M<-1000 # number of paths of W to be simulated
r<- 0.05
sigma <- 0.20
S0 <- 100
K <- 105
t<-.3 # current time
T<- 1 # maturity time
St <- S0*exp( sigma*sqrt(t)*rnorm(M) + (r - sigma^2/2)*t)
ST <- St*exp( sigma*sqrt(T-t)*rnorm(M) + (r - sigma^2/2)*(T-t))
VT<-pmax((ST-K),0)
plot(St,VT,pch=1,cex=0.2)
IMPLEMENTATION OF CONDITIONAL EXPECTATION:

AVERAGES IN SMALL VERTICAL STRIPS

```
lines(c(115,115),c(0,70)) # draw vertical line
lines(c(120,120),c(0,70)) # draw vertical line
stripindex<-(1:M)[(115 < St) & (St < 120)]
# the indices for which 115<St<120, to wit
St[stripindex]
[33]  115.9991  115.0173  115.0815  117.4133  116.5738  115.8471  118.1015  115.4685
[57]  115.7899  119.6767  117.5197  116.7798  118.1018  119.4563  117.2527  115.4466
[65]  115.3560  115.9105  115.2426  115.7958  117.3131
```
condexp<-mean(VT[stripindex]) # mean in this vertical strip
condexp
[1] 20.24116
points(117.5,condexp,cex=4,pch=4)
help(ksmooth)

ksmooth package:stats R Documentation

Kernel Regression Smoother

Description:

The Nadaraya-Watson kernel regression estimate.

Usage:

ksmooth(x, y, kernel = c("box", "normal"), bandwidth = 0.5,
        range.x = range(x), n.points = max(100, length(x)),
        x.points)

Arguments:

x: input x values

y: input y values

kernel: the kernel to be used.

bandwidth: the bandwidth. The kernels are scaled so that their
          quartiles (viewed as probability densities) are at +/-

etc
fitval <- ksmooth(St, VT, kernel = "normal", bandwidth = 3)$y
# ksmooth(St, VT, kernel = "normal", bandwidth = 5)$x same as sort(St)
lines(sort(St), fitval)

Picture suggest need larger sample size
Or maybe a different smoother?

lines(lowess(St, VT, f=.20))