

## Expected value

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$$E\{X\} = \int_{-\infty}^{\infty} x f(x) dx \quad \text{continuous r.v.}$$

$$E\{X\} = \sum_n x_n P\{X = x_n\} = \sum_n x_n p_n \quad \text{discrete r.v.}$$

$$E\{Y = g(X)\} = \int_{-\infty}^{\infty} y f_Y(y) dy = \int_{-\infty}^{\infty} g(x) f_X(x) dx$$

for function  $g(X)$

$$E\{g(X)|Y = y\} = \int_{-\infty}^{\infty} g(x) f_x(x|Y = y) dx$$

$$= \frac{\int_{-\infty}^{\infty} g(x) f_{xy}(x, y) dx}{\int_{-\infty}^{\infty} f_{xy}(x, y) dy} \quad \text{conditional expected value}$$

$$E\{g(X, Y|M)\} = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} g(x, y) f(x, y|M) dx dy$$

**Symbol list:**