Total Expenditure into monthly data

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Contents

1 Process

According to your suggestion, I made quarterly into smoothed monthly data. The idea is I give Jan, April, July and Oct 1/3 weight of the previous quarter and 2/3 current quarter, sum up and divided by 2. Feb, May, August, Nov keep their quarter figures and divide by 2. March, June, Sept and Dec have given 1/3 of the previous quarter and 2/3 current quarter, sum up and divided by 2.

```
##
##  Augmented Dickey-Fuller Test
##
## data:  df.ts
## Dickey-Fuller = -3.0187, Lag order = 6, p-value = 0.1469
## alternative hypothesis: stationary
```

2 Augmented Dickey-Fuller Test

One way to test whether a time series is stationary is to perform an augmented Dickey-Fuller test, which uses the following null and alternative hypotheses:

H0: The time series is non-stationary. In other words, it has some time-dependent structure and does not have constant variance over time.

HA: The time series is stationary.

P-value: 0.1469

Since the p-value is 0.1469 not less than .05, we fail to reject the null hypothesis.

This means the time series is non-stationary. In other words, it has some time-dependent structure and does not have constant variance over time.

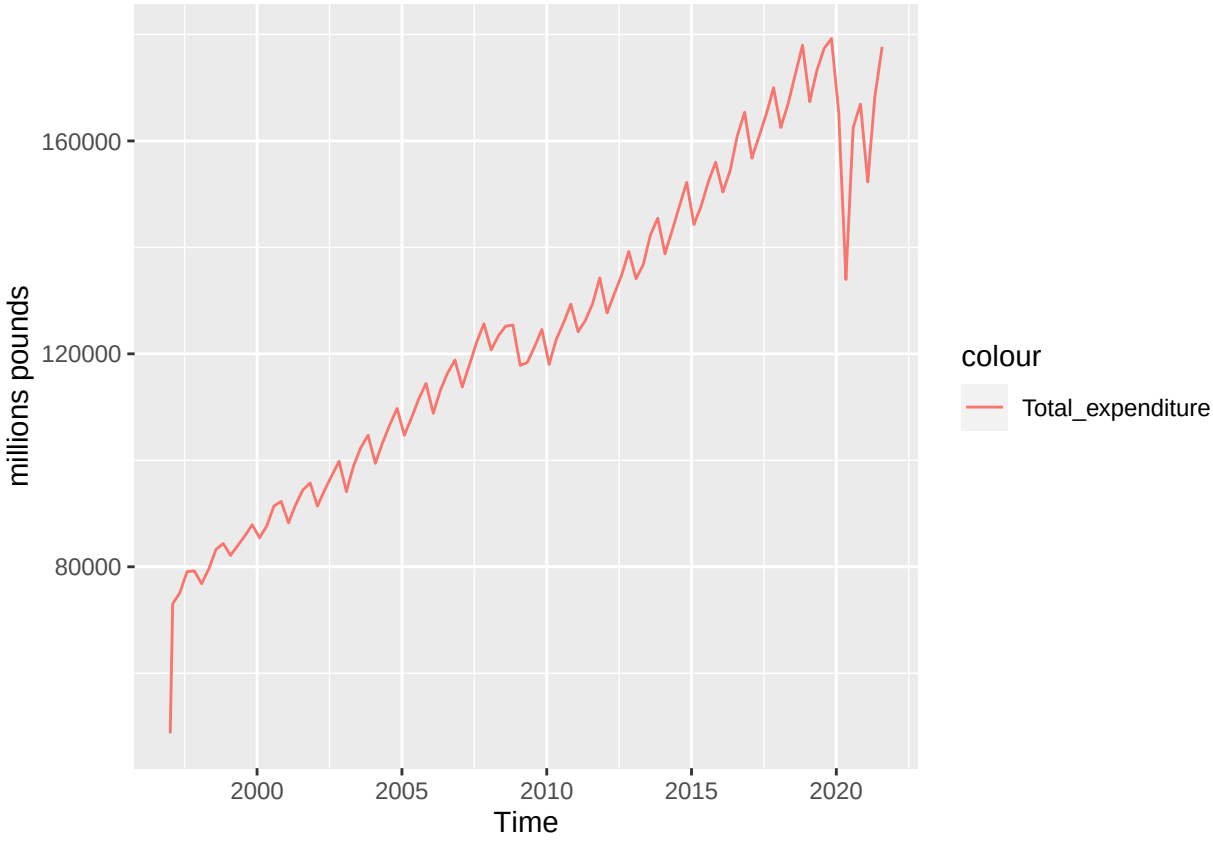

Figure 1: Total expenditure

3 Growh rate

Since total expenditure monthly data is not stationary, I try to convert to a percentage growth rate.

```
##
##  Augmented Dickey-Fuller Test
##
## data:  df.ts
## Dickey-Fuller = -8.332, Lag order = 6, p-value = 0.01
## alternative hypothesis: stationary
```

We examine the growth rate stationary by applying the ADF test. The p-value is 0.01; we reject the null hypothesis. This means the time series is stationary now.

