14주차 2차시 : 확률과정(종류)

1. 확률과정의 종류

   (1) 확률과정

   (2) 확률과정의 종류

1.확률과정의 종류

(1) 확률과정

- T개의 관측치(시계열자료) $y_1, y_2, \cdots, y_T$ 는 확률변수 $Y_1, Y_2, \cdots, Y_T$의 실현된 값이며,
  확률변수 $Y_1, Y_2, \cdots, Y_T$는 무한계열의 일부분으로 볼 수 있는데 이 무한한 계열을 확률과정이라고 함

(2) 확률과정의 종류

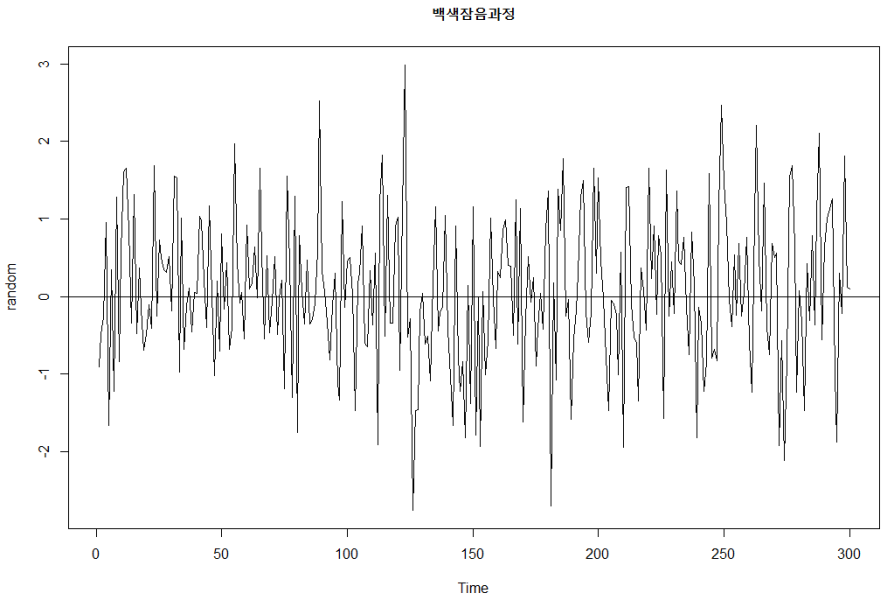
① 백색잡음과정(white noise process)

- $e_1, e_2, \cdots, e_T$ 가 있을 경우 다음이 성립하는 확률과정

$$E(e_t) = 0 \; for \; \forall \; t \; (zero \; mean)$$

$$E(e_t e_s) = 0 \; for \; \forall \; t \neq s \; (uncorrelated)$$

$$E(e_1^2) = \cdots = E(e_t^2) = \sigma_e^2 < \infty \; (finite \; variance)$$



② 임의보행과정(random walk process)

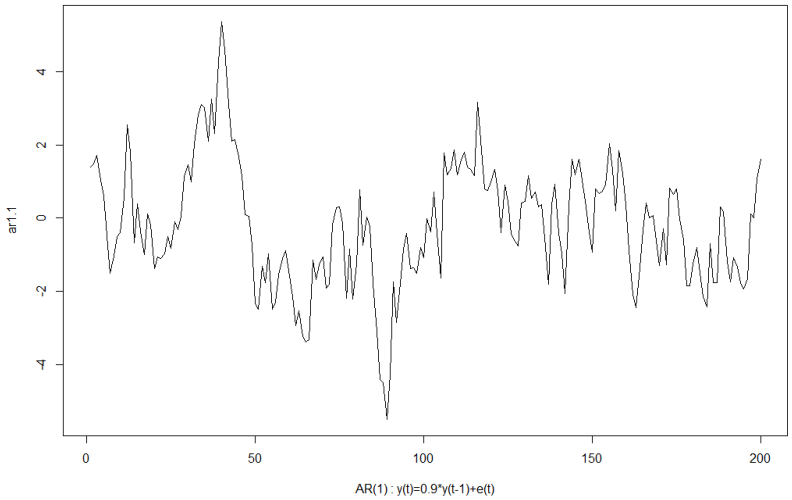
- 절편이 없는 임의보행과정 : $y_t = y_{t-1} + e_t$, $e_t \sim WN\ N(0,1)$

