

36-467 Homework 3

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Question 1

The dates of the 4 leap days are as follows:

Table 1: Row numbers & Dates of leap days

	day	month	year
1155	29	2	64
2616	29	2	68
4077	29	2	72
5538	29	2	76

Question 2

Q2 a) The mean wind speed on Jan 1 in Dublin is 12.677.

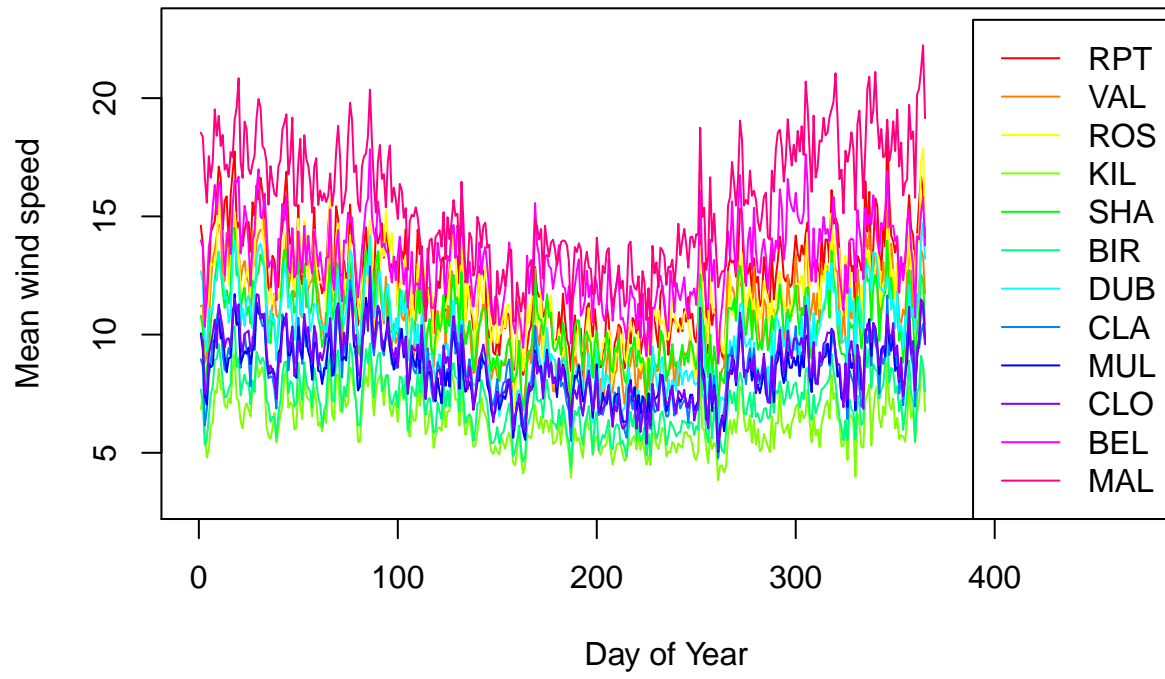
Q2 b) The mean wind speed on Jan 1 at each location is as follows:

Table 2: Mean wind speed on 1st Jan at locations

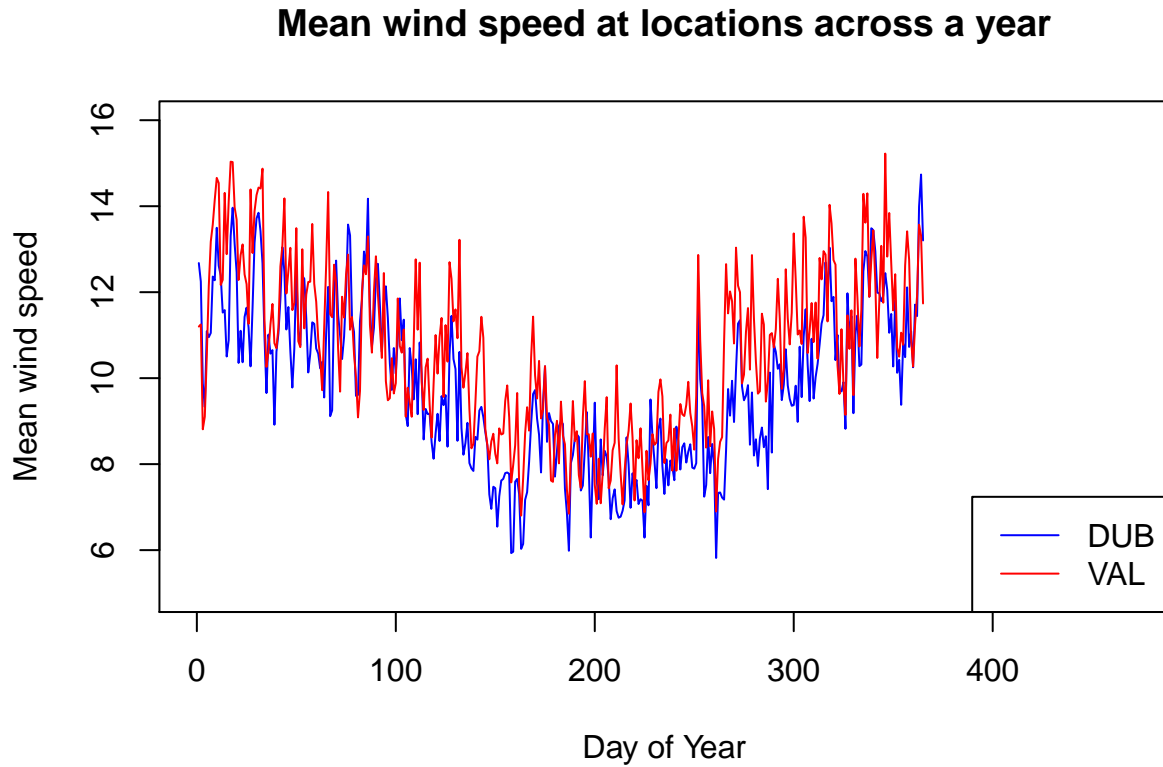
	Mean wind speed
RPT	14.61000
VAL	11.20056
ROS	12.93167
KIL	6.84556
SHA	10.79833
BIR	7.67833
DUB	12.67722
CLA	8.95278
MUL	10.05722
CLO	9.93667
BEL	13.98722
MAL	18.53667

Q2 c)

Mean wind speed at locations across a year



Q2 d)

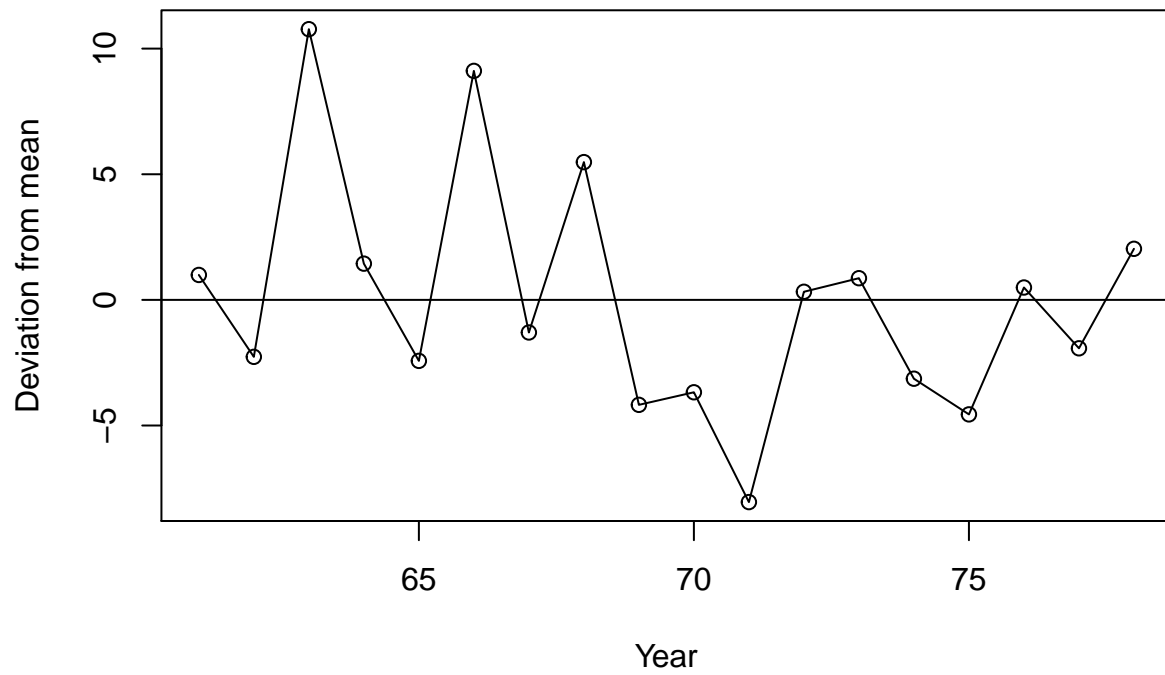


Both mean wind speeds at Dublin and Valencia seem to follow a seasonal sinusoidal pattern where the period looks like a year (365 days), with the peak at the start and end of a year and trough in the middle of the year. For both locations, the wind speeds seem to be roughly the same at the same points of time throughout the year, with Valencia having just slightly higher wind speeds sometimes.

Question 3

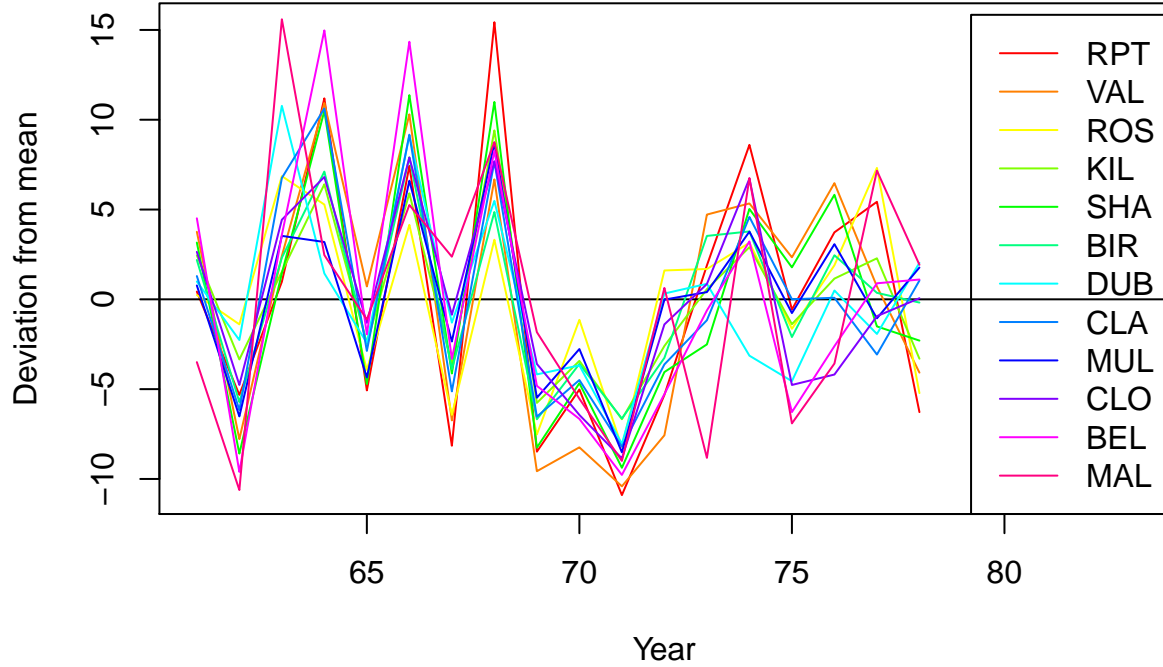
Q3 a)

Plot of wind speed deviation at Dublin on Jan 1 against the years



Q3 b)

Plot of wind speed deviation on Jan 1 against the years



Q3 c)

Table 3: Summaries of detrended wind speeds

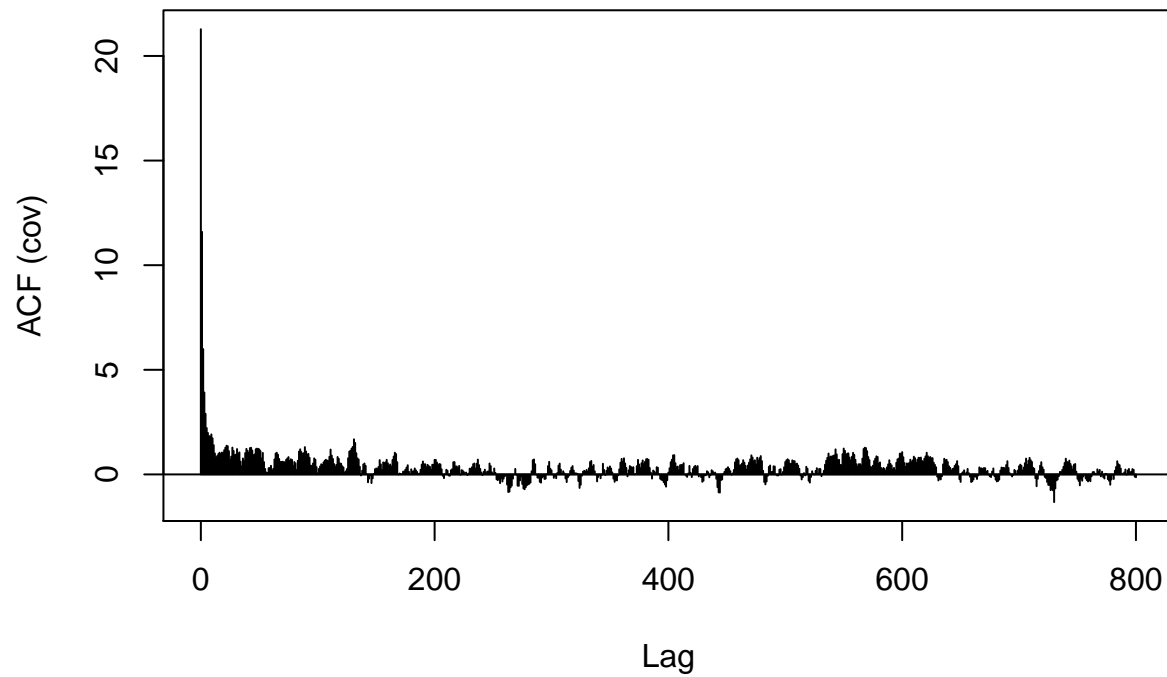
	RPT	VAL	ROS	KIL	SHA	BIR
Min.	-15.21778	-13.22944	-12.09500	-8.59889	-11.90111	-10.03500
1st Qu.	-3.80458	-3.56611	-3.32778	-2.47167	-3.44306	-2.84819
Median	-0.46861	-0.27861	-0.53306	-0.42639	-0.41083	-0.17194
Mean	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3rd Qu.	3.27083	3.16861	2.83833	2.08306	3.05083	2.54319
Max.	20.35222	19.08167	20.34833	21.05333	24.01500	16.53833

	DUB	CLA	MUL	CLO	BEL	MAL
Min.	-11.75389	-10.76944	-10.84500	-10.84889	-14.75111	-18.32111
1st Qu.	-3.36208	-3.19708	-2.92833	-3.19944	-4.14778	-4.57361
Median	-0.38861	-0.32472	-0.25389	-0.32639	-0.31472	-0.41639
Mean	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3rd Qu.	2.86153	2.77875	2.64986	2.84653	3.66972	3.95375
Max.	18.21111	20.84889	15.82667	17.71722	27.02333	22.14000

Question 4

Q4 a)

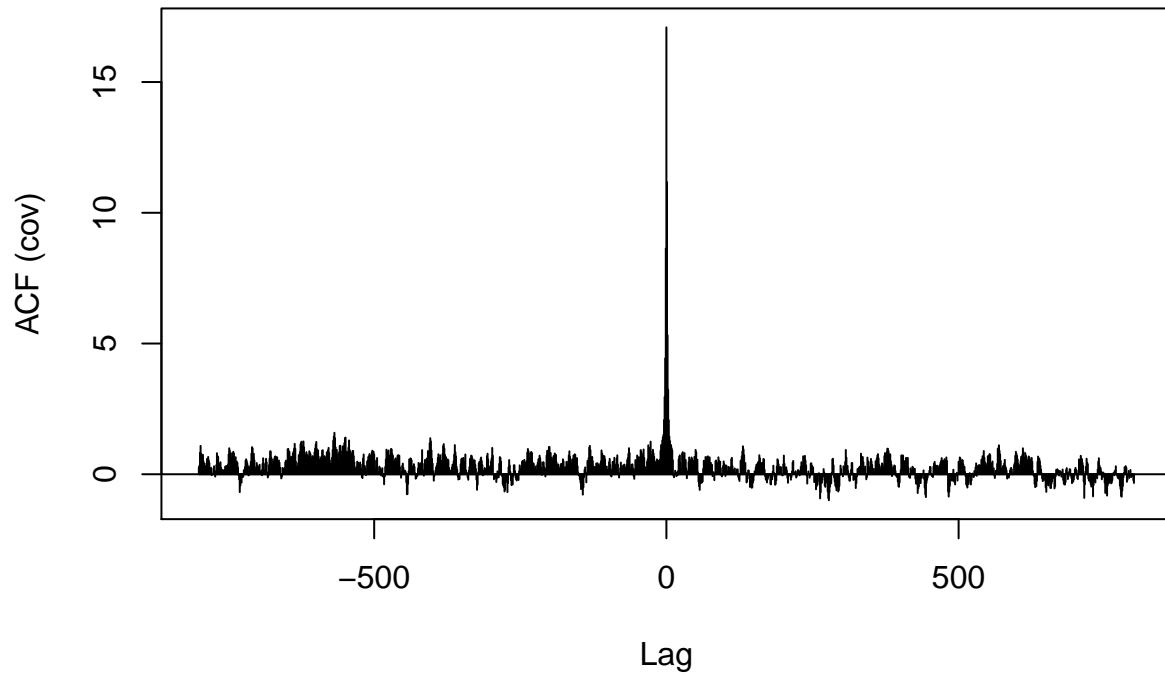
Autocovariance of Wind Speeds in Dublin



Compared to the auto-correlation plot in the previous homework, this auto-covariance plot lacks the obvious sinusoidal trend that was present in the previous one.

Q4 b)

Autocovariance of Wind Speeds in Dublin



Compared to the cross-correlation plot in the previous homework, this cross-covariance plot lacks the obvious sinusoidal trend that was present in the previous one.

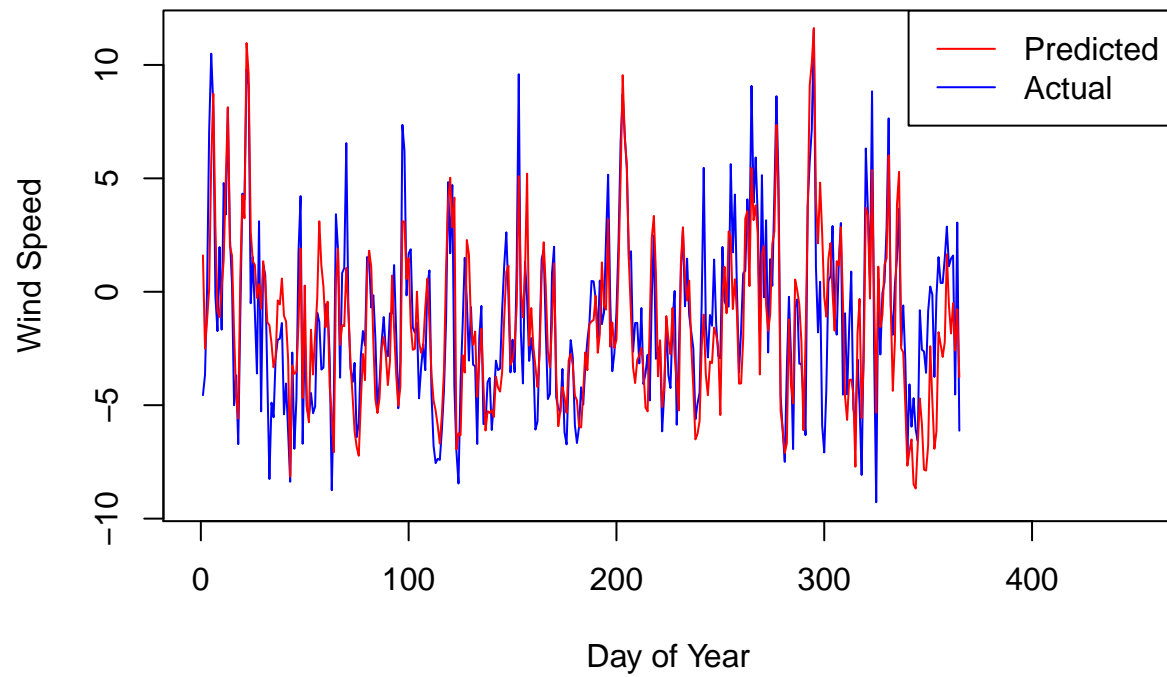
Q4 c)

Table 5: Model coefficients

	Coefficients
Intercept	-0.18169
$X(t-1, \text{DUB})$	0.26792
$X(t, \text{SHA})$	0.69498

Q4 d)

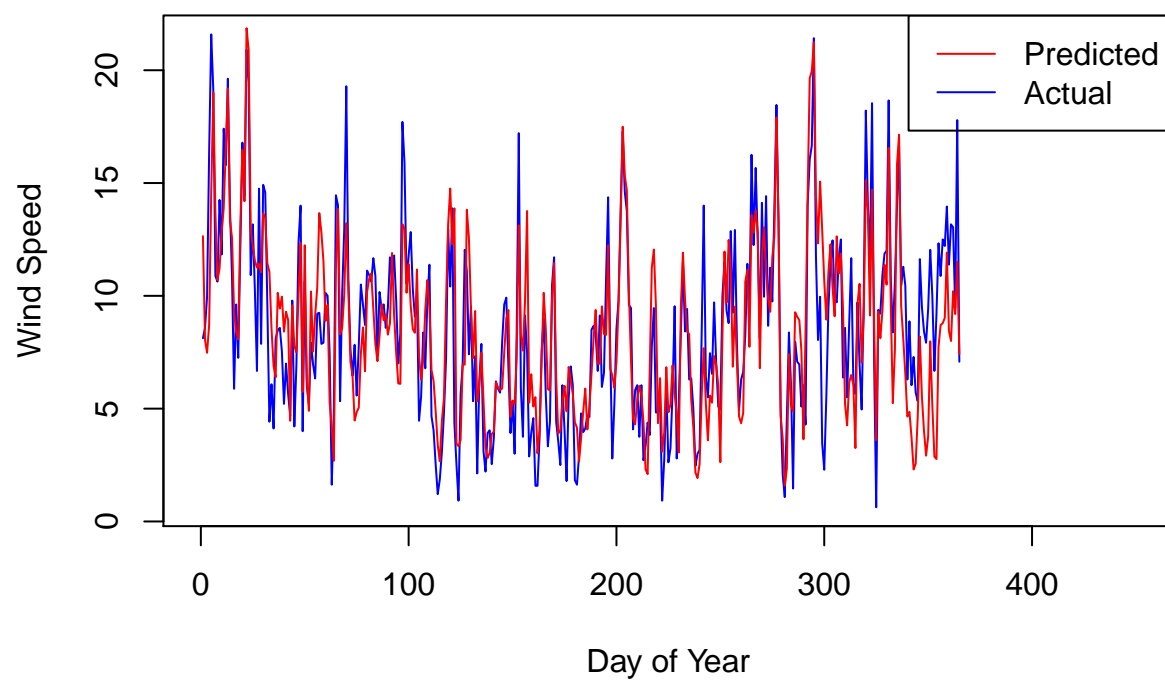
Plot of Predicted & Actual Wind Speed in Dublin across 1975



The root-mean-squared error is 2.374.

Q4 e)

Plot of Predicted & Actual Wind Speed in Dublin across 1975



The root-mean-squared error is 2.5431.