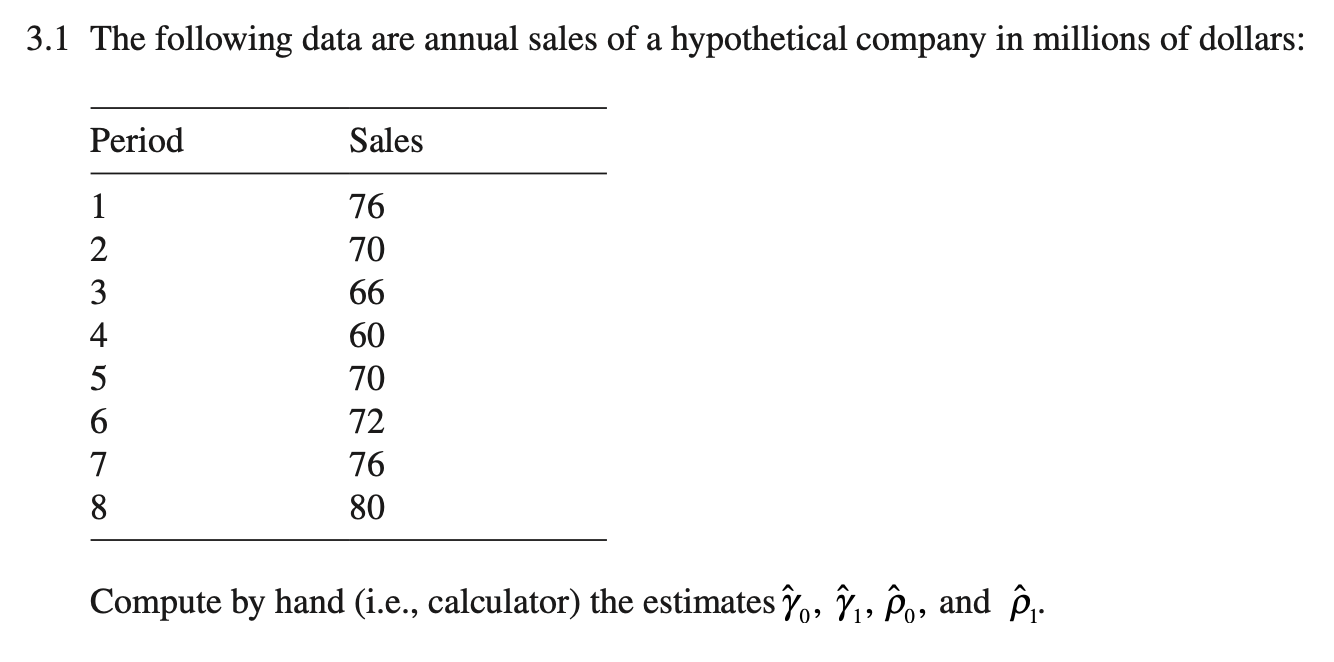
Chapter 3 Solutions:



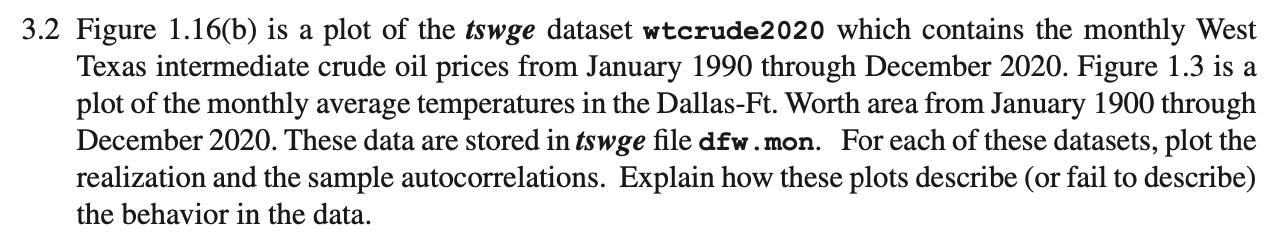
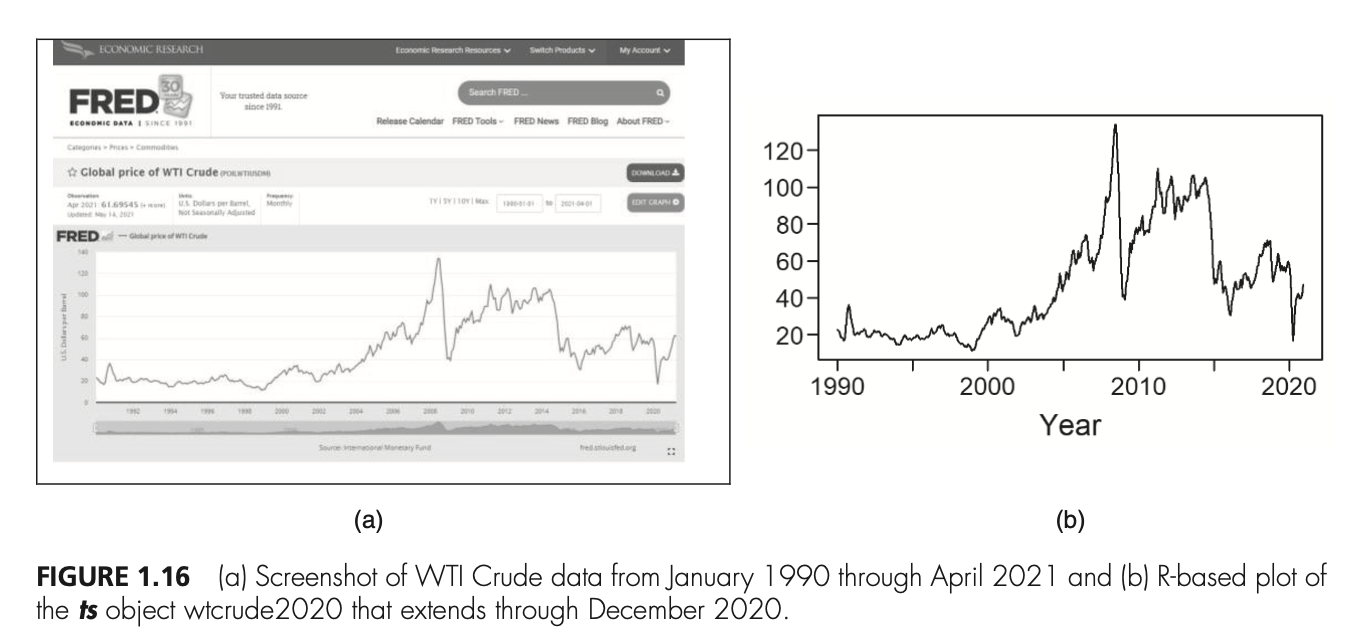
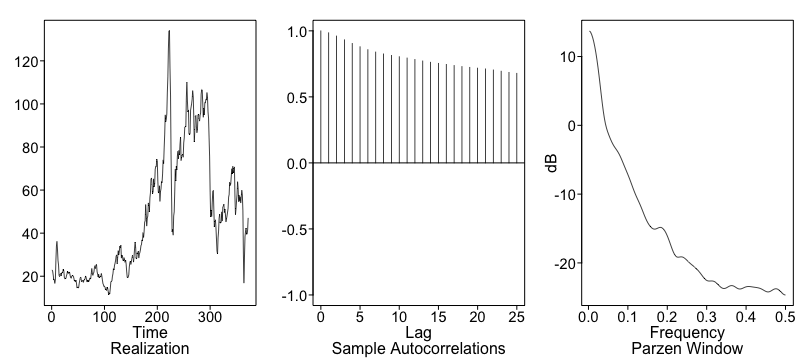


