Appendix

Data Analysis using R programming language

Appendix 1

RAW DATA WORKSHEET

```r
# Importing necessary libraries
library(tseries)
library(remotes)
library(vars)
library(ggplot2)
library(tidyr)
library(stargazer)
library(psych)
library(reshape2)
library(dplyr)
library(car)
library(forecast)

# Reading the csv file with the values of inflation expectation (one period
# ahead inflation)
dataset <- read.csv("inf_ir_lead.csv", header = TRUE)

# Converting Date column as date
dataset$Date <- as.Date(dataset[["Date"]], format = "%d/%m/%Y")

# Printing the entire dataset
knitr::kable(dataset, "latex", booktabs = TRUE, longtable = TRUE, digits = 2) %>%
    kableExtra::kable_styling(font_size = 9)
```

Date	all	food	alco	cloth	house	furnish	health	transpo	ict	rec	educ	restau	personal	high	low
1997-09-01	5.9	3.5	5.8	7.3	8.4	6.5	8.1	12.3	1.1	3.4	13.8	5.6	5.3	25.55	23.14
1997-10-01	6.7	4.5	5.8	7.6	8.7	6.8	8.4	13.1	1.3	1.7	19.3	5.8	5.7	28.22	25.17
1997-11-01	6.5	4.2	6.1	7.4	8.5	6.9	8.8	10.3	1.5	3.4	19.5	6.0	5.8	26.27	23.89
1997-12-01	6.6	4.2	5.2	5.8	8.9	6.7	8.7	9.1	0.2	3.0	19.2	6.1	5.5	25.51	23.43
1998-01-01	7.7	5.5	7.3	7.1	9.1	8.3	10.2	10.0	1.7	3.2	19.2	6.5	6.8	26.82	24.71
1998-02-01	8.2	5.5	7.1	7.8	8.9	10.1	11.4	10.7	2.7	4.0	19.2	7.4	8.7	26.06	23.79
1998-03-01	8.7	6.6	8.0	8.1	8.7	10.5	12.3	10.0	3.4	4.0	18.9	7.0	9.4	23.27	20.21
1998-04-01	9.8	8.5	8.5	8.5	9.5	11.3	12.3	9.0	3.4	4.5	19.1	7.1	9.9	22.00	17.79
1998-05-01	10.2	9.4	8.4	8.6	9.1	11.2	11.5	9.6	3.6	6.0	15.7	6.9	11.4	21.24	17.04
1998-06-01	10.1	9.7	9.2	8.7	9.0	11.0	12.0	9.9	3.6	6.1	15.3	7.2	11.7	19.77	16.08
1998-07-01	10.1	9.1	10.0	8.8	9.2	11.0	12.8	9.6	4.5	6.6	14.8	7.8	12.2	20.37	16.63
1998-08-01	10.2	9.0	10.4	8.9	10.2	10.4	12.2	9.5	6.2	6.8	15.0	7.4	12.1	19.92	16.42
1998-09-01	10.0	8.9	10.6	8.0	9.8	9.9	12.3	8.2	6.2	7.4	20.5	7.0	12.4	19.67	16.27
1998-10-01	10.6	11.1	11.0	7.5	9.2	9.5	12.2	5.9	6.1	7.4	14.9	6.4	12.5	19.75	16.25
1998-11-01	10.0	10.4	10.3	7.3	9.0	9.4	12.1	3.5	6.0	6.7	14.7	6.2	12.1	19.74	16.09
1998-12-01	10.7	12.5	10.2	8.6	8.5	10.2	13.2	2.3	5.0	8.9	14.7	4.8	12.4	19.71	16.17
1999-01-01	9.3	10.5	7.1	7.6	7.9	8.6	12.7	0.9	3.5	8.9	14.7	4.5	10.8	19.48	15.95
1999-02-01	7.9	8.8	6.2	6.7	7.7	7.4	11.1	0.8	2.5	8.0	14.7	4.1	10.5	19.02	15.45
1999-03-01	7.4	7.1	5.7	6.6	8.0	6.9	10.6	1.7	2.2	8.0	14.7	3.7	9.8	18.45	14.87
1999-04-01	6.1	4.8	5.1	5.8	7.6	6.1	10.8	2.3	1.9	7.7	14.4	3.3	9.0	17.22	13.73
1999-05-01	5.3	2.6	4.9	5.4	7.5	5.6	12.0	2.5	1.8	5.6	18.3	3.0	8.2	16.24	12.57
1999-06-01	5.1	2.3	4.6	5.1	7.2	5.8	11.4	2.5	1.8	5.1	18.7	2.8	7.9	15.58	11.81
1999-07-01	4.8	2.4	4.3	4.8	7.0	5.6	10.8	2.8	1.1	4.6	19.2	2.4	7.0	14.85	11.06
1999-08-01	4.9	2.5	4.0	4.4	7.3	5.6	10.7	3.1	0.2	4.5	19.0	2.1	6.8	14.72	10.93
1999-09-01	5.1	2.1	3.9	4.3	7.4	5.3	10.3	7.9	0.5	3.8	18.5	2.4	6.2	14.09	11.24
1999-10-01	3.9	-0.8	3.7	4.4	7.4	5.0	10.1	11.2	0.6	3.8	18.4	2.6	5.7	13.86	11.06
1999-11-01	3.9	-0.3	4.0	4.5	7.2	5.1	9.8	12.1	0.5	4.3	18.4	2.2	5.7	14.16	11.25
1999-12-01	5.5	-0.3	4.5	5.2	7.5	5.0	13.0	25.4	13.0	-0.7	23.1	6.3	9.3	14.19	11.42
2000-01-01	5.6	0.6	4.7	4.9	7.0	4.9	12.3	25.7	13.0	-0.9	22.9	6.3	9.0	14.19	11.34

2000-02-01	5.9	1.6	4.9	5.0	6.8	4.6	12.8	23.9	12.4	-0.9	22.9	5.9	7.8	14.15	11.27
2000-03-01	6.2	2.2	5.0	5.1	6.9	4.3	12.3	24.4	13.0	-0.6	22.9	5.6	8.1	14.19	11.32
2000-04-01	6.5	2.9	5.1	5.3	6.9	4.5	12.4	23.7	13.1	-0.7	23.1	5.9	8.3	14.11	11.25
2000-05-01	6.1	3.0	4.8	5.0	6.4	4.2	10.0	22.9	12.6	7.4	18.1	5.9	7.4	14.18	11.36
2000-06-01	6.5	3.6	5.2	5.0	6.6	4.2	11.2	24.0	12.0	7.9	17.4	5.9	7.6	14.28	11.48
2000-07-01	6.8	4.1	5.2	5.0	6.5	4.3	11.3	24.4	11.8	7.8	17.4	5.7	7.6	14.28	11.46
2000-08-01	6.5	3.3	5.3	4.8	6.3	4.0	10.9	24.3	11.7	8.0	17.4	5.9	7.6	14.32	11.42
2000-09-01	6.9	4.1	5.7	5.5	6.6	4.4	11.1	24.5	11.8	8.0	17.6	6.0	7.8	14.58	11.64
2000-10-01	7.8	5.8	6.0	5.8	7.0	4.6	11.2	25.2	11.8	8.1	17.5	6.2	8.1	17.84	15.07
2000-11-01	8.7	6.6	6.3	5.9	7.7	4.9	11.3	26.8	11.9	8.5	17.5	6.5	8.2	20.82	18.86
2000-12-01	5.8	4.9	4.9	3.2	6.9	4.2	6.1	14.4	0.4	11.6	12.9	3.5	4.1	19.89	18.01
2001-01-01	5.8	3.8	4.9	3.5	7.5	4.2	7.9	14.4	0.5	11.7	13.3	4.2	4.7	18.99	17.14
2001-02-01	5.8	3.6	4.9	3.2	7.9	4.5	8.3	15.6	0.9	11.9	13.3	4.6	5.0	17.40	15.58
2001-03-01	5.5	3.3	5.0	3.2	7.7	5.0	8.6	15.5	0.3	11.7	13.1	4.3	5.0	15.67	14.02
2001-04-01	5.5	3.4	5.1	3.3	7.2	5.0	8.2	16.0	0.2	12.0	13.5	4.0	5.0	15.17	13.51
2001-05-01	5.9	4.2	5.5	3.5	7.7	5.5	8.9	16.6	0.3	3.9	8.5	4.1	5.1	15.04	13.43
2001-06-01	6.0	4.4	5.6	3.4	7.8	5.5	7.8	15.8	0.6	4.0	8.9	4.9	5.1	14.45	12.91
2001-07-01	5.7	3.7	6.1	3.4	7.4	5.7	7.8	15.0	0.8	4.1	8.9	5.1	5.2	14.20	12.59
2001-08-01	5.7	4.0	6.2	3.6	7.3	5.7	8.0	14.7	0.7	4.0	8.9	4.9	5.1	14.51	12.88
2001-09-01	5.2	3.5	5.8	2.9	7.0	5.4	8.0	9.4	0.7	4.0	8.7	4.4	4.6	14.56	12.98
2001-10-01	4.2	2.5	5.5	2.7	7.1	5.2	7.5	4.8	0.7	4.0	8.9	4.4	4.2	14.75	13.14
2001-11-01	3.7	2.0	4.9	2.4	6.5	4.5	7.1	2.6	0.6	3.7	8.9	4.1	3.9	14.77	13.17
2001-12-01	3.3	1.7	4.7	3.3	5.8	3.8	7.3	1.8	-1.4	3.5	9.2	3.4	2.7	14.22	12.68
2002-01-01	2.9	1.8	4.3	3.0	5.2	3.6	5.6	1.4	-1.6	3.4	9.0	2.6	2.3	13.27	11.65
2002-02-01	3.3	2.3	4.4	3.2	5.1	3.3	5.4	1.4	-1.1	3.5	9.0	2.6	2.2	12.26	10.56
2002-03-01	3.4	2.6	4.2	3.1	5.0	2.9	5.2	1.4	-1.0	3.4	9.2	3.4	2.2	11.32	9.65
2002-04-01	3.2	2.2	3.9	3.0	5.4	2.9	5.4	1.6	-0.9	3.1	8.7	3.2	2.2	9.78	8.22
2002-05-01	2.6	1.7	3.6	3.1	3.7	2.3	5.1	1.0	-0.7	2.5	9.7	3.2	1.9	9.31	7.72
2002-06-01	2.5	1.9	3.3	3.4	2.9	2.3	5.5	1.0	-0.3	2.6	9.4	2.9	1.3	9.59	7.88
2002-07-01	2.7	2.7	3.0	3.4	3.0	2.2	5.6	0.8	-0.4	2.5	9.4	2.7	1.3	9.67	7.93
2002-08-01	2.5	2.3	2.7	3.4	2.4	2.3	4.9	1.0	-0.4	2.5	9.4	2.7	1.2	9.78	8.03
2002-09-01	2.3	1.9	2.5	3.5	2.3	2.3	4.6	1.5	-0.5	2.4	9.4	2.9	1.2	9.99	8.15
2002-10-01	2.1	1.5	2.3	3.3	2.0	2.1	4.6	2.5	-0.6	2.1	9.4	2.7	1.2	10.04	8.16
2002-11-01	2.1	1.2	2.3	3.3	2.1	2.3	5.0	3.1	-0.6	2.0	9.4	4.2	1.3	10.07	8.17
2002-12-01	1.7	0.5	1.9	2.6	2.6	1.9	6.8	3.5	0.8	1.3	8.7	4.2	1.7	10.02	8.12
2003-01-01	2.3	1.0	2.0	2.5	2.7	1.7	6.3	4.7	1.2	1.0	8.7	4.2	1.6	9.99	8.13
2003-02-01	2.1	0.7	2.1	2.6	2.3	2.1	6.2	5.2	0.7	1.0	8.7	3.4	1.6	10.41	8.51
2003-03-01	2.2	0.7	1.8	2.5	3.2	2.3	6.5	5.4	1.6	1.4	8.1	4.2	1.3	10.91	8.96
2003-04-01	2.2	1.0	1.6	3.1	3.0	2.1	6.4	4.6	0.5	1.6	8.1	4.2	1.2	12.02	10.00
2003-05-01	2.8	1.9	1.5	3.0	4.2	2.4	6.2	4.0	2.4	2.8	7.5	3.9	1.5	11.84	9.92
2003-06-01	2.3	1.1	1.8	2.8	4.6	2.3	6.0	3.6	1.9	1.7	7.0	3.5	2.0	10.75	9.04
2003-07-01	2.2	0.6	1.3	2.8	4.8	2.2	5.8	3.8	1.8	1.5	7.0	3.7	1.7	10.21	8.65
2003-08-01	2.2	0.6	1.2	2.7	4.9	2.2	5.5	4.0	0.9	1.5	7.0	4.0	1.8	10.07	8.43
2003-09-01	2.3	0.8	1.3	2.4	4.7	2.1	5.8	3.4	1.0	1.7	7.0	3.8	1.7	10.17	8.42
2003-10-01	2.4	1.3	1.3	2.4	4.4	2.3	5.3	3.0	1.0	1.7	7.0	3.8	1.7	10.46	8.61
2003-11-01	2.5	1.8	1.2	2.4	4.3	2.5	5.0	3.2	1.0	1.8	7.0	2.3	1.8	10.94	9.01
2003-12-01	3.1	3.3	1.6	2.2	3.5	2.5	3.1	3.6	1.5	2.2	7.5	2.2	1.3	11.28	9.34
2004-01-01	2.9	3.3	1.5	2.3	3.6	2.6	3.1	3.5	4.3	2.4	7.5	2.3	1.3	11.00	9.16
2004-02-01	3.1	4.2	1.5	2.0	3.3	2.2	3.1	2.9	4.4	2.3	7.5	2.6	1.3	11.08	9.26
2004-03-01	3.2	4.9	1.8	2.2	2.4	2.2	2.8	2.9	1.0	1.9	8.0	1.9	1.6	11.82	9.90
2004-04-01	3.6	5.3	2.3	1.6	2.6	2.3	2.8	3.8	1.4	1.7	8.0	2.1	1.7	12.35	10.32
2004-05-01	4.1	5.3	2.4	1.7	3.2	2.4	3.3	9.2	-0.8	0.8	8.4	2.4	1.7	11.95	9.95
2004-06-01	5.5	6.7	2.3	1.8	3.4	2.6	3.4	16.7	-0.6	1.8	9.7	2.3	1.7	12.13	10.07
2004-07-01	5.7	7.4	2.8	1.7	3.4	2.5	3.8	17.6	-0.6	2.2	9.7	2.7	2.1	12.36	10.25
2004-08-01	6.2	7.8	2.9	1.9	3.8	2.7	4.4	18.4	0.2	2.3	9.7	3.0	2.3	12.04	9.99
2004-09-01	6.3	7.9	3.1	2.5	4.2	2.8	4.2	19.5	0.1	2.1	9.7	3.1	2.5	12.35	10.27
2004-10-01	6.8	7.8	3.1	2.6	6.0	3.3	4.8	20.9	0.2	2.3	9.6	3.1	2.8	12.54	10.47
2004-11-01	7.1	8.4	3.6	2.7	6.3	3.3	4.9	21.2	0.4	2.3	9.6	3.5	2.8	12.65	10.65
2004-12-01	7.3	7.6	3.9	2.9	7.6	3.7	4.5	20.6	0.4	2.3	9.6	4.1	3.1	12.63	10.52
2005-01-01	7.3	7.9	6.1	3.1	7.3	3.8	4.8	19.9	-2.5	2.4	9.6	4.1	3.4	12.48	10.36
2005-02-01	7.1	7.2	6.6	3.3	7.3	3.9	4.9	21.1	-2.5	2.4	9.6	4.2	3.5	11.72	9.64

