Forecasting Time Series modeled as Brownian Motion

Anastasia Kasara

April 2018

## Description

## First-order autoregressive model

The main subject of the current project is the modeling of time-series data by assuming a model of the following type:

where are deterministic parameters and represents a normally distributed variable with mean value zero, and variance, . The above model is known as **geometric brownian model** (GBM) with applications in a diverse range of domains, eg. physics, economics, biology, environmental, etc.. This model was first developed as a physical model (Einstein 1905) for the explanation of the observed irregular motion of particles (Brown ). The rationale behind this model can be found if the above model rewriten as

where, , and . In principle the above equation says that the change of the modeled quantity, , between and is due to a deterministic bias (), proportional to the the time elapsed, and by a random amount . The random increments have the following properties:

* the increments are independent each other

with , being the normal distribution: