Stochastic Process,

Subset of “dynamic random states” model family. State is a possible outcome, States = finite possible outcomes. State and time either discrete/continuous. Stochastic process describes time-dependent states of a system.

A random (any) event, has a chance of happening; Probability, measure of that chance.

Markov Chain, if stage = time; Markov Random Field, if stage = space

Random variable as a function, X(t), receive a random event (e.g. news) return a real number. A state.

X:Omega -> E

X is a Measurable function, form

A Set of Possible outcomes, Omega, to

A Measurable space = E

Each realization xk, (i.e. Markov Chain) produce diff results. Results forms functional space of the random function.

Brownian Motion aka. Wiener Process

1. W0=0
2. The function t→Wt is continuous
3. Wt has independent normally distributed increments i.e.  Wt−Ws ~ N(0,t−s)

Geometric Brownian Motion

dSt=μStdt+σdStWt

dSt is the change in the asset price, S, at time t

μ is the percentage drift expected per annum

dt, represents time (1/252 is used for daily changes)

σ is the daily volatility expected in the asset prices,

Wt is a Wiener process