Covid-19 effects on liquor retailing in Australia

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1/12/2020

In this project, I have tried to analyse the effects of Covid-19 on liquor retailing turnover in Australia. This analysis has been done for the period between January 2020 and October 2020. After visualising the effects, I have then selected appropriate models for the time series to generate turnover forecasts for the next 24 months.

```r
retail_ts <- read_abs ("8501.0", tables = 11)

retail_ts <- retail_ts %>%
  mutate(Month = yearmonth(date)) %>%
  rename(Turnover = value, `Series ID` = series_id) %>%
  select(Month, `Series ID`, series, Turnover)

retail_ts <- retail_ts %>%
  separate(series, c("Category", "State", "Industry"), sep = ";", extra = "drop") %>%
  mutate(
    State = trimws(State),
    Industry = trimws(Industry),
  ) %>%
  select(-Category)

retail_ts <- retail_ts %>%
  as_tsibble(index = Month, key = c(State, Industry)) %>%
  filter(!is.na(Turnover))

mydata_new <- retail_ts %>%
  filter(`Series ID`=="A3349462J")
```
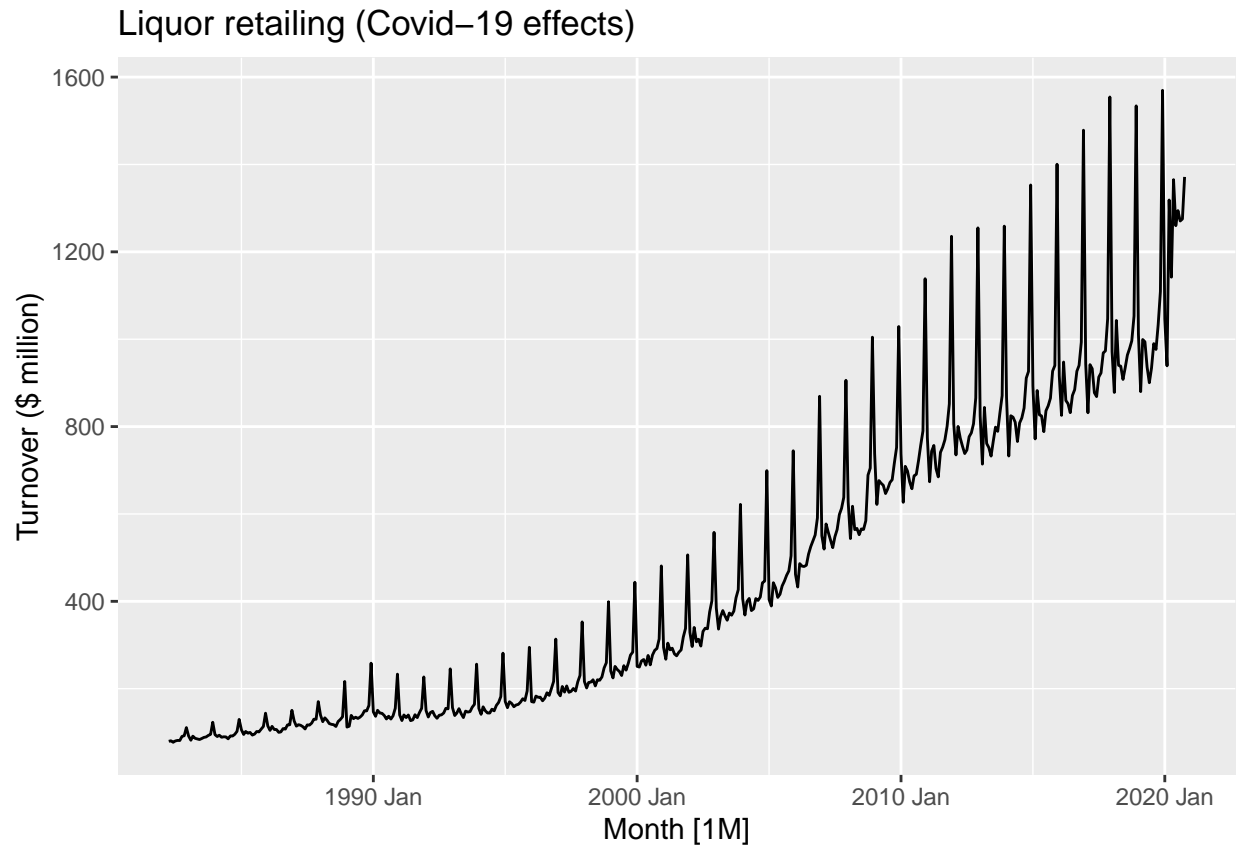
```r
mydata_new %>%
  autoplot(Turnover) +
  ggtitle("Liquor retailing (Covid-19 effects)") +
  ylab("Turnover ($ million)")
```

