PPP Assignment

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4/06/2022

Contents

1 Loading & Transforming data

```
data <- read_excel('landt.xls') %>%
  rename(
    Puk = UKWPI,
    Pus = USWPI
  ) %>% mutate(
    q = log(S) + log(Puk) - log(Pus),
    qq = q - q[YEAR == 1900]
  ) %>% tsibble(index=YEAR)
```

2 Plotting

```
datatsqq <- ts(data$qq, start=1791, end=1990)
autoplot(datatsqq) + geom_line(y=0) + scale_y_continuous(breaks=seq(-.9, .9, 0.1)) +
  scale_x_continuous(breaks=seq(1790, 2000, 20)) + ylim(-.9, .9)
```

3 Testing

3.1 Whole Period

```
a <- data %>% filter(YEAR >=1791, YEAR <= 1990)
get_stat(ur.df(a$qq, lags=0, type='drift'))
```

t-stat	1pct	5pct	10pct
-3.473654	-3.46	-2.88	-2.57

Yes, according to the ADF test we can reject the null hypothesis. It also matches the value seen in Table 1

3.2 Float Period

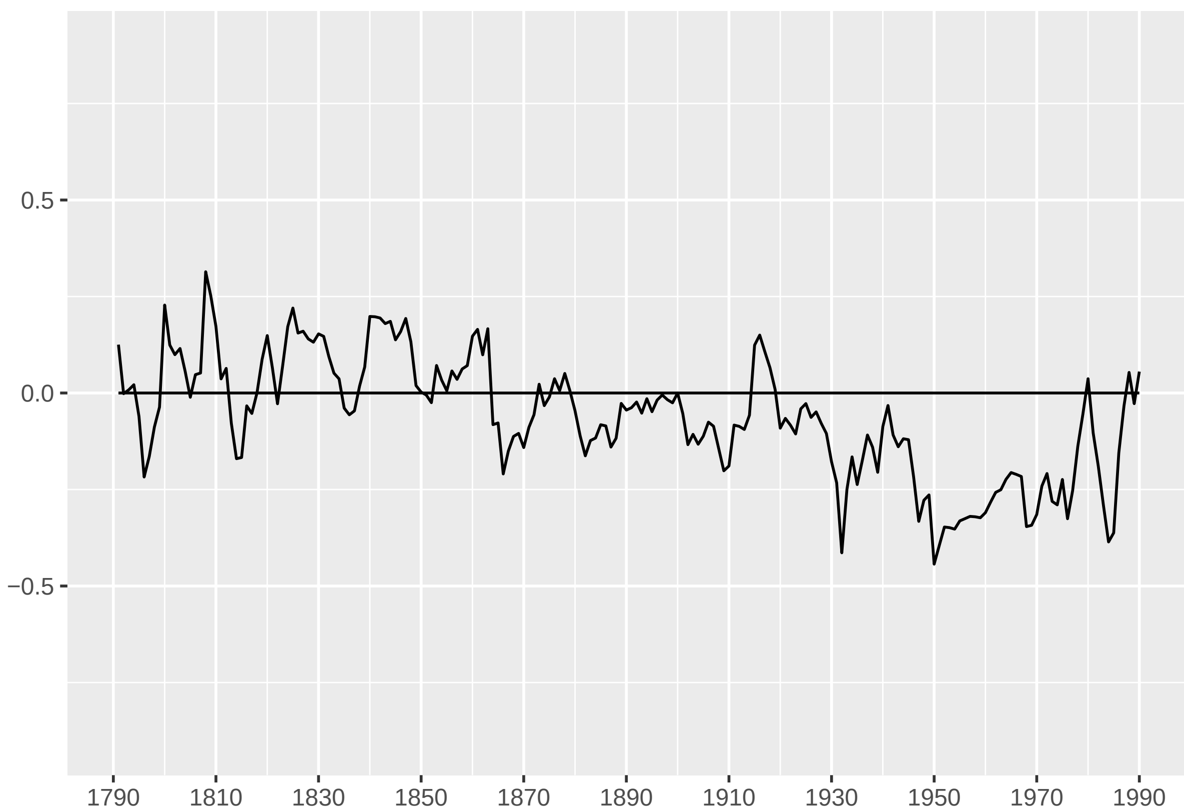

Figure 1: Plot of qq

```
a <- data %>% filter(YEAR >=1974, YEAR <= 1990)
b <- ur.df(a$qq, lags=0, type='drift')
get_stat(b)
```

