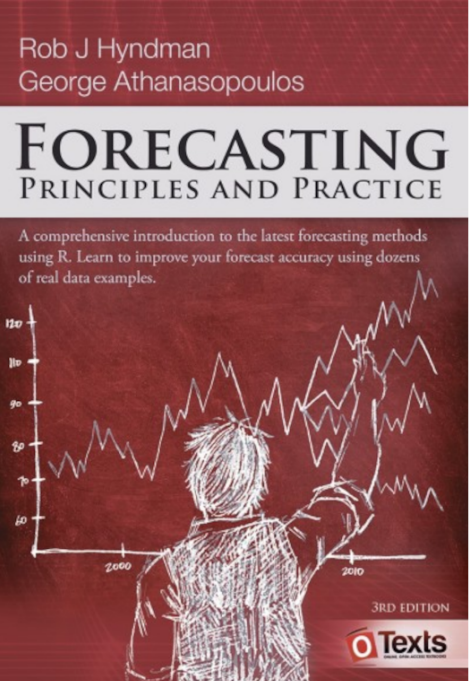


10. Dynamic regression models

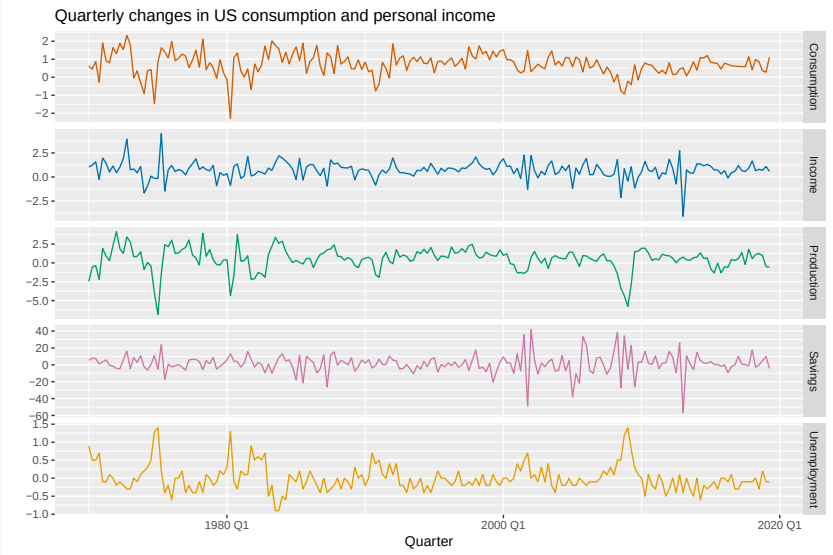
10.2 Dynamic regression using fable

OTexts.org/fpp3/

Regression with ARIMA errors

- In `fable`, we can specify an ARIMA(p, d, q) for the errors, and d levels of differencing will be applied to all variables $(y, x_{1,t}, \dots, x_{k,t})$ during estimation.
- Check that ε_t series looks like white noise.
- AICc can be calculated for final model.
- Repeat procedure for all subsets of predictors to be considered, and select model with lowest AICc value.

US personal consumption and income



US personal consumption and income

```
fit <- us_change |> model(ARIMA(Consumption ~ Income))
report(fit)
```

```
## Series: Consumption
## Model: LM w/ ARIMA(1,0,2) errors
##
## Coefficients:
##          ar1     ma1     ma2  Income  intercept
##       0.707  -0.617  0.2066  0.1976      0.595
## s.e.  0.107   0.122  0.0741  0.0462      0.085
##
## sigma^2 estimated as 0.3113:  log likelihood=-163
## AIC=338   AICc=339   BIC=358
```

US personal consumption and income

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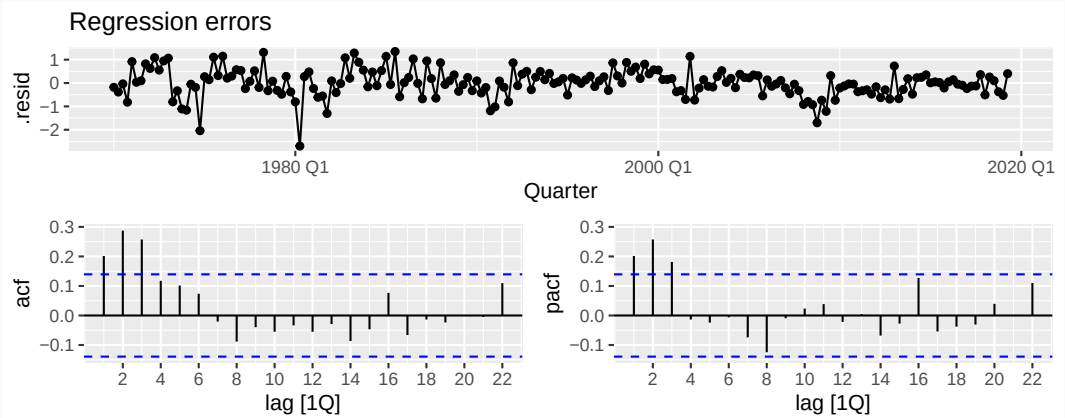
##
## sigma^2 estimated as 0.3113:  log likelihood=-163
## AIC=338   AICc=339   BIC=358
```

Write down the equations for the fitted model.

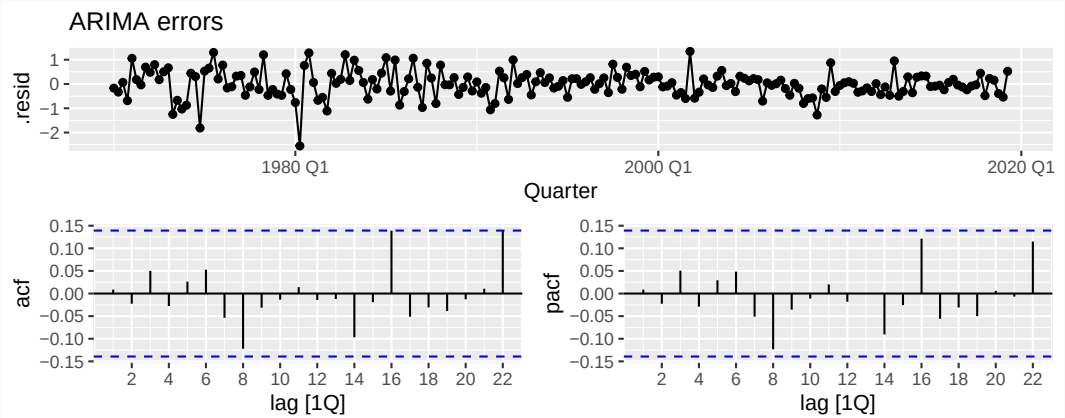
US personal consumption and income

```
residuals(fit, type = "regression") |>
  gg_tsdisplay(.resid, plot_type = "partial") +
  labs(title = "Regression errors")
```



US personal consumption and income

```
residuals(fit, type = "innovation") |>
  gg_tsdisplay(.resid, plot_type = "partial") +
  labs(title = "ARIMA errors")
```



US personal consumption and income

```
augment(fit) |>
  features(.innov, ljung_box, dof = 3, lag = 12)
```

```
## # A tibble: 1 x 3
##   .model                        lb_stat lb_pvalue
##   <chr>                           <dbl>     <dbl>
## 1 ARIMA(Consumption ~ Income)      5.54     0.785
```