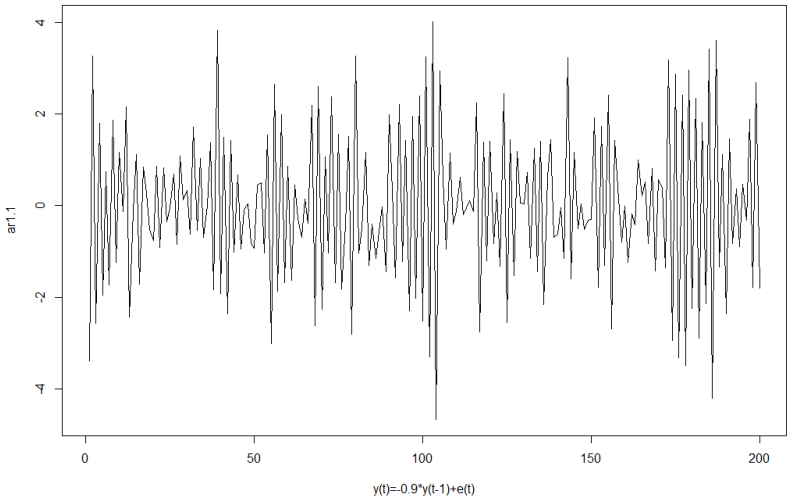
- 절편이 있는 임의보행과정: $y_t = 0.2 + y_{t-1} + e_t$, $y_0 = 0, e_t \sim WN\ N(0,1)$

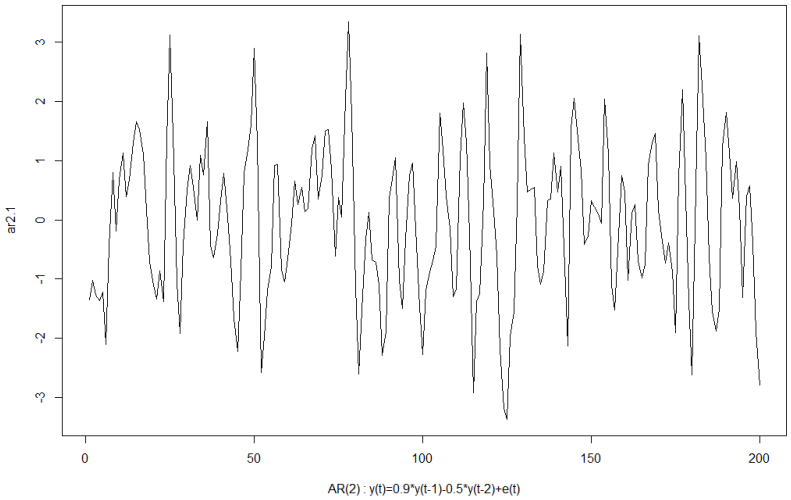
③ 자기회귀과정(AutoRegressive process)

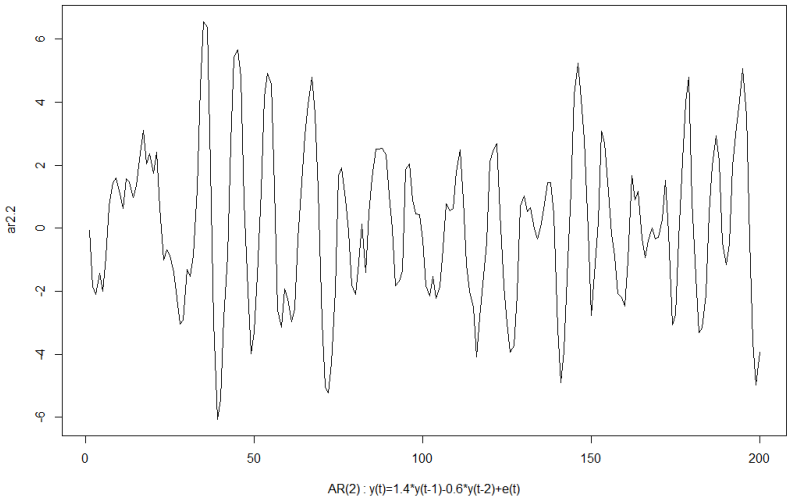
$$y_t = \phi y_{t-1} + e_t \ , \ e_t \sim WN\ N(0,1)\ (AR(1))$$

$$y_t = \phi_1 y_{t-1} + \cdots + \phi_p y_{t-p} + e_t \ , \ y_0 = 0, e_t \sim WN\ N(0,1) (AR(p))$$





