

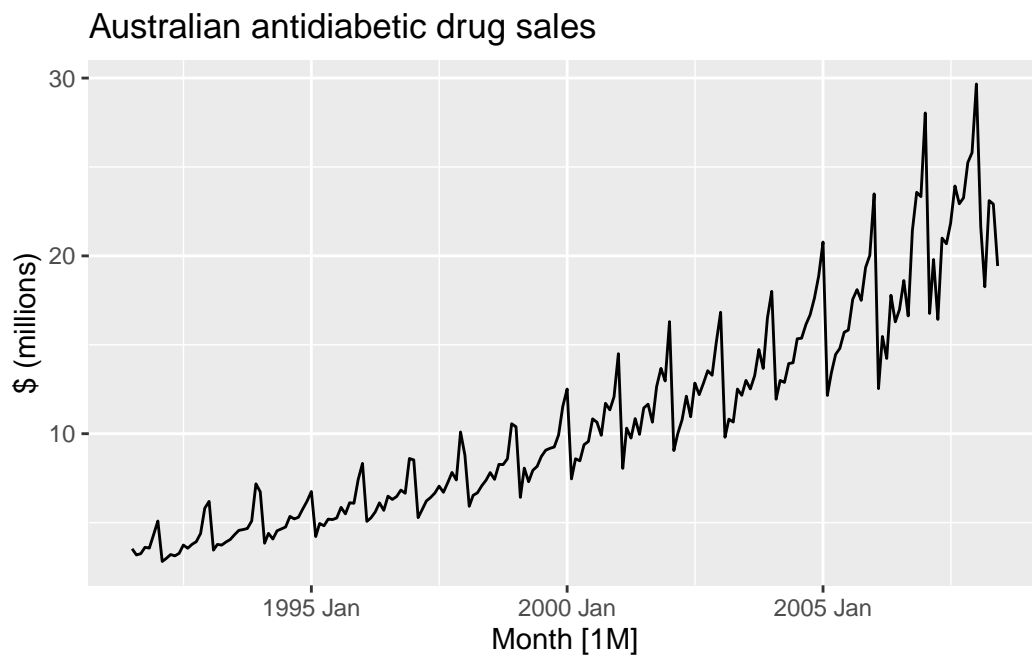
Forecasting Methods

Mock Exam

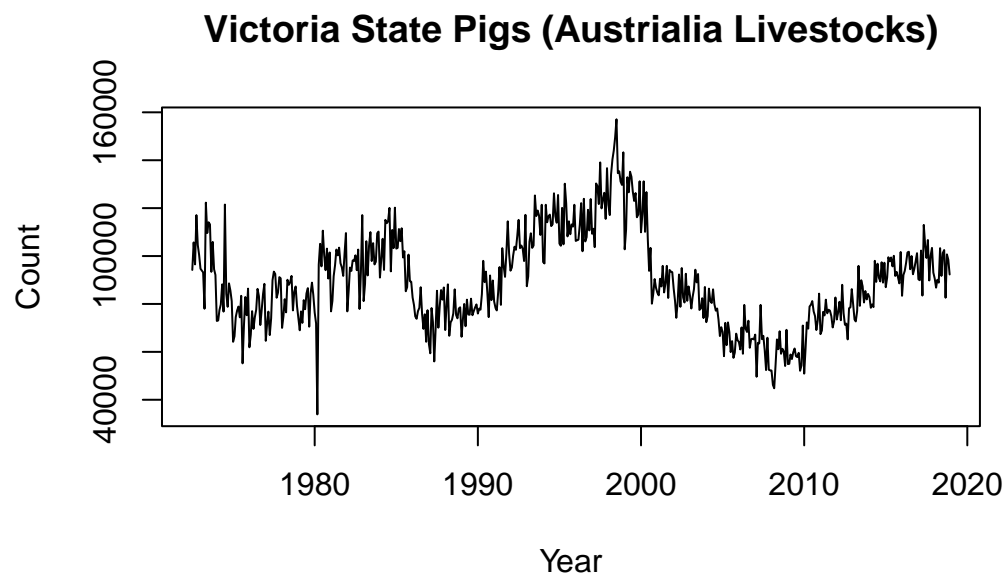
Question 1 (25 points)

Explain the following plots in relation to the components of a time series.

