Time Series Concepts

Econ 424/CFRM 462
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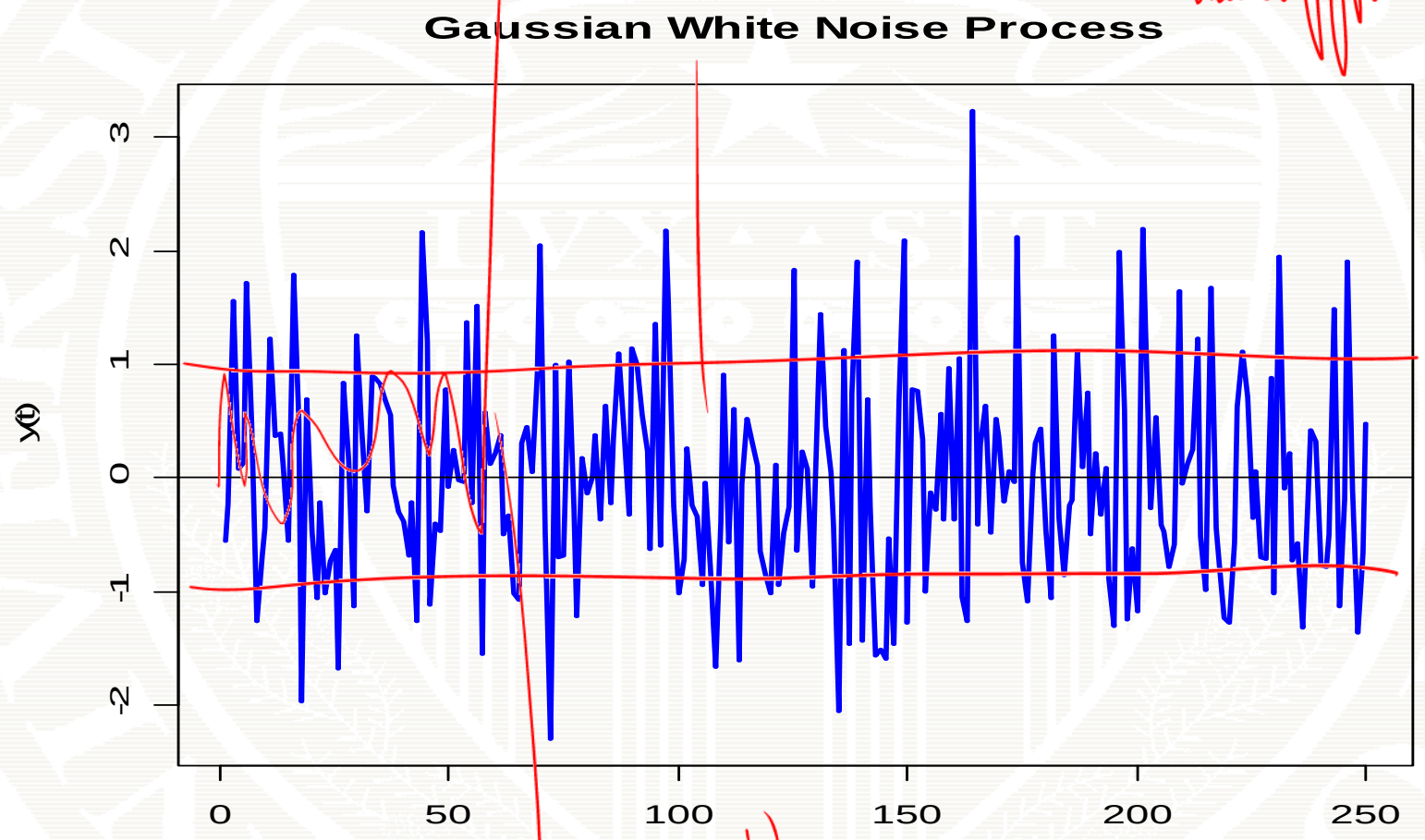
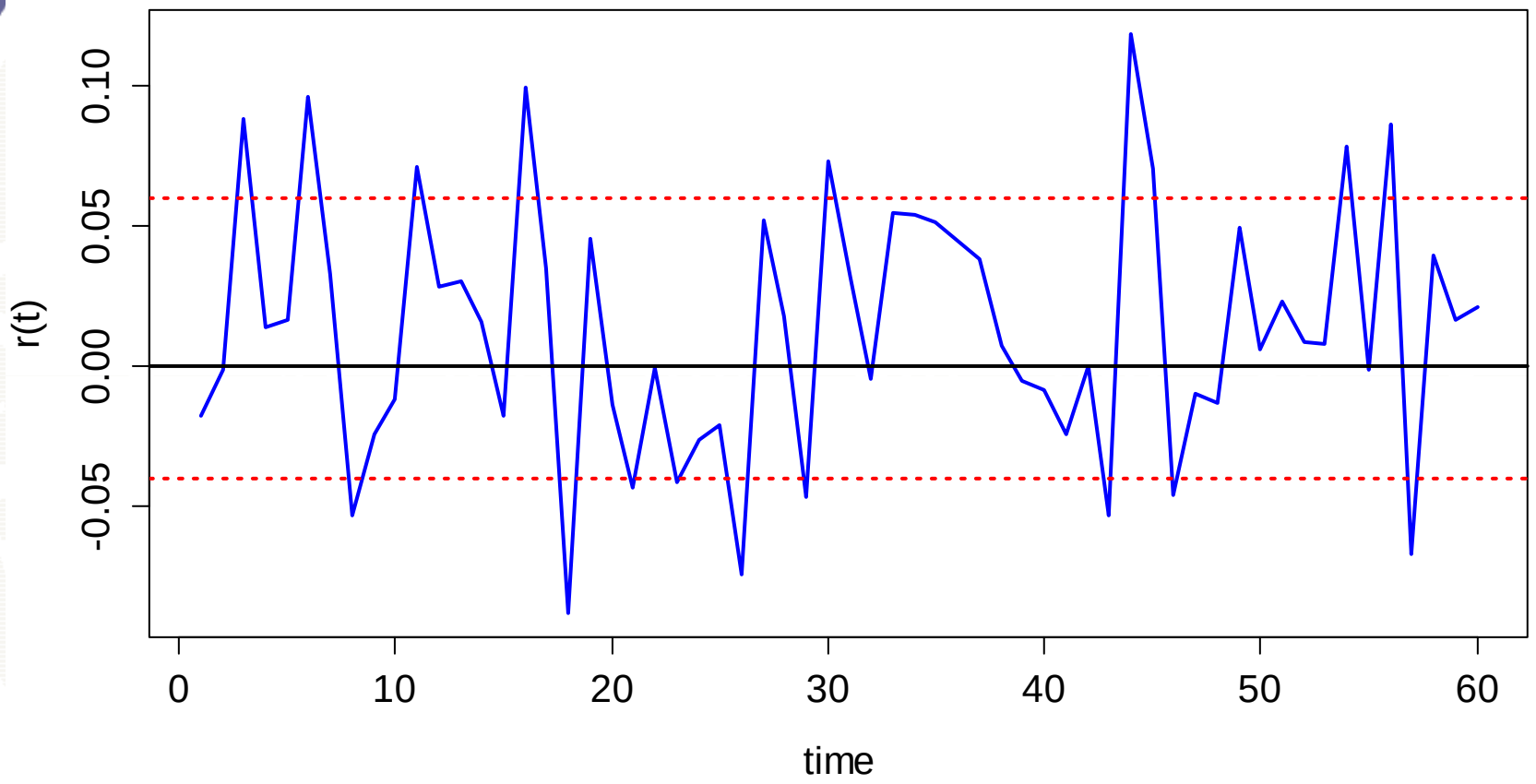
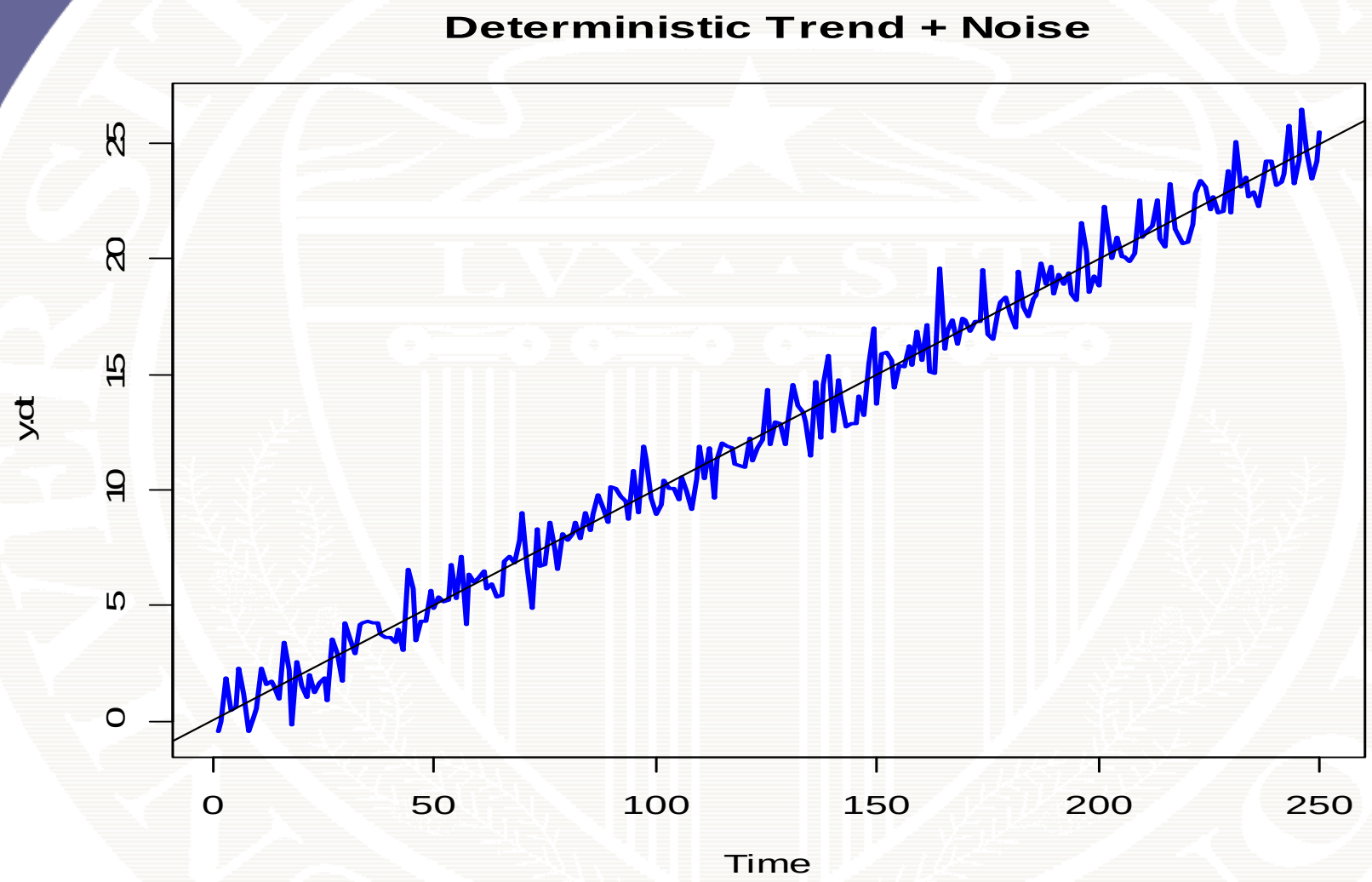


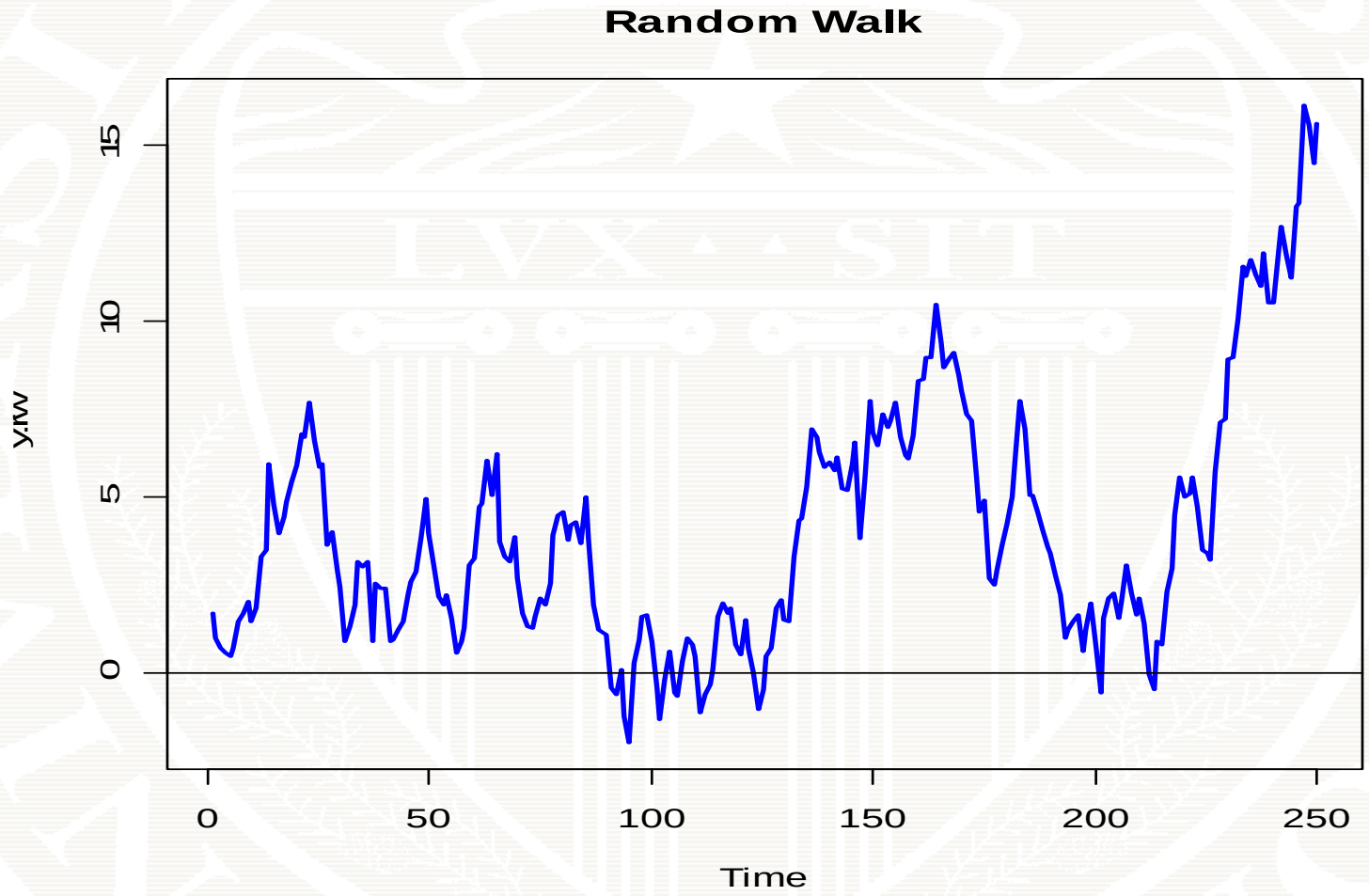

```
> set.seed(123)
> y = rnorm(250)
> ts.plot(y,main="Gaussian White Noise Process",xlab="time",ylab="y(t)“,
          col=“blue”, lwd=2)
> abline(h=0)
```