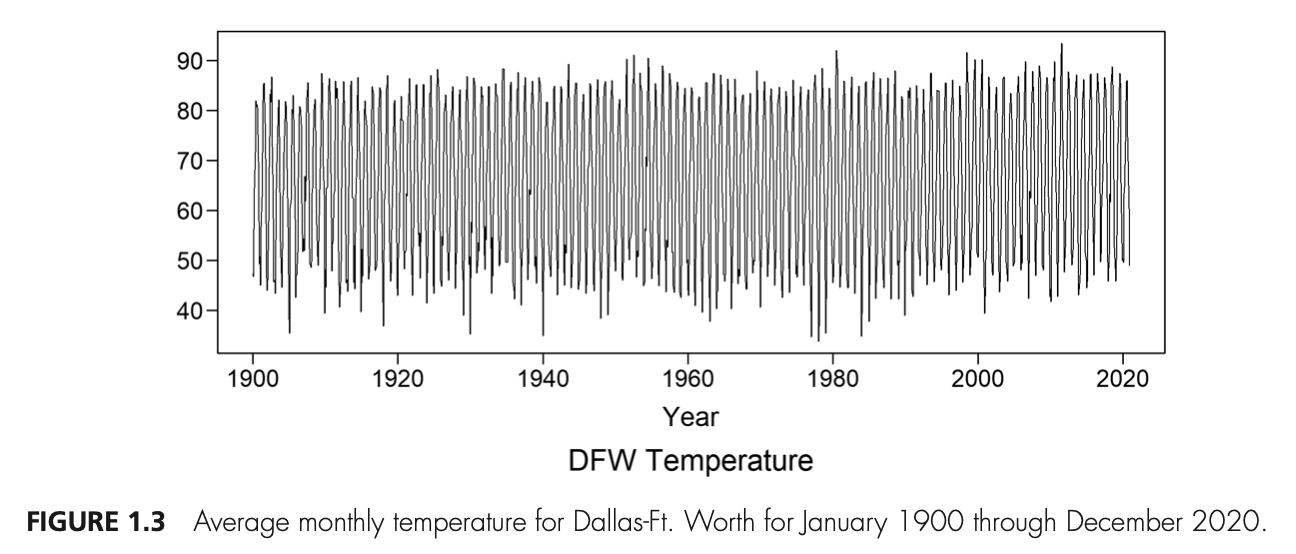
Fig 1.16:



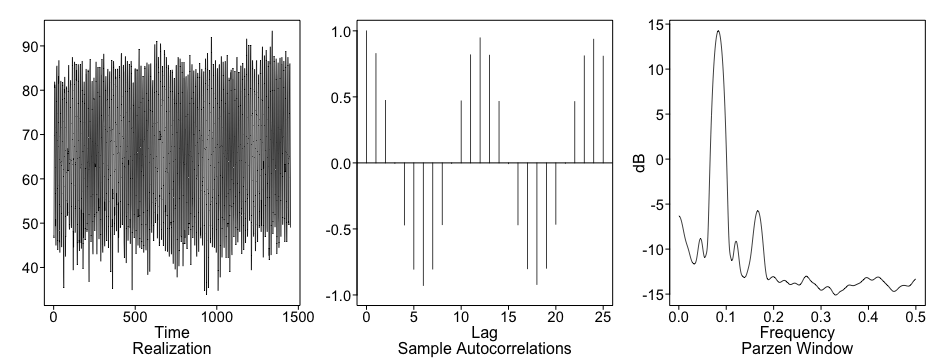
plotts.sample.wge(wtcrude2020)



