Reproduction for Figure 16

Dataset:

All variables can be found in the excel Figure 16 Data.xlsx. Use R to conduct regressions.

The data used in regressions for each sample are in the following sheets:

Sample (a), 1985Q1 to 1998Q1 is in the sheet ‘R data (a)’

Sample (b), 1998Q2 to 2008Q2 is in the sheet ‘R data (b)’

Sample (c), 2008Q3 to 2019Q4 is in the sheet ‘R data (c)’

Sample (d), 2020Q1 to 2022Q3 is in the sheet ‘R data (d)’

To obtain gamma estimation for each period, we shall export the data in the sheet corresponding to that period (specified above) to a csv file and import it to RStudio. Suppose the data set is named ‘data1’ in R. The code that conducts the regression is:

Sample (a):

model <- nls(pe ~ ((gamma)^ttau) \* 4.35 + (1-(gamma))\*cpi2\_median + (1-(gamma)) \* ((gamma)\*lag1CPI + ((gamma)^2)\*lag2CPI + ((gamma)^3)\*lag3CPI + ((gamma)^4)\*lag4CPI + ((gamma)^5)\*lag5CPI + ((gamma)^6)\*lag6CPI + ((gamma)^7)\*lag7CPI + ((gamma)^8)\*lag8CPI + ((gamma)^9)\*lag9CPI + ((gamma)^10)\*lag10CPI + ((gamma)^11)\*lag11CPI + ((gamma)^12)\*lag12CPI + ((gamma)^13)\*lag13CPI + ((gamma)^14)\*lag14CPI + ((gamma)^15)\*lag15CPI + ((gamma)^16)\*lag16CPI + ((gamma)^17)\*lag17CPI + ((gamma)^18)\*lag18CPI + ((gamma)^19)\*lag19CPI + ((gamma)^20)\*lag20CPI + ((gamma)^21)\*lag21CPI + ((gamma)^22)\*lag22CPI + ((gamma)^23)\*lag23CPI + ((gamma)^24)\*lag24CPI + ((gamma)^25)\*lag25CPI + ((gamma)^26)\*lag26CPI + ((gamma)^27)\*lag27CPI + ((gamma)^28)\*lag28CPI + ((gamma)^29)\*lag29CPI + ((gamma)^30)\*lag30CPI + ((gamma)^31)\*lag31CPI + ((gamma)^32)\*lag32CPI + ((gamma)^33)\*lag33CPI + ((gamma)^34)\*lag34CPI + ((gamma)^35)\*lag35CPI + ((gamma)^36)\*lag36CPI + ((gamma)^37)\*lag37CPI + ((gamma)^38)\*lag38CPI + ((gamma)^39)\*lag39CPI + ((gamma)^40)\*lag40CPI + ((gamma)^41)\*lag41CPI + ((gamma)^42)\*lag42CPI + ((gamma)^43)\*lag43CPI + ((gamma)^44)\*lag44CPI + ((gamma)^45)\*lag45CPI + ((gamma)^46)\*lag46CPI + ((gamma)^47)\*lag47CPI + ((gamma)^48)\*lag48CPI + ((gamma)^49)\*lag49CPI + ((gamma)^50)\*lag50CPI +((gamma)^51)\*lag51CPI), start = list(gamma = 0.9), data = data1)

Sample (b):

