Forecasting Random Walks

Suppose on Day 0 the value of X is 1,000 and each day the value of X changes in some particular way. How might we forecast the value of X after 1,000 days?

If the way in which the value of X changes in inherently random, like the scenarios described below, there is of course no way to determine the exact value of X after 1,000 days. Instead, we will approach the problem by attempting to estimate an interval in which the middle 50% of possible outcomes lie.

Discuss each scenario below with your team, and come up with a guess for the 25th percentile (the value under which 25% of the possible outcomes lie) and the 75th percentile (the value under with 75% of the possible outcomes lie). This will serve as our interval estimate of X.

Type of Daily Change

1) X changes by a random number selected uniformly on the interval $[-1,1]$.

2) X changes by a random number selected uniformly on the interval $[-0.5, 1.5]$.

3) X changes by a random number selected from a normal distribution with mean 0 and standard deviation 1

4) X changes by a random number selected from a normal distribution with mean 0.5 and standard deviation 1

5) X changes by a random number selected from a normal distribution whose mean is the previous day's change with standard deviation 1

6) 50% chance of X increasing by 10%, 50% chance of X decreasing by 10%

For Further Consideration

How might you attempt to model, and subsequently forecast, real-world quantities that change frequently? What are the important questions to consider?

Computing Resources

Simulating Series   https://replit.com/@phonner/Simulated-Series
Plotting Time Series   https://replit.com/@phonner/Plotting-Time-Series

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