

Proposition 10.24 If

then $f(y)$ exists and is given by

$$f(\textcolor{red}{y}) = \int f(\textcolor{red}{y}|x) dF(x).$$

Remark Proposition 10.24 says that the pdf of Y exists regardless of the distribution of X . The next proposition is its vector generalization.

Proposition 10.25 Let \mathbf{X} and \mathbf{Y} be jointly distributed random vectors where \mathbf{Y} is continuous and is related to \mathbf{X} through a conditional pdf $f(\textcolor{red}{y}|\mathbf{x})$ defined for all \mathbf{x} . Then $f(\textcolor{red}{y})$ exists and is given by

$$f(\mathbf{y}) = \int f(\mathbf{y}|\mathbf{x}) dF(\mathbf{x}).$$