stationary process

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Defines	strictly stationary process
Defines	covariance stationary process
Defines	evolutionary process

Let $\{X(t) \mid t \in T\}$ be a stochastic process where $T \subseteq \mathbb{R}$ and has the property that $s + t \in T$ whenever $s, t \in T$. Then $\{X(t)\}$ is said to be a *strictly stationary process of order* n if for a given positive integer $n < \infty$, any $t_1, \ldots, t_n$ and $s \in T$, the random vectors

> $(X(t_1), \ldots, X(t_n))$ and $(X(t_1 + s), \ldots, X(t_n + s))$ have identical joint distributions.

$\{X(t)\}$ is said to be a *strictly stationary process* if it is a strictly stationary process of order n for all positive integers n. Alternatively, $\{X(t) \mid t \in T\}$ is strictly stationary if $\{X(t)\}$ and $\{X(t + s)\}$ are identically distributed stochastic processes for all $s \in T$.

A weaker form of the above is the concept of a *covariance stationary process*, or simply, a *stationary process* $\{X(t)\}$. Formally, a stochastic process $\{X(t) \mid t \in T\}$ is stationary if, for any positive integer $n < \infty$, any $t_1, \ldots, t_n$ and $s \in T$, the joint distributions of the random vectors

> $(X(t_1), \ldots, X(t_n))$ and $(X(t_1 + s), \ldots, X(t_n + s))$ have identical means (mean vectors) and identical covariance matrices.

So a strictly stationary process is a stationary process. A non-stationary process is sometimes called an *evolutionary process*.