t-stat	1pct	5pct	10pct
-1.206033	-3.75	-3	-2.63

The DF Test statistic agrees with the results in Table 1. You cannot reject the null hypothesis for this period.

3.3 Gold Standard Period

3.3.1 ADF w/ AIC

```
a <- data %>% filter(YEAR >=1870, YEAR <= 1913)
b <- ur.df(a$qq, type='drift', selectlags='AIC')
get_stat(b)
```

t-stat	1pct	5pct	10pct
-2.689739	-3.58	-2.93	-2.6

No, you cannot reject the null hypothesis at the 5% level.

3.3.2 DF-GLS

```
a <- data %>% filter(YEAR >=1870, YEAR <= 1913)
b <- ur.ers(a$qq, model='trend')
get_stat(b, gls=T)
```

t-stat	1pct	5pct	10pct
-1.790813	-3.77	-3.19	-2.89

No, you cannot reject the null at 5% using DF-GLS.

3.4 Breakpoint Testing

Stat	Value
Varying Regressors	C @TREND
Breakpoint	1973
F-Stat	3.1437
Prob. F	0.0453
Wald	0.0431

(1) They do not agree with L-T's results. My F stat is far, far higher and is statistically significant. It pretty much shows the opposite of their results.

(2) It fails the test for serial correlation, getting a Prob. F of 0.0282 and F stat of 3.633, leading to rejecting the null of having no serial correlation. In terms of heterskedasticity, With Breusch-Pagan I got an F-stat of 0.3 and Prob. F of .74. The null hypothesis is homoskedasticity, so I could not reject the null. This points towards it not being heteroskedastic.

(3) In terms of the residual diagonistics on the regressions they have in Table 3, they seem acceptable. Robust standard errors are quite good. Given their results, I would mostly agree.

(4) No, I do not know how they came to that conclusion. Well, Their Chow results are significantly different than mine own. I am not really sure why this is, but given my results I would disagree, as I reached the opposite conclusion.

(5) yes, the computed prob chi-square was 0.0431, which is under .05.

3.5 Out of sample test

```
h <- (data %>% filter(YEAR >=1791 , YEAR <= 1974) %>% select(qq))
test <- (data %>% filter(YEAR >=1791 , YEAR <= 1990) %>% select(qq))
trained <- h %>% model(
  ar_1 = ARIMA(qq ~ pdq(1,0,0) + PDQ(0,0,0)),
  random_walk = RW(qq)
)
forecast <- trained %>% forecast(h=16)
accuracy(forecast, test)
```

.model	.type	ME	RMSE	MAE	MPE	MAPE	MASE	RMSSE	ACF1
ar_1	Test	0.0160207	0.1341615	0.1134000	31.01771	148.4807	2.248035	1.932485	0.6675985
random_walk	Test	0.1399177	0.2001111	0.1656162	-25.40242	300.9802	3.283164	2.882434	0.6679911

```
plot2 <- forecast %>% autoplot(test, level = NULL)  + geom_line(y=0)   + scale_y_continuous(breaks=seq(-.9, .9, 0.1)) +
  scale_x_continuous(breaks=seq(1790, 2000, 20)) + ylim(-.9, .9)  + xlim(1950, 1990)
```

(1) According to RSME, the ar_1 model makes a better model.

(2) The plot can be seen in Figure **??**

(3) The AR(1) model makes the better forecast.