Liquor retailing (Covid−19 effects)

Here we can observe that the time plot replicates seasonality in 2020 in liquor retailing industry. An upward trend can also be observed in the time series suggesting that this industry has not been badly affected by Covid-19. In fact, there has been an increase in turnover during this period.

```r
mydata_new %>%
  gg_season((Turnover), labels = "both") +
  labs(title = "Seasonal plot") +
  ylab("Turnover ($ million)")
```
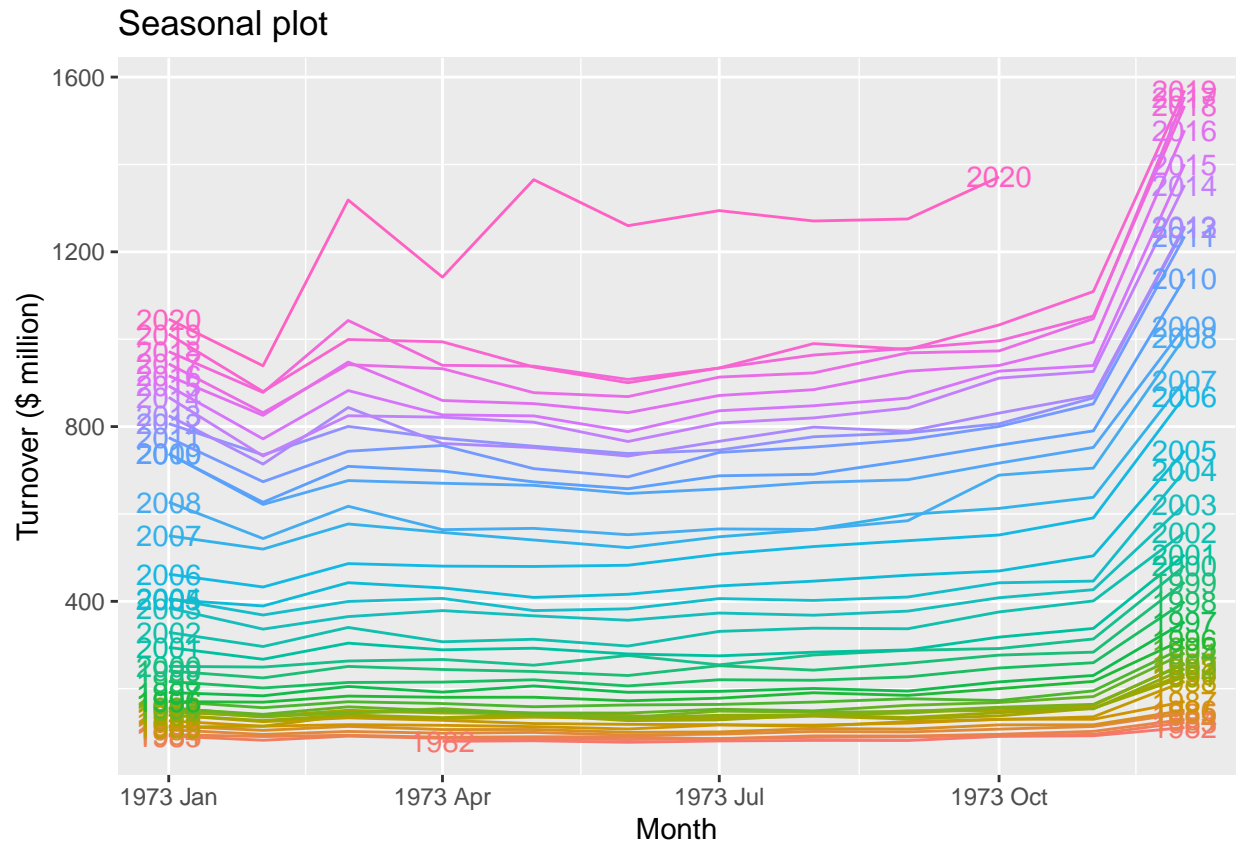
Seasonal plot

