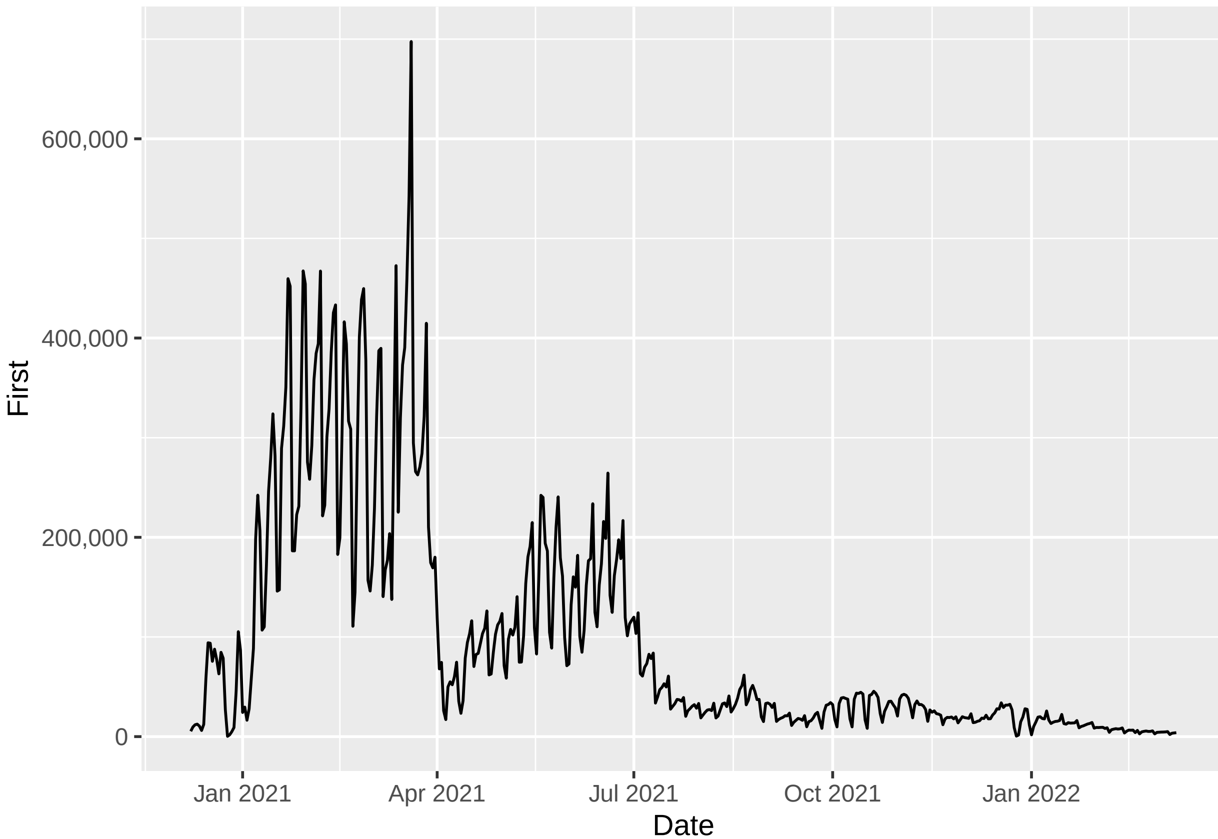
Contents

0.1 Model for England

Look at the dataset.

	Date	First	Second	Third
457	2020-12-08	5370	146	0
456	2020-12-09	9648	137	2
455	2020-12-10	11888	119	1
454	2020-12-11	12516	82	1
453	2020-12-12	10565	23	3
452	2020-12-13	6134	30	0



What can we say?

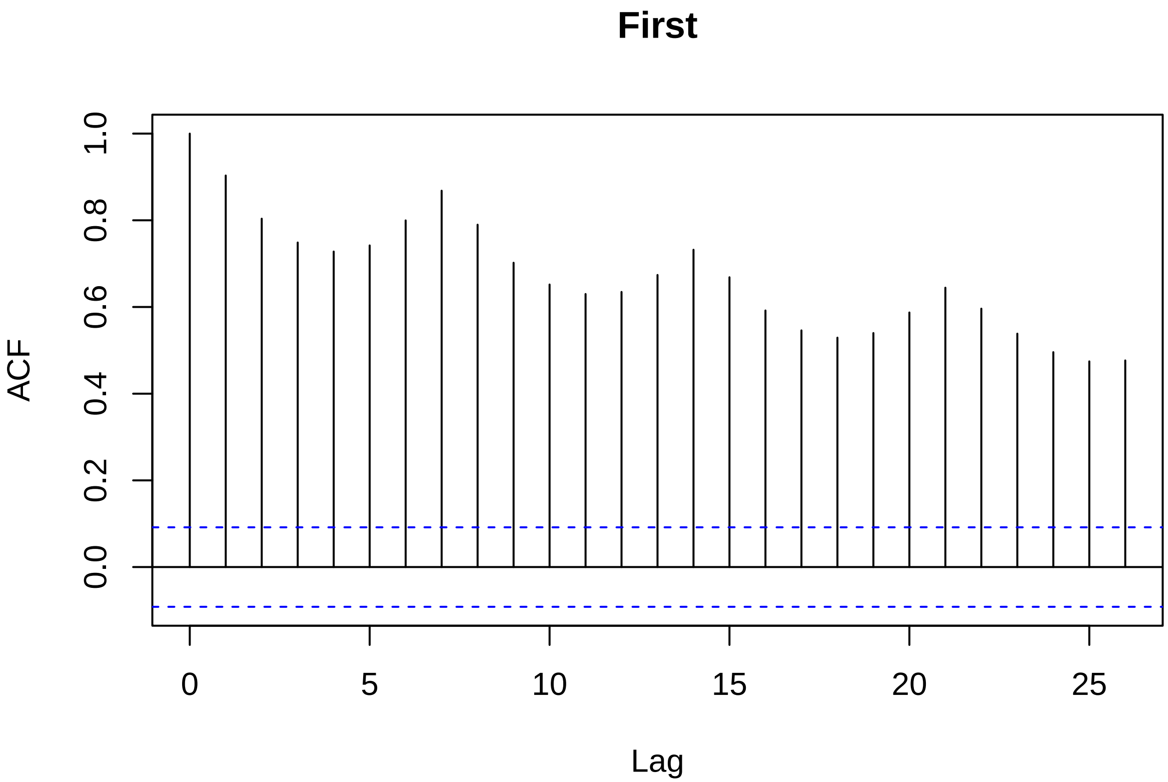
There is a not stationary time series, as the series wanders up and down for long periods.

```
## Series: englandFit
## ARIMA(5,1,3)
##
## Coefficients:
##          ar1      ar2      ar3      ar4      ar5      ma1     ma2      ma3
##       0.1844  -0.8187  -0.1423  -0.2771  -0.5162  -0.4280  0.7674  -0.1984
## s.e.  0.0609   0.0472   0.0701   0.0406   0.0472   0.0646  0.0465   0.0534
##
## sigma^2 = 1.382e+09:  log likelihood = -5443.42
```

```
## AIC=10904.84   AICc=10905.24   BIC=10941.94
##
## Training set error measures:
##                      ME     RMSE      MAE       MPE     MAPE      MASE
## Training set -18.47453 36805.03 19210.84 -40.98583 58.06987 0.7904012
##                     ACF1
## Training set -0.03255101
```

ARIMA(5, 1, 3) ARIMA(p,d,q)

- p - is the order of Auto-regressive or linear model
- q – is the order of Moving Average/ number of lagged values
- d- difference value to make the time series stationary from non-stationary. If the data is stationary, then d=0. So, I was right earlier.

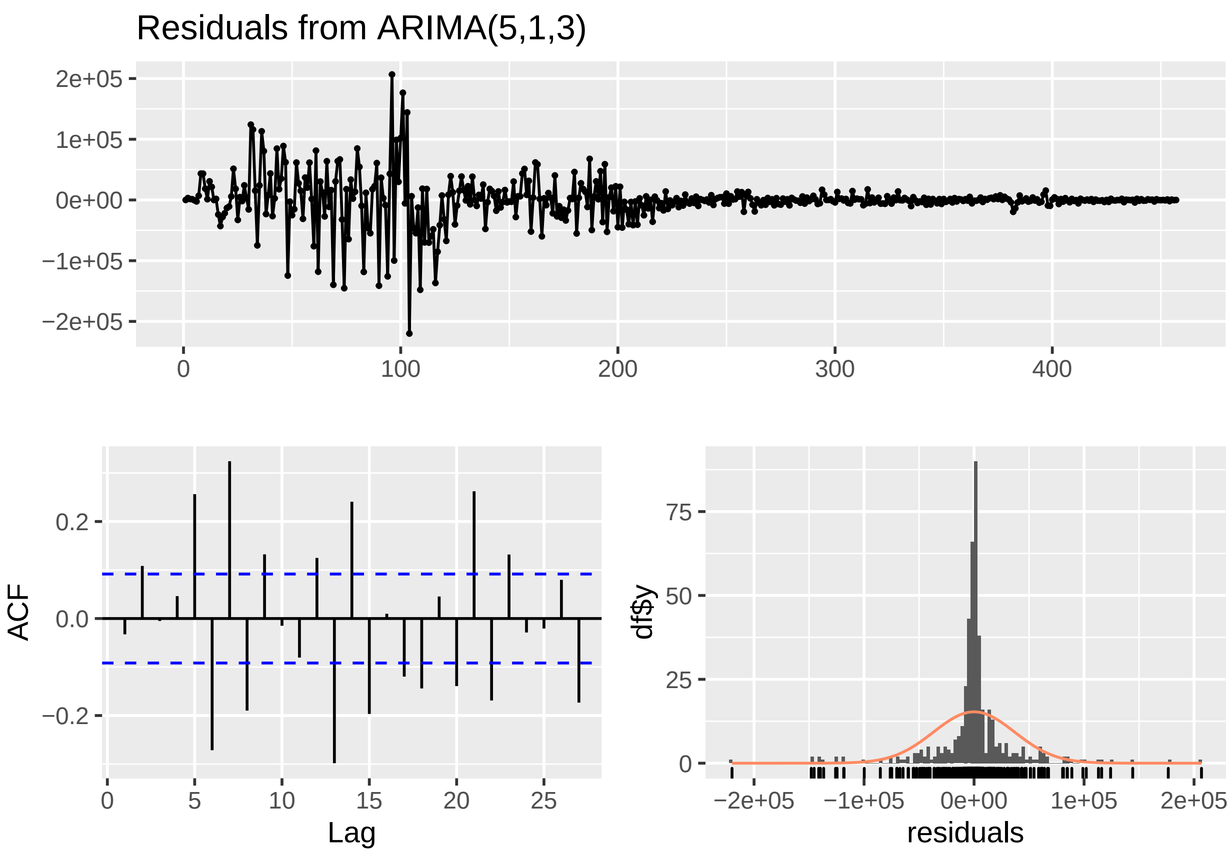


As we know, the autocorrelation function (ACF) assesses the correlation between observations in a time series for a set of lags. In an ACF plot, each bar represents the size and direction of the correlation. Bars that extend across the blue line are statistically significant.

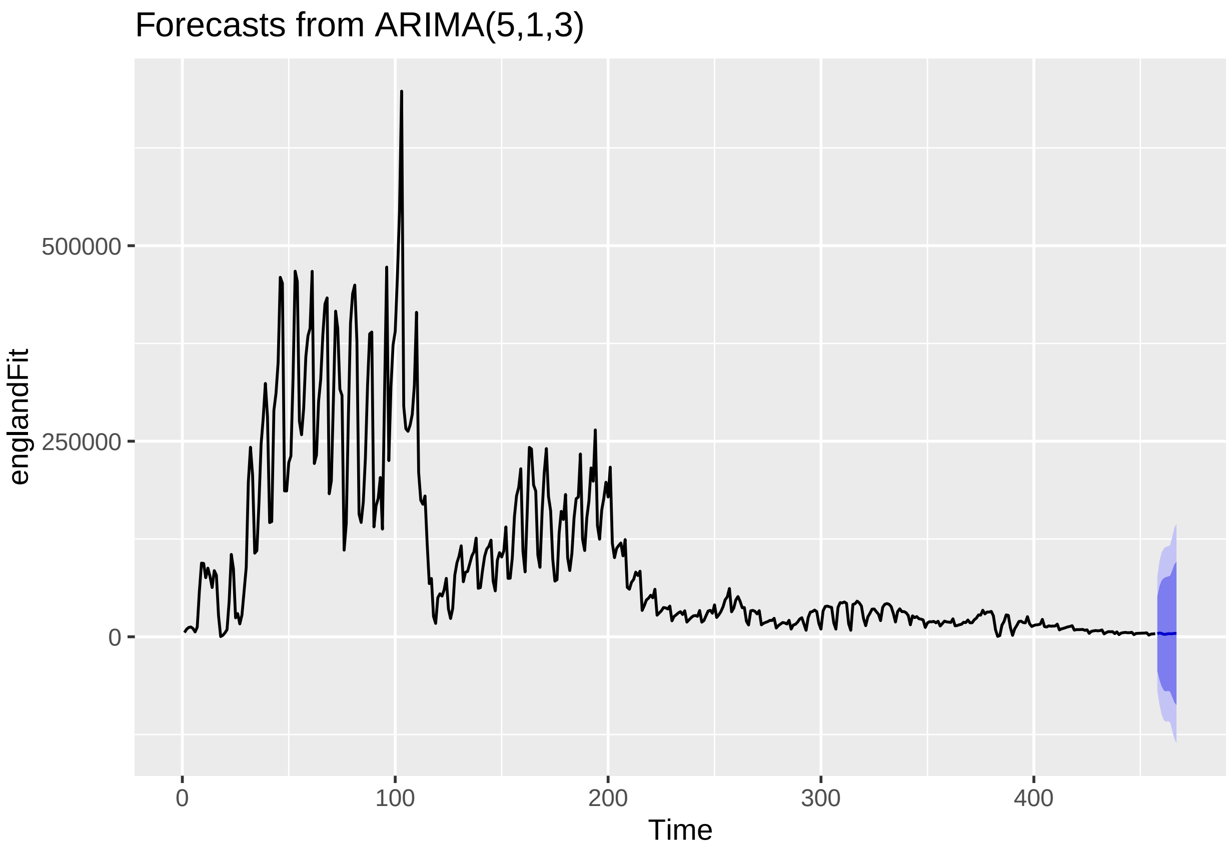
So,

- this ACF plot indicates that these time series data are not random.
- the autocorrelations decline slowly.
- When a time series has both a trend and seasonality, the ACF plot displays a mixture of both effects. Notice how you can see the wavy correlations for the seasonal pattern and the slowly diminishing lags of a trend.

The residuals in ARIMA models tell a story about the performance of your model and should be taken into consideration when evaluating them. The functions checkresiduals, ACF and PACF make it easy to keep track of the information left behind in the residuals by your model. https://towardsdatascience.com/time-series-analysis-with-auto-arima-in-r-2b220b20e8ab



```
##
##  Ljung-Box test
##
## data:  Residuals from ARIMA(5,1,3)
## Q* = 148.81, df = 3, p-value < 2.2e-16
##
## Model df: 8.   Total lags used: 11
```




```
forecast(fit)$lower
```

```
## Time Series:
```

```
## Start = 458
## End = 467
## Frequency = 1
##           80%        95%
## 458 -43782.97  -69001.52
## 459 -54927.77  -86548.71
## 460 -63249.94  -98986.75
## 461 -68432.48 -106338.20
## 462 -69923.65 -108617.74
## 463 -69190.35 -107892.99
## 464 -70108.61 -109273.86
## 465 -77076.64 -119910.27
## 466 -83815.86 -130472.92
## 467 -87430.74 -135959.13
```

```
forecast(fit)$upper[1,]
```

```
##      80%      95%
## 51494.96 76713.51
```