Theorem 0.0.1 (Fubini–Tonelli theorem). *Let X be a stochastic process such that $\int_0^T \mathbb{E}(|X_s|)\,ds < \infty$, then*

$$\mathbb{E}\left[\int_0^T X_s\,ds\right] = \int_0^T \mathbb{E}[X_s]\,ds.$$