Problem Solving Set 1

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```
## Warning: package 'knitr' was built under R version 4.3.2
```

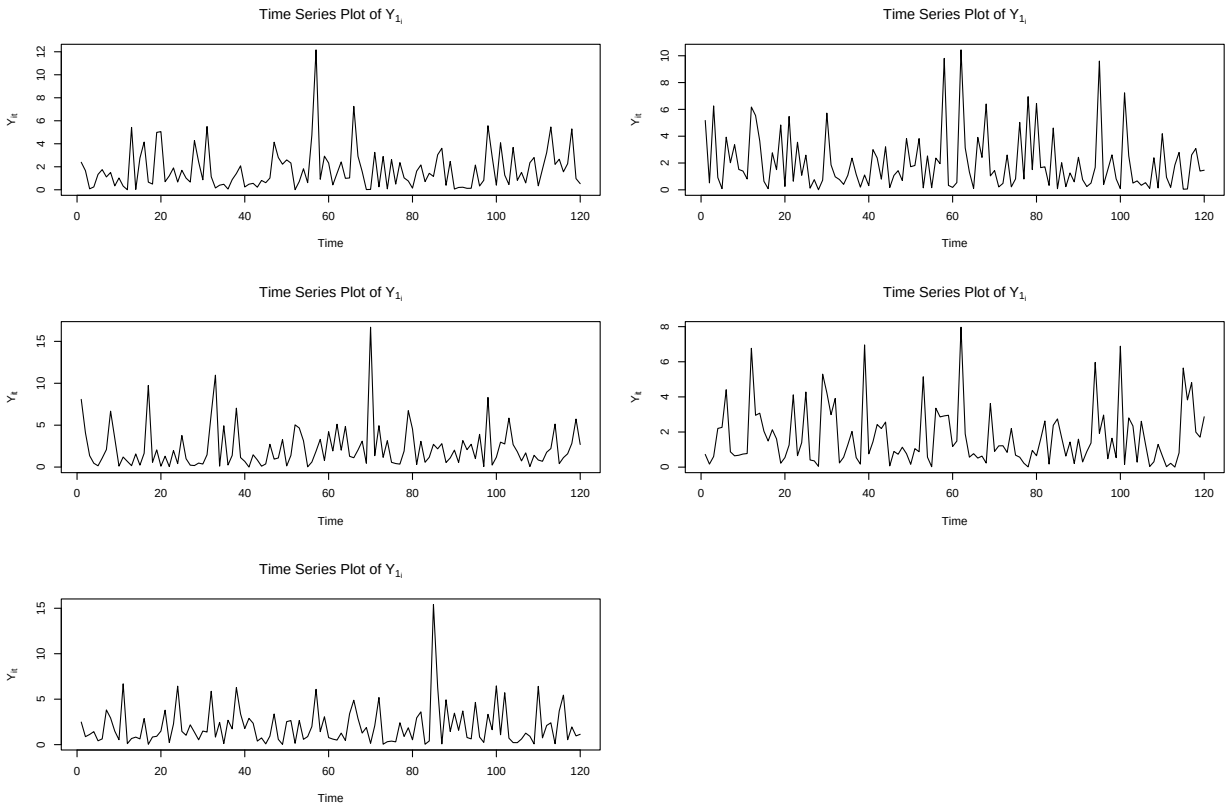
```
set.seed(1401)
```

Part 1

