```
## Registering fonts with R
## Warning:  package 'ggplot2' was built under R version 3.3.3
## Warning:  package 'xtable' was built under R version 3.3.3
```

1 Description

The symetric 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 depend on the evolution of a random variable X_i. The previous RV can take two value at each time, like tossing a coin. X_i can take the value 1 or -1.

$$X_i = \begin{cases} 1 \\ -1 \end{cases} \tag{1}$$

The Symetric Random Walk is constructed by summing up the different outcome of the random variable X_i from k experiments:

$$M_k = \sum_{j=1}^{k} X_j \tag{2}$$

In the following lines of code, X_i is randomly difined. The variable k ensure to have a sufficent number of periods to further generate the scaled random walk. It refers to the k of equation 2. p and q are the probability measure, 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 differente output we get from time 1 up to k to get a specific Symetric Random Walk.

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

Table 1: 300 steps Symmetric Random Walk

```
Mk <- fi <- data.frame(matrix(rep(0, (k + 1)^2), nrow = k + 1))
for(j in 1:(k + 1))
 for(i in 1:j)
   Mk[i,j] <- (j-i) + (1-i)
xtable(Mk[1:10, 1:10])
```

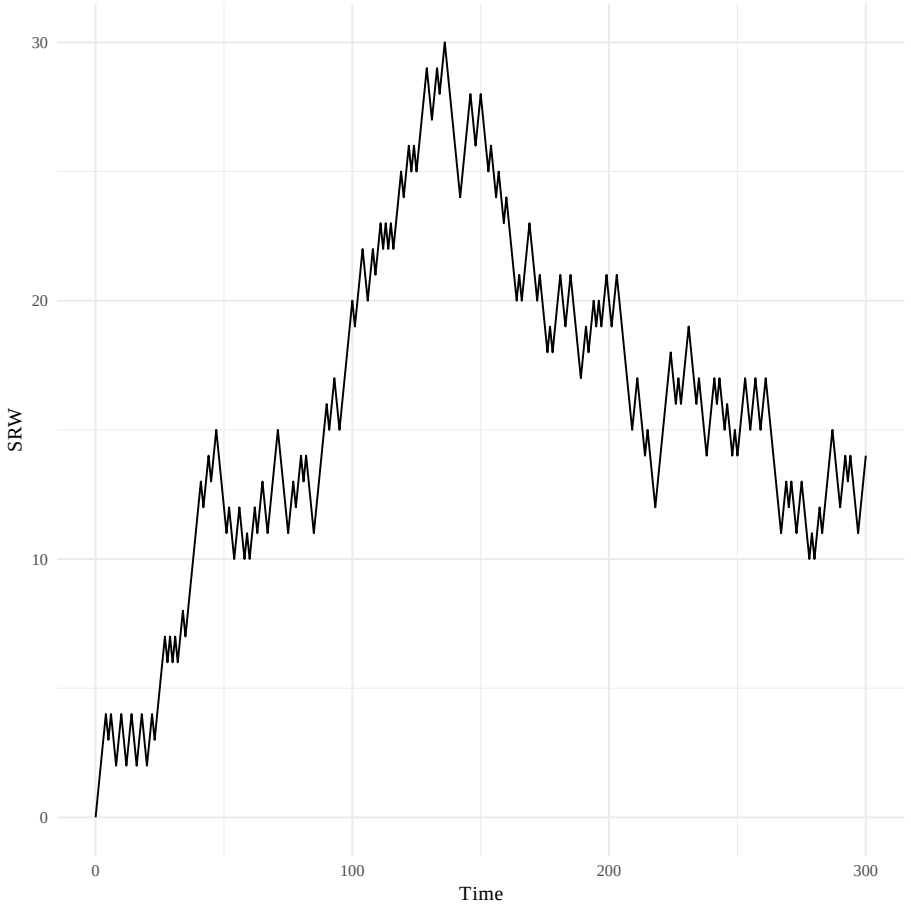

Figure 1: Symmetric Random Walk

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10
1	0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
2	0.00	-1.00	0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00
3	0.00	0.00	-2.00	-1.00	0.00	1.00	2.00	3.00	4.00	5.00
4	0.00	0.00	0.00	-3.00	-2.00	-1.00	0.00	1.00	2.00	3.00
5	0.00	0.00	0.00	0.00	-4.00	-3.00	-2.00	-1.00	0.00	1.00
6	0.00	0.00	0.00	0.00	0.00	-5.00	-4.00	-3.00	-2.00	-1.00
7	0.00	0.00	0.00	0.00	0.00	0.00	-6.00	-5.00	-4.00	-3.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-7.00	-6.00	-5.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-8.00	-7.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-9.00