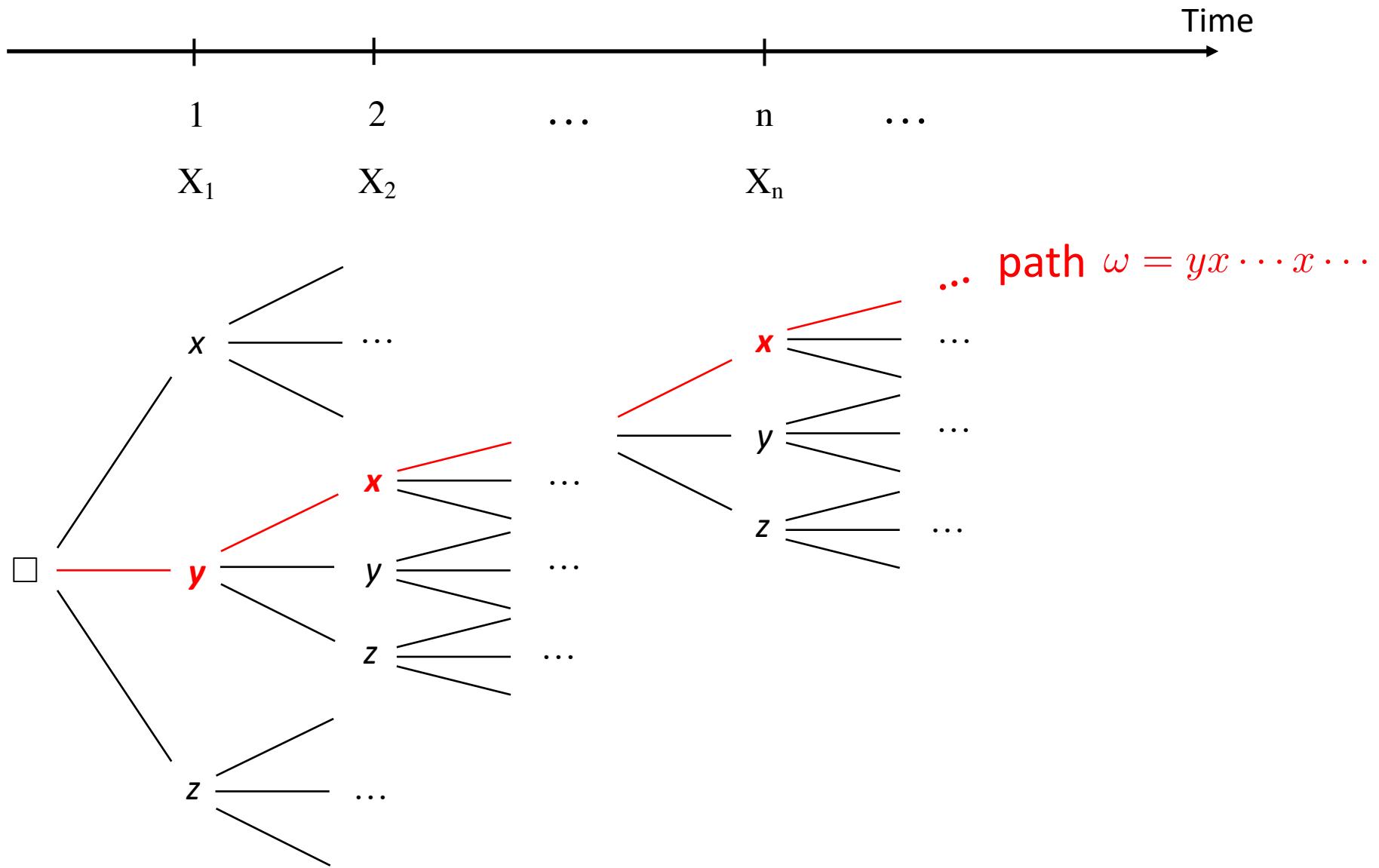


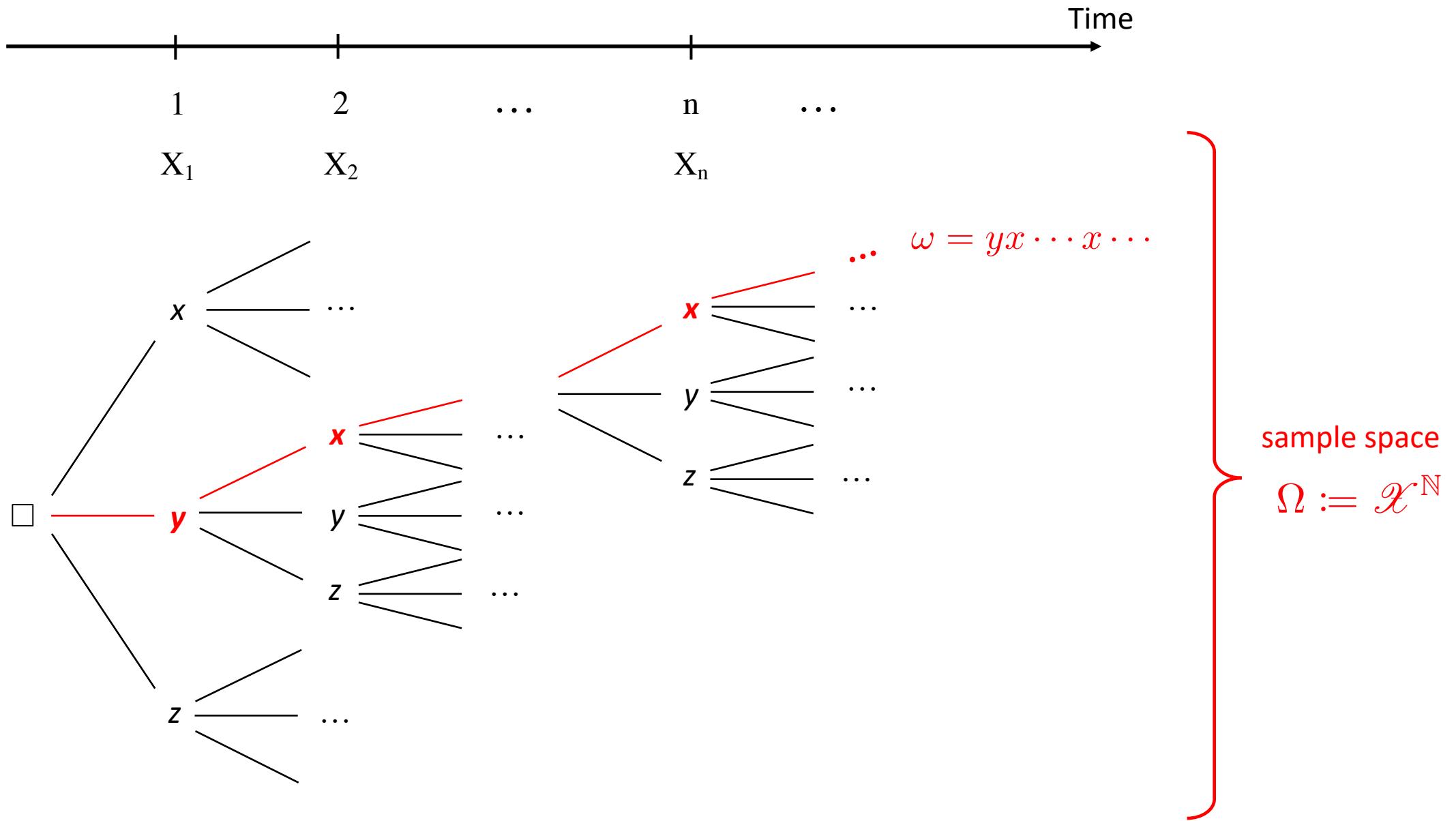


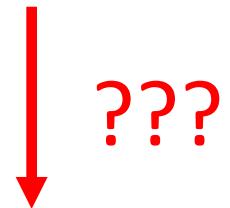
