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simple predictable process

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Defines	simple predictable
Defines	elementary predictable

Simple predictable processes are a particularly simple class of stochastic processes, for which the Ito integral can be defined directly. They are often used as the starting point for defining stochastic integrals of more general predictable integrands.

Suppose we are given a <http://planetmath.org/FiltrationOfSigmaAlgebrasfiltration> (\mathcal{F}_t) on the measurable space (Ω, \mathcal{F}) with time index t ranging over the non-negative real numbers. A simple predictable process ξ is a left-continuous and adapted process which can be written as

$$\xi_t = 1_{\{t=0\}}A_0 + \sum_{k=1}^n 1_{\{S_k < t \leq T_k\}}A_k$$

for some $n \geq 0$, stopping times $S_k < T_k$, \mathcal{F}_0 -measurable and bounded random variable A_0 and \mathcal{F}_{S_k} -measurable and bounded random variables A_k . In the case where S_k and T_k are deterministic times, then ξ is called an *elementary predictable* process.

The stochastic integral of the simple predictable process ξ with respect to a stochastic process X_t can then be written as

$$\int_0^t \xi dX = \sum_{k=1}^n 1_{\{t > S_k\}}A_k(X_{\min(t, T_k)} - X_{S_k}).$$