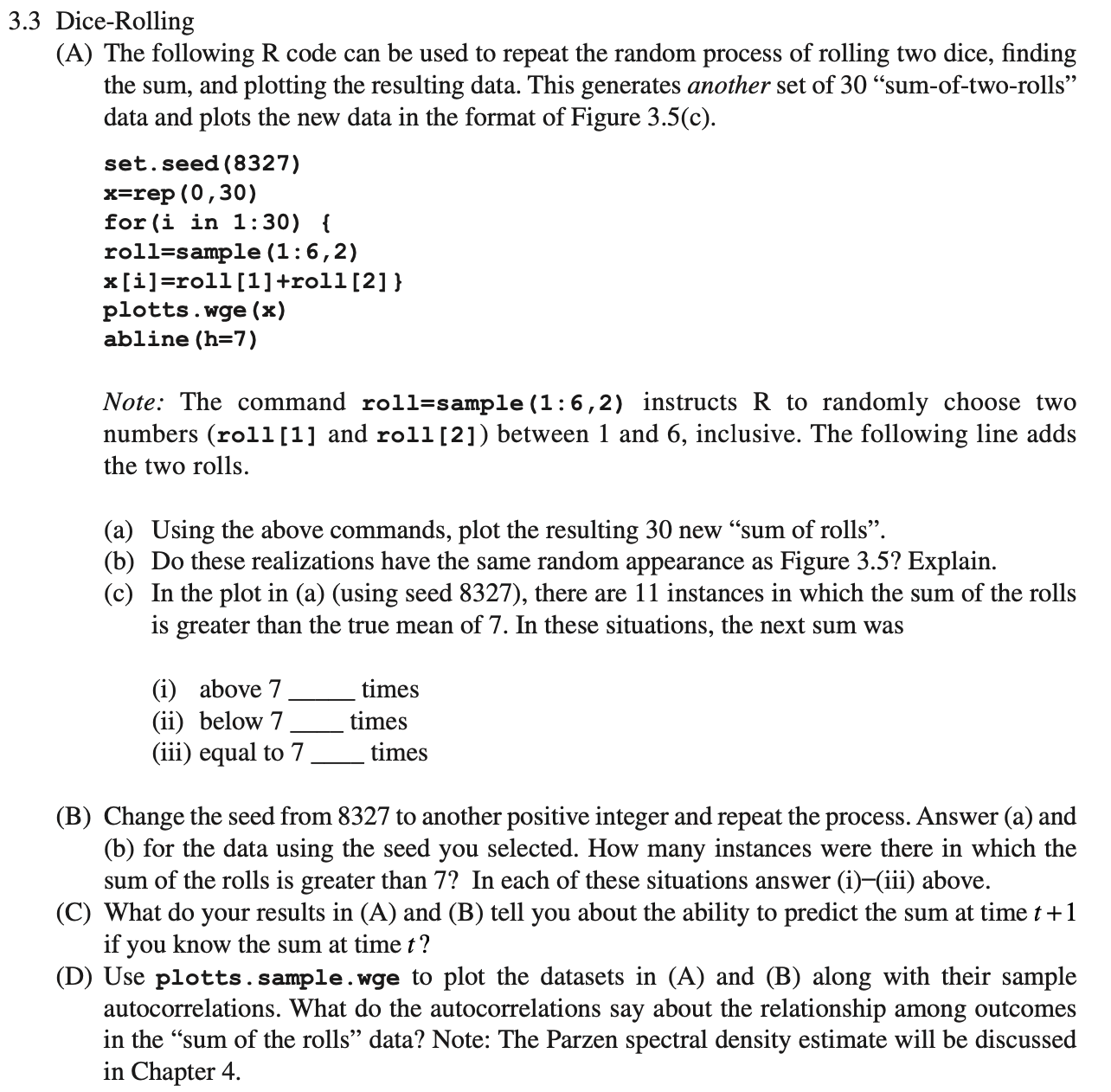
The autocorrelations are positive and slowing damping as the lag increases indicating that for lags up to at least 25 (and likely even further apart) pairs of observations lag units apart tend to be on the same side of the overall mean. Practically, this means that the series will tend to wander and go on extended runs above or below the mean; that when the series is above/below the overall mean, it sends to stay there for a while. The Parzen window of the spectral density estimate will be discussed in Chapter 4.