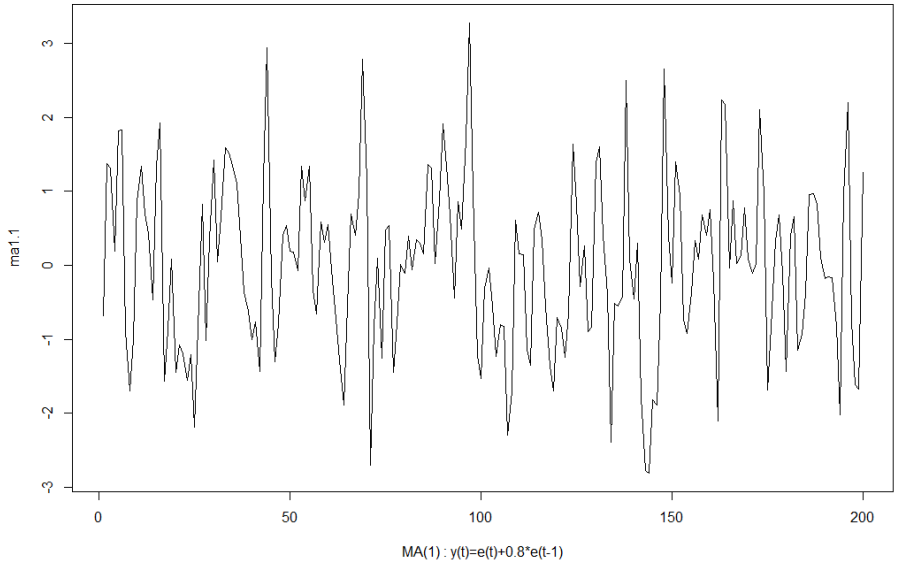


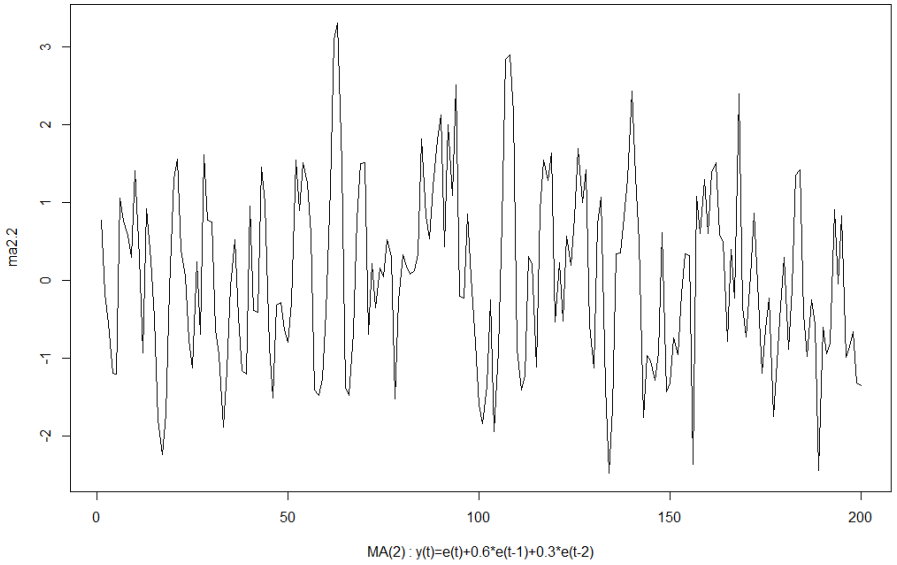


④ 이동평균과정(Moving Average process)

$$y_t = e_t + \theta e_{t-1}\ ,\ e_t \sim WN\ N(0,1)\ (MA(1))$$

$$y_t = e_t + \theta_1 e_{t-1} \ldots + \theta_q e_{t-q},\ e_t \sim WN\ N(0,1)(MA(q))$$