2005-03-01	7.2	7.1	7.0	3.3	7.7	3.8	5.2	21.5	-0.3	2.5	9.6	4.3	3.5	11.48	9.43
2005-04-01	7.3	6.9	7.1	3.3	8.1	4.0	5.4	21.7	0.3	2.8	9.6	4.3	3.7	11.52	9.47
2005-05-01	6.7	6.4	7.3	3.2	7.8	4.0	4.9	17.5	1.5	3.2	5.4	4.2	3.6	11.09	9.08
2005-06-01	6.0	5.5	7.9	3.3	8.1	3.9	4.9	13.4	1.8	3.4	4.8	5.6	3.6	10.77	8.76
2005-07-01	6.1	5.3	7.6	3.3	8.1	3.9	4.6	13.7	1.8	3.1	4.8	5.3	3.4	10.75	8.72
2005-08-01	6.0	5.4	7.8	3.4	7.8	3.5	4.5	13.7	1.8	3.0	4.8	5.0	3.3	10.58	8.61
2005-09-01	6.2	5.8	7.7	2.9	7.5	3.6	4.4	14.0	1.9	3.1	4.8	5.4	3.4	10.69	8.72
2005-10-01	6.2	6.0	8.0	3.1	6.5	3.4	4.6	15.2	1.8	3.2	4.7	6.3	3.1	10.78	8.81
2005-11-01	5.9	5.2	7.9	3.0	6.6	3.4	5.1	14.1	1.5	3.2	4.7	6.3	3.1	10.57	8.62
2005-12-01	5.9	5.6	8.4	3.1	6.1	3.3	5.5	15.7	1.2	3.8	5.0	5.8	3.4	10.30	8.40
2006-01-01	6.5	6.1	6.1	3.1	6.9	3.3	5.7	16.9	1.2	3.9	5.0	6.6	3.6	10.04	8.20
2006-02-01	6.6	6.1	5.7	3.1	7.4	3.8	5.6	15.6	1.5	3.9	5.0	6.6	3.6	10.07	8.21
2006-03-01	6.3	5.8	5.5	3.1	7.1	3.8	5.5	14.6	1.7	3.9	5.0	6.6	3.6	10.08	8.19
2006-04-01	6.0	5.5	5.3	3.1	6.3	3.5	5.4	14.9	1.7	3.8	5.0	6.7	3.3	9.85	8.08
2006-05-01	5.9	5.2	5.1	3.1	6.3	3.5	5.5	14.6	0.4	3.4	5.8	7.6	3.6	9.92	8.22
2006-06-01	5.5	4.9	4.6	2.9	6.2	3.5	5.8	11.7	0.2	3.1	5.1	6.1	3.5	10.34	8.59
2006-07-01	5.2	4.9	4.5	3.0	5.8	3.4	5.7	11.1	0.3	3.1	5.2	5.9	3.4	10.87	8.87
2006-08-01	4.9	4.4	4.4	2.9	5.6	3.5	5.7	9.1	0.3	3.1	5.2	6.2	3.3	10.34	8.54
2006-09-01	4.7	4.6	4.3	2.9	5.3	3.4	5.7	6.7	0.4	3.0	5.2	5.6	3.3	10.30	8.44
2006-10-01	4.2	4.6	4.1	2.6	4.7	3.2	5.6	3.5	0.5	2.9	5.0	4.7	3.2	10.35	8.45
2006-11-01	4.1	4.4	4.1	2.8	4.1	3.2	4.9	3.9	0.5	3.0	5.0	4.5	3.2	9.93	7.97
2006-12-01	3.8	4.2	3.6	2.9	3.6	3.2	5.0	2.7	0.6	2.5	4.8	5.0	3.2	9.77	7.78
2007-01-01	2.9	3.4	3.8	2.7	2.3	2.9	4.6	0.8	0.5	2.2	4.8	4.1	2.8	9.07	7.23
2007-02-01	2.6	3.0	3.4	2.7	1.9	2.3	4.4	0.8	0.3	2.2	4.8	4.0	2.6	8.33	6.68
2007-03-01	2.6	3.0	3.1	2.6	1.8	2.3	4.2	1.1	0.2	2.2	4.9	3.9	2.5	8.27	6.60
2007-04-01	2.7	3.0	2.9	2.4	2.4	2.2	4.1	0.5	0.4	2.2	4.9	3.5	2.6	8.24	6.58
2007-05-01	2.6	3.1	2.8	2.4	2.3	2.2	3.9	0.5	0.5	1.9	6.2	2.6	2.3	8.29	6.62
2007-06-01	2.9	3.4	2.8	2.4	3.0	2.1	3.5	0.4	0.6	1.9	7.5	2.7	2.6	8.34	6.67
2007-07-01	2.7	3.1	3.0	2.3	2.7	2.0	3.5	-0.1	0.5	1.9	7.4	2.6	2.3	8.57	6.85
2007-08-01	2.9	4.1	2.8	2.1	2.1	1.9	3.0	0.5	0.5	1.9	7.4	2.1	2.3	8.74	7.01
2007-09-01	2.9	4.3	2.8	2.1	1.4	1.9	3.3	2.3	0.3	2.0	7.4	2.3	2.1	8.82	7.02
2007-10-01	3.1	4.4	2.7	1.9	1.5	1.8	3.3	3.5	0.2	1.9	7.4	2.3	2.1	8.83	7.01
2007-11-01	3.7	5.4	2.8	1.8	2.2	1.8	3.2	4.3	0.3	1.7	7.4	2.3	1.9	8.80	6.96
2007-12-01	4.6	6.8	3.8	2.9	3.2	2.5	4.3	5.2	0.5	2.2	7.5	3.2	2.5	8.78	6.95
2008-01-01	5.1	7.4	4.0	3.8	3.4	3.2	4.8	5.7	0.7	2.4	7.5	3.4	2.9	8.79	6.92
2008-02-01	5.9	8.8	4.3	4.0	3.9	3.8	5.2	5.9	0.7	2.7	7.5	4.0	3.2	8.81	6.97
2008-03-01	7.3	11.6	4.8	4.2	5.0	4.2	5.5	6.5	0.7	2.9	7.3	4.2	3.4	8.80	6.96
2008-04-01	8.2	13.8	5.2	4.5	5.0	4.6	5.9	8.0	0.6	3.0	7.2	4.5	3.5	8.79	6.97
2008-05-01	9.4	16.1	5.4	4.6	4.8	5.0	6.3	10.7	0.7	3.3	7.3	5.0	3.7	8.95	7.15
2008-06-01	10.2	17.3	5.6	5.3	4.2	5.1	6.9	15.0	0.6	3.8	6.4	5.3	3.6	9.09	7.30
2008-07-01	10.5	17.1	5.7	5.5	5.0	5.5	7.2	17.7	0.8	3.9	6.4	5.6	4.1	9.61	7.65
2008-08-01	10.1	16.0	5.9	5.6	5.6	5.8	7.6	15.9	0.8	3.8	6.4	5.8	4.2	9.83	7.80
2008-09-01	9.7	14.4	5.8	5.8	6.4	5.9	7.4	13.4	0.9	3.7	6.4	5.7	4.3	9.89	7.86
2008-10-01	9.1	13.4	5.9	5.9	6.2	6.1	7.2	9.6	0.9	3.9	6.5	6.0	4.4	10.11	8.09
2008-11-01	7.8	12.3	5.6	5.9	3.7	6.1	7.3	5.1	0.8	3.9	6.5	6.1	4.6	10.25	8.29
2008-12-01	7.1	11.3	5.0	5.4	2.8	5.7	6.8	2.6	-0.4	3.6	6.4	7.2	4.2	10.51	8.54
2009-01-01	7.2	11.7	5.0	4.4	3.2	5.0	6.5	2.8	-0.6	3.4	6.5	7.2	3.6	10.01	8.18
2009-02-01	6.6	10.9	4.9	4.2	2.2	4.6	6.2	1.6	-0.5	3.3	6.5	6.4	3.6	9.41	7.69
2009-03-01	5.6	8.3	4.6	4.1	2.1	4.3	5.8	2.2	-0.5	3.1	6.5	6.5	3.4	9.30	7.49
2009-04-01	4.3	6.3	4.4	3.9	1.2	4.0	5.4	0.3	-0.6	3.0	6.6	6.4	3.3	9.22	7.37
2009-05-01	3.2	4.0	4.2	3.8	1.1	3.6	5.1	-0.8	-0.7	2.8	3.9	6.0	3.0	9.27	7.37
2009-06-01	2.2	2.5	4.0	3.2	0.8	3.4	4.6	-4.5	-0.7	2.3	3.7	5.5	3.0	9.34	7.38
2009-07-01	1.7	2.4	3.8	3.0	0.6	3.2	4.4	-6.3	-0.9	2.2	3.7	5.6	2.7	9.28	7.32
2009-08-01	2.3	3.0	3.7	3.1	0.8	3.0	4.2	-4.6	-0.8	2.4	3.7	5.8	2.6	9.04	7.02
2009-09-01	2.9	4.6	3.9	2.8	0.8	2.9	4.3	-3.6	-0.9	2.4	3.7	5.8	2.6	9.07	7.02
2009-10-01	3.5	5.7	3.9	2.8	1.2	2.8	4.1	-0.6	-1.0	2.2	3.7	5.5	2.6	9.03	7.00
2009-11-01	4.4	6.1	4.3	2.7	3.3	2.7	4.0	4.3	-1.1	2.1	3.9	5.3	2.3	8.99	6.96
2009-12-01	3.9	5.0	3.7	2.3	3.1	2.6	4.0	6.2	-0.3	2.2	4.2	3.0	2.3	8.99	6.93
2010-01-01	3.9	4.4	3.6	2.4	4.1	2.5	4.0	6.1	-0.3	2.3	4.2	3.2	2.3	8.95	6.86
2010-02-01	3.9	3.9	3.5	2.3	5.4	2.3	3.7	7.6	-0.4	2.2	4.2	2.9	2.1	8.92	6.83
2010-03-01	4.0	3.6	3.1	2.4	6.3	2.5	3.7	6.1	-0.3	2.3	4.2	2.8	2.4	8.90	6.79

2010-04-01	3.9	3.4	2.9	2.4	5.7	2.6	3.7	6.5	-0.3	2.1	4.3	2.8	2.4	8.89	6.73
2010-05-01	3.6	3.5	2.8	2.4	5.7	2.6	3.8	3.7	-0.3	1.9	4.5	2.6	2.5	8.88	6.69
2010-06-01	3.7	3.9	2.7	2.5	5.5	2.7	3.9	3.5	-0.3	1.9	4.5	2.9	2.4	8.85	6.66
2010-07-01	4.1	4.4	2.6	3.1	6.0	2.6	3.7	2.8	-0.3	2.0	4.6	2.6	2.5	8.88	6.67
2010-08-01	3.8	4.3	2.7	3.0	5.2	2.6	3.7	2.3	-0.4	1.9	4.6	2.3	2.6	8.89	6.68
2010-09-01	3.2	3.5	2.6	2.9	4.1	2.5	3.5	3.1	-0.4	2.0	4.6	2.3	2.5	8.88	6.67
2010-10-01	3.7	3.9	2.6	3.0	5.3	2.6	3.8	3.1	-0.3	1.9	5.0	2.3	2.4	8.73	6.54
2010-11-01	3.6	4.0	2.6	3.4	5.2	2.5	3.9	2.6	-0.1	2.2	4.7	2.2	2.6	8.16	6.05
2010-12-01	4.0	4.8	2.9	3.0	5.1	2.1	3.0	3.2	0.4	1.6	4.2	1.7	2.6	7.45	5.40
2011-01-01	4.7	5.9	4.0	3.2	5.0	2.5	2.9	5.2	0.2	1.5	4.4	2.1	2.8	7.38	5.29
2011-02-01	4.9	6.2	4.6	3.4	4.6	2.5	3.2	5.8	0.3	1.6	4.4	2.8	2.9	7.60	5.52
2011-03-01	4.7	6.3	5.0	3.4	3.7	2.4	3.2	7.0	0.3	1.5	4.3	2.3	2.7	7.52	5.37
2011-04-01	4.9	6.2	5.2	3.7	5.0	2.4	3.6	7.2	0.2	1.8	4.3	2.9	2.8	7.46	5.35
2011-05-01	5.2	6.0	5.8	3.9	5.8	2.5	3.4	7.3	0.3	2.8	5.2	3.0	2.9	7.34	5.27
2011-06-01	4.9	5.7	6.0	4.2	5.1	2.5	3.2	7.3	0.3	3.0	5.2	3.0	2.9	8.20	6.02
2011-07-01	4.6	5.2	6.3	3.8	4.8	2.6	3.3	7.5	0.3	3.0	5.1	3.2	3.0	8.22	6.06
2011-08-01	4.7	5.0	6.1	3.9	5.5	2.5	3.4	7.5	0.3	2.8	5.1	3.3	3.0	8.00	5.84
2011-09-01	5.2	5.7	6.2	3.9	6.3	2.5	3.4	7.2	0.5	2.8	5.1	3.2	3.3	7.72	5.59
2011-10-01	4.7	4.8	6.3	4.0	5.5	2.3	3.1	6.8	0.5	3.2	4.7	3.2	3.3	7.87	5.74
2011-11-01	4.2	4.1	6.0	3.7	4.9	2.5	3.0	6.1	0.4	3.1	4.7	3.1	3.3	7.81	5.69
2011-12-01	4.1	3.1	6.0	4.4	5.8	2.5	3.7	5.9	0.6	3.8	5.1	4.2	2.9	7.84	5.67
2012-01-01	3.0	1.5	5.0	4.2	5.0	2.2	3.4	4.9	0.8	3.7	4.8	3.3	2.8	7.90	5.73
2012-02-01	2.9	1.5	4.6	4.0	4.7	2.5	3.4	4.9	0.6	3.7	4.8	3.0	2.9	8.01	5.45
2012-03-01	3.2	1.9	4.8	4.6	4.5	3.3	3.7	4.1	0.7	4.0	4.9	3.4	3.3	8.03	5.81
2012-04-01	2.9	1.9	4.9	4.9	4.3	3.3	3.3	2.3	0.8	4.2	4.8	3.1	3.5	8.07	5.83
2012-05-01	2.7	2.1	4.3	5.0	3.8	3.7	3.3	0.6	0.8	3.3	4.7	3.2	3.5	8.01	5.75
2012-06-01	3.1	2.5	4.4	4.6	4.9	3.9	3.1	-0.8	0.8	3.3	4.5	3.0	3.7	7.98	5.69
2012-07-01	3.7	3.6	4.8	4.9	5.7	4.4	3.1	0.6	0.8	3.2	4.5	2.8	3.6	7.94	5.70
2012-08-01	3.6	3.7	5.0	4.7	4.5	4.6	3.0	1.9	0.7	3.3	4.5	2.8	3.8	7.83	5.54
2012-09-01	3.2	2.8	5.1	4.9	4.5	4.6	3.0	1.7	0.5	3.2	4.5	2.9	3.6	7.65	5.41
2012-10-01	2.8	2.5	5.3	4.9	3.7	4.7	3.0	0.9	0.6	3.1	4.3	3.1	3.6	7.58	5.32
2012-11-01	2.9	2.5	5.4	4.9	3.7	4.7	3.1	0.7	0.6	3.1	4.3	3.2	3.5	7.53	5.27
2012-12-01	2.8	2.7	14.1	4.3	3.5	4.9	2.3	0.1	0.3	2.4	4.2	2.3	3.5	7.51	5.27
2013-01-01	2.9	2.9	24.9	4.3	2.5	5.1	2.9	-0.2	0.3	2.6	4.2	2.5	3.5	7.13	4.90
2013-02-01	2.7	2.7	28.0	4.4	2.0	4.6	2.9	-1.6	0.3	2.6	4.2	2.6	3.4	7.13	4.86
2013-03-01	2.2	2.0	28.3	3.7	1.5	3.8	2.8	-2.9	0.1	2.6	4.2	2.6	2.9	7.08	4.82
2013-04-01	2.3	2.2	29.1	3.3	1.7	3.7	2.7	-2.3	0.1	2.4	4.2	2.4	2.6	6.95	4.72
2013-05-01	2.5	2.1	31.1	3.2	1.8	3.3	2.7	0.5	0.0	11.7	4.0	2.3	2.8	6.91	4.64
2013-06-01	2.4	1.9	31.0	3.0	0.8	3.1	2.6	2.6	0.0	11.4	4.1	2.3	2.6	7.06	4.68
2013-07-01	1.8	1.3	30.3	2.7	-0.4	2.6	2.6	1.1	0.0	11.4	4.1	2.4	2.6	6.98	4.59
2013-08-01	2.3	2.2	30.2	2.6	1.1	2.5	2.6	0.3	0.1	11.5	4.1	2.2	2.3	7.02	4.52
2013-09-01	2.4	2.9	29.9	2.5	0.8	2.5	2.5	-0.2	0.1	11.5	4.1	2.3	2.2	6.92	4.49
2013-10-01	2.9	3.3	29.5	2.4	2.1	2.4	2.6	0.6	0.1	11.5	4.1	2.1	2.2	6.76	4.39
2013-11-01	3.8	4.2	30.0	2.6	3.7	2.5	2.7	1.5	0.0	11.5	4.1	2.2	2.2	6.62	4.33
2013-12-01	3.7	4.5	19.8	2.8	3.4	2.6	2.5	1.7	0.1	11.5	4.1	2.0	2.2	6.59	4.29
2014-01-01	3.6	4.8	9.6	3.0	3.8	2.7	2.2	1.1	0.1	11.6	4.1	1.8	2.4	6.66	4.34
2014-02-01	3.5	5.0	7.2	3.0	3.1	2.8	2.3	1.3	0.1	11.5	4.1	1.5	2.4	6.75	4.43
2014-03-01	3.6	5.3	6.5	3.0	3.7	2.6	2.1	1.8	0.1	11.2	4.1	1.2	2.3	6.78	4.33
2014-04-01	4.0	5.8	5.5	3.3	4.0	2.6	2.0	2.4	0.1	11.1	4.1	1.2	2.3	6.73	4.35
2014-05-01	3.8	6.4	3.8	3.3	2.6	2.7	1.9	1.9	0.2	1.9	4.5	1.1	2.2	6.81	4.38
2014-06-01	4.2	7.2	3.7	3.5	2.7	2.7	2.3	1.9	0.2	1.9	4.5	1.1	2.2	6.88	4.29
2014-07-01	4.2	7.5	3.7	3.8	2.9	3.0	2.4	0.7	0.2	2.0	4.5	1.1	2.2	6.92	4.38
2014-08-01	3.9	6.6	3.8	3.8	2.5	2.9	2.5	0.0	0.3	2.0	4.5	1.3	2.2	6.93	4.40
2014-09-01	3.7	6.0	3.8	3.9	2.8	3.0	2.6	0.0	0.2	2.0	4.6	1.3	2.1	6.81	4.38
2014-10-01	3.0	5.4	4.1	4.0	0.9	3.0	2.4	-1.3	0.1	1.9	4.6	1.4	2.1	6.73	4.42
2014-11-01	1.9	4.6	3.6	3.8	-1.2	2.8	2.6	-4.6	0.2	1.9	4.6	1.4	2.2	6.76	4.43
2014-12-01	1.5	4.5	3.5	3.4	-1.8	2.5	2.7	-7.3	0.1	1.8	4.6	1.2	2.1	6.86	4.47
2015-01-01	1.5	4.0	3.2	3.3	-1.1	2.2	2.4	-6.8	0.0	1.5	4.6	1.3	1.7	6.89	4.54
2015-02-01	1.5	3.5	2.9	3.2	0.0	2.2	2.3	-5.8	0.0	1.5	4.6	1.4	1.5	6.86	4.48
2015-03-01	1.4	3.3	3.0	3.0	-0.5	2.3	2.2	-5.6	0.0	1.4	4.6	1.4	1.6	6.86	4.49
2015-04-01	0.9	2.5	2.9	2.7	-1.3	2.1	2.2	-4.9	0.0	1.4	4.6	1.4	1.4	6.85	4.51