4 The Bottom Line

It probably depends on the extend of “long run”. At least in this sample, there does seem to be a breakpoint when switching to float, which suggests that something changed during the switch to floating currencies. On the other hand, the data itself is very limited, and the out of sample example has the AR model performing quite well. This could be a good sign of mean reverting behavior. Also, adf tests for the whole period point towards stationarity, with ones examining smaller periods being inconclusive. This could just be that the mean reverting behavior is a very slow process, however. I’m not sure if a breakpoint is compatable with the long term constant or not, as it seems feasible the switch to floating currency systems could change the speed at which they could return to baseline in the first place, which may change the trend enough to see it as a breakpoint. Overall though I think I agree with them, although I have some reservations.

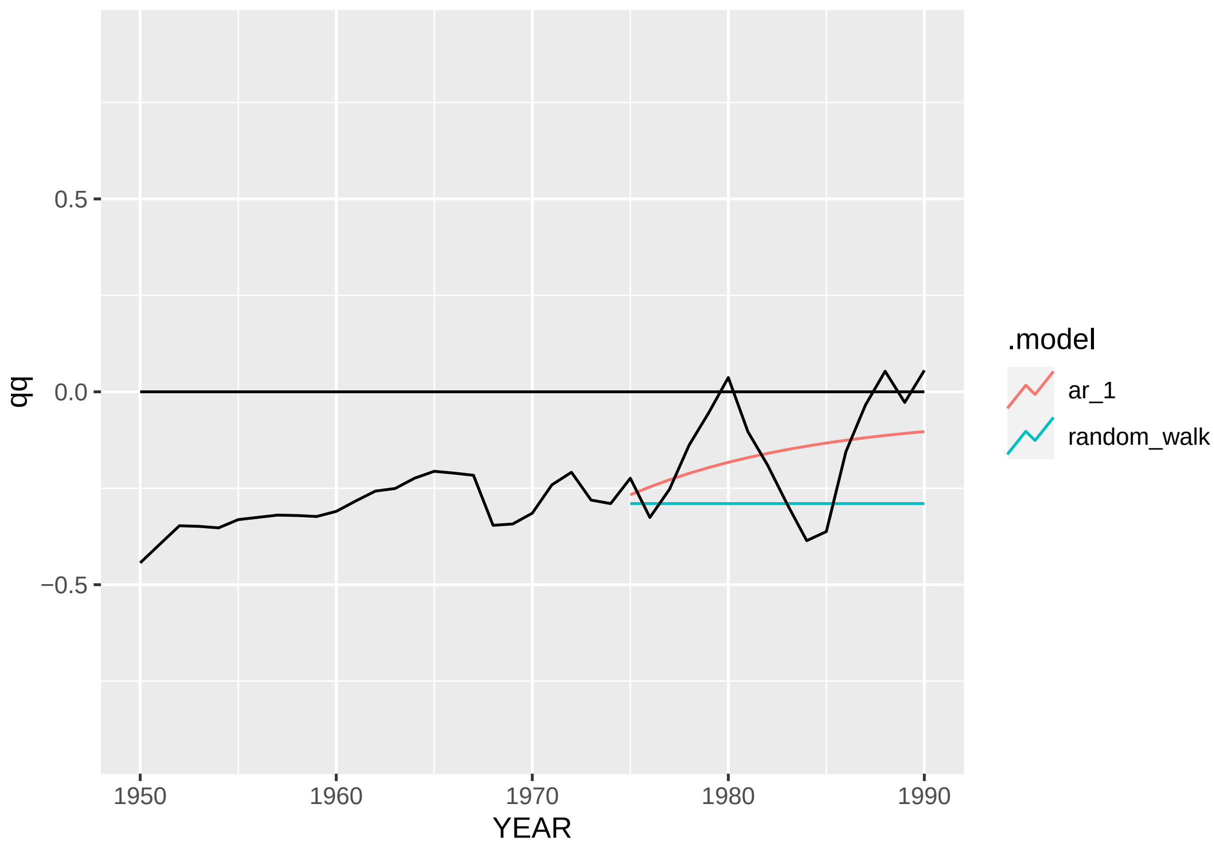

Figure 2: Model Comparison