(a)

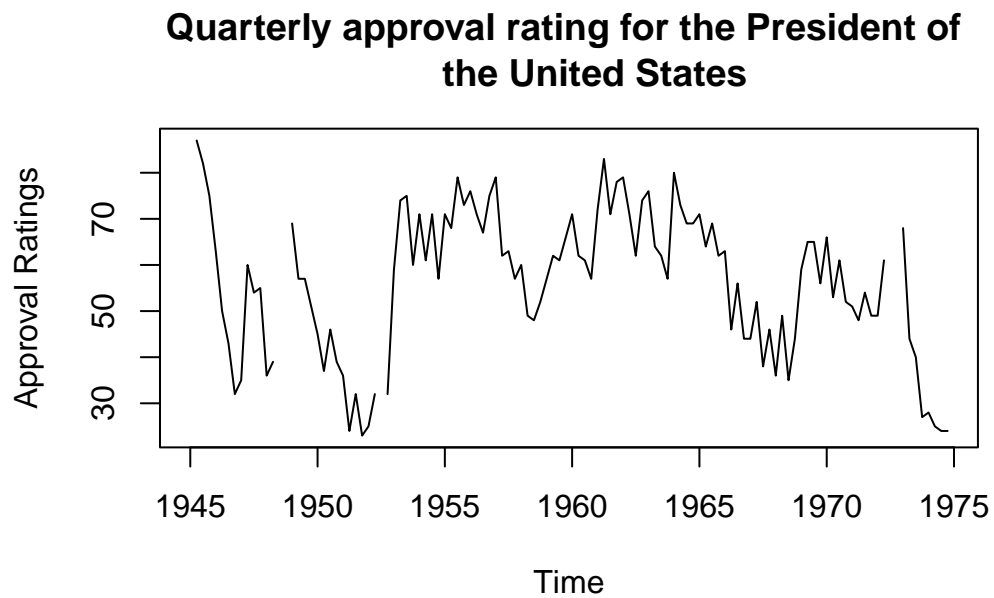


(b)

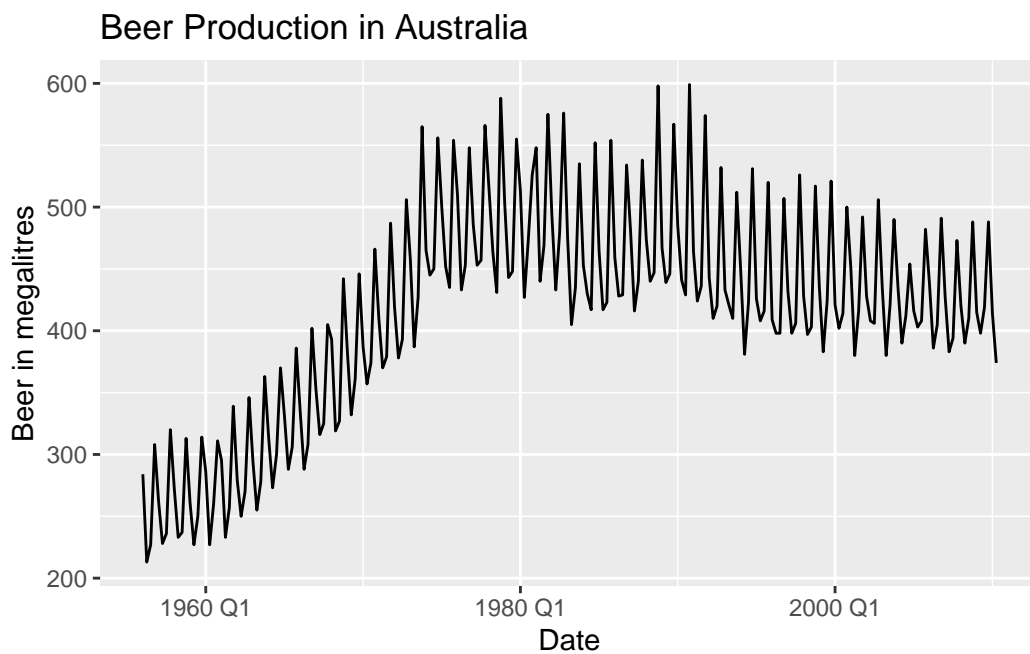


Identify the components of the given time series. State and explain an appropriate model that can be applied.