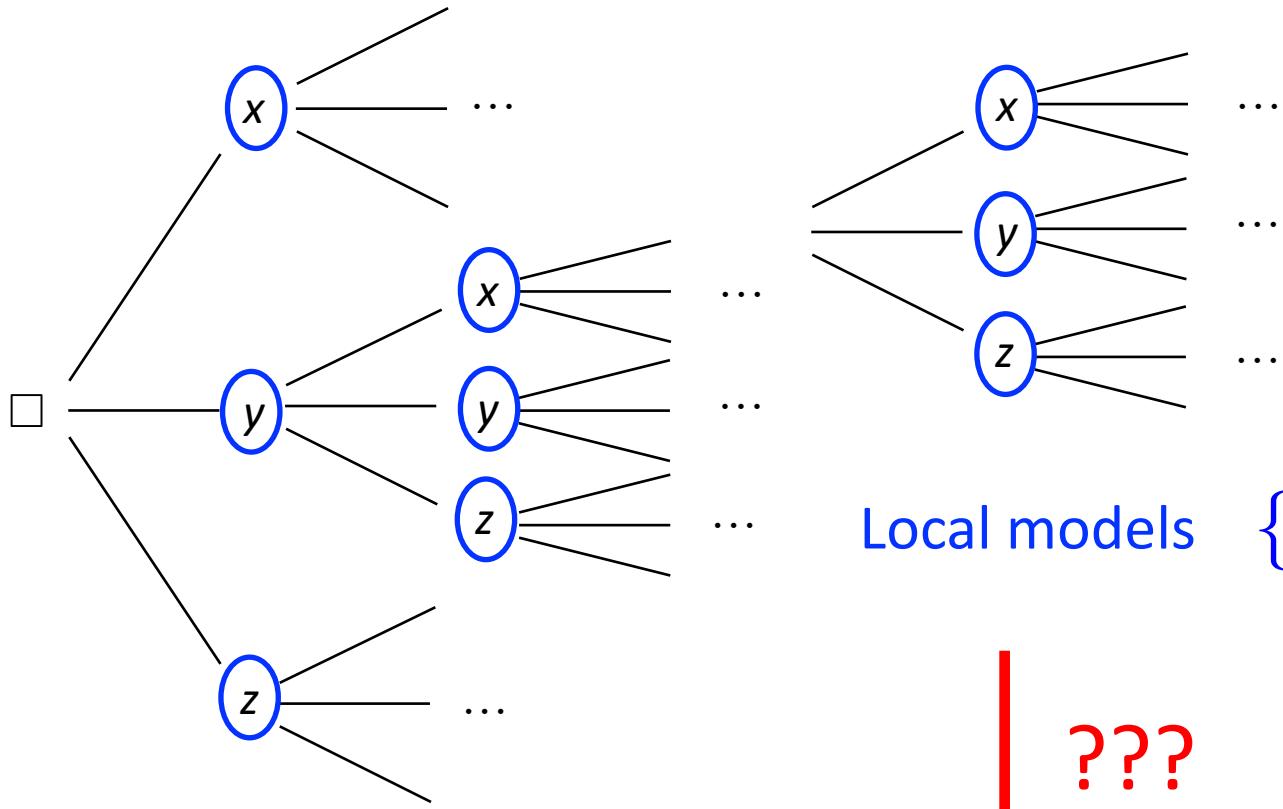












global model  $\bar{E}$

*What properties should  $\overline{E}$  satisfy?*

• P1.  $\bar{E}(f(X_{n+1})|x_{1:n}) = \bar{Q}_{x_{1:n}}(f)$  [Compatibility.]

P2.  $\bar{E}(f|s) = \bar{E}(f \mathbb{I}_s | s)$  [Conditioning.]

