Problem 1

(a) The lag one autocorrelation for Series A will be strongly positive since neighboring points in time are almost universally on the same side of the mean. The scale is not relevant. The lag one autocorrelation for Series B, on the other hand, will be strongly negative since neighboring points in time are almost universally on opposite sides of the mean.

(b) The lag two autocorrelation for Series A will also be positive again since points two apart in in time are almost universally on the same side of the mean. The lag two autocorrelation for Series B will be (strongly) positive since points two apart in time are almost uniersally on the same side of the mean.

Problem 2

(a) $\rho_1 = 0.6, \rho_5 = (0.6)^5 = 0.07776$

(b)

```
Autocorrelations of series ‘’series , by lag

    1      2      3      4      5
0.422  0.057 −0.106 −0.108 −0.091
```

The standard error of r_1 is $\sqrt{(1-\phi^2)/n} = \sqrt{(1-(0.6)^2)/48} = \sqrt{0.01333333} = 0.11547$ and of r_5 is $\sqrt{\frac{1}{n}[\frac{1+\phi^2}{1-\phi^2}]} = \sqrt{\frac{1}{48}[\frac{1+(0.6)^2}{1-(0.6)^2}]} = 0.2104064$. With these standard errors in mind, the estimates of 0.422 and -0.091 are good estimate of r_1 and r_5.

```
Autocorrelations of series ‘’series , by lag

    1      2      3      4      5
0.527  0.259 −0.017 −0.085 −0.093
```

The standard error of r_1 is $\sqrt{(1-\phi^2)/n} = \sqrt{(1-(0.6)^2)/48} = \sqrt{0.01333333} = 0.11547$ and of r_5 is $\sqrt{\frac{1}{n}[\frac{1+\phi^2}{1-\phi^2}]} = \sqrt{\frac{1}{48}[\frac{1+(0.6)^2}{1-(0.6)^2}]} = 0.2104064$. With these standard errors in mind, the estimates of 0.527 and -0.093 are not good estimate of r_1 and r_5.

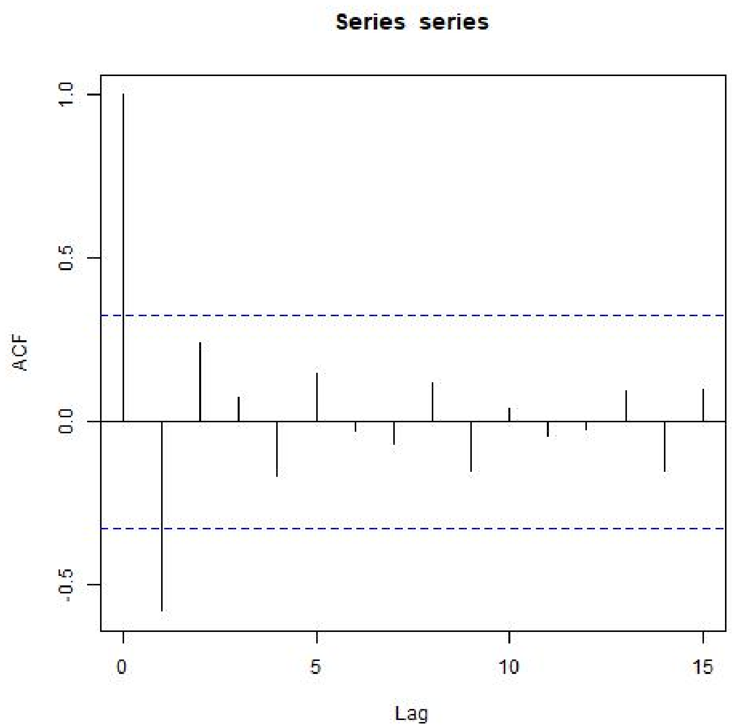
(d) From R, the mean of r_1 is 0.5285988 and the median is 0.5391729. This agrees with the observed skewness toward the lower values. The standard deviation is 0.1242305 which agrees well with asymoptotic theory.

the mean of r_5 is 0.03439699 and the median is 0.0343186. This agrees with the near symmetry of distribution of r_5. The standard deviation is 0.1714892 which agrees reasonably with asymoptotic theory.

Problem 3

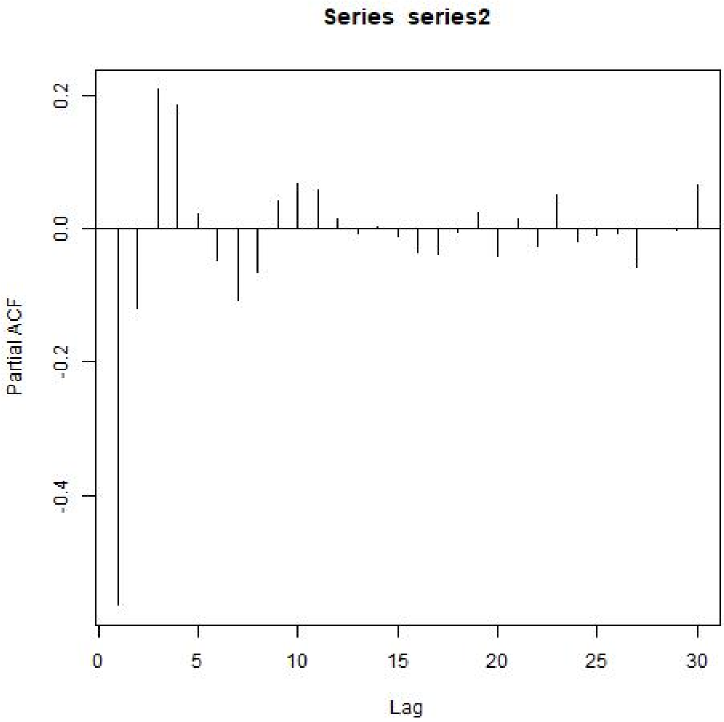
(a) $r_1 = -0.6034483$, $r_2 = 0.2873563$, for time lag $k > 2$, $r_k = 0$.

(b)

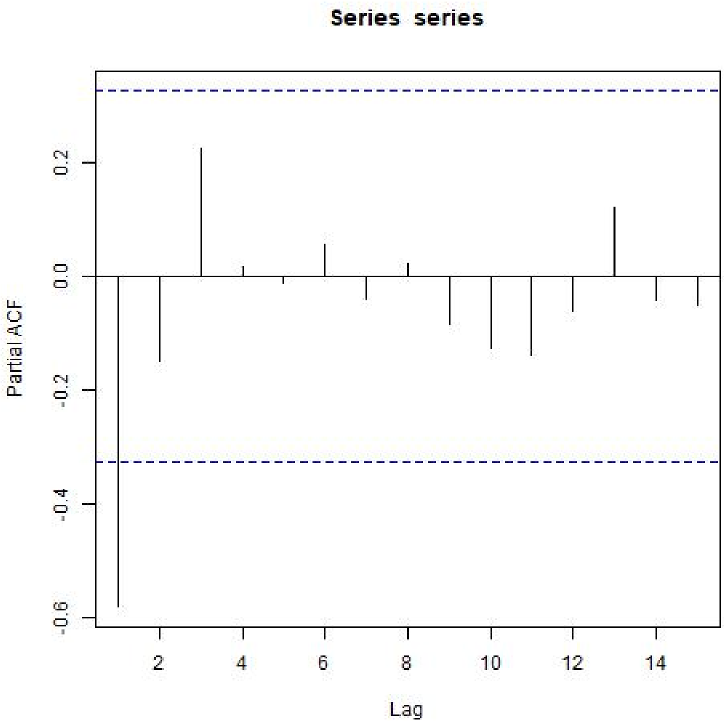


With this small sample size we only get a reasonably good match at lag 1 and 2.

(c)


Series series2
Partial ACF
0.2
0.0
-0.2
-0.4
0
5
10
15
20
25
30
Lag

(d)