model <- nls(pe ~ ((gamma)^ttau) \* 2.5 + (1-(gamma))\*cpi2\_median + (1-(gamma)) \* ((gamma)\*lag1CPI + ((gamma)^2)\*lag2CPI + ((gamma)^3)\*lag3CPI + ((gamma)^4)\*lag4CPI + ((gamma)^5)\*lag5CPI + ((gamma)^6)\*lag6CPI + ((gamma)^7)\*lag7CPI + ((gamma)^8)\*lag8CPI + ((gamma)^9)\*lag9CPI + ((gamma)^10)\*lag10CPI + ((gamma)^11)\*lag11CPI + ((gamma)^12)\*lag12CPI + ((gamma)^13)\*lag13CPI + ((gamma)^14)\*lag14CPI + ((gamma)^15)\*lag15CPI + ((gamma)^16)\*lag16CPI + ((gamma)^17)\*lag17CPI + ((gamma)^18)\*lag18CPI + ((gamma)^19)\*lag19CPI + ((gamma)^20)\*lag20CPI + ((gamma)^21)\*lag21CPI + ((gamma)^22)\*lag22CPI + ((gamma)^23)\*lag23CPI + ((gamma)^24)\*lag24CPI + ((gamma)^25)\*lag25CPI + ((gamma)^26)\*lag26CPI + ((gamma)^27)\*lag27CPI + ((gamma)^28)\*lag28CPI + ((gamma)^29)\*lag29CPI + ((gamma)^30)\*lag30CPI + ((gamma)^31)\*lag31CPI + ((gamma)^32)\*lag32CPI + ((gamma)^33)\*lag33CPI + ((gamma)^34)\*lag34CPI + ((gamma)^35)\*lag35CPI + ((gamma)^36)\*lag36CPI + ((gamma)^37)\*lag37CPI + ((gamma)^38)\*lag38CPI + ((gamma)^39)\*lag39CPI), start = list(gamma = 0.9), data = data1)

Sample (c)

model <- nls(pe ~ (gamma^(ttau)) \* 2.5 + (1-gamma)\*cpi2\_median + (1-gamma) \* (gamma\*lag1CPI + (gamma^2)\*lag2CPI + (gamma^3)\*lag3CPI + (gamma^4)\*lag4CPI + (gamma^5)\*lag5CPI + (gamma^6)\*lag6CPI + (gamma^7)\*lag7CPI + (gamma^8)\*lag8CPI + (gamma^9)\*lag9CPI + (gamma^10)\*lag10CPI + (gamma^11)\*lag11CPI + (gamma^12)\*lag12CPI + (gamma^13)\*lag13CPI + (gamma^14)\*lag14CPI + (gamma^15)\*lag15CPI + (gamma^16)\*lag16CPI + (gamma^17)\*lag17CPI + (gamma^18)\*lag18CPI + (gamma^19)\*lag19CPI + (gamma^20)\*lag20CPI + (gamma^21)\*lag21CPI + (gamma^22)\*lag22CPI + (gamma^23)\*lag23CPI + (gamma^24)\*lag24CPI + (gamma^25)\*lag25CPI + (gamma^26)\*lag26CPI + (gamma^27)\*lag27CPI + (gamma^28)\*lag28CPI + (gamma^29)\*lag29CPI + (gamma^30)\*lag30CPI + (gamma^31)\*lag31CPI + (gamma^32)\*lag32CPI + (gamma^33)\*lag33CPI + (gamma^34)\*lag34CPI + (gamma^35)\*lag35CPI + (gamma^36)\*lag36CPI + (gamma^37)\*lag37CPI + (gamma^38)\*lag38CPI + (gamma^39)\*lag39CPI + (gamma^40)\*lag40CPI + (gamma^41)\*lag41CPI + (gamma^42)\*lag42CPI + (gamma^43)\*lag43CPI + (gamma^44)\*lag44CPI), start = list(gamma = 0.9), data = data1)

Sample (d)

model <- nls(pe ~ ((gamma)^(ttau)) \* 2.18 + (1-(gamma))\*cpi2\_median + (1-(gamma)) \* ((gamma)\*lag1CPI + ((gamma)^2)\*lag2CPI + ((gamma)^3)\*lag3CPI + ((gamma)^4)\*lag4CPI + ((gamma)^5)\*lag5CPI + ((gamma)^6)\*lag6CPI + ((gamma)^7)\*lag7CPI + ((gamma)^8)\*lag8CPI+ ((gamma)^9)\*lag9CPI), start = list(gamma = 0.9), data = data1)

To view the gamma estimation for any period, we can use the code:

summary(model)

The RSS is reported by the code:

deviance(model)

The fitted values for a given period can be computed by the code:

predict(model)

The graph can be reproduced by plotting the predicted values against the SPF long run actual (pe in dataset). The data series for graph is in the last sheet.