2015-05-01	0.6	1.6	3.1	2.5	-1.2	2.0	2.3	-4.8	-0.2	1.1	3.3	1.4	1.2	6.99	4.52
2015-06-01	0.2	0.9	3.1	2.3	-1.1	1.8	2.0	-6.2	-0.1	1.1	3.2	1.4	1.2	6.97	4.52
2015-07-01	0.0	0.4	3.0	2.0	-1.2	1.5	1.8	-6.4	-0.1	1.0	3.2	1.4	1.3	6.99	4.56
2015-08-01	-0.4	0.1	2.9	2.0	-2.1	1.5	1.6	-6.3	-0.2	0.8	3.2	1.2	1.5	6.98	4.50
2015-09-01	-0.2	0.2	2.8	1.9	-2.0	1.3	1.6	-5.3	-0.1	1.0	3.2	1.2	1.9	6.84	4.45
2015-10-01	0.3	1.0	2.8	1.9	-1.4	1.4	1.8	-4.3	0.0	1.0	3.2	1.3	1.9	6.70	4.33
2015-11-01	0.7	1.1	3.1	1.9	-0.3	1.6	1.5	-1.2	0.0	1.0	3.2	1.0	1.9	6.76	4.37
2015-12-01	0.7	0.9	3.3	1.8	-0.2	1.5	1.5	-0.3	0.1	1.1	3.2	1.0	1.7	6.82	4.37
2016-01-01	0.5	0.9	3.5	1.7	-0.8	1.5	1.7	-2.7	0.2	1.1	3.2	0.9	2.0	6.86	4.45
2016-02-01	0.6	1.0	3.7	1.7	-1.3	1.5	1.6	-2.6	0.1	1.1	3.2	1.6	2.1	6.87	4.37
2016-03-01	0.7	0.8	3.8	1.6	-1.0	1.4	1.7	-2.2	0.2	1.1	3.2	1.6	2.1	6.79	4.39
2016-04-01	0.9	1.4	4.0	1.8	-0.8	1.6	2.0	-2.0	0.3	1.2	3.2	1.6	2.3	6.79	4.38
2016-05-01	1.3	1.9	4.4	1.9	0.2	1.6	2.1	-2.2	0.4	1.2	2.8	1.6	2.3	6.82	4.45
2016-06-01	1.3	1.7	4.9	2.2	0.8	1.8	2.2	-1.9	0.3	1.4	2.9	1.6	2.3	6.71	4.39
2016-07-01	1.3	1.5	5.1	2.4	1.0	2.1	2.2	-1.4	0.3	1.5	2.9	1.6	2.3	6.69	4.33
2016-08-01	1.7	1.9	5.3	2.5	1.6	2.2	2.5	-0.8	0.4	1.6	2.9	1.7	2.2	6.65	4.27
2016-09-01	1.8	2.3	5.3	2.6	1.5	2.4	2.5	-0.7	0.4	1.5	2.8	1.4	2.0	6.55	4.24
2016-10-01	2.1	2.3	6.2	2.5	2.1	2.3	2.9	-0.1	0.3	1.8	3.1	1.3	2.1	6.49	4.18
2016-11-01	2.2	2.3	6.5	2.6	1.9	2.3	3.0	1.7	0.3	1.7	3.1	1.7	2.1	6.42	4.09
2016-12-01	2.5	2.6	6.5	2.8	2.0	2.2	3.1	3.6	0.2	1.4	3.1	1.8	2.2	6.42	4.06
2017-01-01	3.1	3.0	7.2	2.8	3.0	2.3	3.1	6.0	0.3	1.5	3.1	1.9	2.2	6.43	4.18
2017-02-01	3.1	2.9	7.5	2.9	3.7	2.6	3.3	5.6	0.4	1.5	3.1	1.1	2.2	6.53	4.22
2017-03-01	3.2	3.3	7.4	2.9	3.4	2.6	3.1	5.7	0.3	1.5	3.1	1.0	2.1	6.56	4.21
2017-04-01	2.9	3.1	7.4	2.7	3.4	2.4	2.8	4.2	0.2	1.4	3.1	1.1	2.0	6.52	4.21
2017-05-01	2.5	3.0	7.0	2.6	1.8	2.3	2.8	3.6	0.2	1.5	2.0	1.3	1.9	6.47	4.17
2017-06-01	2.4	2.8	6.8	2.3	1.3	2.4	2.6	3.8	0.4	2.6	2.1	1.4	2.1	6.38	4.14
2017-07-01	2.6	2.9	6.8	2.3	1.5	2.1	2.6	5.6	0.4	2.4	2.1	1.6	2.0	6.45	4.09
2017-08-01	3.0	3.3	6.7	2.1	3.2	2.1	2.4	6.0	0.3	2.0	2.1	1.9	1.8	6.47	4.08
2017-09-01	3.1	3.2	7.2	2.0	3.5	2.0	2.3	5.6	0.3	2.0	2.1	1.9	1.7	6.51	4.09
2017-10-01	3.0	3.0	6.2	2.0	3.3	2.0	1.8	5.7	0.3	1.6	1.8	2.0	1.5	6.53	4.06
2017-11-01	2.9	3.5	6.3	1.8	2.8	2.1	1.6	4.0	0.3	1.7	1.8	2.1	1.6	6.49	4.07
2017-12-01	3.4	4.5	13.7	1.9	2.4	2.6	2.3	4.8	0.3	2.3	-2.1	2.2	1.9	6.57	4.14
2018-01-01	3.7	4.8	17.7	2.1	2.5	2.6	2.4	5.9	0.3	2.6	-2.1	2.8	2.0	6.57	4.12
2018-02-01	4.3	5.5	18.8	2.1	2.8	2.7	2.5	5.0	0.3	2.5	-2.1	4.0	2.0	6.63	4.17
2018-03-01	4.3	5.6	20.1	2.2	2.8	2.8	2.7	5.5	0.3	2.5	-2.1	4.2	2.1	6.67	4.21
2018-04-01	4.6	5.6	20.5	2.1	2.9	2.9	2.9	6.8	0.3	2.5	-2.1	4.4	2.2	6.84	4.21
2018-05-01	5.0	5.9	20.7	2.2	4.5	3.0	2.9	7.9	0.3	2.7	-0.3	4.3	2.1	6.93	4.31
2018-06-01	5.8	7.1	21.2	2.4	5.6	3.1	3.4	8.0	0.3	1.6	0.1	4.6	2.3	6.98	4.40
2018-07-01	6.6	8.6	21.3	2.4	5.7	3.3	3.6	7.6	0.3	4.2	0.1	4.8	2.4	7.00	4.47
2018-08-01	6.9	10.2	21.4	2.5	4.8	3.4	3.9	7.8	0.3	4.5	0.1	4.7	2.5	7.03	4.57
2018-09-01	6.9	9.6	21.1	2.6	4.9	3.6	4.1	8.6	0.4	4.7	0.1	4.9	2.6	7.14	4.72
2018-10-01	6.1	8.1	21.5	2.8	4.3	3.8	4.4	7.4	0.3	4.8	0.1	5.2	2.8	7.55	5.05
2018-11-01	5.2	6.5	21.2	2.8	4.2	3.7	4.6	2.7	0.4	4.9	0.1	5.1	2.7	7.88	5.26
2018-12-01	4.4	5.0	14.3	2.6	4.4	3.2	3.9	1.3	0.4	4.6	4.2	5.3	2.6	8.10	5.38
2019-01-01	3.8	4.1	11.0	2.5	4.1	3.2	3.8	0.9	0.3	4.3	4.2	4.8	2.4	8.25	5.50
2019-02-01	3.4	3.2	10.2	2.5	3.6	3.0	3.6	3.0	0.3	4.3	4.2	3.7	2.4	8.38	5.69
2019-03-01	3.2	2.8	9.3	2.4	3.5	2.9	3.7	3.4	0.3	4.4	4.2	3.7	2.3	8.49	5.80
2019-04-01	3.2	2.9	8.9	2.5	3.7	3.0	3.6	3.0	0.4	4.5	4.2	3.5	2.2	8.61	5.90
2019-05-01	2.7	2.4	8.8	2.5	3.1	3.0	3.9	0.7	0.4	4.3	3.1	3.5	2.5	8.53	5.84
2019-06-01	2.2	1.5	8.5	2.7	2.4	2.9	4.2	1.0	0.3	4.5	3.3	3.4	2.4	8.38	5.71
2019-07-01	1.4	0.0	9.7	2.8	1.5	2.8	4.5	0.3	0.3	2.2	3.8	3.3	2.4	8.10	5.60
2019-08-01	0.5	-1.8	13.6	2.8	0.3	2.9	4.4	-0.5	0.4	2.3	3.8	3.0	2.4	7.78	5.44
2019-09-01	0.6	-1.4	15.3	2.8	0.4	2.7	4.3	-1.3	0.3	2.2	3.8	2.9	2.3	7.63	5.26
2019-10-01	1.2	-0.3	16.3	2.8	1.1	2.7	4.2	-1.1	0.4	2.1	3.8	2.6	2.4	7.37	5.09
2019-11-01	2.4	1.8	17.2	2.8	1.8	2.7	4.2	3.2	0.4	2.2	3.8	2.5	2.3	7.35	5.07
2019-12-01	3.0	2.5	17.5	2.8	2.6	2.9	4.2	4.1	0.4	2.1	3.7	2.3	2.3	7.35	5.05
2020-01-01	2.5	2.5	16.7	2.7	1.6	3.2	4.3	1.5	0.4	2.3	3.7	2.2	2.5	10.95	5.76
2020-02-01	2.2	2.7	16.7	2.8	1.0	3.5	4.4	-2.3	0.5	2.4	3.7	2.2	2.5	10.89	6.11
2020-03-01	1.8	3.7	16.8	2.7	0.0	3.6	4.3	-7.4	0.5	2.2	3.7	2.0	2.5	11.17	6.22
2020-04-01	1.6	3.4	17.0	2.5	-0.2	3.4	4.3	-7.2	0.4	2.0	3.7	2.0	2.5	11.20	6.56
2020-05-01	2.3	2.9	17.5	2.5	0.3	3.4	4.2	0.0	0.4	1.8	1.3	1.9	2.3	10.95	6.13

2020-06-01	2.4	2.4	18.4	2.2	0.4	3.2	3.7	3.7	0.6	1.6	0.5	2.1	2.3	9.77	5.93
2020-07-01	2.2	1.9	16.8	2.1	0.6	3.2	3.5	4.2	0.6	0.0	0.0	1.9	2.2	10.63	6.35
2020-08-01	2.2	1.7	12.5	2.0	1.2	3.0	3.4	5.5	0.5	-0.6	0.9	2.0	2.3	10.67	5.95
2020-09-01	2.3	2.2	11.5	1.9	0.7	3.1	3.5	5.3	0.6	-0.6	0.9	2.1	2.4	10.23	5.82
2020-10-01	3.0	4.4	12.3	1.6	0.4	2.9	3.4	5.0	0.6	-0.6	0.9	1.9	2.2	9.89	5.62
2020-11-01	3.3	4.6	11.9	1.7	0.1	2.8	3.7	6.1	0.6	-0.7	0.9	2.3	2.3	10.22	5.84
2020-12-01	3.7	5.9	11.3	1.6	0.2	2.6	3.8	6.6	0.6	-0.6	1.0	2.6	2.4	9.28	5.26
2021-01-01	4.2	6.2	11.7	1.7	0.6	2.3	3.9	8.2	0.7	-0.7	1.0	3.0	2.4	9.45	5.54
2021-02-01	4.1	5.3	11.3	1.7	0.7	1.8	4.0	11.9	0.6	-0.7	1.0	2.9	2.4	9.52	5.49
2021-03-01	4.1	3.8	11.2	1.7	1.3	1.9	4.0	16.6	0.6	-0.6	1.0	3.3	2.4	9.43	5.48
2021-04-01	4.1	3.5	11.1	1.9	1.7	2.2	4.1	16.2	0.6	-0.5	1.0	3.9	2.4	9.83	5.59
2021-05-01	3.7	3.6	10.4	1.8	2.0	2.2	3.9	10.3	0.8	-0.5	1.0	4.2	2.4	10.06	5.62
2021-06-01	3.7	3.9	9.3	1.9	2.7	2.1	3.9	7.1	0.5	-0.6	1.0	3.8	2.3	9.80	5.62
2021-07-01	4.4	5.5	9.4	1.8	3.4	2.0	3.8	7.0	0.6	1.1	0.9	4.0	2.2	9.80	5.36
2021-08-01	4.2	5.0	9.5	1.9	3.8	2.2	3.8	5.6	0.7	1.6	0.7	4.0	2.2	9.86	5.45
2021-09-01	4.0	3.7	8.7	1.9	4.3	2.1	3.7	7.6	0.6	1.6	0.7	3.8	2.1	10.10	5.88
2021-10-01	3.7	2.2	6.9	2.0	4.8	2.1	3.6	9.8	0.6	1.6	0.7	3.7	2.2	10.30	5.66
2021-11-01	3.1	1.6	6.2	1.9	5.1	2.1	3.2	6.6	0.6	1.6	0.7	3.2	2.1	10.59	5.63
2021-12-01	3.0	1.7	5.6	2.0	4.5	2.4	3.1	7.0	0.7	1.5	0.6	3.0	2.2	10.83	5.64
2022-01-01	3.0	1.2	4.7	1.9	4.8	2.3	2.7	8.8	0.6	1.6	0.6	2.9	2.2	10.44	5.29
2022-02-01	4.0	2.6	4.8	1.9	6.2	2.6	2.5	10.3	0.7	1.5	0.6	3.0	2.2	10.76	5.47
2022-03-01	4.9	3.8	5.9	2.0	6.9	2.6	2.4	13.0	0.7	1.6	0.6	2.8	2.3	10.54	5.49
2022-04-01	5.4	4.9	6.8	2.1	6.5	2.5	2.4	14.6	0.7	1.7	0.6	2.8	2.5	10.33	5.13
2022-05-01	6.1	6.0	7.8	2.2	6.6	2.9	2.6	17.1	0.5	1.9	0.6	2.8	2.6	10.04	5.13
2022-06-01	6.4	6.9	8.5	2.5	5.7	3.1	2.4	18.1	0.5	2.2	0.6	3.4	2.8	10.06	5.36
2022-07-01	6.3	6.3	9.3	2.8	6.8	3.4	2.5	14.6	0.4	2.4	3.8	4.2	3.3	10.70	5.34
2022-08-01	6.9	7.4	9.8	2.9	7.3	3.5	2.4	14.5	0.5	2.7	3.5	4.6	3.4	10.52	5.50
2022-09-01	7.7	9.4	10.4	3.1	7.4	3.8	2.6	12.5	0.5	3.0	3.4	5.7	3.7	10.64	5.86
2022-10-01	8.0	10.0	10.6	3.6	6.9	4.5	2.8	12.3	0.7	3.3	3.6	6.5	4.2	11.10	6.05
2022-11-01	8.1	10.2	10.7	3.9	7.0	4.8	3.1	11.7	0.7	3.9	3.6	7.0	4.5	11.46	6.74
2022-12-01	8.7	10.7	10.9	4.4	8.6	5.2	3.3	11.1	0.7	4.2	3.6	7.6	5.0	11.79	6.93
2023-01-01	8.6	10.8	11.0	4.8	8.6	6.2	4.0	9.0	0.8	4.4	3.6	8.1	5.3	11.80	7.44
2023-02-01	7.6	9.3	12.2	5.0	7.6	6.2	3.9	5.3	0.7	4.6	3.6	8.3	5.6	11.97	7.60
2023-03-01	6.6	7.9	12.7	5.1	6.5	6.1	4.1	2.6	0.7	4.7	3.6	8.6	5.7	11.93	7.73
2023-04-01	6.1	7.4	12.3	5.1	6.5	6.2	4.1	-0.5	0.7	4.9	3.6	8.3	5.7	12.10	7.59
2023-05-01	5.4	6.7	11.6	5.1	5.6	6.0	3.9	-3.1	0.7	4.8	3.6	8.2	5.8	12.02	7.45
2023-06-01	4.7	6.3	10.9	4.8	4.5	5.8	3.9	-4.7	0.7	4.7	3.7	7.9	5.6	11.85	7.44
2023-07-01	5.3	8.1	10.1	4.8	2.5	5.6	3.9	0.2	0.7	4.9	2.9	7.1	5.5	12.00	7.52
2023-08-01	6.1	9.7	9.8	4.7	2.4	5.4	4.1	1.2	0.6	5.1	3.8	7.1	5.4	12.09	7.51
2023-09-01	4.9	7.0	9.3	4.8	2.6	5.3	4.0	1.0	0.8	5.0	3.8	6.3	5.3	12.06	7.22
2023-10-01	4.1	5.7	9.0	4.3	2.5	4.7	3.8	-0.8	0.6	4.9	3.5	5.6	4.8	12.26	7.22

Appendix 2

DESCRIPTIVE STATISTICS RESULT

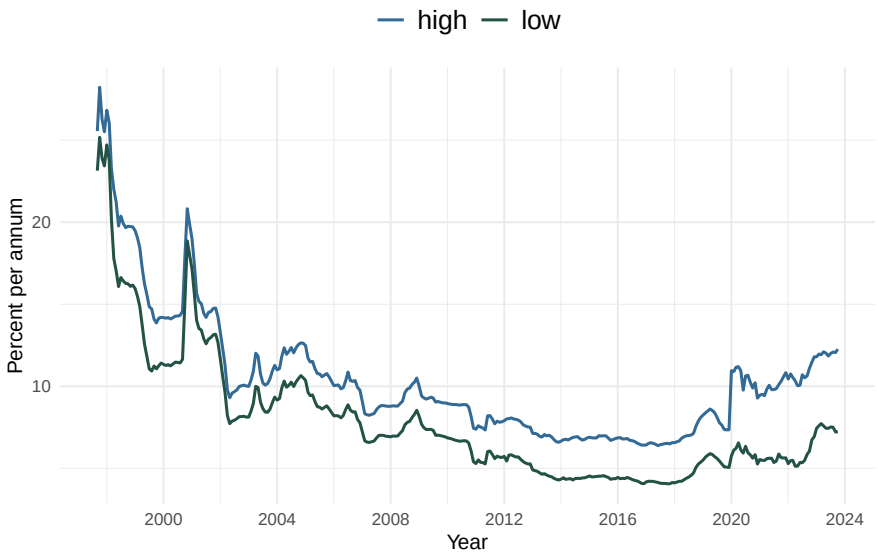
```
# Selecting all columns except the date column
selected_columns <- describe(dataset[, 2:ncol(dataset)])

# Computing for the descriptive statistics of variables
summary_stat <- selected_columns[c("mean", "median", "sd", "min", "max", "range")]

# Printing Summary Statistics
knitr::kable(summary_stat, "latex", booktabs = TRUE, longtable = TRUE, digits = 2) %>%
    kableExtra::kable_styling(font_size = 10)
```

	mean	median	sd	min	max	range
all	4.37	3.90	2.30	-0.40	10.70	11.10
food	4.58	4.00	3.12	-1.80	17.30	19.10
alco	7.47	5.40	6.05	1.20	31.10	29.90
cloth	3.43	3.00	1.51	1.60	8.90	7.30
house	4.15	4.10	2.70	-2.10	10.20	12.30
furnish	3.58	3.00	1.85	1.30	11.30	10.00
health	4.90	3.95	2.83	1.50	13.20	11.70
transpo	5.95	4.15	7.16	-7.40	26.80	34.20
ict	1.02	0.40	2.51	-2.50	13.10	15.60
rec	3.26	2.50	2.64	-0.90	12.00	12.90
educ	6.39	4.60	5.20	-2.10	23.10	25.20
restau	3.73	3.30	1.82	0.90	8.60	7.70
personal	3.48	2.60	2.30	1.20	12.50	11.30
high	10.44	9.72	4.03	6.38	28.22	21.84
low	7.84	6.76	3.96	4.06	25.17	21.11

Appendix 3

LENDING RATES LINE PLOT

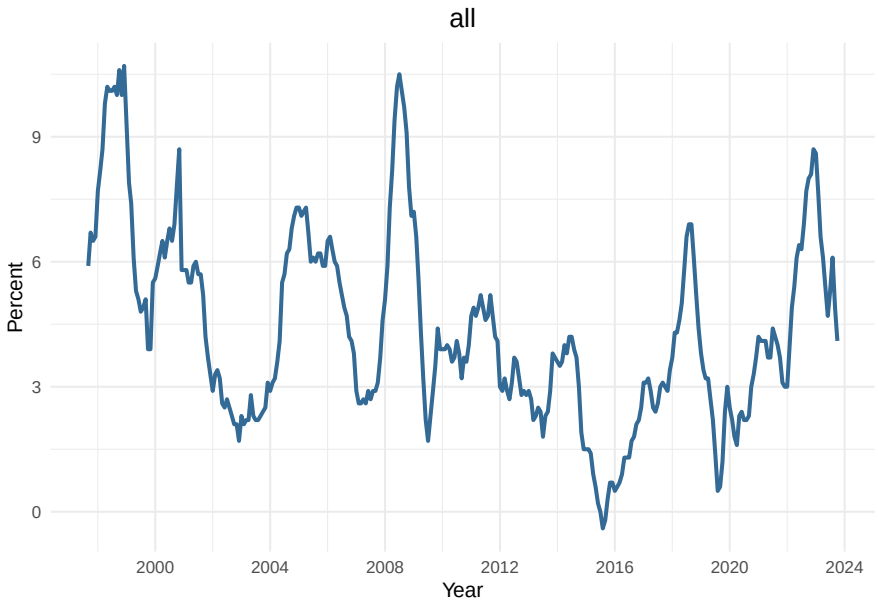
```
# Converting dataset into long format
dataset_long <- dataset[c("Date", c("high", "low"))] %>%
    pivot_longer(cols = -Date, names_to = "Column", values_to = "Value")

# Visualizing the data using line plot
ggplot(dataset_long, aes(x = Date, y = Value, color = Column)) + geom_line(linewidth = 0.75) +
    labs(title = "", x = "Year", y = "Percent per annum") + theme_minimal() + theme(legend.position = "top",
    legend.title = element_blank(), legend.text = element_text(size = 14)) + scale_x_date(date_labels = "%Y",
    date_breaks = "4 year") + scale_color_manual(values = c(high = "#336A96", low = "#235347"))
```