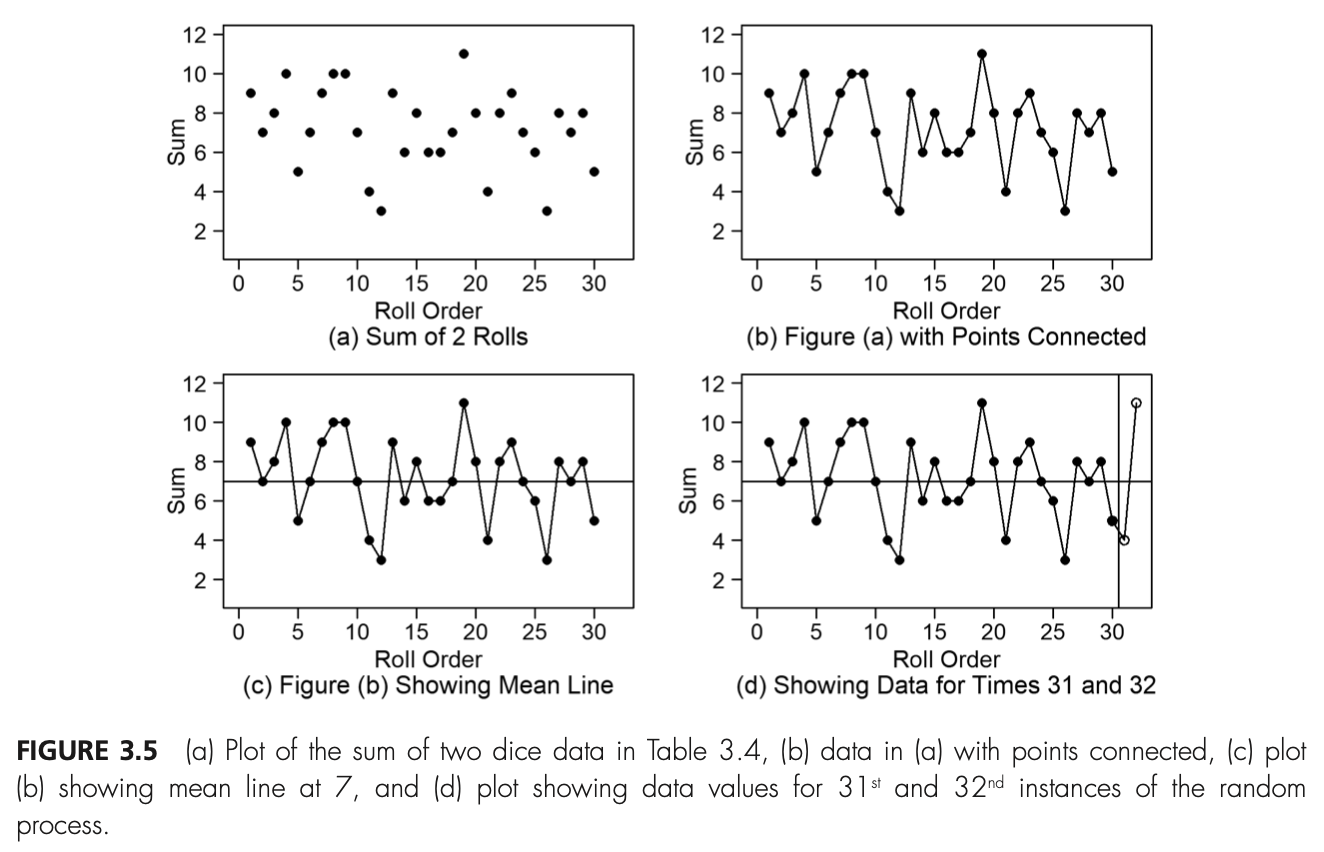


plotts.sample.wge(dfw.mon)



We always want to consider domain knowledge when we have it and we can assume we all have some domain knowledge on montly temperatures. In DFW our experience tell that it is relatively (relative to the annual mean temp) warm in the Summer, cold in the Winter and near the average temperature in the Spring and the Fall. This is reflected in the realization and in the acf. The ACF has quickly damping positive autocorrelation for lags 1 – 2 indicating that average temperatures within a month or two or even three of each other tend to be on the same side of the overall mean. For lag 3, we see a zero autocorrelation reflecting the fact that pairs of months 3 months apart will sometimes be on opposite sides of the mean and sometimes be on the same side so that the cross products will cancel each other out in the calculation fo the autocovariance / autocorrelation. For lags 4 – 8 the autocorrelation is negative and of increasing magnitude to lag 6 (half a year) which matches the assumption that temperature that are above the mean (eg. in the peak of summer time) tend to be very much below the mean (et. in the dead of winter) 6 months earlier. This is true for most months, thus adding negative cross products to the calculation of the autocovariance / autocorrelation, except for those in the middle of Fall and Spring which may tend to be similar. This pair will add zero to the cross product in the calculation of the autocovariance / autocorrelation and thus the overall result will be a negative autocorrelation. Lag 9 is similar to lag 3 (think about. it and / or write it out). The autocorrelation in positive and increasing in magnitude for lags 10-12 which, for lag 12) means that pairs of months 12 months apart should be similar with respect to the overall annual mean temperature (eg. December should be similar to December the previous year and true for any month). The Parzen window of the spectral density estimate will be discussed in Chapter 4.





