Crisis Learning

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Howdy hey, gang. The goal of this document is to describe the rough shape of an economy with a simple state-based structure.

1 Model styles

In all models, it is assumed that the initial state distribution is categorically distributed with probabilities $\Pi = [\pi_1, \pi_2]$. We'll keep it simple for now and use only two possible states, but in general everything should function with an arbitrary number of states.

1.1 Simple Gaussian

Figure 1.1 demonstrates an extremely simple economy where a latent state variable S_t evolves over time. In each possible state $S_t \in \mathbb{S}$, the location and scale parameters ($\mu(S_t)$ and $\Sigma(S_t)$) of the Gaussian return vector R_t may vary:

1. The degenerate constant mean/variance condition $\Sigma(S_t) = \Sigma$ and a changing mean return vector, $\mu(S_t) = \mu$.
2. A constant variance term $\Sigma(S_t) = \Sigma(S_t') = \Sigma$ and a changing mean return vector, $\mu(S_t) \neq \mu(S_t')$.
3. A varying variance term $\Sigma(S_t) \neq \Sigma(S_t')$ and a constant mean return vector, $\mu(S_t) = \mu$.
4. The "everything changes" case where both $\mu(S_t)$ and $\Sigma(S_t)$ vary.

Investors do not observe all elements of R_t simultaneously. Rather, they observe them sequentially –

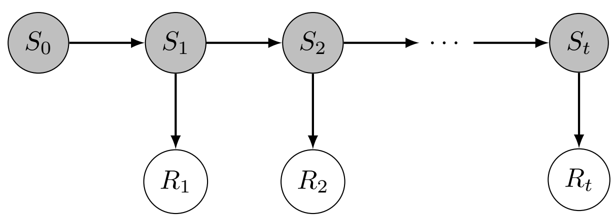

Figure 1: Depiction of the underlying economic process. S_t is a Markov state process drawn from $S_t \sim P(S_t, S_{t-1})$, while R_t is a multivariate Gaussian of dimension K (one for each firm). R_t is Gaussian only conditional on S_t, i.e. $R_t \mid S_t \sim N(\mu(S_t), \Sigma(S_t))$.