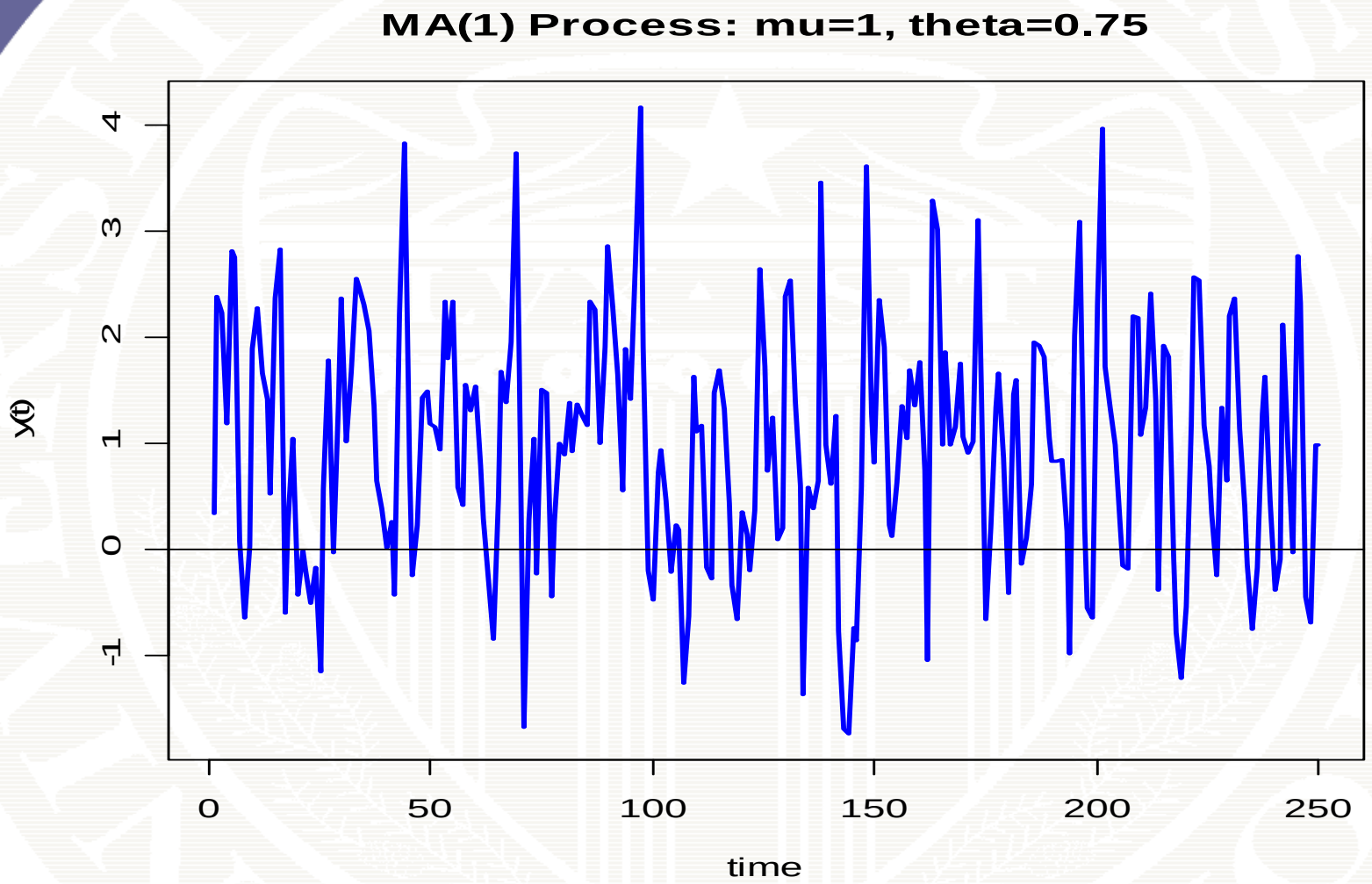

```
> y = rnorm(60, mean=0.01, sd=0.05)
> ts.plot(y,main="GWN for Monthly Continuously Compounded Returns",
        xlab="time",ylab="r(t)", col="blue", lwd=2, type="h")
> abline(h=c(0,-0.05,0.05), lwd=2, lty=c("solid","dotted","dotted"),
      col=c("black", "red", "red"))
```



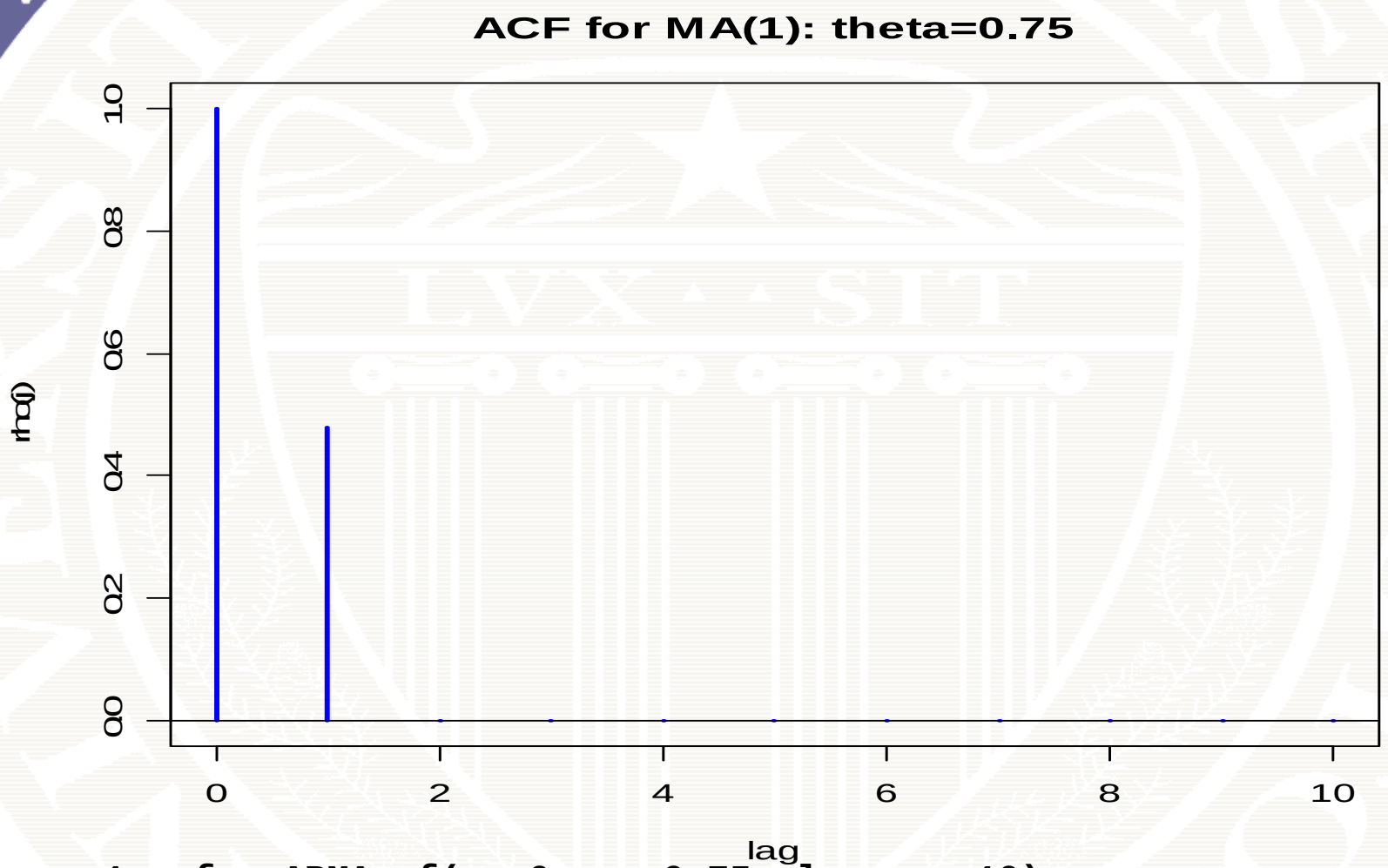

```
> set.seed(0);y = rnorm(250)
> y.dt = 0.1*seq(1,250) + y
> ts.plot(y.dt, lwd=2, col=2)
```