(a)

set.seed(8327)

xA=rep(0,30)

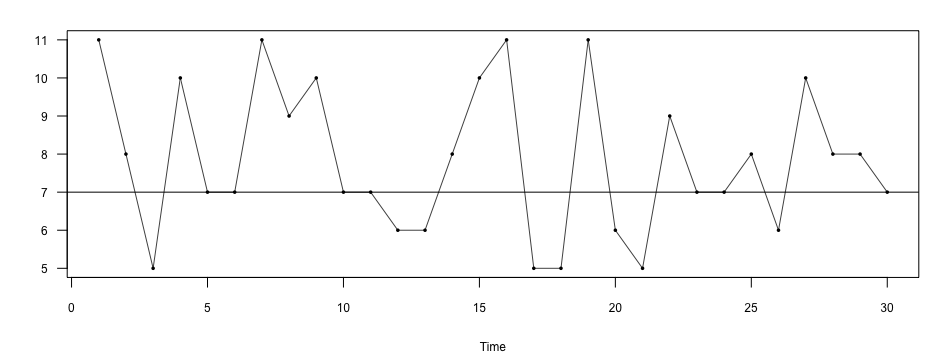
for(i in 1:30) {

roll=sample(1:6,2)

xA[i]=roll[1]+roll[2]}

plotts.wge(xA)

abline(h=7)



(b) These look a little more heavily weighted above the overall mean of 7 but the question would be if this is more extreme than would be expected to occur by chance if the rolls were completely independent.

(c) Of the 15 sums above 7: (i) above 7 **six** times (ii) below 7 **five** times (iii) equal to 7 **four** times

(a)

set.seed(8326)

xB=rep(0,30)

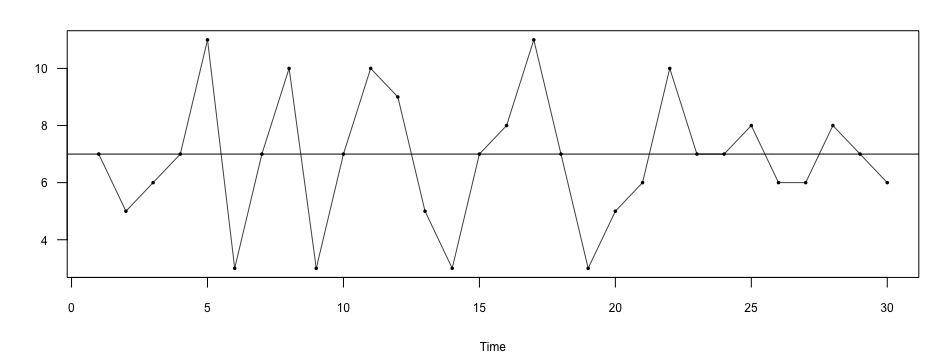
for(i in 1:30) {

roll=sample(1:6,2)

xB[i]=roll[1]+roll[2]}

plotts.wge(xB)

abline(h=7)

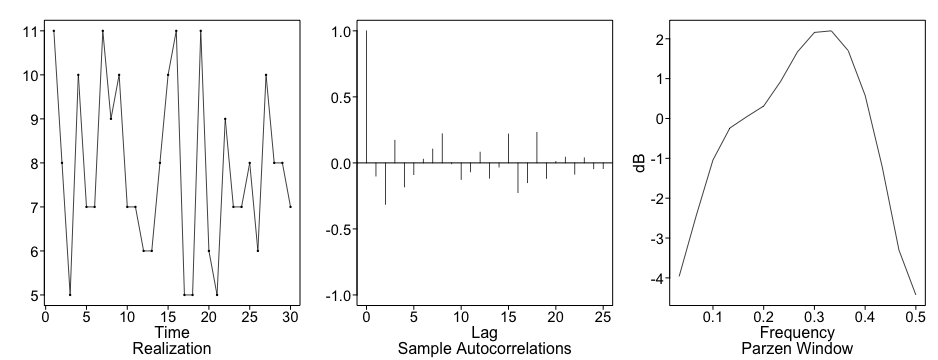


(b) These look a little more evenly distributed above and below the overall mean of 7.