```
n <- 120
```

```
series_list <- replicate(5, as.ts(rchisq(n, 2, ncp = 0)))
```

```
par(mfrow = c(3, 2))
for (i in 1:5) {
    plot(series_list[, i], type = "l", xlab = expression("Time"),
        ylab = expression(paste("Y"[i][t])), main = expression(paste("Time Series Plot of Y"[1[i]])))
}
```



Y_1

- spikes between 50 and 70
- centered around 2
- no patterns / random scatter

Y_2

- more variation than Y_1
- still centered at 2
- no patterns

Y_3

- similar to Y_1
- spike at 70

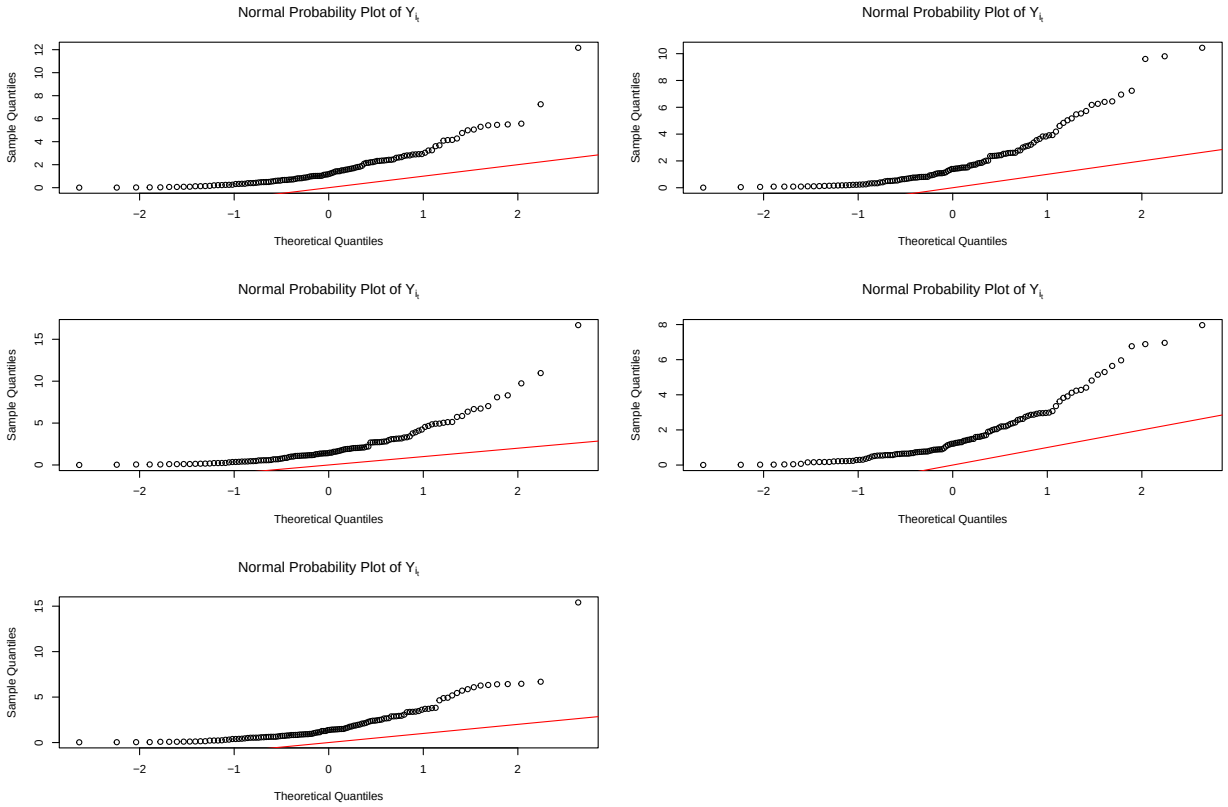
Y_4

- centered at 2
- spike near 60
- random scatter

Y_5

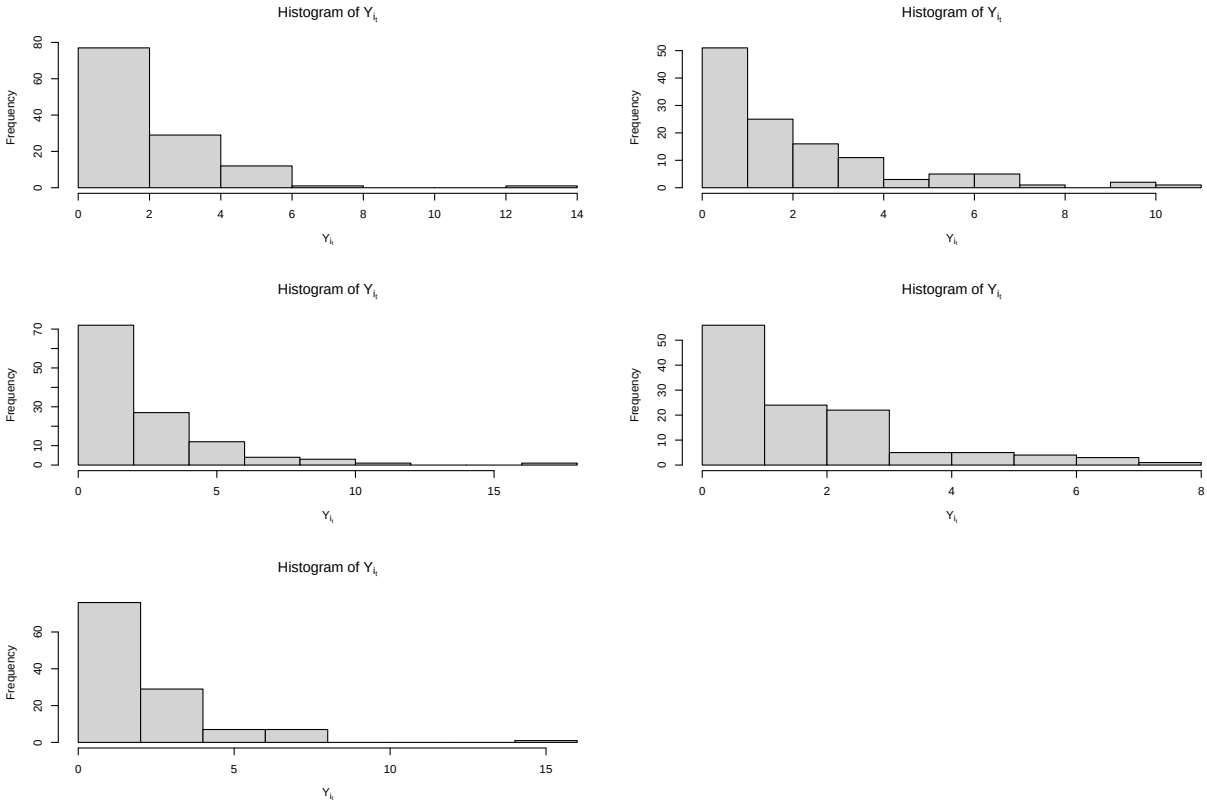
- similar to Y_1, Y_3
- spike at / around 90

```
par(mfrow = c(3, 2))
for (i in 1:5) {
    qqnorm(series_list[, i], main = expression(paste("Normal Probability Plot of Y"[i[t]])))
    abline(a = 0, b = 1, col = "red")
}
```



- not linear, - heavy right tail -> skewed right

```
par(mfrow = c(3, 2))
for (i in 1:5) {
    hist(series_list[, i], xlab = expression(paste("Y"[i[t]])),
        main = expression(paste("Histogram of Y"[i[t]])))
}
```



Part 2

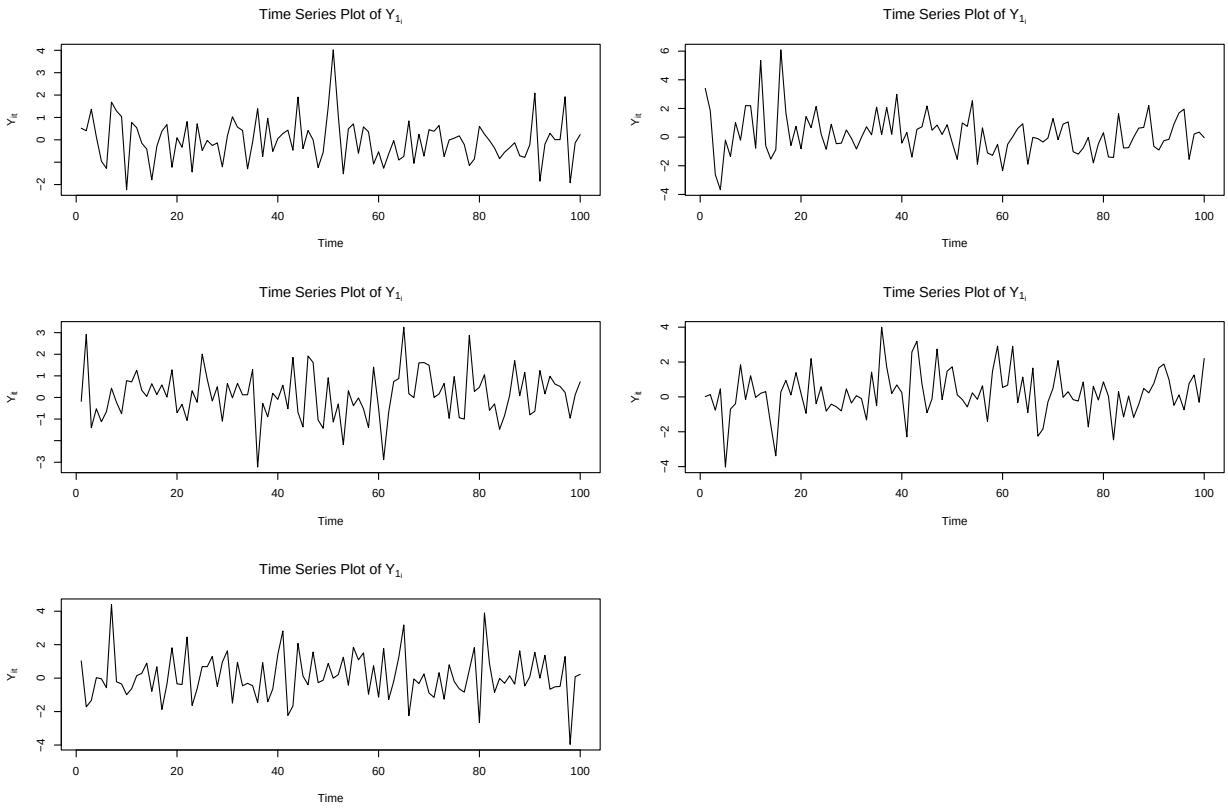
Expectations

- properties of a t-dist.
- look somewhat normal
- unimodal
- symmetric
- centered about 0
- random scatter / no patterns - property of random sample

```
n <- 100
```

```
series_list <- replicate(5, as.ts(rt(n, 5, ncp = 0)))
```

```
par(mfrow = c(3, 2))
for (i in 1:5) {
    plot(series_list[, i], type = "l", xlab = expression("Time"),
        ylab = expression(paste("Y"[i][t])), main = expression(paste("Time Series Plot of Y"[1[i]])))
}
```



Y_1

- centered at 0
- spike at 50
- random scatter / no patterns

Y_2

- signs of uneven spread
- suggests nonstationary series
- centered at 0
- no patterns

Y_3

- centered at 0
- random scatter
- fairly even spread

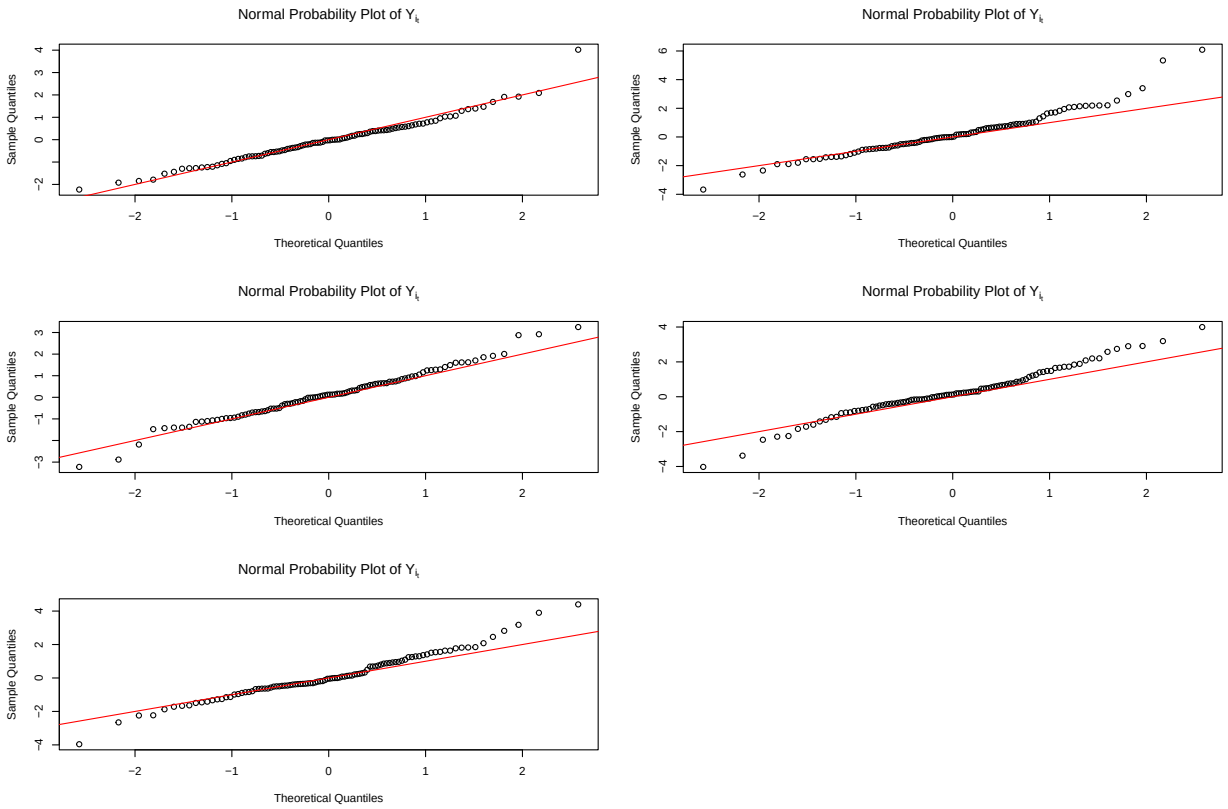
Y_4

- centered at 0
- possible periodic pattern
- fairly even spread

Y_5

- centered at 0
- random scatter
- fairly even spread

```
par(mfrow = c(3, 2))
for (i in 1:5) {
    qqnorm(series_list[, i], main = expression(paste("Normal Probability Plot of Y"[i[t]])))
    abline(a = 0, b = 1, col = "red")
}
```



Y_1

- heavy right tail
- left side - tail resembles that of a normal distribution

Y_2

- two heavy tails
- middle looks really normal

Y_3

- heavy tails

- middle looks okay
- lighter than tails of Y_2

Y_4

- both tails are heavy
- middle is linear

Y_5

- similar to Y_4

```
par(mfrow = c(3, 2))
for (i in 1:5) {
    hist(series_list[, i], xlab = expression(paste("Y"[i[t]])),
        main = expression(paste("Histogram of Y"[i[t]])))
}
```