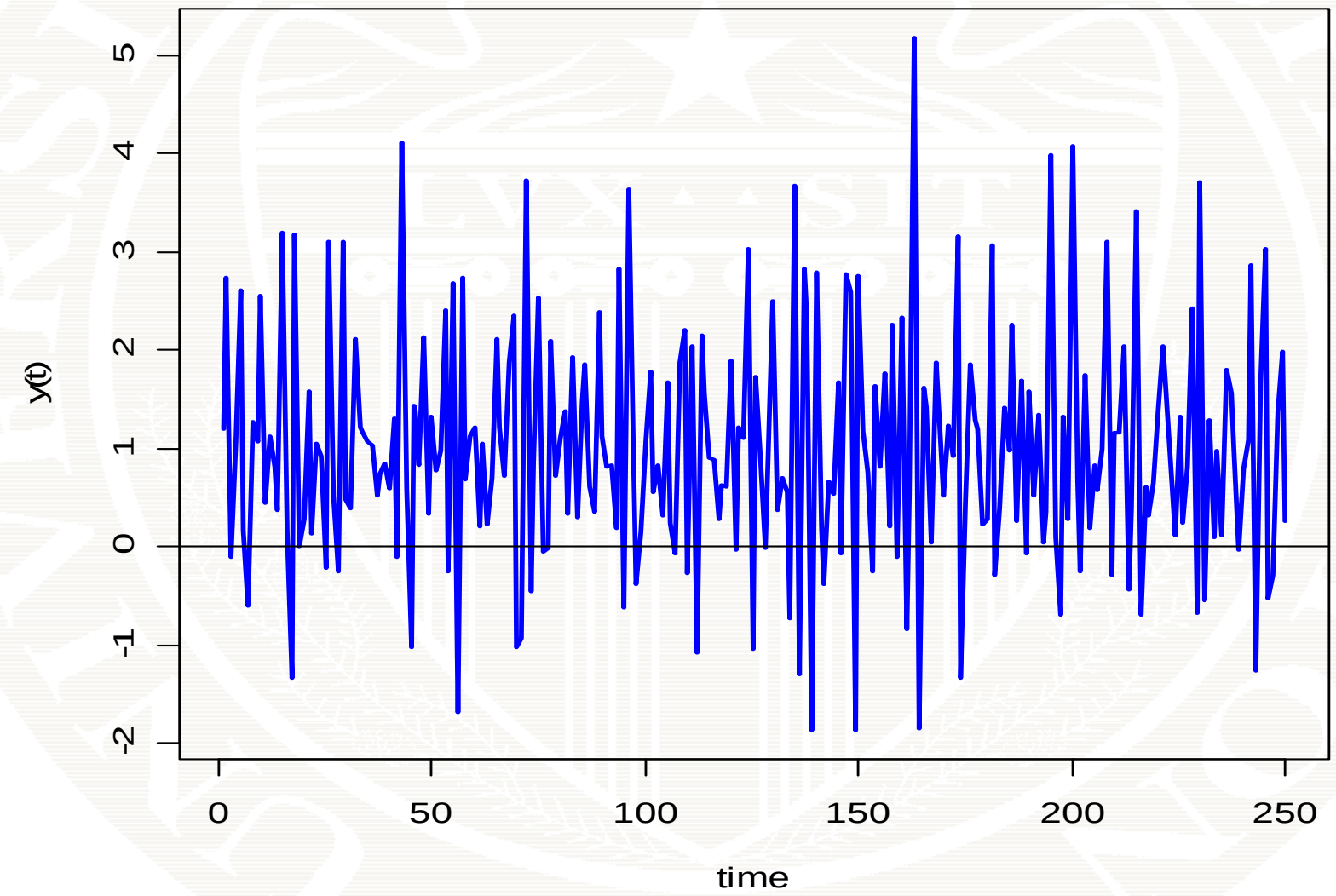

```
> set.seed(321); z = rnorm(250); y.rw = cumsum(z);
> ts.plot(y.rw, lwd=2, col="blue"); abline(h=0)
```

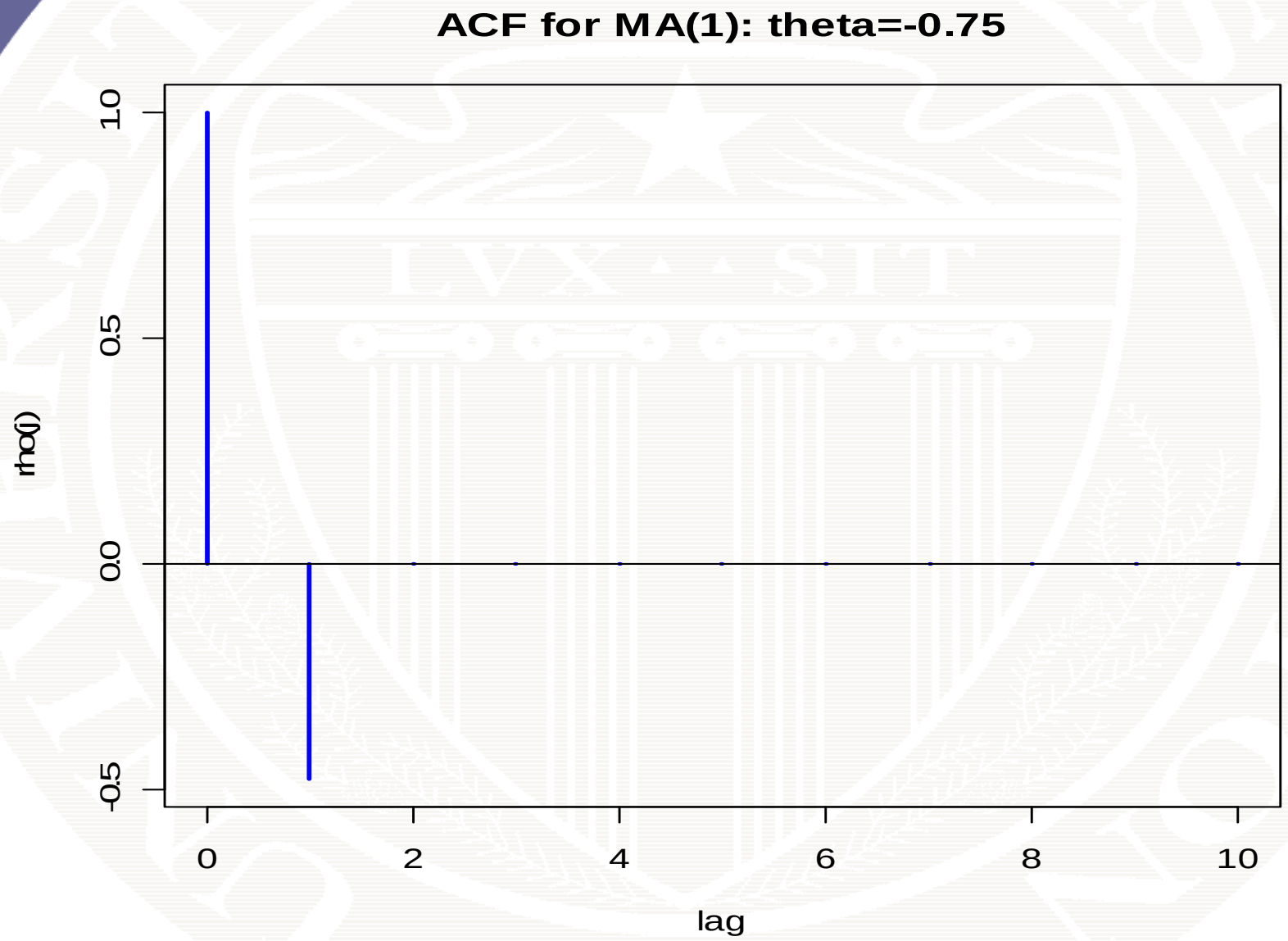


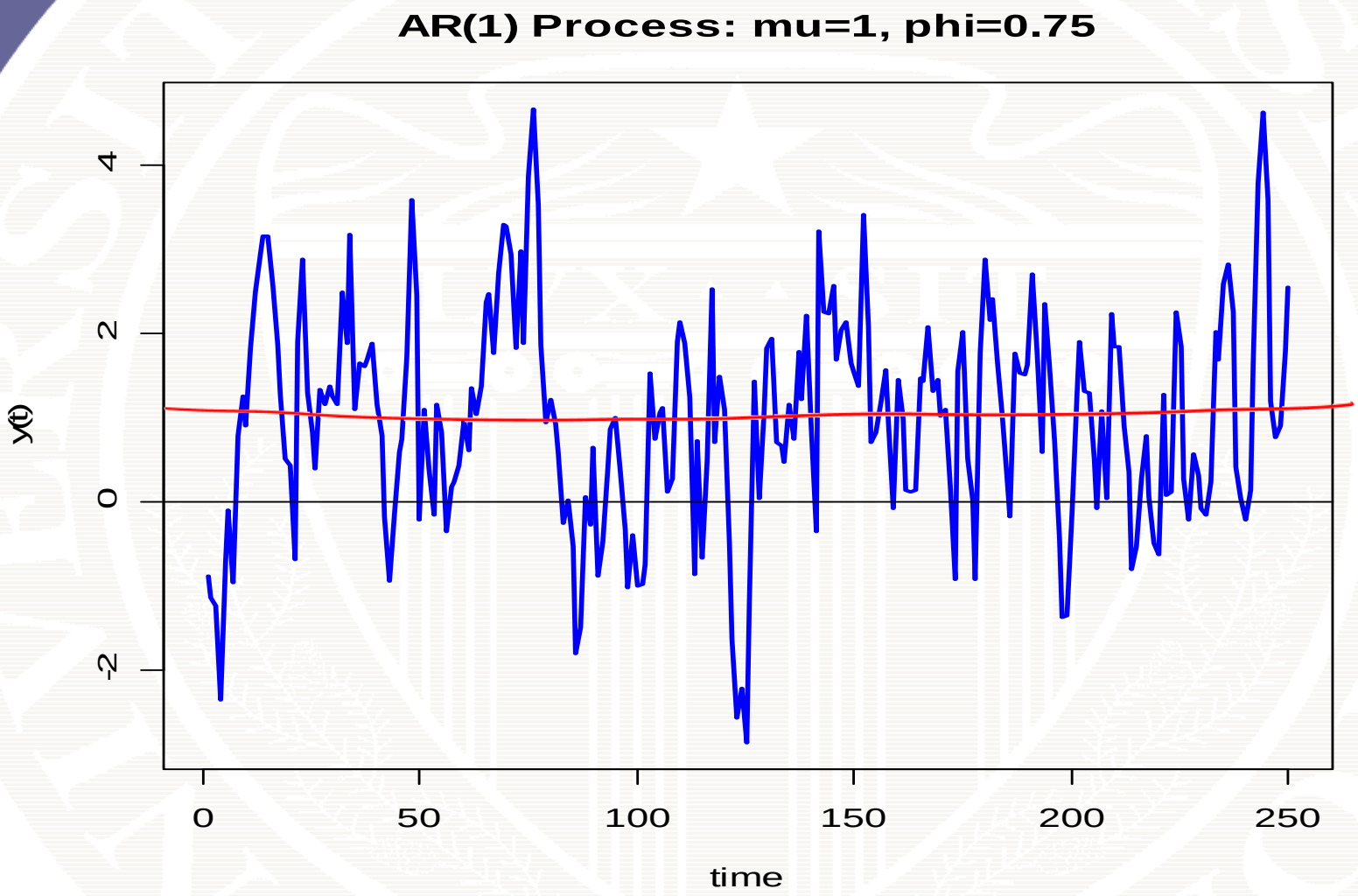

```
> ma1.model = list(ma=0.75); mu = 1; set.seed(123)
> ma1.sim = mu + arima.sim(model=ma1.model,n=250)
> ts.plot(ma1.sim,main="MA(1) Process: mu=1, theta=0.75",
          xlab="time",ylab="y(t)“, col=“blue”, lwd=2)
> abline(h=0)
```



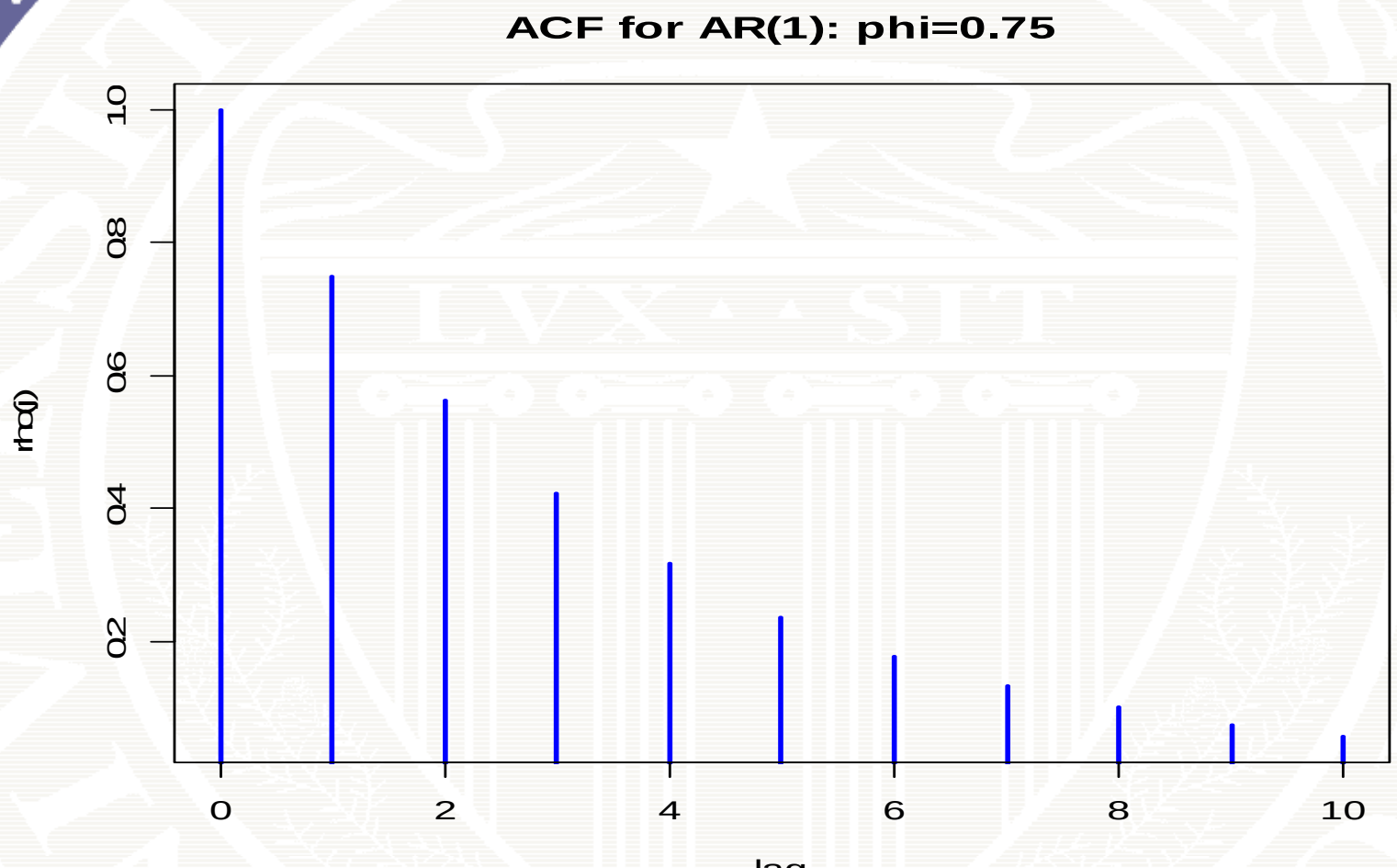

```
> ma1.acf = ARMAacf(ar=0, ma=0.75, lag.max=10)
> plot(0:10, ma1.acf,type="h", col="blue", lwd=2,
     main="ACF for MA(1): theta=0.75",xlab="lag",ylab="rho(j)")
> abline(h=0)
```



