

Stationarity

1. Notation

- X<sub>t</sub> : Reponse
- t: time(day) is the explanatory variable

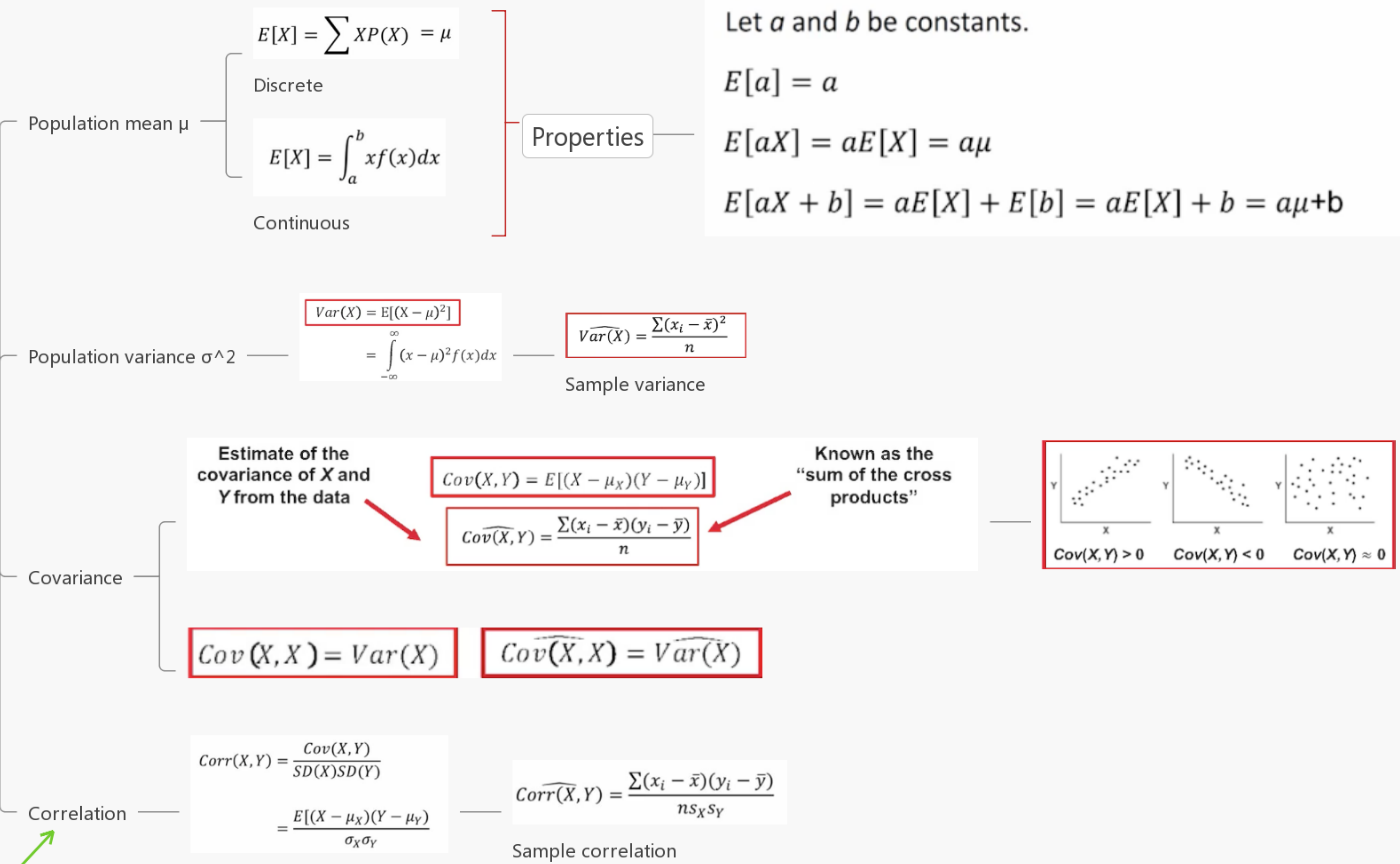
2. Realization vs Ensemble

- Realization — A realization is one of the infinite possible time series that we could have observed. The one we actually observed.
- Ensemble — Totality of all possible realizations(population). Often impractical to view.

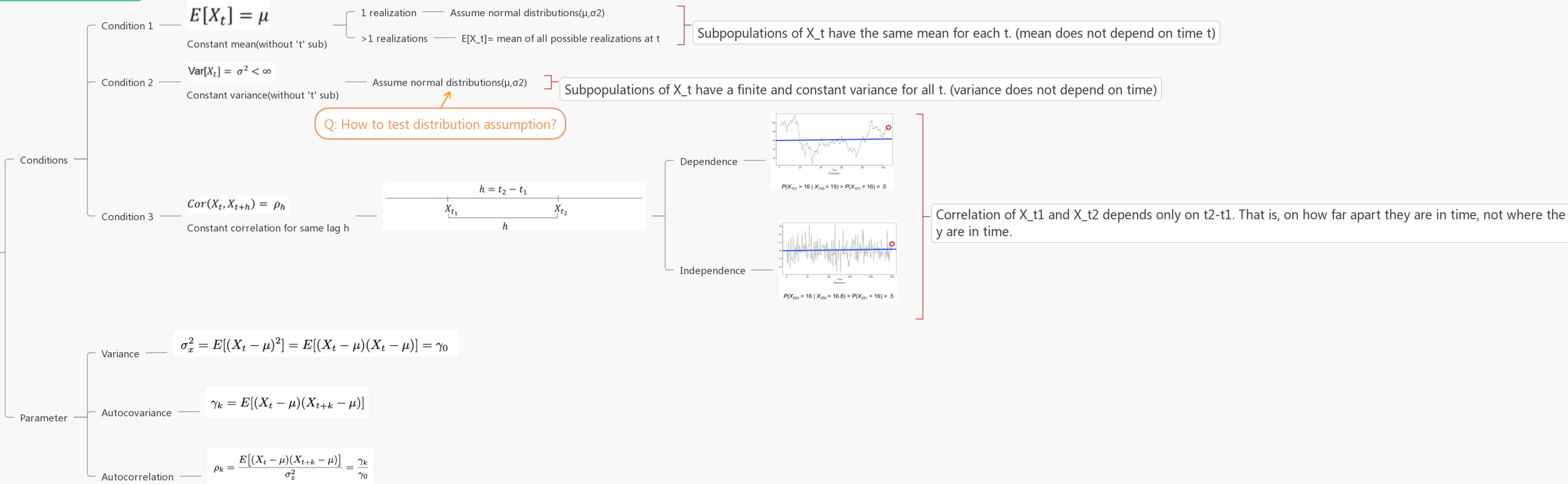
3. The mean and variance of X<sub>t</sub>

- Mean:  $\mu_t$  is the mean of all possible realizations of X<sub>t</sub> for a fixed t.
  - Variance:  $\sigma_t^2$  is the variance of all possible realizations of X<sub>t</sub> for a fixed t
- Estimate  $\mu_t$  using  $\hat{\mu}_t$  in 95% CI(assuming normality)

4. Expected value



5. Stationarity



6. Estimation parameters of stationary series

For stationary time series, if the acf approach 0 as the lag increases, then a single realization can be used to estimate. Only have one realization of finite length n. Unbiased estimate are:

