

$$E\left[\sum_{i=1}^{k_n} Y_i\right] = E\left[\sum_{i=1}^{k_n} X_i I[X_i \leq i]\right]$$

$$= E k_n E Y_i = \sum_{i=1}^{k_n} E Y_i$$

$\int_{-\infty}^{\infty} x f(x) dx < \infty \Rightarrow \int_{-\infty}^{\infty} x^2 f(x) dx < \infty$   
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$$E Y_n = E X_n I[X_n \leq n] = E[X$$

$$C^T \hat{\beta} = C^T (X^T X)^{-1} X^T Y$$

$$Y = X\beta + \varepsilon$$

$$Y = X\beta + \varepsilon$$

$$X^T Y = X^T X \beta + X^T \varepsilon$$

$$(X^T X)^{-1} X^T Y = \beta + (X^T X)^{-1} X^T \varepsilon$$

$$Y_i = X_i^T \beta + \varepsilon_i$$

$$X_i Y_i = X_i X_i^T \beta + X_i \varepsilon_i$$

$$(X_i X_i^T)^{-1} X_i Y_i = \beta + (X_i X_i^T)^{-1} X_i \varepsilon_i$$