1. In this part I provided data for humidity in my covered garden for the March 2020 through March 19th 2021 period. You will use this to guess when I installed different dehumidifiers and to evaluate if you’d recommend these brands to somebody. Background knowledge: I purchased two dehumidifiers. One is a cheaper one that doesn’t control the humidity level precisely but it’s stronger, the other one is smaller one that gives me more precise control but it was much more expensive. The optimal level of humidity for plants is around 50%.
   1. Plot the humidity rate and discuss the patterns. In particular, based on informal visual inspection, does it look like the series has a break in its mean? When do you think I installed the devices? You don’t have to convert the days to dates, you can use day 1, day 100, etc as they’re shown on the graph.
      1. A graph with lines and numbers

         Description automatically generatedAt sometime around day 150 the cheap dehumidifier was installed which drastically reduced the humidity by about 25%. Shortly after day 250 the expensive dehumidifier was purchased which brought the humidity to the optimal 50%.
   2. Conduct unit root tests (DF) and stationarity tests for humidity. Report your results for both tests. What are your conclusions? Does humidity have a stochastic trend?

Hint: this question should look very familiar because you’ve already done a very similar question. I am asking you to repeat similar tasks again because the doing the steps in order is part of “good research hygiene”.

* + 1. ADF: -2.23  
       KPSS: 2.12
  1. Check if there is any evidence that there is a single structural break in the level of humidity. The Fstats the name of the procedure for the test that checks iteratively by checking if there is evidence of a break at each point in time. Report the break date. Do the results for the break date match up with your ad hoc visual guess from part a?
     1. Assuning two divisions with one breakpoint, the breakpoint would be at day 166
  2. Check if there is any evidence that there are multiple breaks in the humidity level. The function breakpoints is the procedure for the test that checks iteratively by creating (thousands of) dummies for all possible combinations of break dates and picks the ones that provide the best fit. Report the results.
     1. How many breaks does the Bai-Perron test select?
        1. 5
     2. Do the dates make sense based on your visual inspection and prior knowledge that I provided? Again, for the “make sense” part, I am just looking for a speculative answer here.
        1. Visually there should be 2 breakpoints at days 166 and 256. The other dates that have been picked out are probably due the high variance in humidity pre-humidifier.
     3. Did the test pick more or less break dates than the two break dates I mentioned (purchase of first dehumidifier, purchase of the second one)
        1. The test picked out more breaks than there were specified.
  3. Based on the optimal number of breaks selected by the BP test, the code constructs dummies for the different periods. What line in the code does this for you?
     1. Line 100 “fit\_dummies2<-lm (humidity ~ breakfactor(breakpointdates2, breaks = 5))”
  4. A graph with blue lines

     Description automatically generatedPlot the humidity rate and the estimates for the time-varying mean, but change the color of the humidity rate to blue in the graph. Discuss your results: how did the mean in the humidity rate change over time?
  5. The mean-adjusted data is the distance between the actual data and the time-varying mean. What lines in the code generate the new data humidity\_hat?
     1. Line 104 “humidity\_hat<-residuals(fit\_dummies2)”
  6. Product testing: the dehumidifiers work for reducing the level of humidity? How can you support your claim?
     1. The humidifiers do work to different extents. The ‘cheap’ humidier takes as much moisture as possible while the ‘expensive’ humidier takes a certain amount of moisture out of the area.
  7. Decision making: Spider plants need low level of humidity (30-40%). Do I need to buy the more expensive dehumidifier if I only want to grow spider plants and nothing else?
     1. The cheap humidifier would work as well as the expensive one (provided that the expensive one can reach that level of humidity). You can save a few bucks by not buying the expensive option if spider plants are all that you are trying to grow.