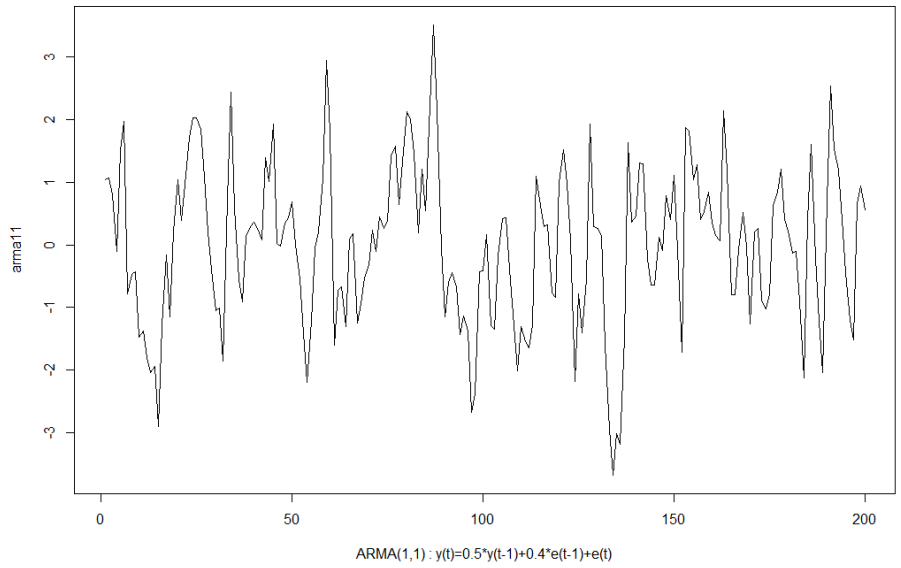


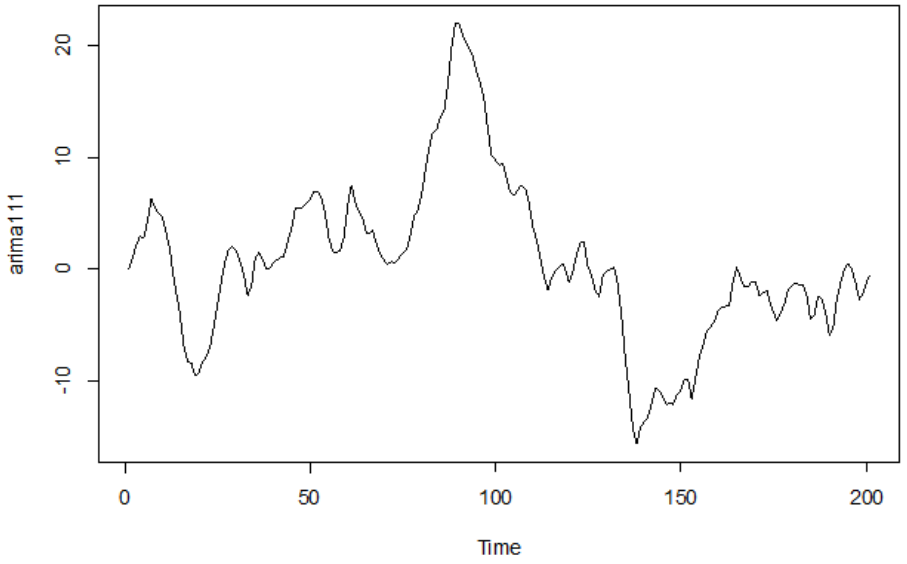
⑤ 자기회귀이동평균과정(ARMA process)

$$y_t - \phi_1 y_{t-1} - \cdots - \phi_p y_{t-p} = e_t + \theta_1 e_{t-1} \ldots + \theta_q e_{t-q},\ e_t \sim WN\ N(0,1)(ARMA(p,q))$$

⑥ 자기회귀적분이동평균과정(ARIMA process)

$$\Delta y_t - \phi_1 \Delta y_{t-1} - \cdots - \phi_p \Delta y_{t-p} = e_t + \theta_1 e_{t-1} \ldots + \theta_q e_{t-q},\ e_t \sim WN\ N(0,1)(ARIMA(p,q))$$





ARIMA(1,1,1) : $\Delta y_t = \Delta 0.5 y_{t-1} + 0.4 e_{t-1} + e_t$