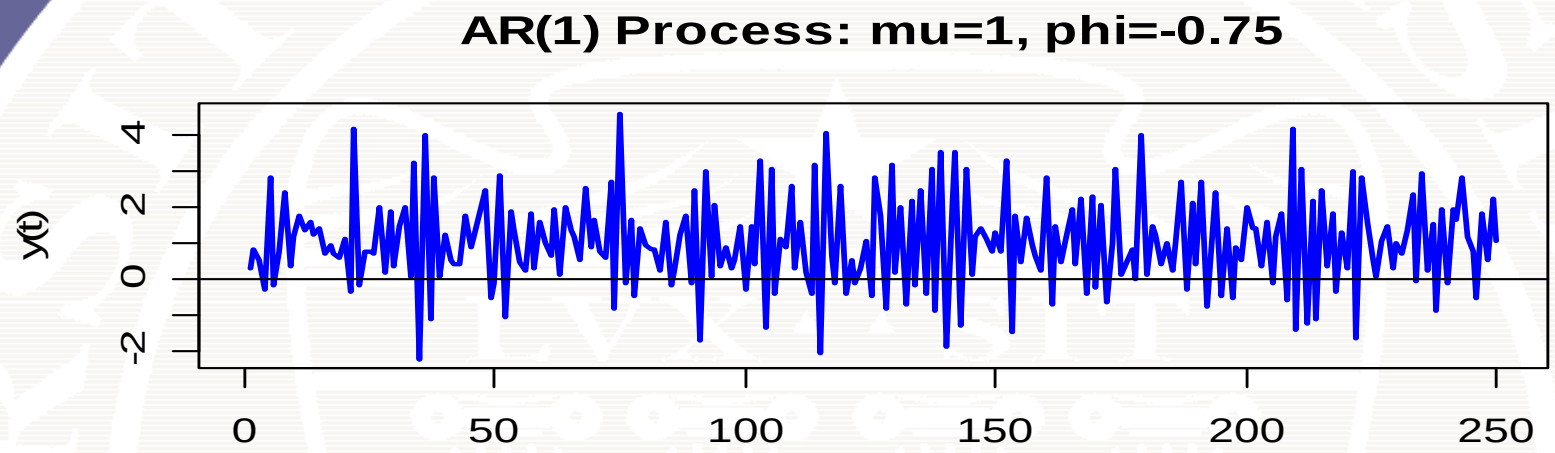




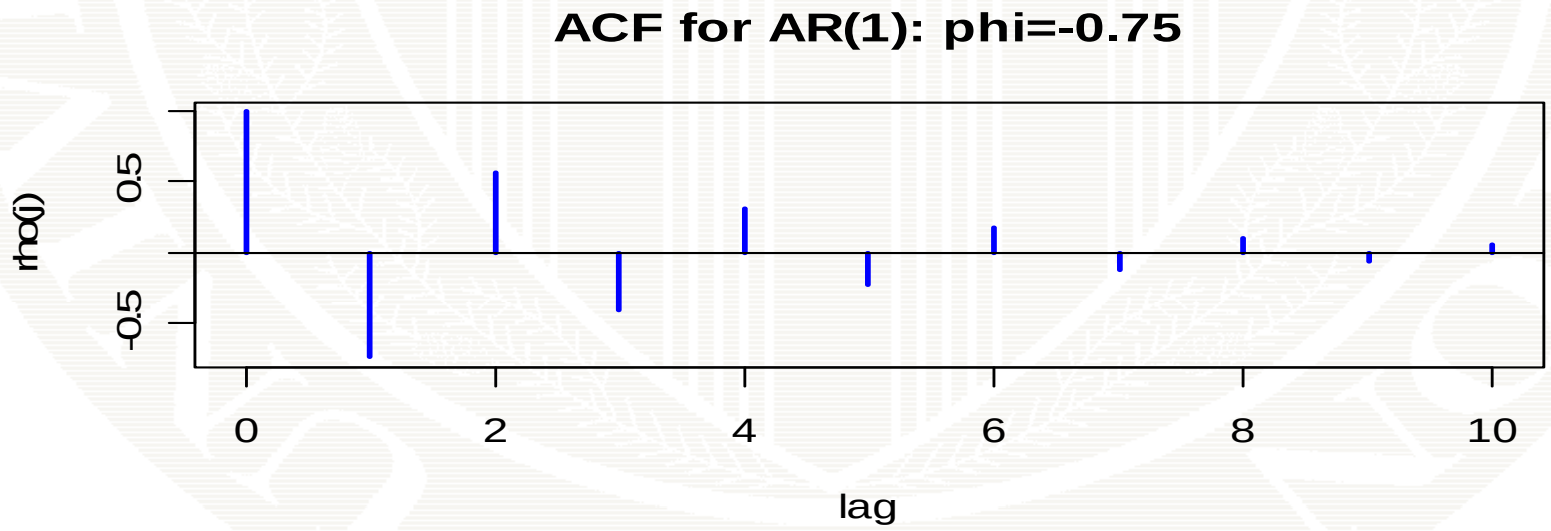

```
> ar1.model = list(ar=0.75); mu = 1; set.seed(123)
> ar1.sim = mu + arima.sim(model=ar1.model,n=250)
> ts.plot(ar1.sim,main="AR(1) Process: mu=1, phi=0.75",
          xlab="time",ylab="y(t)")
> abline(h=0)
```




```
> ar1.acf = ARMAacf(ar=0.75, ma=0, lag.max=10)
> plot(0:10, ar1.acf,type="h", col="blue", lwd=2,
       main="ACF for AR(1):phi=0.75",
       xlab="lag",ylab="rho(j)")
> abline(h=0)
```



$\rho_j = \phi^j$



$\rho_1 = -0.75$

$\rho_2 = (-0.75)^2$

$y_t - \mu = \phi(y_{t-1} - \mu) + \epsilon_t$

If $\phi = 1$ then $y_t - \mu = y_{t-1} - \mu + \epsilon_t = y_{t-1} + \epsilon_t$