(c)



(d)



Question 2 (25 points)

(a) Is this series stationary? Explain

```
#####  
# Augmented Dickey-Fuller Test Unit Root Test #  
#####
```

Test regression none

Call:

```
lm(formula = z.diff ~ z.lag.1 - 1 + z.diff.lag)
```

Residuals:

Min	1Q	Median	3Q	Max
-122.86	-18.67	9.06	29.48	184.03

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
z.lag.1	-0.18769	0.04931	-3.806	0.000181	***
z.diff.lag	-0.38891	0.06172	-6.302	1.47e-09	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 42.38 on 232 degrees of freedom

Multiple R-squared: 0.2739, Adjusted R-squared: 0.2676

F-statistic: 43.75 on 2 and 232 DF, p-value: < 2.2e-16

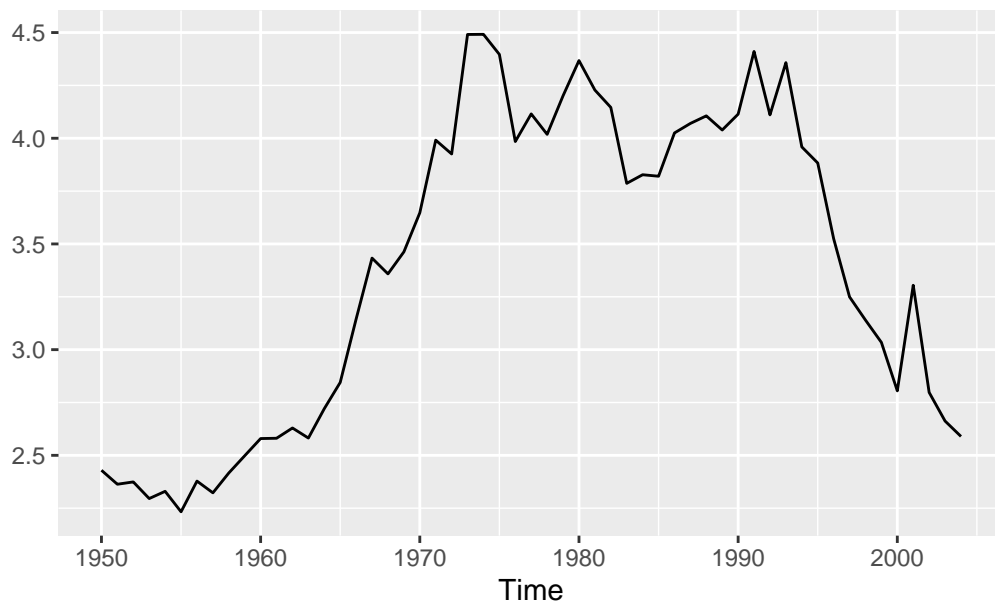
Value of test-statistic is: -3.8061

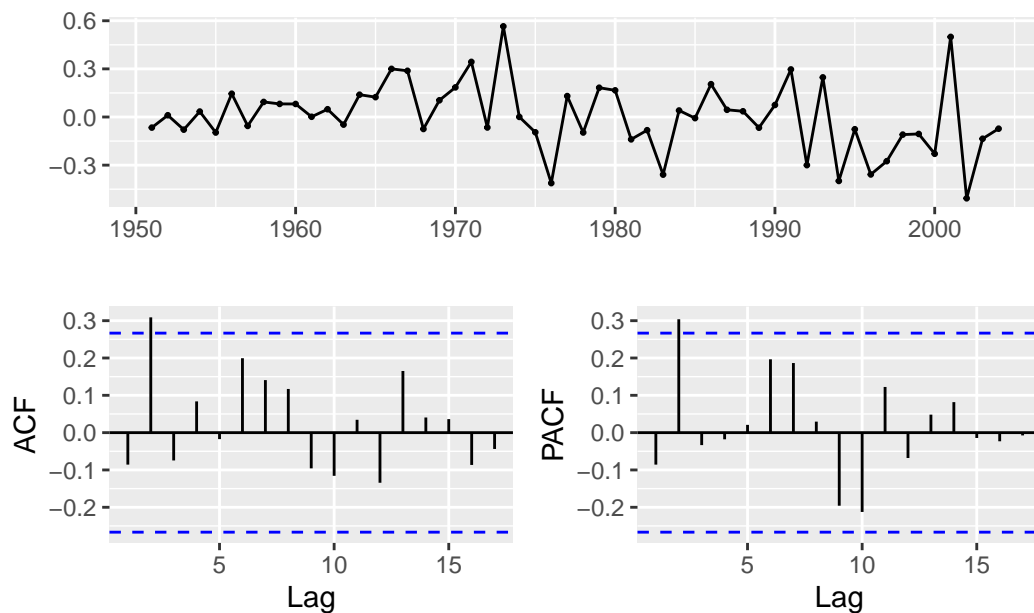
Critical values for test statistics:

	1pct	5pct	10pct
tau1	-2.58	-1.95	-1.62

(b) Analyze the graphs of the original series and the first difference series below.

- Identify an appropriate ARIMA(p,d,q) model.
- Should a constant be included in the ARIMA model? Explain.





Question 3 (25 points)

You are a sales analyst with access to monthly sales data for Lidl supermarket in Oldenburg, Germany, spanning from 1990 to 2020.

- Outline the steps to follow for an accurate sales forecast.
- Explain why data partitioning is important in forecasting.
- What is the minimum duration you should select for your test data? Explain briefly

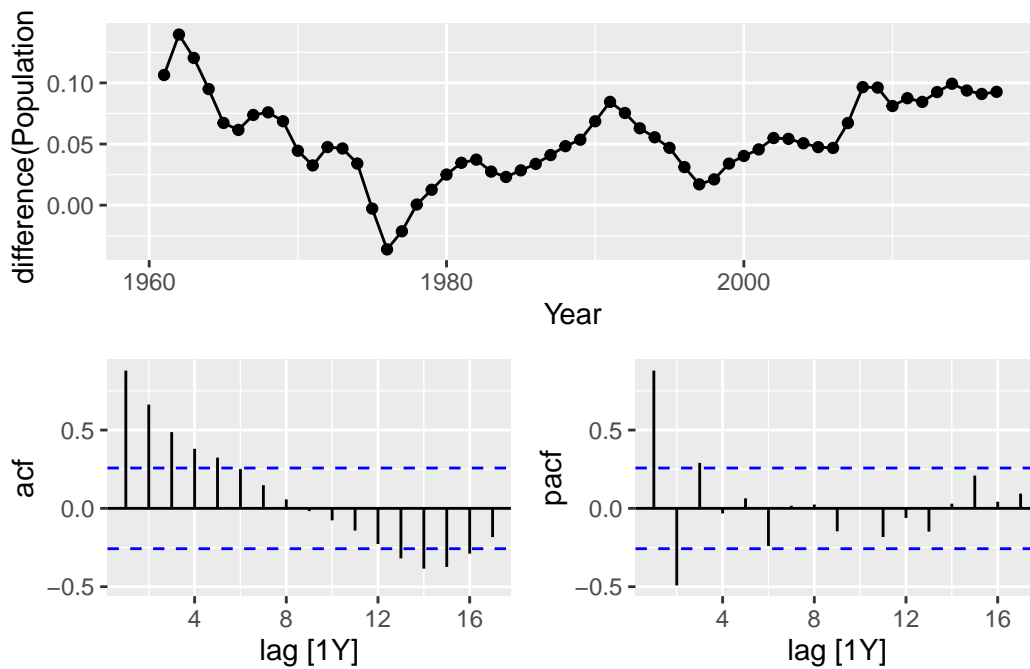
Question 4 (25 points)

(a) Choose the best model and explain?

```
# A tibble: 6 x 2
  .model  AICc
  <chr>    <dbl>
1 arima010 668.
2 arima011 659.
3 arima012 660.
```

4 arima013 662.
 5 arima110 657.
 6 arima111 659.

(b) Explain the selection of the model with parameters $p=3$, $d=1$, and $q=0$ by analyzing the ACF and PACF of the differenced series. Fill in the ARIMA (, ,) notation accordingly.



(c) What condition/s must a time series satisfy to apply an ARMA model, and why are these condition/s important?

(d) State and explain the different types of moving averages.