Series series
Partial ACF
0.2
0.0
-0.2
-0.4
-0.6
2
4
6
8
10
12
14
Lag

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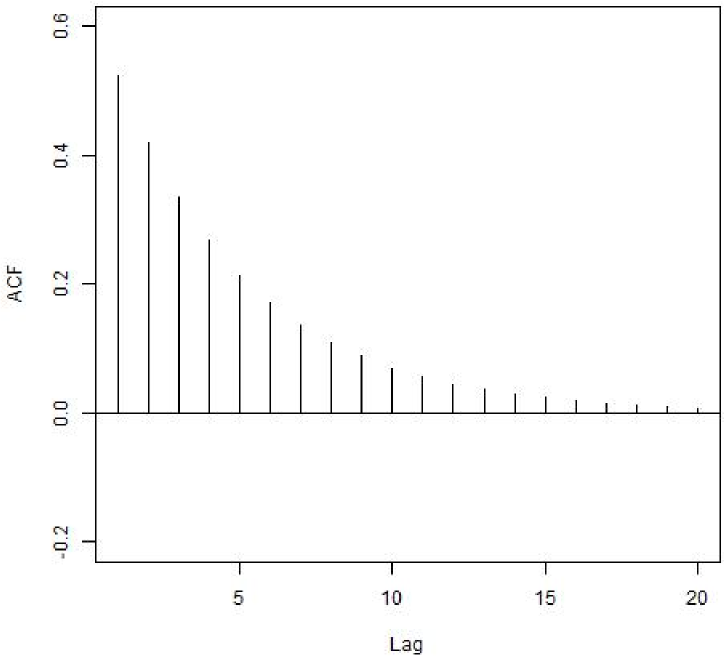
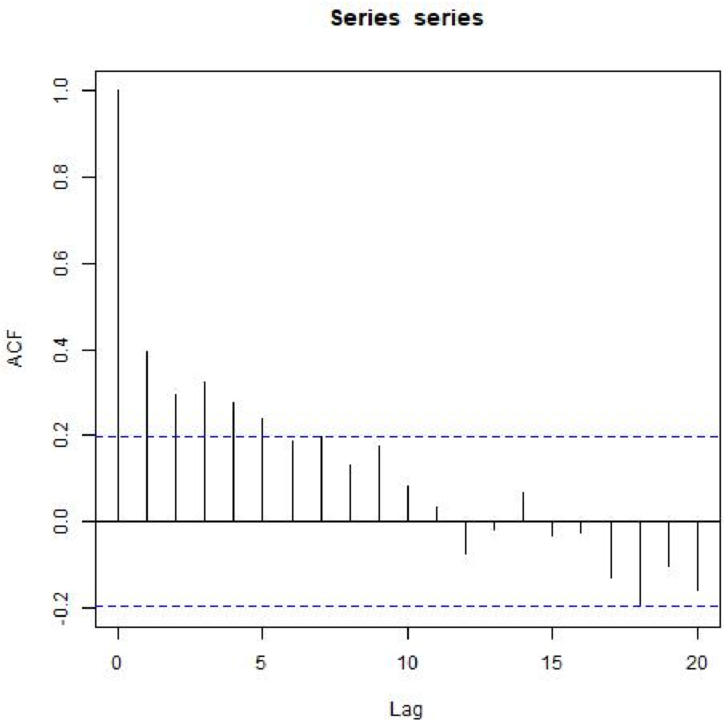
The first 3 partials match the theorectical pattern well.

Problem 4

(a)



(b)

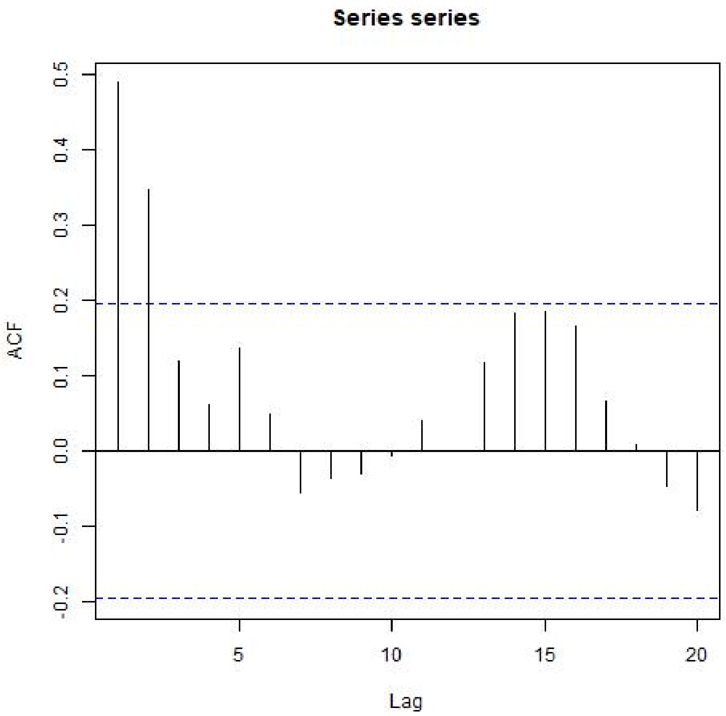


The sample ACF only matches the first 3 time lag. It is because of sample size.

```
> eacf(series)
AR/MA
  0 1 2 3 4 5 6 7 8 9 10 11 12 13
0 x x o o o o o o o x x  o  o  o
1 x o o o o o o o o o o  o  o  o
2 x x o o o o o o o o o  o  o  o
3 x x o o o o o o o o o  o  o  o
4 x o o o o o o o o o o  o  o  o
5 x o o o o o o o o o o  o  o  o
6 x o o x o o o o o o o  o  o  o
7 o x x o o o o o o o o  o  o  o
```