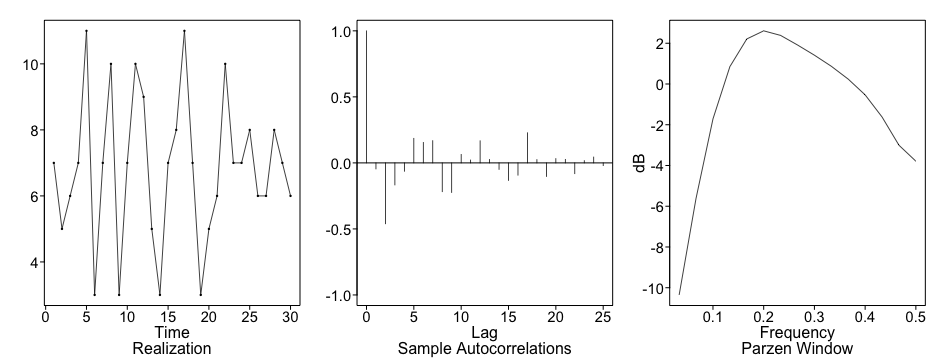
(c) of the 9 sums above 7: (i) above 7 **two** times (ii) below 7 **four** times (iii) equal to 7 **three** times

1. The results from (A) and (B) were not consistent with one another thus suggesting that knowing the sum at t does not tell you much about whether the sum will be above, below or equal to 7 at t+1.

plotts.sample.wge(xA)



plotts.sample.wge(xB)



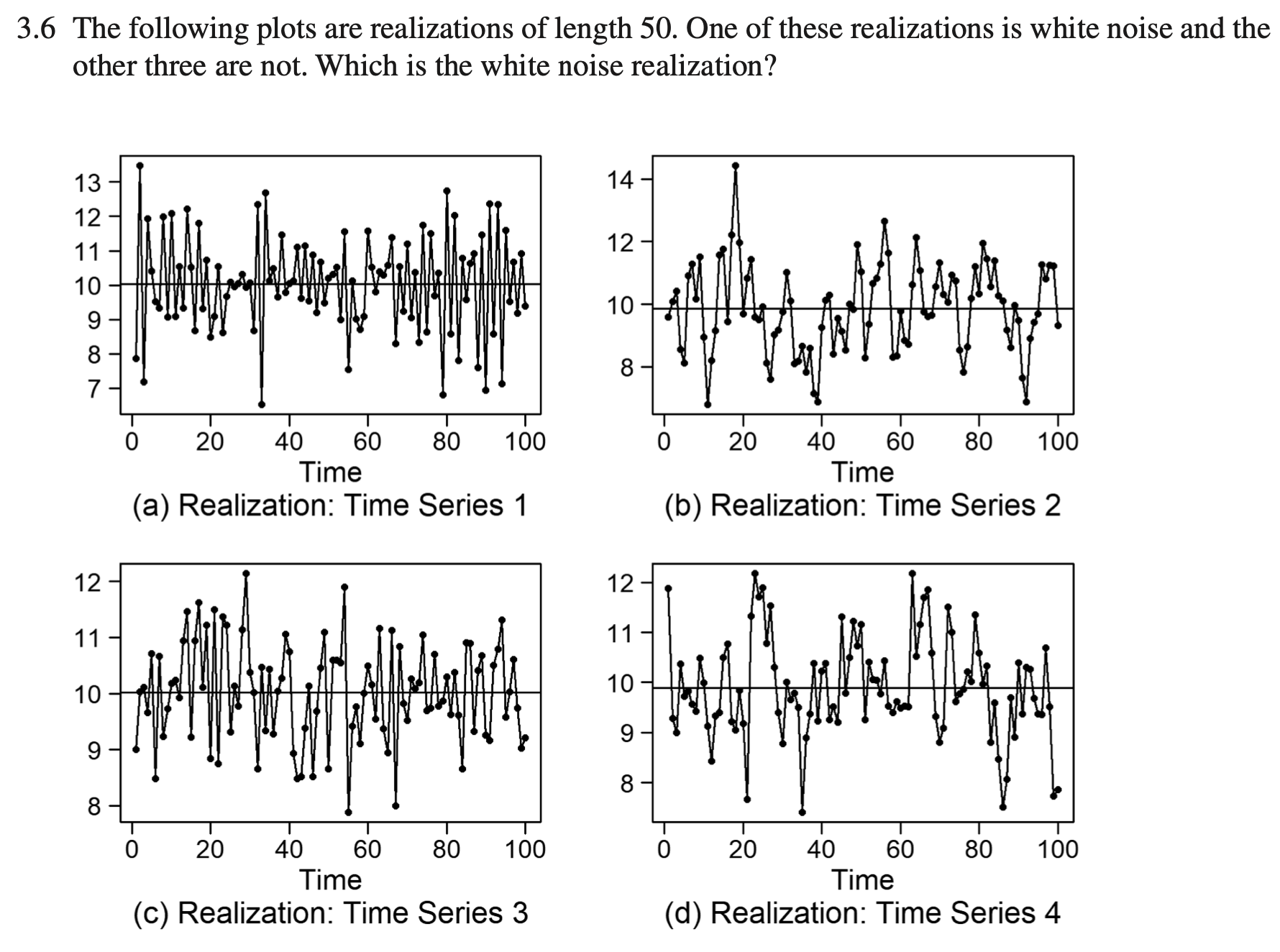
Note that the acf for both the series from seed 8327 and 8326 have what appear to be relatively small and random autocorrelations for each lag. This is consistent with sums that are independent of each other at each lag including t and t + 1 (lag 1). The Parzen window of the spectral density estimate will be discussed in Chapter 4 … it is fascinating!

3.4. 1. C. 2. A. 3. D. 4. B.

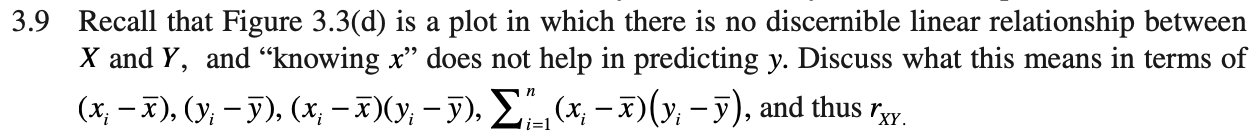
|  |  |
| --- | --- |
|  |  |
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|  |  |
|  |  |

3.5 1.B. 2. D. 3. C 4. A

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |



1. These clearly and consistently oscillate above and below the overall mean



will be positive when X is greater than xbar and negative when x is less than xbar.

will be positive when y is greater than xbar and negative when y is less than ybar.

Will be positive when X is greater than xbar and y is greater than ybar(the upper right hand quadrant of a scatterplot)

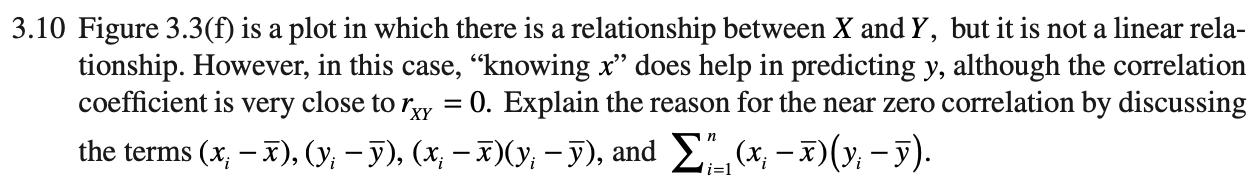
Will be positive when X is less than xbar and y is less than ybar(the lower left hand quadrant of a scatterplot)

Will be negative when X is less than xbar and y is greater than ybar(the upper left hand quadrant of a scatterplot)

Will be positive when X is greater than xbar and y is less than ybar(the lower right hand quadrant of a scatterplot)

Note that in plots like 3.3(d) points are distributed in all four quandrants relatively equally. This mean that there will be about the same number of positive and negative cross products (with similar magnitudes). For this reason the expression will be the sum of positive and negative cross-products of similar magnitude which means that the sum will be about zero.

Since , will be approximately zero.



will be positive when X is greater than xbar and negative when x is less than xbar.

will be positive when y is greater than xbar and negative when y is less than ybar.

Will be positive when X is greater than xbar and y is greater than ybar(the upper right hand quadrant of a scatterplot)

Will be positive when X is less than xbar and y is less than ybar(the lower left hand quadrant of a scatterplot)

Will be negative when X is less than xbar and y is greater than ybar(the upper left hand quadrant of a scatterplot)

Will be positive when X is greater than xbar and y is less than ybar(the lower right hand quadrant of a scatterplot)

The data in Fig 3.3 (f) are approximately equally distributed in lower left and upper right quadrants (positive cross-products) as they are in the upper left and lower right quadrants (negative cross-products). For this reason, summing the cross products will lead to a near zero sum and thus will be approximately zero.

Since , will be approximately zero.