

# 1 Description

The symmetric random walk will be described in this document (Mt). it covers the theory of "Stochastic Calculus for finance" Tome 2 chapter 3 section 1.

The construction of the random walk depends on the evolution of a random variable  $X_i$ . The previous RV can take two values at each time, like tossing a coin.  $X_i$  can take the value 1 or -1.

$$X_i = \begin{cases} 1 \\ -1 \end{cases} \quad (1)$$

The Symmetric Random Walk is constructed by summing up the different outcomes of the random variable  $X_i$  from  $k$  experiments:

$$M_k = \sum_{j=1}^k X_j \quad (2)$$

In the following lines of code,  $X_i$  is randomly defined. The variable  $k$  ensures to have a sufficient number of periods to further generate the scaled random walk. It refers to the  $k$  of equation 2.  $p$  and  $q$  are the probability measures, respectively  $p$  chance to get value 1 and  $q$  chance to get -1 from random variable  $X_i$ .

After creating the random variable  $X_i$  it suffices to add up all the different outputs we get from time 1 up to  $k$  to get a specific Symmetric Random Walk.

The following outcome presents a randomly generated 300 steps symmetric random walk.

Table 1: 300 steps Symmetric Random Walk

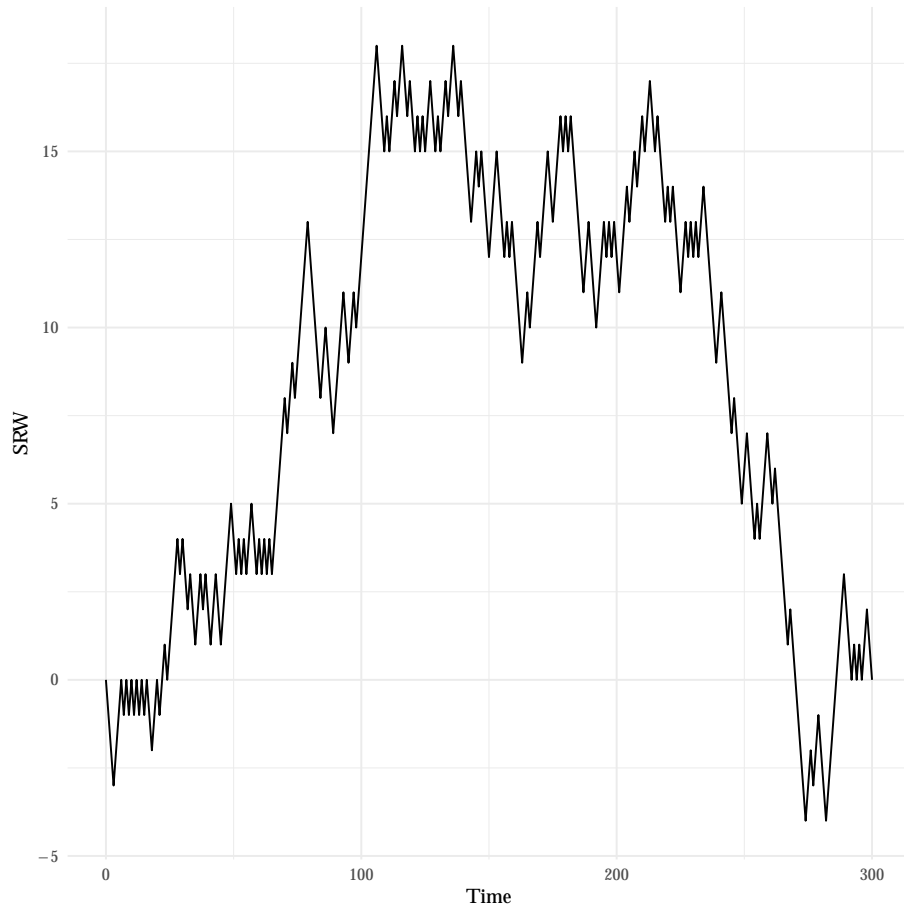


Figure 1: Symmetric Random Walk