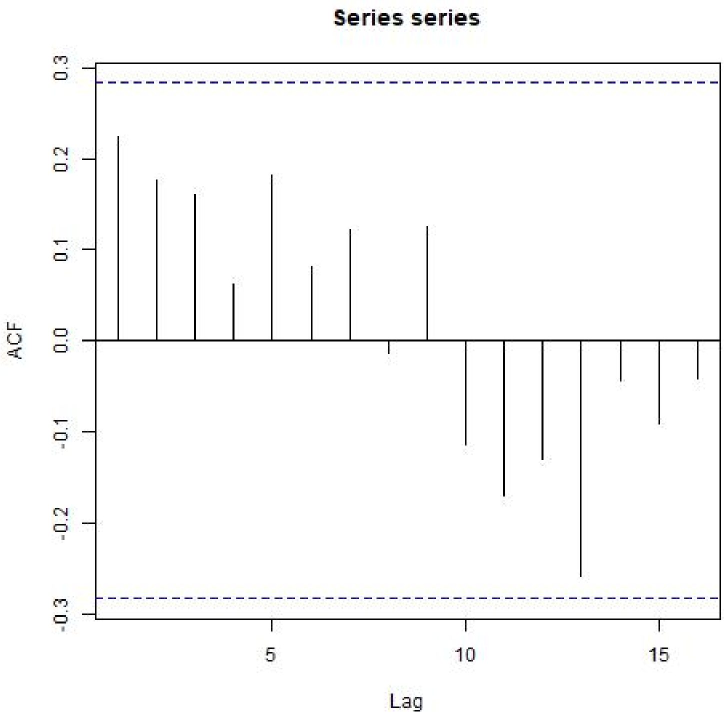
This sample EACF points to the MA rather than ARMA(1,1).

(d)




```
> eacf(series)
AR/MA
  0 1 2 3 4 5 6 7 8 9 10 11 12 13
0 x x o o o o o o o o o  o  o  o
1 x x o o o o o o o o o  o  o  o
2 x o o o o o o o o o o  o  o  o
3 o x o o o o o o o o o  o  o  o
4 o x o o o o o o o o o  o  o  o
5 x x o o o o o o o o o  o  o  o
6 x x x o o o o o o o o  o  o  o
7 x x o o o o o o o o o  o  o  o
```

(e)

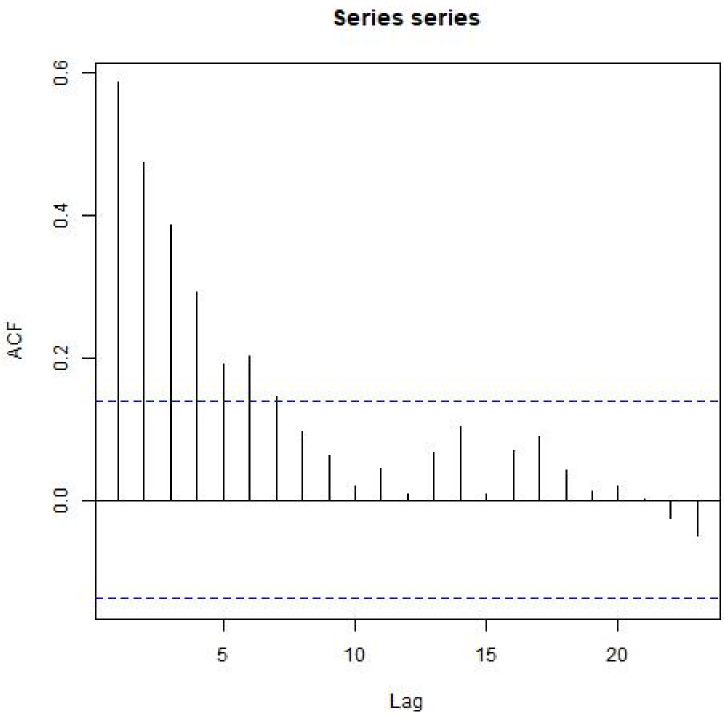



```
> eacf(series)
```

AR/MA

	0	1	2	3	4	5	6	7	8	9	10	11	12	13
0	o	o	o	o	o	o	o	o	o	o	o	o	o	o
1	x	o	o	o	o	o	o	o	o	o	o	o	o	o
2	x	o	o	o	o	o	o	o	o	o	o	o	o	o
3	o	o	o	o	o	o	o	o	o	o	o	o	o	o
4	o	o	x	x	o	o	o	o	o	o	o	o	o	o
5	o	o	o	o	o	o	o	o	o	o	o	o	o	o
6	x	o	o	o	o	o	o	o	o	o	o	o	o	o
7	x	o	o	o	o	o	o	o	o	o	o	o	o	o

(f)




```
> eacf(series)
```

AR/MA

	0	1	2	3	4	5	6	7	8	9	10	11	12	13
0	x	x	x	x	x	x	x	o	o	o	o	o	o	o
1	x	o	o	o	o	o	o	o	o	o	o	o	o	o
2	x	x	o	o	o	o	o	o	o	o	o	o	o	o
3	o	x	o	o	o	o	o	o	o	o	o	o	o	o
4	o	x	o	o	o	o	o	o	o	o	o	o	o	o
5	x	x	x	o	o	o	o	o	o	o	o	o	o	o
6	x	x	x	x	o	x	o	o	o	o	o	o	o	o
7	x	o	o	x	o	o	o	o	o	o	o	o	o	o