After we perform an augmented Dickey-Fuller test on the data, we can create a quick plot to visualize the data: There was a very clear fluctuation between March and August 2020.

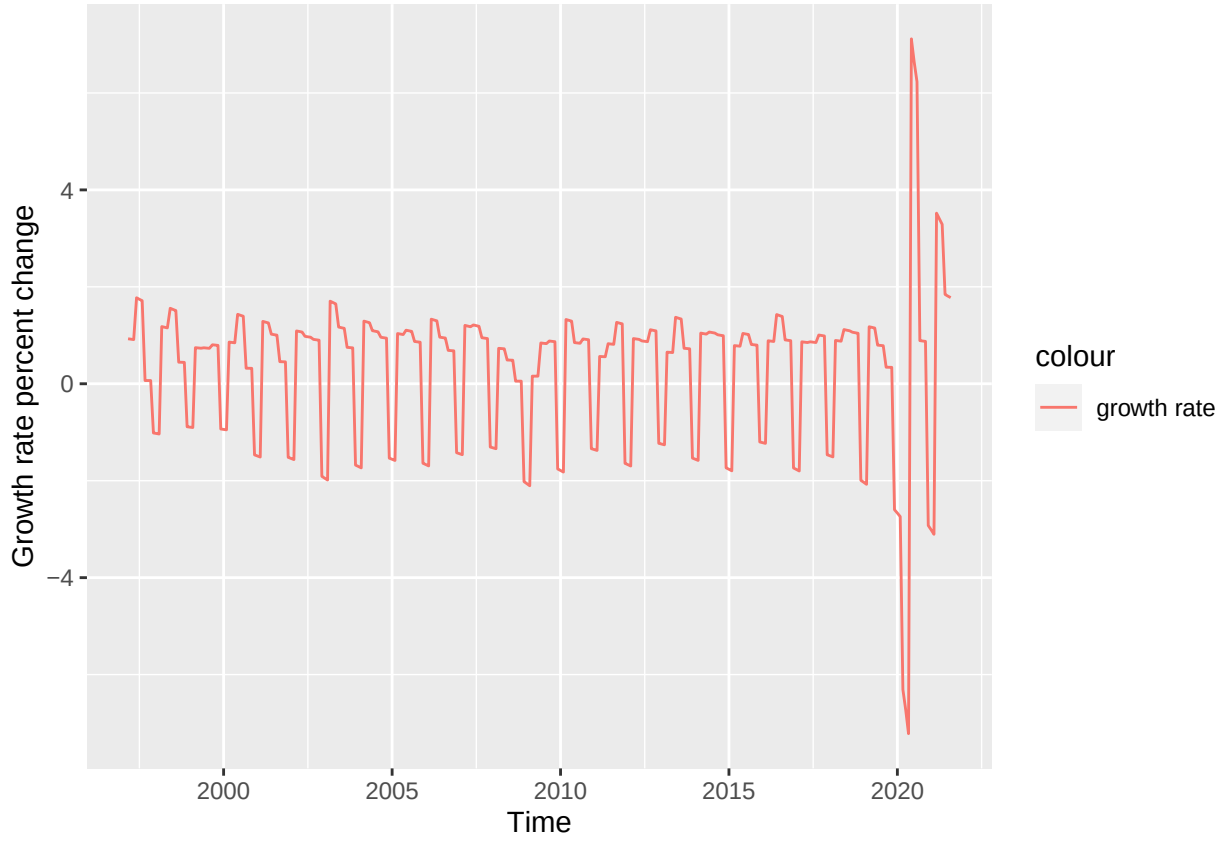

Figure 2: Growth rate

4 Questions:

Now we have a stationary monthly demand variable, but I am not sure how I can do it for the general CPI model and the 12 COCOP divisions. The following formula is how we model inflation in chapter 1. My plans are: : replace CPI in the right hand to 12 lags demand variables and keep rest dummies variables. I would be appreciated it if you could provide more suggestions.

$$\begin{aligned} CPI_t = & CPI + \text{ Trend}_t + \beta_1 Q_1 + \beta_2 Q_3 + \beta_3 Q_4 \\ & + \beta_4 D_{\text{recesion}} + \beta_5 D_{VAT_1} + \beta_6 D_{VAT_2} + \beta_7 D_{VAT_3} \\ & + \sum_{i=1}^{4} \lambda_i CPI_{t-i} + \sigma_t \end{aligned}$$