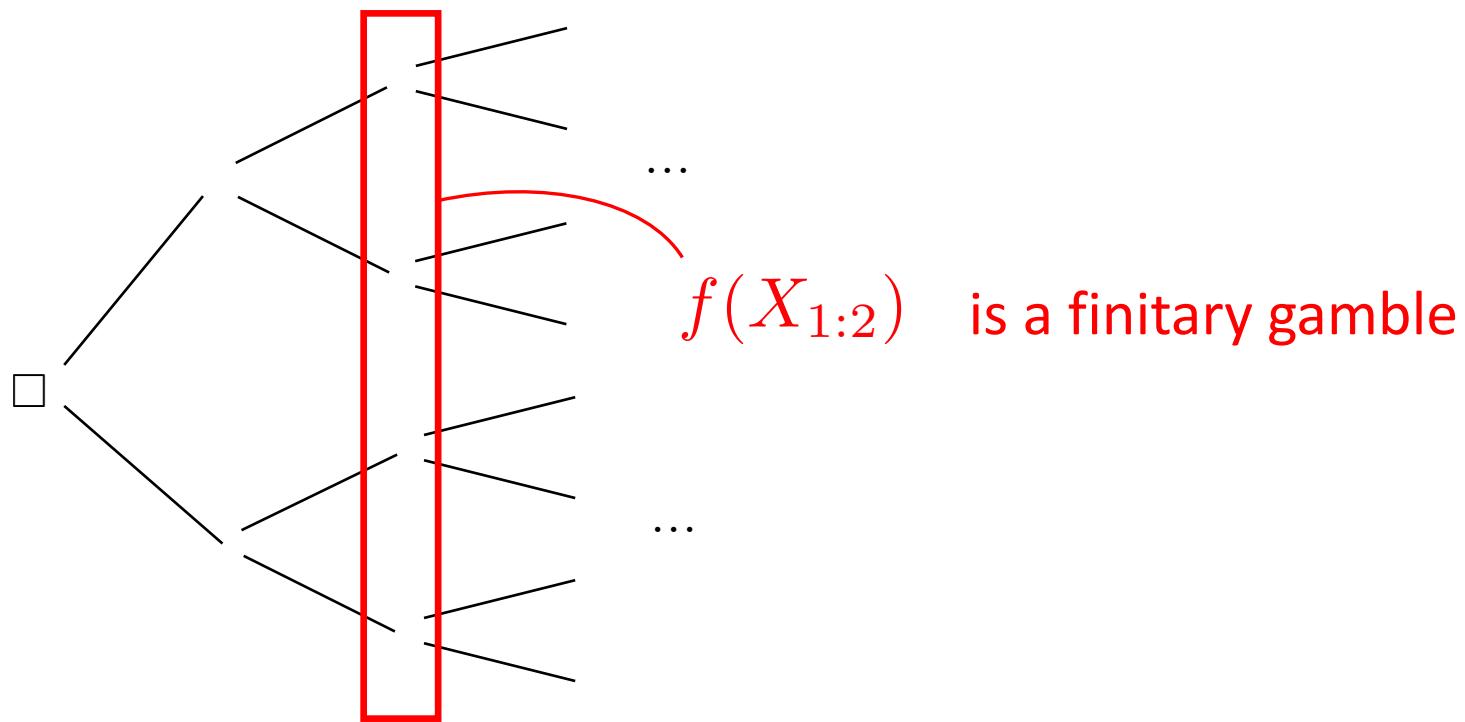
P3.  $\bar{E}(f|X_{1:k}) \leq \bar{E}(\bar{E}(f|X_{1:k+1})|X_{1:k})$  [Iterated Expectations.]

P4.  $f \leq g \Rightarrow \bar{E}(f|s) \leq \bar{E}(g|s)$  [Monotonicity.]

P5.  $\lim_{n \rightarrow +\infty} f_n = f \Rightarrow \limsup_{n \rightarrow +\infty} \bar{E}(f_n|s) \geq \bar{E}(f|s)$  [Continuity].

P5. For any sequence  $\{f_n\}_{n \in \mathbb{N}_0}$  of **finitary gambles** that is uniformly bounded below and any  $s \in \mathcal{X}^*$ :

•  $\lim_{n \rightarrow +\infty} f_n = f \Rightarrow \limsup_{n \rightarrow +\infty} \bar{E}(f_n|s) \geq \bar{E}(f|s).$



• P1.  $\bar{E}(f(X_{n+1})|x_{1:n}) = \bar{Q}_{x_{1:n}}(f)$  [Compatibility.]

P2.  $\bar{E}(f|s) = \bar{E}(f \mathbb{I}_s | s)$  [Conditioning.]

P3.  $\bar{E}(f|X_{1:k}) \leq \bar{E}(\bar{E}(f|X_{1:k+1})|X_{1:k})$  [Iterated Expectations.]

P4.  $f \leq g \Rightarrow \bar{E}(f|s) \leq \bar{E}(g|s)$  [Monotonicity.]

P5.  $\lim_{n \rightarrow +\infty} f_n = f \Rightarrow \limsup_{n \rightarrow +\infty} \bar{E}(f_n|s) \geq \bar{E}(f|s)$  [Continuity].

# Cool thing #1

P1-P5 is consistent + There is a unique largest model!



## Cool thing #2

Coincides with a version of Shafer and Vovk's game-theoretic upper expectation!

strong properties + alternative definition

A photograph of a man with light brown hair, wearing a grey suit jacket, white shirt, and dark tie. He is seated at a table, looking slightly to his left with a thoughtful expression. In his right hand, he holds a clear wine glass filled with red wine. The background shows a dark, patterned wall and a bar counter with various items on it.

Interested? Come see  
us at our poster!