This is the seasonal plot which shows turnover from liquor retailing from within each season. When compared to earlier years, it shows a similar pattern for all the months except March. An unsual jump can be observed in the month of March. A plausible reason for this could be that consumers stockpiled supplies of liquor fearing that government would announce closure of bottle shops during the lockdown.

```
fit.new <- mydata_new %>%
  model(ets = ETS(Turnover ~error("M") + trend("A") + season("M")),
        arima = ARIMA(log(Turnover) ~ pdq(3,1,1) + PDQ(0,1,2)))
```

After visualising the time series, I have compared two models to generate forecasts for the next 24 months. First model I have used to genereate forecasts is ETS(M,A,M). Since there's an increase in seasonal variation with the increase in the level of series, multiplicative seasonality is useful. It is better to have a model with multiplicative error as data are strictly positive.

For the ARIMA model, in order to make the time series stationary, taking first difference after seasonal difference makes sense as the time series has strong trend and seasonality. I have chosen ARIMA(2,1,0)(0,1,2). Through automatic selection, R chooses ARIMA(3,1,1)(0,1,2) which has less value of AICc. Hence out of the two, the model selected by R has been used to generate forecasts.

```
fit.fc <- fit.new %>%
  forecast(h=24)

fit.fc %>%
  autoplot(mydata_new, level = NULL) +
  labs(title = "Liquor retailing", subtitle = "Forecasts for the next 24 months")
```
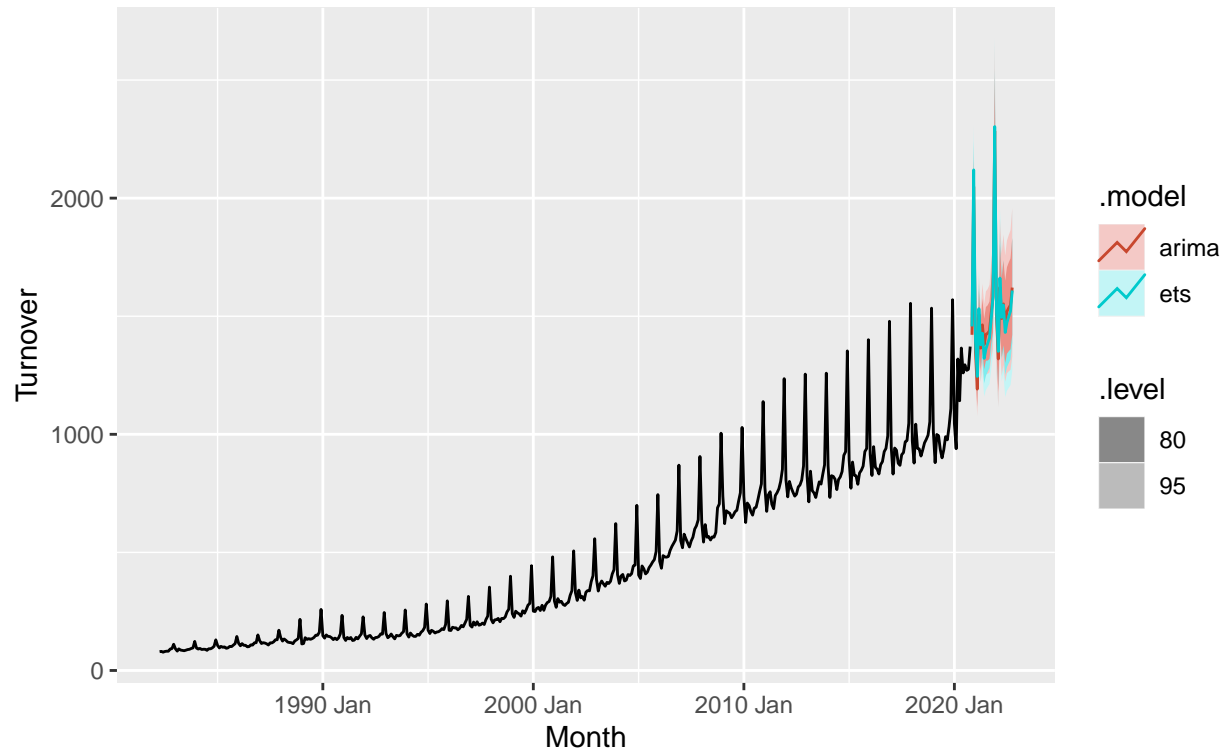
Liquor retailing
Forecasts for the next 24 months
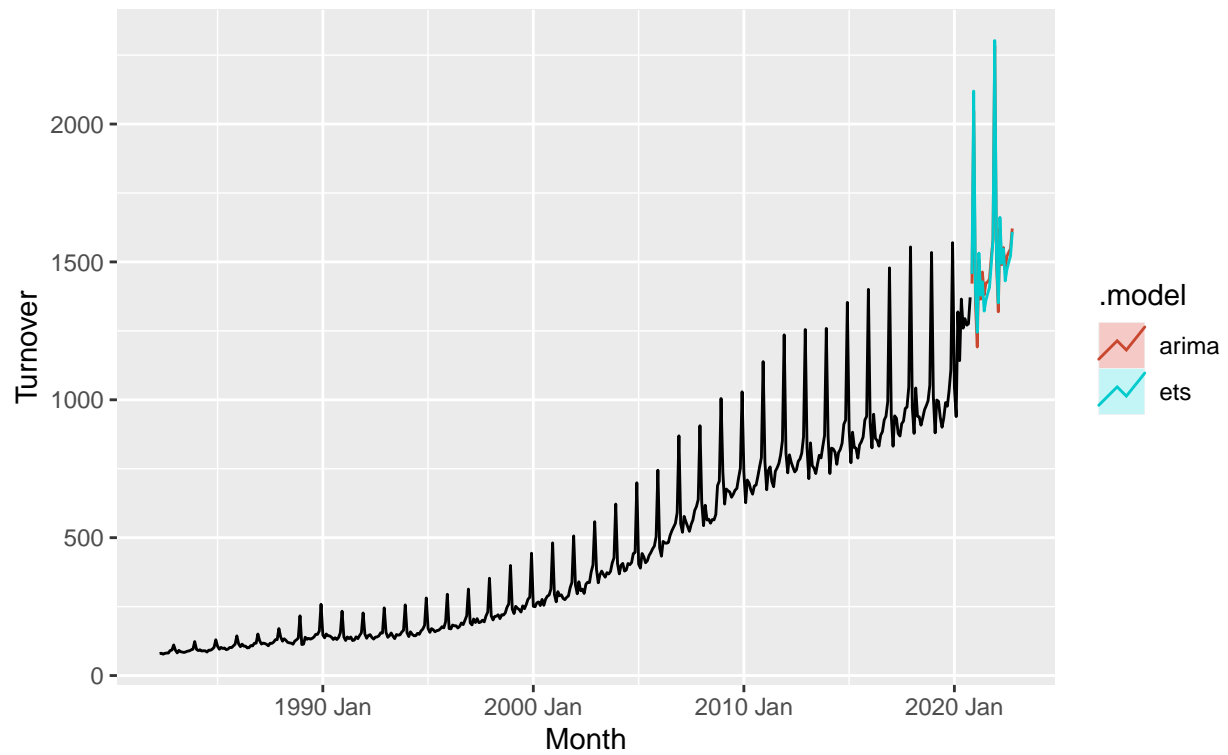

```r
fit.fc %>%
  autoplot(mydata_new) +
  labs(title = "Liquor retailing", subtitle = "Forecasts for the next 24 months with prediction interval
```

Liquor retailing

Forecasts for the next 24 months with prediction intervals

Forecasts from the series shows similar trend and seasonal pattern. Point Forecasts from both ETS and ARIMA models suggests a higher projection in turnover from liquor retailing during the next 24 months. In terms of accuracy, ARIMA model performs better as it gives lower value of AICc. Thus, through this short exercise it can be concluded that Covid-19 has not affected the liquor industry badly so this industry is expected to flourish in future as well.