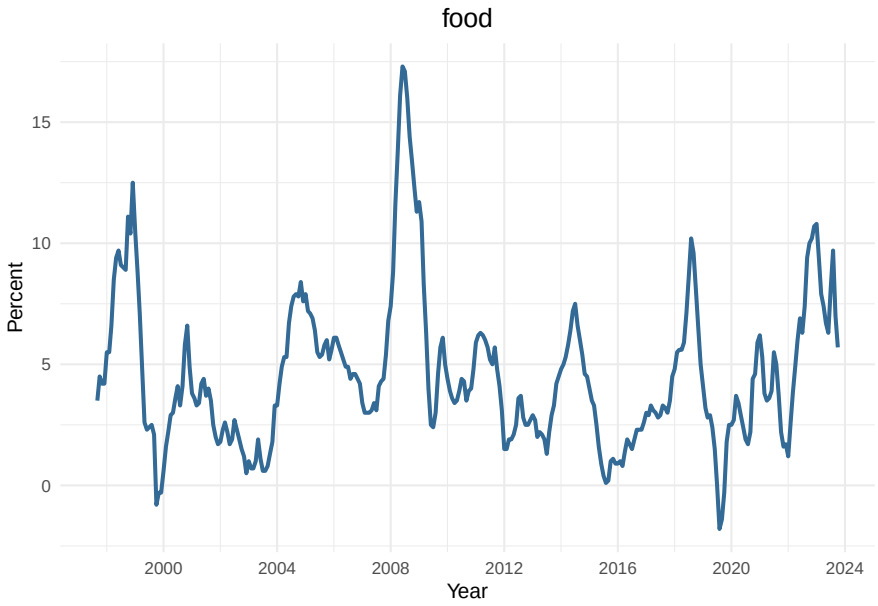


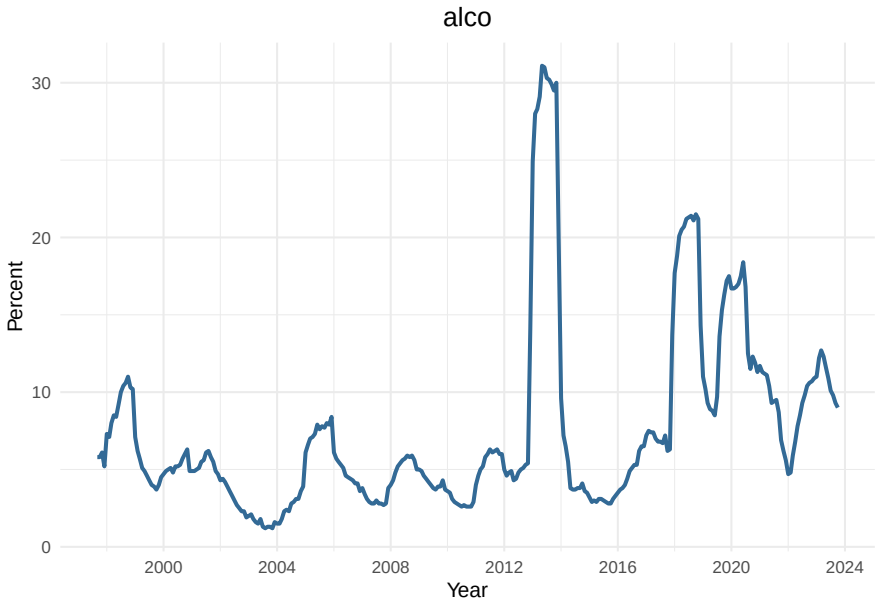
Appendix 4

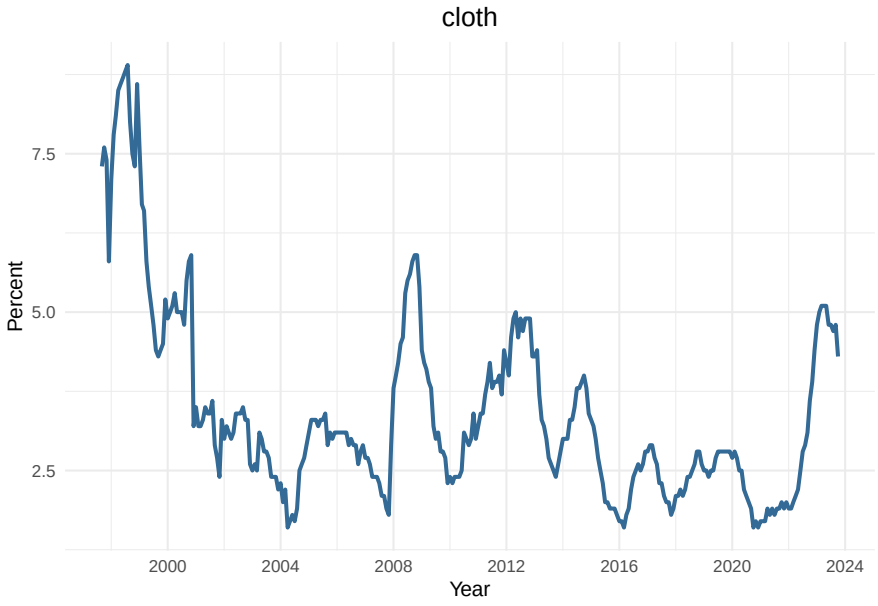
INFLATION EXPECTATIONS LINE PLOTS

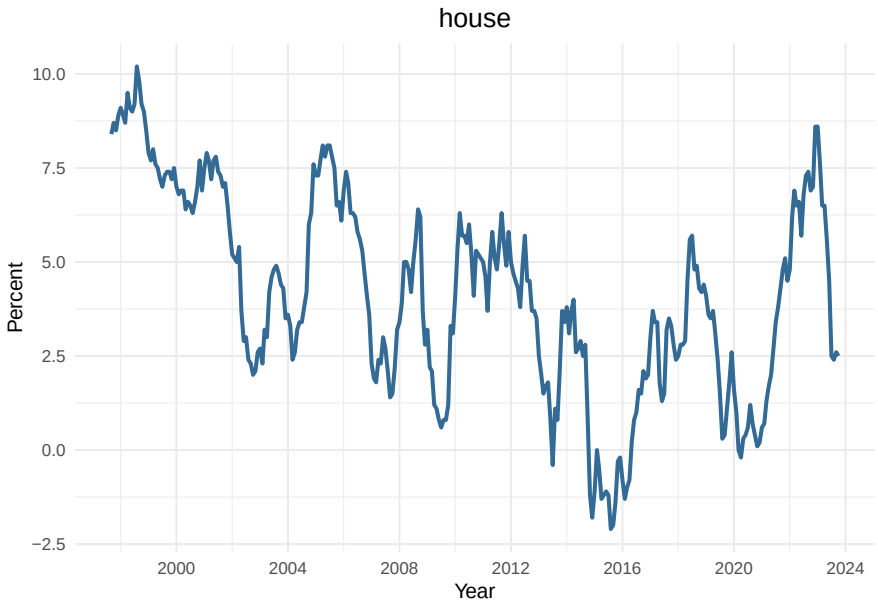
```
# Looping through each commodity inflation
for (i in 2:14) {

    # Converting dataset into long format
    dataset_long <- dataset[c("Date", names(dataset)[i])] %>%
        pivot_longer(cols = -Date, names_to = "Column", values_to = "Value")

    # Get the column name
    col_name <- names(dataset)[i]

    # Visualizing the data
    p <- ggplot(dataset_long, aes(x = Date, y = Value, color = col_name)) + geom_line(linewidth = 1) +
        labs(title = col_name, x = "Year", y = "Percent") + theme_minimal() + theme(legend.position = "none",
        plot.title = element_text(hjust = 0.5, size = 14)) + scale_x_date(date_labels = "%Y",
        date_breaks = "4 year") + scale_color_manual(values = "#336A96")

    print(p)
}
```

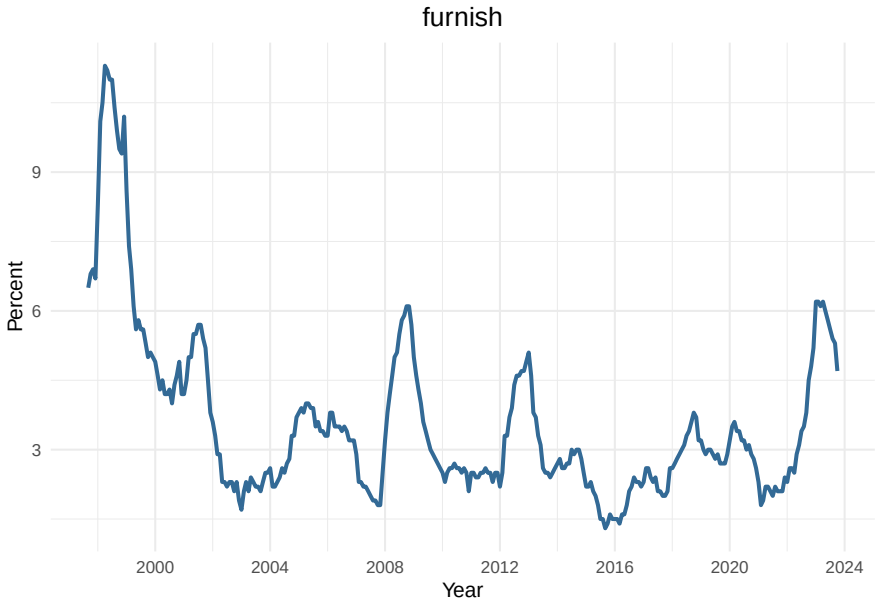



food
Percent
15
10
5
0
2000
2004
2008
2012
2016
2020
2024
Year

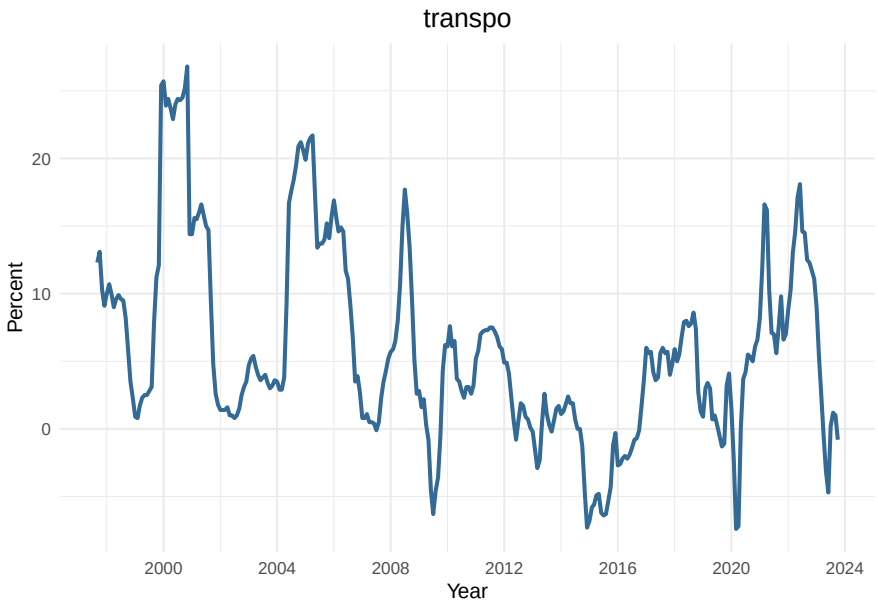

alco
Percent
30
20
10
0
2000
2004
2008
2012
2016
2020
2024
Year

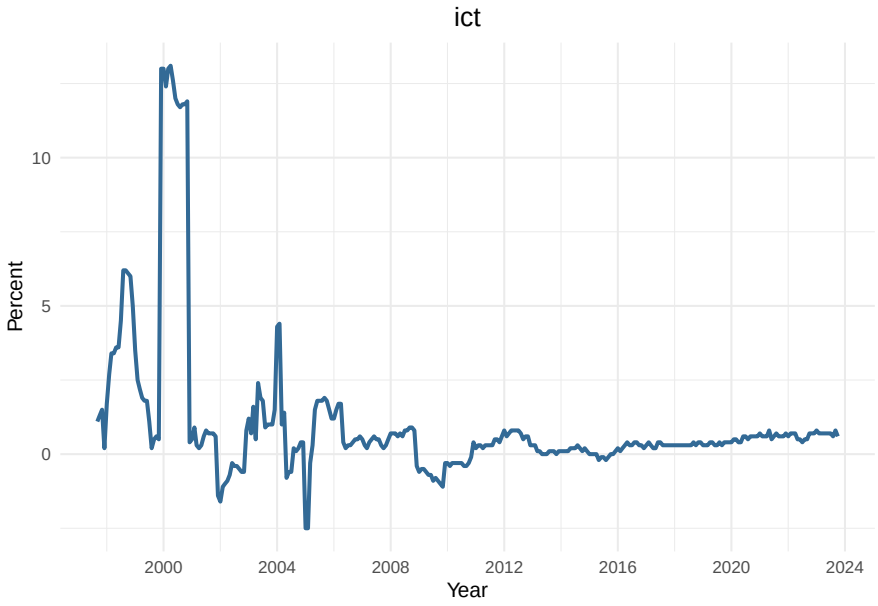

cloth
Percent
7.5
5.0
2.5
2000
2004
2008
2012
2016
2020
2024
Year

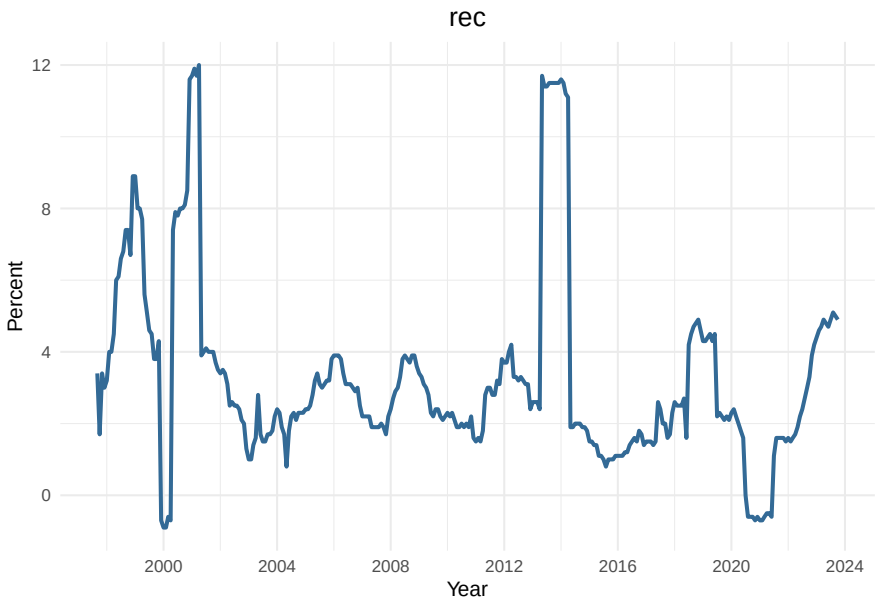

house
10.0
7.5
5.0
2.5
0.0
−2.5
Percent
2000
2004
2008
2012
2016
2020
2024
Year

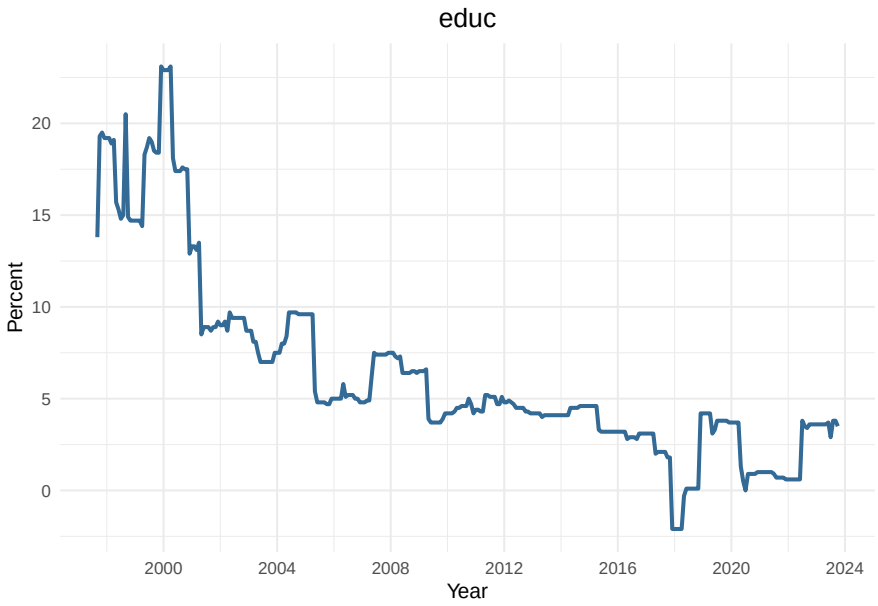

furnish
9
6
3
Percent
2000
2004
2008
2012
2016
2020
2024
Year

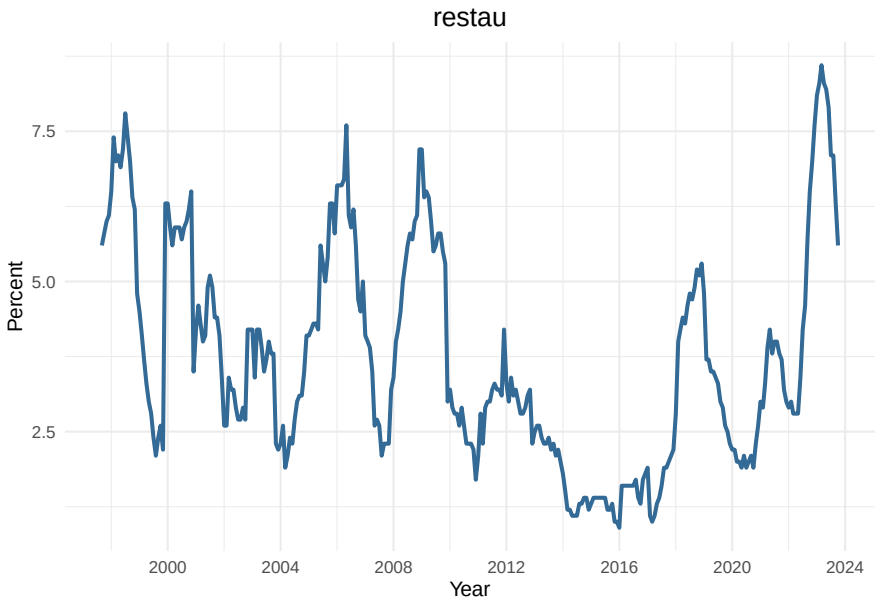

health
10
5
Percent
2000
2004
2008
2012
2016
2020
2024
Year

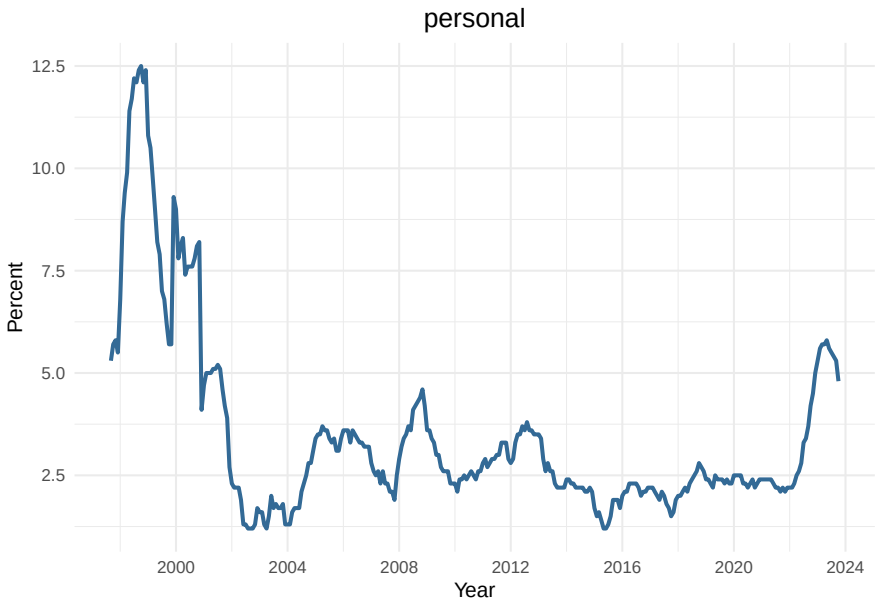

transpo
Percent
20
10
0
2000
2004
2008
2012
2016
2020
2024
Year


ict
Percent
10
5
0
2000
2004
2008
2012
2016
2020
2024
Year


rec
Percent
12
8
4
0
2000
2004
2008
2012
2016
2020
2024
Year


educ
Percent
20
15
10
5
0
2000
2004
2008
2012
2016
2020
2024
Year


restau
Percent
7.5
5.0
2.5
2000
2004
2008
2012
2016
2020
2024
Year


personal
Percent
12.5
10.0
7.5
5.0
2.5
2000
2004
2008
2012
2016
2020
2024
Year

Appendix 5

UNIT ROOT TEST AT LEVEL RESULTS

```
# Looping through each variable
for (i in names(dataset)) {
    if (i != "Date") {
        cat("\n-----Unit Root of ", i, "at Level------")

        # Testing for stationarity at level
        print(adf.test(dataset[[i]]))

        cat("------------------------------------------------------------------------------")
    }
}
```

```

-----Unit Root of  all at Level------
    Augmented Dickey-Fuller Test

data:  dataset[[i]]
Dickey-Fuller = -4.5749, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

------------------------------------------------------------------------------
-----Unit Root of  food at Level------
    Augmented Dickey-Fuller Test

data:  dataset[[i]]
Dickey-Fuller = -4.8674, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

------------------------------------------------------------------------------
-----Unit Root of  alco at Level------
    Augmented Dickey-Fuller Test

data:  dataset[[i]]
Dickey-Fuller = -4.9194, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

------------------------------------------------------------------------------
-----Unit Root of  cloth at Level------
    Augmented Dickey-Fuller Test

data:  dataset[[i]]
Dickey-Fuller = -4.1001, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

------------------------------------------------------------------------------
-----Unit Root of  house at Level------
    Augmented Dickey-Fuller Test

data:  dataset[[i]]
Dickey-Fuller = -3.8637, Lag order = 6, p-value = 0.01619
alternative hypothesis: stationary

------------------------------------------------------------------------------
-----Unit Root of  furnish at Level------
```

```
    Augmented Dickey-Fuller Test

data:  dataset[[i]]
Dickey-Fuller = -5.1103, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

-------------------------------------------------------------------------------
-----Unit Root of  health at Level------
    Augmented Dickey-Fuller Test

data:  dataset[[i]]
Dickey-Fuller = -2.3152, Lag order = 6, p-value = 0.4435
alternative hypothesis: stationary

-------------------------------------------------------------------------------
-----Unit Root of  transpo at Level------
    Augmented Dickey-Fuller Test

data:  dataset[[i]]
Dickey-Fuller = -4.0285, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

-------------------------------------------------------------------------------
-----Unit Root of  ict at Level------
    Augmented Dickey-Fuller Test

data:  dataset[[i]]
Dickey-Fuller = -4.3351, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

-------------------------------------------------------------------------------
-----Unit Root of  rec at Level------
    Augmented Dickey-Fuller Test

data:  dataset[[i]]
Dickey-Fuller = -4.0746, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

-------------------------------------------------------------------------------
-----Unit Root of  educ at Level------
    Augmented Dickey-Fuller Test

data:  dataset[[i]]
Dickey-Fuller = -2.761, Lag order = 6, p-value = 0.2556
alternative hypothesis: stationary

-------------------------------------------------------------------------------
-----Unit Root of  restau at Level------
    Augmented Dickey-Fuller Test

data:  dataset[[i]]
Dickey-Fuller = -4.1496, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

-------------------------------------------------------------------------------
-----Unit Root of  personal at Level------
    Augmented Dickey-Fuller Test

data:  dataset[[i]]
Dickey-Fuller = -3.0921, Lag order = 6, p-value = 0.116
alternative hypothesis: stationary
```

```

--------------------------------------------------------------------------------
-----Unit Root of  high at Level------
    Augmented Dickey-Fuller Test

data:  dataset[[i]]
Dickey-Fuller = -2.8708, Lag order = 6, p-value = 0.2093
alternative hypothesis: stationary

--------------------------------------------------------------------------------
-----Unit Root of  low at Level------
    Augmented Dickey-Fuller Test

data:  dataset[[i]]
Dickey-Fuller = -3.0898, Lag order = 6, p-value = 0.1169
alternative hypothesis: stationary

--------------------------------------------------------------------------------
```

Appendix 6

UNIT ROOT TEST AT FIRST DIFFERENCE RESULTS

```
# Looping through each variable
for (i in names(dataset)) {
    if (i != "Date") {
        cat("\n-----Unit Root of ", i, " at First Difference------")

        # Testing for stationarity at First Difference
        print(adf.test(diff(dataset[[i]])))
        cat("--------------------------------------------------------------------------------")
    }
}
```

```

-----Unit Root of  all  at First Difference------
    Augmented Dickey-Fuller Test

data:  diff(dataset[[i]])
Dickey-Fuller = -5.3129, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

--------------------------------------------------------------------------------
-----Unit Root of  food  at First Difference------
    Augmented Dickey-Fuller Test

data:  diff(dataset[[i]])
Dickey-Fuller = -5.3347, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

--------------------------------------------------------------------------------
-----Unit Root of  alco  at First Difference------
    Augmented Dickey-Fuller Test

data:  diff(dataset[[i]])
Dickey-Fuller = -6.3775, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

--------------------------------------------------------------------------------
-----Unit Root of  cloth  at First Difference------
    Augmented Dickey-Fuller Test

data:  diff(dataset[[i]])
Dickey-Fuller = -5.7012, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

--------------------------------------------------------------------------------
-----Unit Root of  house  at First Difference------
    Augmented Dickey-Fuller Test

data:  diff(dataset[[i]])
Dickey-Fuller = -6.0456, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

--------------------------------------------------------------------------------
-----Unit Root of  furnish  at First Difference------
    Augmented Dickey-Fuller Test
```

```

data:  diff(dataset[[i]])
Dickey-Fuller = -6.8492, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

--------------------------------------------------------------------------------
-----Unit Root of  health  at First Difference------
    Augmented Dickey-Fuller Test

data:  diff(dataset[[i]])
Dickey-Fuller = -6.3554, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

--------------------------------------------------------------------------------
-----Unit Root of  transpo  at First Difference------
    Augmented Dickey-Fuller Test

data:  diff(dataset[[i]])
Dickey-Fuller = -6.1396, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

--------------------------------------------------------------------------------
-----Unit Root of  ict  at First Difference------
    Augmented Dickey-Fuller Test

data:  diff(dataset[[i]])
Dickey-Fuller = -6.9529, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

--------------------------------------------------------------------------------
-----Unit Root of  rec  at First Difference------
    Augmented Dickey-Fuller Test

data:  diff(dataset[[i]])
Dickey-Fuller = -6.3042, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

--------------------------------------------------------------------------------
-----Unit Root of  educ  at First Difference------
    Augmented Dickey-Fuller Test

data:  diff(dataset[[i]])
Dickey-Fuller = -6.8521, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

--------------------------------------------------------------------------------
-----Unit Root of  restau  at First Difference------
    Augmented Dickey-Fuller Test

data:  diff(dataset[[i]])
Dickey-Fuller = -5.6128, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

--------------------------------------------------------------------------------
-----Unit Root of  personal  at First Difference------
    Augmented Dickey-Fuller Test

data:  diff(dataset[[i]])
Dickey-Fuller = -6.4732, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

```

```
--------------------------------------------------------------------------------
-----Unit Root of  high  at First Difference------
    Augmented Dickey-Fuller Test

data:  diff(dataset[[i]])
Dickey-Fuller = -7.9457, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

--------------------------------------------------------------------------------
-----Unit Root of  low  at First Difference------
    Augmented Dickey-Fuller Test

data:  diff(dataset[[i]])
Dickey-Fuller = -8.1055, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

--------------------------------------------------------------------------------
```

Appendix 7

AKAIKE INFORMATION CRITERION RESULTS

```r
# Looping through the first difference dataset
for (i in names(dataset_diff)) {
    if (i != "Date" && i != "high" && i != "low") {

        cat("\n-----High lending rate and ", i, "-----\n")

        # To get the optimal lag length of every combination of high lending
        # rate and commodity inflation
        print(VARselect(data.frame(dataset_diff[["high"]], dataset_diff[[i]])))

        cat("------------------------------------------------------------------------------")

        cat("\n-----Low lending rate and ", i, "------\n")

        # To get the optimal lag length of every combination of low lending
        # rate and commodity inflation
        print(VARselect(data.frame(dataset_diff[["low"]], dataset_diff[[i]])))

        cat("------------------------------------------------------------------------------")
    }
}
```

```

-----High lending rate and  all -----
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     3      1      1      3

$criteria
                1          2          3          4          5          6
AIC(n) -3.04573065 -3.0478339 -3.05844814 -3.04162492 -3.0293922 -3.0314504
HQ(n)  -3.01630996 -2.9987994 -2.98979985 -2.95336284 -2.9215163 -2.9039607
SC(n)  -2.97219139 -2.9252685 -2.88685652 -2.82100713 -2.7597482 -2.7127803
FPE(n)  0.04756161  0.0474619  0.04696129  0.04775889  0.0483481  0.0482507
                7          8          9         10
AIC(n) -3.02899053 -3.03144882 -3.01818331 -3.01509807
HQ(n)  -2.88188706 -2.86473155 -2.83185224 -2.80915321
SC(n)  -2.66129422 -2.61472633 -2.55243464 -2.50032323
FPE(n)  0.04837227  0.04825707  0.04890607  0.04906286

------------------------------------------------------------------------------
-----Low lending rate and  all ------
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     3      3      1      3

$criteria
                1          2          3          4          5          6
AIC(n) -3.46556907 -3.4840655 -3.50802749 -3.50357336 -3.48793979 -3.47685723
HQ(n)  -3.43614837 -3.4350310 -3.43937920 -3.41531127 -3.38006391 -3.34936755
SC(n)  -3.39202980 -3.3615000 -3.33643587 -3.28295557 -3.21829583 -3.15818708
FPE(n)  0.03125525  0.0306826  0.02995644  0.03009072  0.03056573  0.03090764
                7          8          9         10
AIC(n) -3.46677596 -3.46110810 -3.45785122 -3.45296674
```

```
HQ(n)  -3.31967248 -3.29439083 -3.27152015 -3.24702188
SC(n)  -3.09907964 -3.04438561 -2.99210255 -2.93819189
FPE(n)  0.03122257  0.03140236  0.03150775  0.03166569

--------------------------------------------------------------------------------
-----High lending rate and  food -----
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     1      1      1      1

$criteria
                1          2          3          4          5          6
AIC(n) -2.1235112 -2.1052206 -2.0919307 -2.0948922 -2.0810673 -2.1032230
HQ(n)  -2.0940905 -2.0561861 -2.0232824 -2.0066301 -1.9731914 -1.9757333
SC(n)  -2.0499719 -1.9826551 -1.9203391 -1.8742744 -1.8114233 -1.7845529
FPE(n)  0.1196111  0.1218195  0.1234506  0.1230878  0.1248049  0.1220753
                7          8          9         10
AIC(n) -2.1017486 -2.0864232 -2.0659624 -2.072371
HQ(n)  -1.9546451 -1.9197059 -1.8796313 -1.866426
SC(n)  -1.7340522 -1.6697007 -1.6002137 -1.557596
FPE(n)  0.1222623  0.1241596  0.1267381  0.125943

--------------------------------------------------------------------------------
-----Low lending rate and  food ------
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     4      1      1      4

$criteria
                1           2           3           4           5           6
AIC(n) -2.5034157 -2.51207982 -2.51566467 -2.52068140 -2.50501249 -2.51150990
HQ(n)  -2.4739950 -2.46304533 -2.44701638 -2.43241932 -2.39713661 -2.38402022
SC(n)  -2.4298765 -2.38951438 -2.34407306 -2.30006361 -2.23536853 -2.19283975
FPE(n)  0.0818052  0.08109988  0.08081051  0.08040761  0.08167979  0.08115418
                7           8           9          10
AIC(n) -2.50236918 -2.48374937 -2.47075790 -2.47533876
HQ(n)  -2.35526570 -2.31703210 -2.28442683 -2.26939390
SC(n)  -2.13467286 -2.06702688 -2.00500923 -1.96056392
FPE(n)  0.08190402  0.08344951  0.08454863  0.08417195

--------------------------------------------------------------------------------
-----High lending rate and  alco -----
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     3      3      1      3

$criteria
                1          2          3          4          5          6
AIC(n) -1.1545488 -1.1812148 -1.2019938 -1.1900415 -1.1759739 -1.1754690
HQ(n)  -1.1251281 -1.1321803 -1.1333455 -1.1017794 -1.0680980 -1.0479794
SC(n)  -1.0810096 -1.0586494 -1.0304022 -0.9694237 -0.9063299 -0.8567989
FPE(n)  0.3152001  0.3069075  0.3005992  0.3042193  0.3085381  0.3087067
                7          8          9         10
AIC(n) -1.1751594 -1.1549886 -1.1338204 -1.1242528
HQ(n)  -1.0280560 -0.9882713 -0.9474893 -0.9183079
SC(n)  -0.8074631 -0.7382661 -0.6680717 -0.6094780
FPE(n)  0.3088198  0.3151355  0.3219076  0.3250398

--------------------------------------------------------------------------------
-----Low lending rate and  alco ------
$selection
```

```
AIC(n)  HQ(n)  SC(n) FPE(n)
     3      3      2      3

$criteria
                1          2          3          4          5          6
AIC(n) -1.4937188 -1.5596378 -1.5811369 -1.5773421 -1.5589188 -1.5361519
HQ(n)  -1.4642981 -1.5106033 -1.5124886 -1.4890800 -1.4510429 -1.4086622
SC(n)  -1.4201795 -1.4370724 -1.4095453 -1.3567243 -1.2892749 -1.2174818
FPE(n)  0.2245364  0.2102135  0.2057444  0.2065305  0.2103768  0.2152303
                7          8          9         10
AIC(n) -1.526486 -1.5028028 -1.4891359 -1.4735073
HQ(n)  -1.379383 -1.3360855 -1.3028049 -1.2675625
SC(n)  -1.158790 -1.0860803 -1.0233873 -0.9587325
FPE(n)  0.217333  0.2225581  0.2256418  0.2292225

------------------------------------------------------------------------------
-----High lending rate and  cloth -----
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     9      1      1      9

$criteria
                 1           2           3           4           5           6
AIC(n) -3.94483189 -3.94786257 -3.93808900 -3.94888507 -3.94142928 -3.93453500
HQ(n)  -3.91541120 -3.89882808 -3.86944072 -3.86062298 -3.83355340 -3.80704532
SC(n)  -3.87129263 -3.82529713 -3.76649739 -3.72826728 -3.67178531 -3.61586485
FPE(n)  0.01935449  0.01929602  0.01948574  0.01927686  0.01942168  0.01955685
                 7           8           9          10
AIC(n) -3.93470228 -3.95040892 -3.95375102 -3.94056611
HQ(n)  -3.78759881 -3.78369165 -3.76741995 -3.73462124
SC(n)  -3.56700597 -3.53368643 -3.48800235 -3.42579126
FPE(n)  0.01955469  0.01925137  0.01918893  0.01944586

------------------------------------------------------------------------------
-----Low lending rate and  cloth ------
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     4      2      1      4

$criteria
                 1           2           3           4           5           6
AIC(n) -4.38439925 -4.41004825 -4.41573275 -4.43898168 -4.42040848 -4.40318757
HQ(n)  -4.35497855 -4.36101375 -4.34708446 -4.35071960 -4.31253260 -4.27569789
SC(n)  -4.31085999 -4.28748281 -4.24414113 -4.21836389 -4.15076451 -4.08451743
FPE(n)  0.01247039  0.01215466  0.01208589  0.01180837  0.01203009  0.01223956
                 7           8           9          10
AIC(n) -4.39394718 -4.41113377 -4.41221842 -4.41018775
HQ(n)  -4.24684371 -4.24441650 -4.22588735 -4.20424289
SC(n)  -4.02625087 -3.99441127 -3.94646975 -3.89541291
FPE(n)  0.01235388  0.01214427  0.01213224  0.01215831

------------------------------------------------------------------------------
-----High lending rate and  house -----
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     1      1      1      1

$criteria
                 1           2           3           4           5           6
AIC(n) -2.40538900 -2.39211451 -2.37288966 -2.36049968 -2.35130132 -2.34817698
HQ(n)  -2.37596831 -2.34308002 -2.30424137 -2.27223759 -2.24342543 -2.22068731
```

```
SC(n)  -2.33184974 -2.26954907 -2.20129804 -2.13988189 -2.08165735 -2.02950684
FPE(n)  0.09023051  0.09143668  0.09321252  0.09437635  0.09525122  0.09555325
                7           8          9         10
AIC(n) -2.33876185 -2.31460693 -2.2937377 -2.2772331
HQ(n)  -2.19165837 -2.14788966 -2.1074066 -2.0712883
SC(n)  -1.97106553 -1.89788443 -1.8279890 -1.7624583
FPE(n)  0.09646261  0.09882833  0.1009219  0.1026133

------------------------------------------------------------------------------
-----Low lending rate and  house ------
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     2      1      1      2

$criteria
                1           2          3           4          5           6
AIC(n) -2.74252822 -2.76169867 -2.7416849 -2.74275133 -2.7320389 -2.71488612
HQ(n)  -2.71310753 -2.71266418 -2.6730366 -2.65448924 -2.6241631 -2.58739644
SC(n)  -2.66898896 -2.63913323 -2.5700933 -2.52213354 -2.4623950 -2.39621598
FPE(n)  0.06440739  0.06318473  0.0644627  0.06439519  0.0650906  0.06621947
                7           8          9          10
AIC(n) -2.69689512 -2.67271037 -2.65624931 -2.63470996
HQ(n)  -2.54979165 -2.50599310 -2.46991825 -2.42876509
SC(n)  -2.32919881 -2.25598787 -2.19050064 -2.11993511
FPE(n)  0.06742542  0.06908108  0.07023421  0.07177172

------------------------------------------------------------------------------
-----High lending rate and  furnish -----
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     5      1      1      5

$criteria
                1           2           3           4           5           6
AIC(n) -4.23296321 -4.24048782 -4.24775456 -4.24550060 -4.25603059 -4.24690141
HQ(n)  -4.20354251 -4.19145333 -4.17910628 -4.15723851 -4.14815471 -4.11941173
SC(n)  -4.15942394 -4.11792239 -4.07616295 -4.02488281 -3.98638663 -3.92823126
FPE(n)  0.01450935  0.01440065  0.01429653  0.01432906  0.01417938  0.01431001
                7           8           9          10
AIC(n) -4.2442651 -4.24372469 -4.24783352 -4.23541361
HQ(n)  -4.0971616 -4.07700742 -4.06150245 -4.02946875
SC(n)  -3.8765688 -3.82700219 -3.78208485 -3.72063877
FPE(n)  0.0143486  0.01435741  0.01429988  0.01448027

------------------------------------------------------------------------------
-----Low lending rate and  furnish ------
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     4      2      1      4

$criteria
                1            2           3           4           5
AIC(n) -4.59208801 -4.635181659 -4.647001939 -4.667154342 -4.649759259
HQ(n)  -4.56266731 -4.586147168 -4.578353651 -4.578892258 -4.541883378
SC(n)  -4.51854874 -4.512616220 -4.475410324 -4.446536551 -4.380115292
FPE(n)  0.01013169  0.009704402  0.009590469  0.009399306  0.009564515
                6           7           8           9          10
AIC(n) -4.632752921 -4.6245049 -4.603009 -4.621743288 -4.61949526
HQ(n)  -4.505263244 -4.4774014 -4.436291 -4.435412221 -4.41355039
SC(n)  -4.314082779 -4.2568085 -4.186286 -4.155994619 -4.10472041
FPE(n)  0.009728968  0.0098101  0.010024  0.009838876  0.00986216
```

```
--------------------------------------------------------------------------------
-----High lending rate and  health -----
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     7      1      1      7

$criteria
                 1           2           3           4           5           6
AIC(n) -2.89988879 -2.90357142 -2.92152584 -2.92706114 -2.92213294 -2.91200376
HQ(n)  -2.87046810 -2.85453693 -2.85287755 -2.83879906 -2.81425706 -2.78451408
SC(n)  -2.82634953 -2.78100598 -2.74993423 -2.70644335 -2.65248898 -2.59333362
FPE(n)  0.05502941  0.05482739  0.05385234  0.05355607  0.05382221  0.05437241
                 7           8           9          10
AIC(n) -2.9483525 -2.92966851 -2.91050049 -2.92782783
HQ(n)  -2.8012491 -2.76295124 -2.72416943 -2.72188296
SC(n)  -2.5806562 -2.51294602 -2.44475182 -2.41305298
FPE(n)  0.0524345  0.05342734  0.05446642  0.05353698

--------------------------------------------------------------------------------
-----Low lending rate and  health ------
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
    10      3      1     10

$criteria
                 1           2           3           4           5           6
AIC(n) -3.32965757 -3.3543465 -3.41506282 -3.42548422 -3.4193040 -3.41682140
HQ(n)  -3.30023688 -3.3053120 -3.34641454 -3.33722213 -3.3114281 -3.28933172
SC(n)  -3.25611831 -3.2317811 -3.24347121 -3.20486643 -3.1496600 -3.09815126
FPE(n)  0.03580541  0.0349324  0.03287488  0.03253466  0.0327373  0.03282004
                 7           8           9          10
AIC(n) -3.43520181 -3.42731371 -3.41019760 -3.43568029
HQ(n)  -3.28809834 -3.26059644 -3.22386654 -3.22973543
SC(n)  -3.06750550 -3.01059121 -2.94444893 -2.92090545
FPE(n)  0.03222413  0.03248172  0.03304556  0.03221783

--------------------------------------------------------------------------------
-----High lending rate and  transpo -----
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     2      2      1      2

$criteria
                 1          2          3          4          5          6
AIC(n) -0.3016492 -0.3310093 -0.3217986 -0.31523610 -0.30655610 -0.30564428
HQ(n)  -0.2722285 -0.2819748 -0.2531503 -0.22697402 -0.19868022 -0.17815460
SC(n)  -0.2281099 -0.2084439 -0.1502069 -0.09461831 -0.03691213  0.01302586
FPE(n)  0.7395984  0.7182028  0.7248561  0.72964210  0.73602422  0.73672628
                 7          8          9         10
AIC(n) -0.29250490 -0.2723889 -0.26263493 -0.28604595
HQ(n)  -0.14540142 -0.1056716 -0.07630386 -0.08010108
SC(n)   0.07519142  0.1443336  0.20311374  0.22872890
FPE(n)  0.74651252  0.7617378  0.76927605  0.75156259

--------------------------------------------------------------------------------
-----Low lending rate and  transpo ------
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     5      2      1      5
```

```
$criteria
                1          2          3          4          5          6
AIC(n) -0.6661839 -0.7058748 -0.7052851 -0.7068127 -0.7069250 -0.6913792
HQ(n)  -0.6367632 -0.6568404 -0.6366368 -0.6185506 -0.5990491 -0.5638895
SC(n)  -0.5926446 -0.5833094 -0.5336935 -0.4861949 -0.4372811 -0.3727090
FPE(n)  0.5136657  0.4936795  0.4939759  0.4932310  0.4931898  0.5009376
                7          8          9         10
AIC(n) -0.6740628 -0.6514424 -0.6449371 -0.6955488
HQ(n)  -0.5269593 -0.4847251 -0.4586060 -0.4896039
SC(n)  -0.3063665 -0.2347199 -0.1791884 -0.1807739
FPE(n)  0.5097164  0.5214163  0.5248685  0.4990227

--------------------------------------------------------------------------
-----High lending rate and  ict -----
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     2      2      1      2

$criteria
                1          2          3          4          5          6
AIC(n) -1.4549909 -1.5023800 -1.4967342 -1.4733561 -1.4590849 -1.4640251
HQ(n)  -1.4255702 -1.4533455 -1.4280860 -1.3850940 -1.3512090 -1.3365354
SC(n)  -1.3814517 -1.3798146 -1.3251426 -1.2527383 -1.1894410 -1.1453549
FPE(n)  0.2334028  0.2226011  0.2238637  0.2291631  0.2324637  0.2313278
                7          8          9         10
AIC(n) -1.4560670 -1.4326946 -1.4130401 -1.4765923
HQ(n)  -1.3089635 -1.2659773 -1.2267090 -1.2706475
SC(n)  -1.0883707 -1.0159721 -0.9472914 -0.9618175
FPE(n)  0.2331892  0.2387213  0.2434824  0.2285164

--------------------------------------------------------------------------
-----Low lending rate and  ict ------
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
    10      2      2     10

$criteria
                1          2          3          4          5          6
AIC(n) -1.8823880 -1.9511451 -1.9638381 -1.9549585 -1.9529203 -1.9372289
HQ(n)  -1.8529674 -1.9021106 -1.8951898 -1.8666964 -1.8450444 -1.8097393
SC(n)  -1.8088488 -1.8285796 -1.7922465 -1.7343407 -1.6832764 -1.6185588
FPE(n)  0.1522263  0.1421121  0.1403211  0.1415753  0.1418682  0.1441179
                7          8          9         10
AIC(n) -1.9175030 -1.8980020 -1.8800165 -1.9963647
HQ(n)  -1.7703995 -1.7312848 -1.6936855 -1.7904199
SC(n)  -1.5498066 -1.4812795 -1.4142679 -1.4815899
FPE(n)  0.1469973  0.1499031  0.1526379  0.1358886

--------------------------------------------------------------------------
-----High lending rate and  rec -----
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     7      1      1      7

$criteria
                1          2          3          4          5          6
AIC(n) -1.3453375 -1.3431059 -1.3225614 -1.3079764 -1.3696638 -1.3841970
HQ(n)  -1.3159168 -1.2940715 -1.2539131 -1.2197143 -1.2617879 -1.2567073
SC(n)  -1.2717982 -1.2205405 -1.1509698 -1.0873586 -1.1000198 -1.0655269
FPE(n)  0.2604521  0.2610352  0.2664563  0.2703761  0.2542086  0.2505513
                7          8          9         10
```

```
AIC(n) -1.3971504 -1.3781051 -1.3598097 -1.3498143
HQ(n)  -1.2500469 -1.2113878 -1.1734786 -1.1438694
SC(n)  -1.0294540 -0.9613826 -0.8940610 -0.8350394
FPE(n)  0.2473407  0.2521152  0.2567942  0.2594039

------------------------------------------------------------------------
-----Low lending rate and  rec ------
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     7      6      1      7

$criteria
                1          2          3          4          5         6
AIC(n) -1.6922032 -1.7309207 -1.7070980 -1.6987574 -1.7790647 -1.813362
HQ(n)  -1.6627825 -1.6818862 -1.6384498 -1.6104953 -1.6711889 -1.685873
SC(n)  -1.6186639 -1.6083552 -1.5355064 -1.4781396 -1.5094208 -1.494692
FPE(n)  0.1841137  0.1771223  0.1813944  0.1829171  0.1688067  0.163122
                7          8          9         10
AIC(n) -1.8239928 -1.809125 -1.7984774 -1.7908941
HQ(n)  -1.6768893 -1.642408 -1.6121463 -1.5849492
SC(n)  -1.4562965 -1.392403 -1.3327287 -1.2761192
FPE(n)  0.1614062  0.163836  0.1656053  0.1668852

------------------------------------------------------------------------
-----High lending rate and  educ -----
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     7      1      1      7

$criteria
                1          2          3          4          5          6
AIC(n) -1.7252325 -1.7015061 -1.6861042 -1.6751027 -1.6740790 -1.7265838
HQ(n)  -1.6958118 -1.6524716 -1.6174559 -1.5868406 -1.5662031 -1.5990941
SC(n)  -1.6516932 -1.5789406 -1.5145126 -1.4544849 -1.4044350 -1.4079137
FPE(n)  0.1781319  0.1824097  0.1852428  0.1872955  0.1874927  0.1779098
                7          8          9         10
AIC(n) -1.7395393 -1.7271587 -1.7346654 -1.7204129
HQ(n)  -1.5924358 -1.5604414 -1.5483344 -1.5144680
SC(n)  -1.3718430 -1.3104362 -1.2689168 -1.2056380
FPE(n)  0.1756297  0.1778308  0.1765174  0.1790719

------------------------------------------------------------------------
-----Low lending rate and  educ ------
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     7      1      1      7

$criteria
                1          2          3         4         5          6
AIC(n) -2.0837982 -2.0955384 -2.0836967 -2.080189 -2.102046 -2.1326647
HQ(n)  -2.0543775 -2.0465039 -2.0150485 -1.991927 -1.994170 -2.0051750
SC(n)  -2.0102589 -1.9729730 -1.9121051 -1.859571 -1.832402 -1.8139946
FPE(n)  0.1244568  0.1230047  0.1244713  0.124911  0.122214  0.1185335
                7          8          9         10
AIC(n) -2.1530101 -2.1371502 -2.1515363 -2.1422573
HQ(n)  -2.0059066 -1.9704330 -1.9652052 -1.9363125
SC(n)  -1.7853138 -1.7204277 -1.6857876 -1.6274825
FPE(n)  0.1161529  0.1180185  0.1163437  0.1174418

------------------------------------------------------------------------
-----High lending rate and  restau -----
```

```
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     4      1      1      4

$criteria
                 1           2           3           4           5           6
AIC(n) -2.90492463 -2.89715360 -2.89565061 -2.91430130 -2.90318546 -2.89694614
HQ(n)  -2.87550393 -2.84811910 -2.82700232 -2.82603922 -2.79530958 -2.76945646
SC(n)  -2.83138536 -2.77458816 -2.72405900 -2.69368351 -2.63354150 -2.57827600
FPE(n)  0.05475299  0.05518039  0.05526397  0.05424381  0.05485173  0.05519733
                 7           8           9          10
AIC(n) -2.89021184 -2.8721112 -2.85182839 -2.85605273
HQ(n)  -2.74310836 -2.7053940 -2.66549732 -2.65010787
SC(n)  -2.52251552 -2.4553887 -2.38607972 -2.34127789
FPE(n)  0.05557344  0.0565927  0.05775769  0.05752086

------------------------------------------------------------------------
-----Low lending rate and  restau ------
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     4      2      1      4

$criteria
                 1           2           3           4           5           6
AIC(n) -3.27802304 -3.30608610 -3.31844901 -3.34427755 -3.33580672 -3.31331776
HQ(n)  -3.24860234 -3.25705161 -3.24980073 -3.25601547 -3.22793084 -3.18582809
SC(n)  -3.20448378 -3.18352066 -3.14685740 -3.12365976 -3.06616275 -2.99464762
FPE(n)  0.03770277  0.03665959  0.03620954  0.03528693  0.03558814  0.03639906
                 7           8           9          10
AIC(n) -3.29602270 -3.28288375 -3.26542569 -3.27914943
HQ(n)  -3.14891923 -3.11616648 -3.07909463 -3.07320456
SC(n)  -2.92832639 -2.86616126 -2.79967702 -2.76437458
FPE(n)  0.03703615  0.03752876  0.03819326  0.03767704

------------------------------------------------------------------------
-----High lending rate and  personal -----
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
    10      1      1     10

$criteria
                 1           2           3           4           5           6
AIC(n) -3.43978903 -3.44801981 -3.46678806 -3.47015336 -3.46317820 -3.46247872
HQ(n)  -3.41036833 -3.39898532 -3.39813977 -3.38189128 -3.35530232 -3.33498904
SC(n)  -3.36624977 -3.32545437 -3.29519644 -3.24953557 -3.19353424 -3.14380858
FPE(n)  0.03207149  0.03180875  0.03121765  0.03111335  0.03133203  0.03135526
                 7           8           9          10
AIC(n) -3.46286353 -3.45728200 -3.44100653 -3.47133079
HQ(n)  -3.31576006 -3.29056473 -3.25467546 -3.26538593
SC(n)  -3.09516721 -3.04055950 -2.97525786 -2.95655595
FPE(n)  0.03134497  0.03152274  0.03204298  0.03108948

------------------------------------------------------------------------
-----Low lending rate and  personal ------
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
    10      3      1     10

$criteria
                 1          2          3          4          5          6
AIC(n) -3.86544823 -3.9025394 -3.9606889 -3.97111052 -3.95640071 -3.9474034
```

```
HQ(n)  -3.83602753 -3.8535049 -3.8920406 -3.88284843 -3.84852483 -3.8199138
SC(n)  -3.79190896 -3.7799740 -3.7890973 -3.75049273 -3.68675675 -3.6287333
FPE(n)  0.02095356  0.0201907  0.0190503  0.01885314  0.01913307  0.0193068
                 7           8           9          10
AIC(n) -3.94030956 -3.95354623 -3.93302823 -3.99092585
HQ(n)  -3.79320608 -3.78682896 -3.74669717 -3.78498099
SC(n)  -3.57261324 -3.53682373 -3.46727957 -3.47615100
FPE(n)  0.01944535  0.01919107  0.01959073  0.01849082

------------------------------------------------------------------------
```

Appendix 8

GRANGER CAUSALITY TEST RESULTS

```r
# Is lending interest rates granger cause commodity inflation expectation?  The
# lag order is based on AIC
grangertest(dataset_diff[["all"]] ~ dataset_diff[["high"]], order = 3)
```

```
 Granger causality test

Model 1: dataset_diff[["all"]] ~ Lags(dataset_diff[["all"]], 1:3) + Lags(dataset_diff[["high"]], 1:3)
Model 2: dataset_diff[["all"]] ~ Lags(dataset_diff[["all"]], 1:3)
  Res.Df Df      F   Pr(>F)
1    303
2    306 -3 5.0369 0.002024 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
grangertest(dataset_diff[["all"]] ~ dataset_diff[["low"]], order = 3)
```

```
 Granger causality test

Model 1: dataset_diff[["all"]] ~ Lags(dataset_diff[["all"]], 1:3) + Lags(dataset_diff[["low"]], 1:3)
Model 2: dataset_diff[["all"]] ~ Lags(dataset_diff[["all"]], 1:3)
  Res.Df Df      F    Pr(>F)
1    303
2    306 -3 7.2944 9.735e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
grangertest(dataset_diff[["food"]] ~ dataset_diff[["high"]], order = 1)
```

```
 Granger causality test

Model 1: dataset_diff[["food"]] ~ Lags(dataset_diff[["food"]], 1:1) + Lags(dataset_diff[["high"]], 1:1)
Model 2: dataset_diff[["food"]] ~ Lags(dataset_diff[["food"]], 1:1)
  Res.Df Df      F  Pr(>F)
1    309
2    310 -1 2.8953 0.08984 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
grangertest(dataset_diff[["food"]] ~ dataset_diff[["low"]], order = 4)
```

```
 Granger causality test

Model 1: dataset_diff[["food"]] ~ Lags(dataset_diff[["food"]], 1:4) + Lags(dataset_diff[["low"]], 1:4)
Model 2: dataset_diff[["food"]] ~ Lags(dataset_diff[["food"]], 1:4)
  Res.Df Df      F  Pr(>F)
1    300
2    304 -4 3.2214 0.01307 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
grangertest(dataset_diff[["alco"]] ~ dataset_diff[["high"]], order = 3)
```

```
Granger causality test

Model 1: dataset_diff[["alco"]] ~ Lags(dataset_diff[["alco"]], 1:3) + Lags(dataset_diff[["high"]], 1:3)
Model 2: dataset_diff[["alco"]] ~ Lags(dataset_diff[["alco"]], 1:3)
  Res.Df Df      F Pr(>F)
1    303
2    306 -3 0.5816 0.6275
```

```r
grangertest(dataset_diff[["alco"]] ~ dataset_diff[["low"]], order = 3)
```

```
Granger causality test

Model 1: dataset_diff[["alco"]] ~ Lags(dataset_diff[["alco"]], 1:3) + Lags(dataset_diff[["low"]], 1:3)
Model 2: dataset_diff[["alco"]] ~ Lags(dataset_diff[["alco"]], 1:3)
  Res.Df Df      F Pr(>F)
1    303
2    306 -3 0.6772 0.5666
```

```r
grangertest(dataset_diff[["cloth"]] ~ dataset_diff[["high"]], order = 9)
```

```
Granger causality test

Model 1: dataset_diff[["cloth"]] ~ Lags(dataset_diff[["cloth"]], 1:9) + Lags(dataset_diff[["high"]], 1:9)
Model 2: dataset_diff[["cloth"]] ~ Lags(dataset_diff[["cloth"]], 1:9)
  Res.Df Df      F  Pr(>F)
1    285
2    294 -9 2.0615 0.03299 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
grangertest(dataset_diff[["cloth"]] ~ dataset_diff[["low"]], order = 4)
```

```
Granger causality test

Model 1: dataset_diff[["cloth"]] ~ Lags(dataset_diff[["cloth"]], 1:4) + Lags(dataset_diff[["low"]], 1:4)
Model 2: dataset_diff[["cloth"]] ~ Lags(dataset_diff[["cloth"]], 1:4)
  Res.Df Df      F   Pr(>F)
1    300
2    304 -4 4.6216 0.001235 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
grangertest(dataset_diff[["house"]] ~ dataset_diff[["high"]], order = 1)
```

```
Granger causality test

Model 1: dataset_diff[["house"]] ~ Lags(dataset_diff[["house"]], 1:1) + Lags(dataset_diff[["high"]], 1:1)
Model 2: dataset_diff[["house"]] ~ Lags(dataset_diff[["house"]], 1:1)
  Res.Df Df      F Pr(>F)
1    309
2    310 -1 0.0457 0.8309
```

```r
grangertest(dataset_diff[["house"]] ~ dataset_diff[["low"]], order = 2)
```

```
Granger causality test

Model 1: dataset_diff[["house"]] ~ Lags(dataset_diff[["house"]], 1:2) + Lags(dataset_diff[["low"]], 1:2)
Model 2: dataset_diff[["house"]] ~ Lags(dataset_diff[["house"]], 1:2)
  Res.Df Df      F Pr(>F)
1    306
2    308 -2 0.2936 0.7458
```

```r
grangertest(dataset_diff[["furnish"]] ~ dataset_diff[["high"]], order = 5)
```

```
Granger causality test

Model 1: dataset_diff[["furnish"]] ~ Lags(dataset_diff[["furnish"]], 1:5) + Lags(dataset_diff[["high"]], 1:5)
Model 2: dataset_diff[["furnish"]] ~ Lags(dataset_diff[["furnish"]], 1:5)
  Res.Df Df      F Pr(>F)
1    297
2    302 -5 0.9646 0.4397
```

```r
grangertest(dataset_diff[["furnish"]] ~ dataset_diff[["low"]], order = 4)
```

```
Granger causality test

Model 1: dataset_diff[["furnish"]] ~ Lags(dataset_diff[["furnish"]], 1:4) + Lags(dataset_diff[["low"]], 1:4)
Model 2: dataset_diff[["furnish"]] ~ Lags(dataset_diff[["furnish"]], 1:4)
  Res.Df Df      F  Pr(>F)
1    300
2    304 -4 2.1249 0.07769 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
grangertest(dataset_diff[["health"]] ~ dataset_diff[["high"]], order = 7)
```

```
Granger causality test

Model 1: dataset_diff[["health"]] ~ Lags(dataset_diff[["health"]], 1:7) + Lags(dataset_diff[["high"]], 1:7)
Model 2: dataset_diff[["health"]] ~ Lags(dataset_diff[["health"]], 1:7)
  Res.Df Df      F   Pr(>F)
1    291
2    298 -7 2.7076 0.009839 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
grangertest(dataset_diff[["health"]] ~ dataset_diff[["low"]], order = 10)
```

```
Granger causality test

Model 1: dataset_diff[["health"]] ~ Lags(dataset_diff[["health"]], 1:10) + Lags(dataset_diff[["low"]], 1:10)
Model 2: dataset_diff[["health"]] ~ Lags(dataset_diff[["health"]], 1:10)
  Res.Df  Df      F    Pr(>F)
```

```
1    282
2    292 -10 4.4526 7.751e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
grangertest(dataset_diff[["transpo"]] ~ dataset_diff[["high"]], order = 2)
```

```
 Granger causality test

Model 1: dataset_diff[["transpo"]] ~ Lags(dataset_diff[["transpo"]], 1:2) + Lags(dataset_diff[["high"]], 1:2)
Model 2: dataset_diff[["transpo"]] ~ Lags(dataset_diff[["transpo"]], 1:2)
  Res.Df Df      F    Pr(>F)
1    306
2    308 -2 7.4514 0.0006922 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
grangertest(dataset_diff[["transpo"]] ~ dataset_diff[["low"]], order = 5)
```

```
 Granger causality test

Model 1: dataset_diff[["transpo"]] ~ Lags(dataset_diff[["transpo"]], 1:5) + Lags(dataset_diff[["low"]], 1:5)
Model 2: dataset_diff[["transpo"]] ~ Lags(dataset_diff[["transpo"]], 1:5)
  Res.Df Df      F   Pr(>F)
1    297
2    302 -5 3.4112 0.005176 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
grangertest(dataset_diff[["ict"]] ~ dataset_diff[["high"]], order = 2)
```

```
 Granger causality test

Model 1: dataset_diff[["ict"]] ~ Lags(dataset_diff[["ict"]], 1:2) + Lags(dataset_diff[["high"]], 1:2)
Model 2: dataset_diff[["ict"]] ~ Lags(dataset_diff[["ict"]], 1:2)
  Res.Df Df     F    Pr(>F)
1    306
2    308 -2 12.63 5.365e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
grangertest(dataset_diff[["ict"]] ~ dataset_diff[["low"]], order = 10)
```

```
 Granger causality test

Model 1: dataset_diff[["ict"]] ~ Lags(dataset_diff[["ict"]], 1:10) + Lags(dataset_diff[["low"]], 1:10)
Model 2: dataset_diff[["ict"]] ~ Lags(dataset_diff[["ict"]], 1:10)
  Res.Df  Df      F    Pr(>F)
1    282
2    292 -10 5.6136 1.187e-07 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
grangertest(dataset_diff[["rec"]] ~ dataset_diff[["high"]], order = 7)
```

```
 Granger causality test

Model 1: dataset_diff[["rec"]] ~ Lags(dataset_diff[["rec"]], 1:7) + Lags(dataset_diff[["high"]], 1:7)
Model 2: dataset_diff[["rec"]] ~ Lags(dataset_diff[["rec"]], 1:7)
  Res.Df Df      F  Pr(>F)
1    291
2    298 -7 2.6002 0.01288 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
grangertest(dataset_diff[["rec"]] ~ dataset_diff[["low"]], order = 7)
```

```
 Granger causality test

Model 1: dataset_diff[["rec"]] ~ Lags(dataset_diff[["rec"]], 1:7) + Lags(dataset_diff[["low"]], 1:7)
Model 2: dataset_diff[["rec"]] ~ Lags(dataset_diff[["rec"]], 1:7)
  Res.Df Df      F   Pr(>F)
1    291
2    298 -7 3.4726 0.001369 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
grangertest(dataset_diff[["educ"]] ~ dataset_diff[["high"]], order = 7)
```

```
 Granger causality test

Model 1: dataset_diff[["educ"]] ~ Lags(dataset_diff[["educ"]], 1:7) + Lags(dataset_diff[["high"]], 1:7)
Model 2: dataset_diff[["educ"]] ~ Lags(dataset_diff[["educ"]], 1:7)
  Res.Df Df     F  Pr(>F)
1    291
2    298 -7 1.929 0.06486 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
grangertest(dataset_diff[["educ"]] ~ dataset_diff[["low"]], order = 7)
```

```
 Granger causality test

Model 1: dataset_diff[["educ"]] ~ Lags(dataset_diff[["educ"]], 1:7) + Lags(dataset_diff[["low"]], 1:7)
Model 2: dataset_diff[["educ"]] ~ Lags(dataset_diff[["educ"]], 1:7)
  Res.Df Df      F   Pr(>F)
1    291
2    298 -7 2.7826 0.008142 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
grangertest(dataset_diff[["restau"]] ~ dataset_diff[["high"]], order = 4)
```

```
 Granger causality test

```

```
Model 1: dataset_diff[["restau"]] ~ Lags(dataset_diff[["restau"]], 1:4) + Lags(dataset_diff[["high"]], 1:4)
Model 2: dataset_diff[["restau"]] ~ Lags(dataset_diff[["restau"]], 1:4)
  Res.Df Df      F Pr(>F)
1    300
2    304 -4 1.2617 0.2851
```

```
grangertest(dataset_diff[["restau"]] ~ dataset_diff[["low"]], order = 4)
```

```
 Granger causality test

Model 1: dataset_diff[["restau"]] ~ Lags(dataset_diff[["restau"]], 1:4) + Lags(dataset_diff[["low"]], 1:4)
Model 2: dataset_diff[["restau"]] ~ Lags(dataset_diff[["restau"]], 1:4)
  Res.Df Df      F Pr(>F)
1    300
2    304 -4 1.3116 0.2656
```

```
grangertest(dataset_diff[["personal"]] ~ dataset_diff[["high"]], order = 10)
```

```
 Granger causality test

Model 1: dataset_diff[["personal"]] ~ Lags(dataset_diff[["personal"]], 1:10) + Lags(dataset_diff[["high"]], 1:10
Model 2: dataset_diff[["personal"]] ~ Lags(dataset_diff[["personal"]], 1:10)
  Res.Df  Df      F  Pr(>F)
1    282
2    292 -10 2.1917 0.01845 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
grangertest(dataset_diff[["personal"]] ~ dataset_diff[["low"]], order = 10)
```

```
 Granger causality test

Model 1: dataset_diff[["personal"]] ~ Lags(dataset_diff[["personal"]], 1:10) + Lags(dataset_diff[["low"]], 1:10)
Model 2: dataset_diff[["personal"]] ~ Lags(dataset_diff[["personal"]], 1:10)
  Res.Df  Df      F    Pr(>F)
1    282
2    292 -10 4.4031 9.256e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Appendix 9

R PROGRAMMING LANGUAGE ALGORITHM FOR FORECASTING INFLATION EXPECTATIONS WITH HIGH LENDING RATE

```
# Loop over each significant variables in Granger Causality Test
high_variables <- c("all", "cloth", "health", "transpo", "ict", "rec", "personal")
fullname <- c("ALL ITEMS", "CLOTHING AND FOOTWEAR", "HEALTH", "TRANSPORT", "INFORMATION AND COMMUNICATION",
    "RECREATION, SPORT AND CULTURE", "PERSONAL CARE, AND MISCELLANEOUS GOODS AND SERVICES")


# Appendix count for the title
Appendix = 10

for (inf_exp in high_variables) {

    # Create a monthly time series object for the variables
    ts_inf_exp <- ts(dataset[1:290, inf_exp], start = c(1997, 9), end = c(2021, 10),
        frequency = 12)
    ts_high <- ts(dataset[1:290, "high"], start = c(1997, 9), end = c(2021, 10),
        frequency = 12)

    # Create a monthly time series object for data visualization
    actual_inf_exp <- ts(dataset[289:314, inf_exp], start = c(2021, 11), end = c(2023,
        10), frequency = 12)
    actual_inf_exp_long <- ts(dataset[1:290, inf_exp], start = c(1997, 10), end = c(2021,
        10), frequency = 12)

    # Create a monthly time series object for testing forecasting
    actual_high <- ts(dataset[291:314, "high"], start = c(2021, 11), end = c(2023,
        10), frequency = 12)

    cat("\\newpage")

    cat("# Appendix", Appendix, "\n")
    cat("# FORECASTING ", fullname[Appendix - 9], "INFLATION EXPECTATION WITH HIGH LENDING RATE\n")
    Appendix = Appendix + 1

    cat(" HIGH -> ", toupper(inf_exp), " Inflation Expectation\n")

    # Linear Regression with Autoregressive term fit
    ar_model <- arima(ts_inf_exp, order = c(1, 0, 0), xreg = ts_high)

    # Extract residuals from the fitted AR model
    ar_residuals <- ts(residuals(ar_model), start = c(1997, 9), end = c(2021, 10),
        frequency = 12)

    cat("\n-------- RESIDUALS TIME PLOT ----------")

    # Setting up the plot
    plot(ar_residuals, ylab = "Residuals", xlab = "Year-Month", xaxt = "n", main = paste("HIGH -> ",
        toupper(inf_exp), " Inflation Expectation"))

    dates <- as.Date(time(ar_residuals))
    axis_dates <- time(ar_residuals)[seq(1, length(ar_residuals), by = 4)]
    axis_labels <- format(dates[seq(1, length(ar_residuals), by = 4)], "%Y-%m")

    axis(1, at = axis_dates, labels = axis_labels, las = 2, cex.axis = 0.6)
```

```r
cat("\n\n-------- HETEROCEDASTICITY TEST ----------\n\n")
print(bptest(lm(dataset[2:290, inf_exp] ~ dataset[2:290, "high"] + dataset[1:289,
    inf_exp])))
cat("\n")

cat("\n------------- NORMALITY TEST ---------------\n ")
# Normality
print(jarque.bera.test(ar_residuals))
cat("\n")

cat("\n -------- AUTOCORRELATION TEST ----------\n ")
# Serial Autocorrelation
print(Box.test(ar_residuals, lag = 10, type = "Ljung-Box"))
cat("\n")
cat("\n -------- FORECASTING SUMMARY  ---------- \n ")
print(summary(ar_model))
cat("\n")

# Forecast the inflation expectation from Nov 2021 to Oct 2025
inf_forecast <- predict(ar_model, newxreg = actual_high, n.ahead = 24)
inf_forecast_values <- inf_forecast$pred
inf_forecast_se <- inf_forecast$se

# Extracting dates
dates <- as.Date(time(inf_forecast_values))

# Plotting
plot(inf_forecast_values, main = paste("2-year Forecast for", toupper(inf_exp),
    "Inflation Expectation"), xlab = "Year-Month", ylab = "Inflation Expectation",
    xaxt = "n", col = "red", lty = 1)

# Customize x-axis labels with year-month format
axis(1, at = time(inf_forecast_values)[seq(1, length(inf_forecast_values), by = 4)],
    labels = format(dates[seq(1, length(inf_forecast_values), by = 4)], "%Y-%m"))

# Add thin gray lines matching the y-axis labels
y_ticks <- axTicks(2)
for (y in y_ticks) {
    abline(h = y, col = "gray", lty = 2, lwd = 0.2)
}

# Add value labels every 3 data points
every_third <- seq(1, length(inf_forecast_values), by = 3)
text(x = time(inf_forecast_values)[every_third], y = inf_forecast_values[every_third],
    labels = round(inf_forecast_values[every_third], 2), pos = 3, col = "black",
    cex = 0.8)

# Variables will be used to zoom out the graph
overall_max <- max(max(coredata(inf_forecast_values)), max(actual_inf_exp_long),
    max(inf_forecast_values - 1.96 * inf_forecast_se), max(inf_forecast_values +
        1.96 * inf_forecast_se))
overall_min <- min(min(coredata(inf_forecast_values)), min(actual_inf_exp_long),
    min(inf_forecast_values - 1.96 * inf_forecast_se), min(inf_forecast_values +
        1.96 * inf_forecast_se))

# Plotting the actual values of inflation expectation
plot.ts(actual_inf_exp_long, main = paste("Forecast for", toupper(inf_exp), "Inflation Expectation"),
    xlab = "Year", ylab = "Inflation Expectation", lty = 1, ylim = c(overall_min -
        0.5, overall_max + 0.5))
lines(actual_inf_exp, col = "black", lty = 3)
```

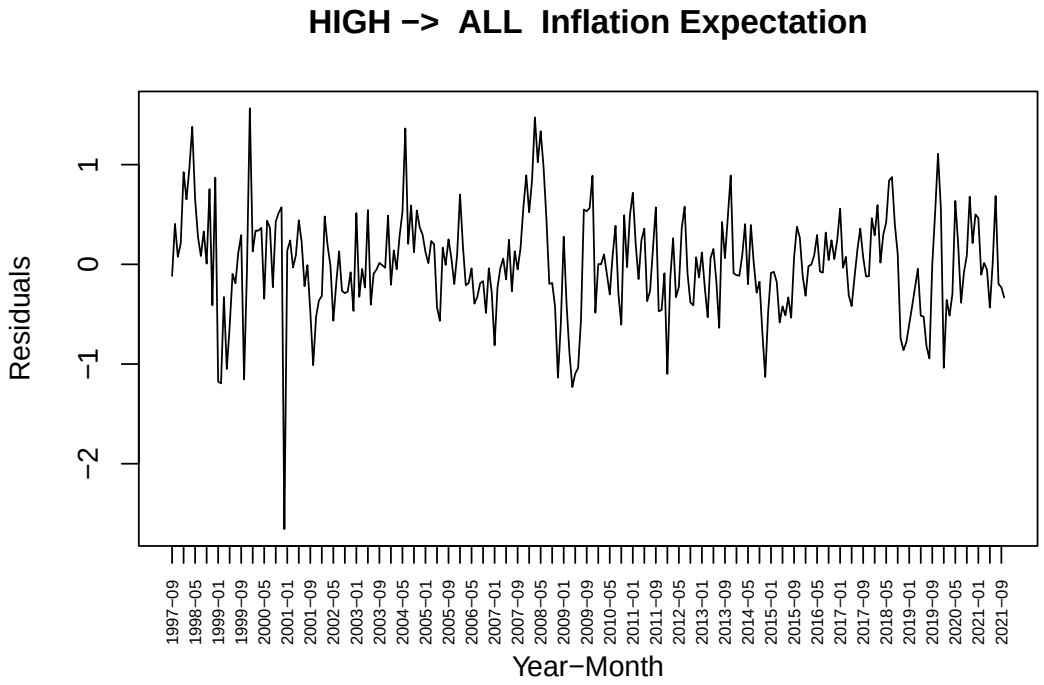
```
    # Add the forecast on the end and confidence intervals
    lines(inf_forecast_values, col = "red", lwd = 2)
    lines(inf_forecast_values - 1.96 * inf_forecast_se, col = 4, lty = 1, lwd = 2)
    lines(inf_forecast_values + 1.96 * inf_forecast_se, col = 4, lty = 1, lwd = 2)

    # Add thin gray lines matching the y-axis labels
    y_ticks <- axTicks(2)
    for (y in y_ticks) {
        abline(h = y, col = "gray", lty = 2, lwd = 0.2)
    }

    # Add legend
    legend("top", legend = c("Actual Values", "Forecast", "Confidence Interval"),
        col = c("black", "red", "blue"), lty = c(1, 1, 1), lwd = c(2, 2, 1), cex = 0.6,
        horiz = TRUE, bg = "transparent")
}
```

Appendix 10

FORECASTING ALL ITEMS INFLATION EXPECTATION WITH HIGH LENDING RATE

HIGH -> ALL Inflation Expectation

——— RESIDUALS TIME PLOT ———-



——— HETEROCEDASTICITY TEST ———-

studentized Breusch-Pagan test

data: lm(dataset[2:290, inf_exp] ~ dataset[2:290, “high”] + dataset[1:289, inf_exp]) BP = 18.302, df = 2, p-value = 0.0001061

————— NORMALITY TEST ——————-

Jarque Bera Test

data: ar_residuals X-squared = 76.278, df = 2, p-value < 2.2e-16

——— AUTOCORRELATION TEST ———-

Box-Ljung test

data: ar_residuals X-squared = 83.536, df = 10, p-value = 1.015e-13

——— FORECASTING SUMMARY ———-

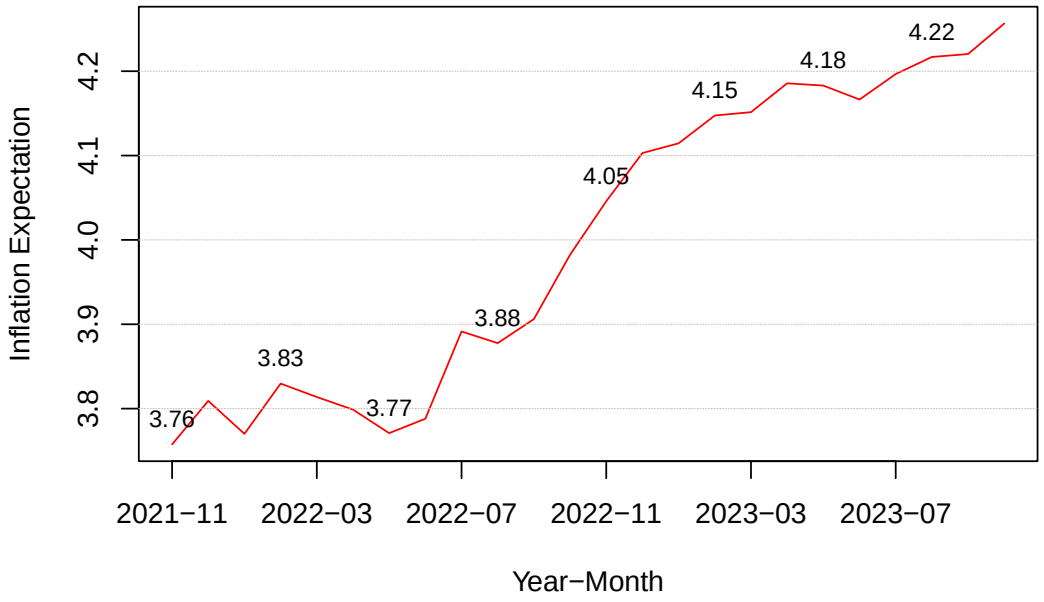
Call: arima(x = ts_inf_exp, order = c(1, 0, 0), xreg = ts_high)

Coefficients: ar1 intercept ts_high 0.9632 2.7088 0.1417 s.e. 0.0148 0.9546 0.0510

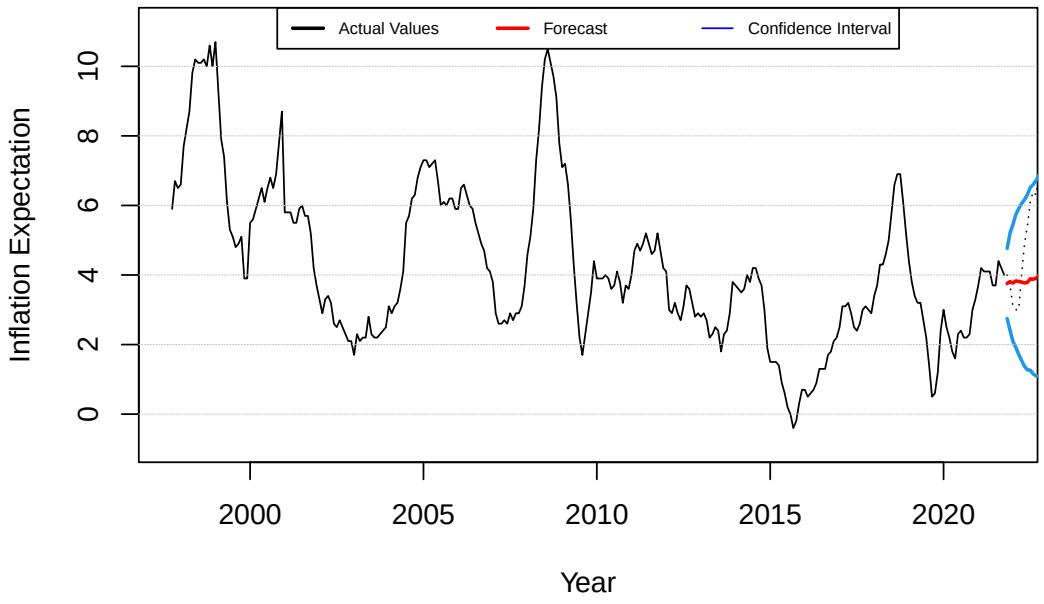
sigma^2 estimated as 0.2643: log likelihood = -219.84, aic = 447.68

Training set error measures: ME RMSE MAE MPE MAPE MASE ACF1 Training set 0.002138173 0.5140693 0.3833286 -Inf Inf 0.9980357 0.4062918

2−year Forecast for ALL Inflation Expectation



Forecast for ALL Inflation Expectation

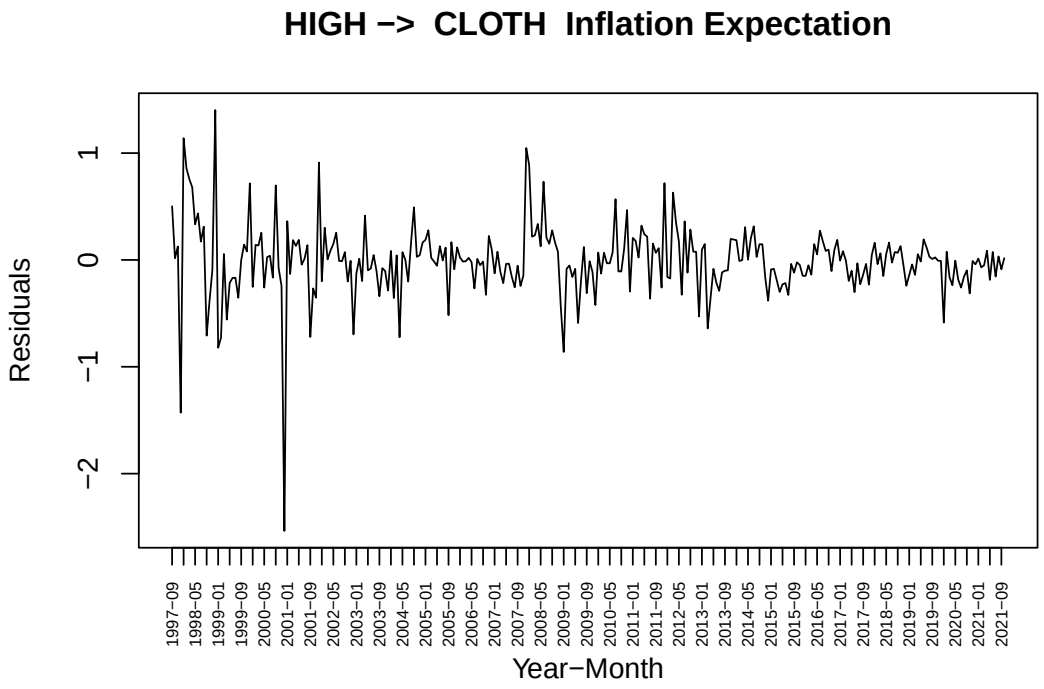


Appendix 11

FORECASTING CLOTHING AND FOOTWEAR INFLATION EXPECTATION WITH HIGH LENDING RATE

HIGH -> CLOTH Inflation Expectation

——— RESIDUALS TIME PLOT ———-



——— HETEROCEDASTICITY TEST ———-

studentized Breusch-Pagan test

data: lm(dataset[2:290, inf_exp] ~ dataset[2:290, “high”] + dataset[1:289, inf_exp]) BP = 33.315, df = 2, p-value = 5.83e-08

————— NORMALITY TEST ——————-

Jarque Bera Test

data: ar_residuals X-squared = 1856.2, df = 2, p-value < 2.2e-16

——— AUTOCORRELATION TEST ———-

Box-Ljung test

data: ar_residuals X-squared = 17.749, df = 10, p-value = 0.05934

——— FORECASTING SUMMARY ———-

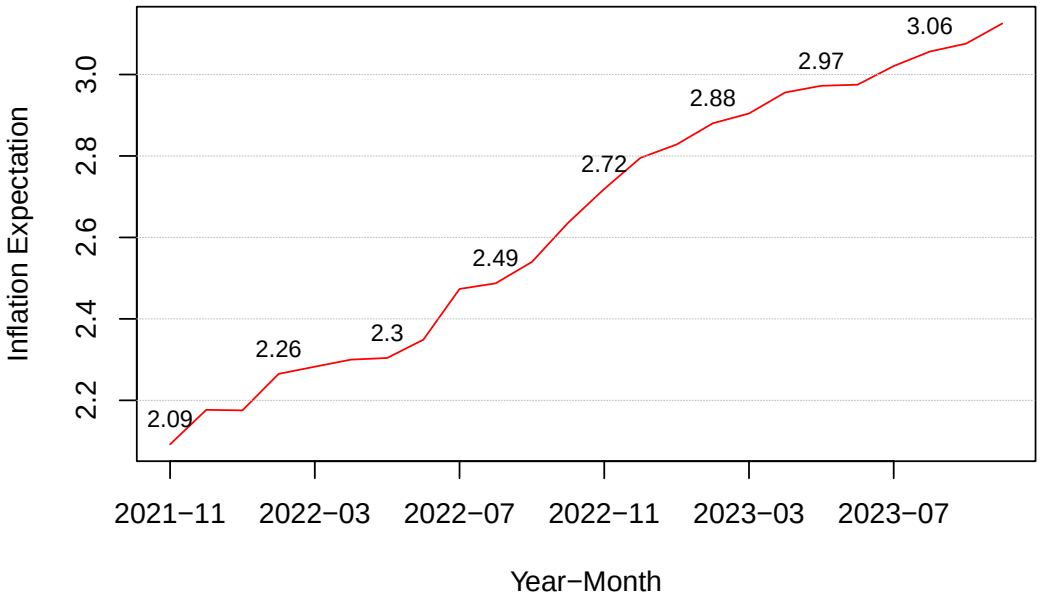
Call: arima(x = ts_inf_exp, order = c(1, 0, 0), xreg = ts_high)

Coefficients: ar1 intercept ts_high 0.9622 2.0696 0.1325 s.e. 0.0169 0.6366 0.0352

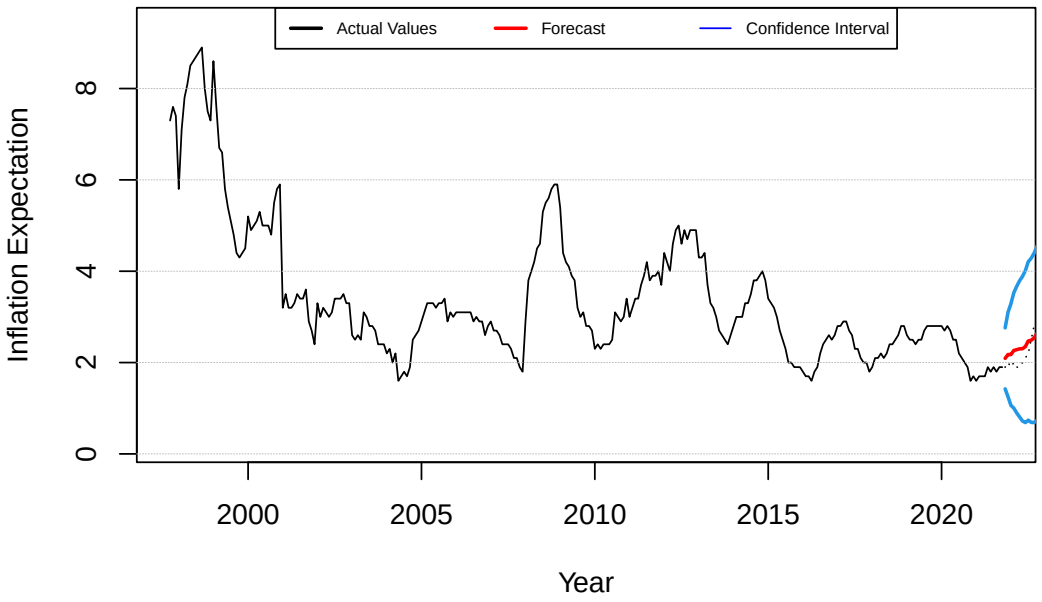
sigma^2 estimated as 0.116: log likelihood = -100.47, aic = 208.94

Training set error measures: ME RMSE MAE MPE MAPE MASE Training set -0.01054261 0.3406252 0.2147248 -1.192619 6.354449 1.018973 ACF1 Training set 0.06056628

2−year Forecast for CLOTH Inflation Expectation



Forecast for CLOTH Inflation Expectation

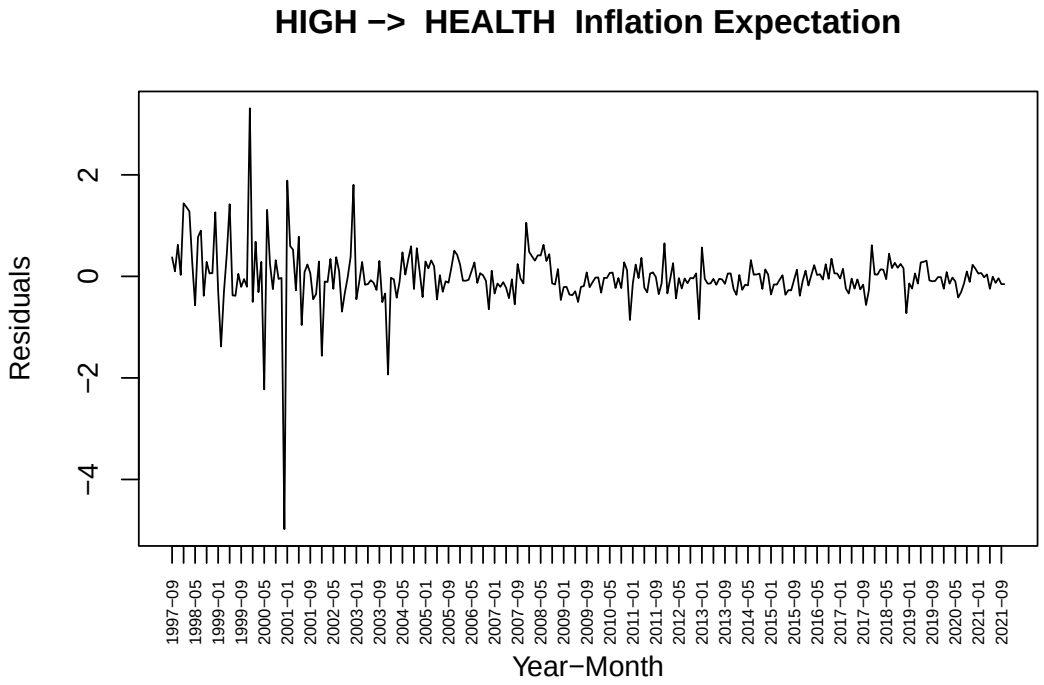


Appendix 12

FORECASTING HEALTH INFLATION EXPECTATION WITH HIGH LENDING RATE

HIGH -> HEALTH Inflation Expectation

——— RESIDUALS TIME PLOT ———-



——— HETEROCEDASTICITY TEST ———-

studentized Breusch-Pagan test

data: lm(dataset[2:290, inf_exp] ~ dataset[2:290, “high”] + dataset[1:289, inf_exp]) BP = 15.849, df = 2, p-value = 0.0003617

————— NORMALITY TEST ——————-

Jarque Bera Test

data: ar_residuals X-squared = 8198.2, df = 2, p-value < 2.2e-16

——— AUTOCORRELATION TEST ———-

Box-Ljung test

data: ar_residuals X-squared = 26.679, df = 10, p-value = 0.002927

——— FORECASTING SUMMARY ———-

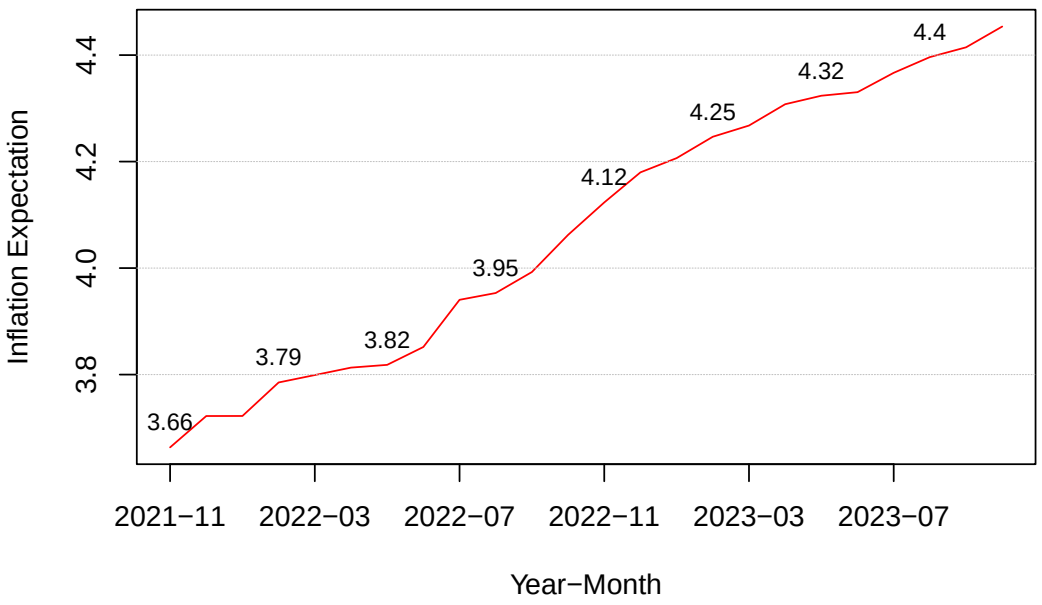
Call: arima(x = ts_inf_exp, order = c(1, 0, 0), xreg = ts_high)

Coefficients: ar1 intercept ts_high 0.9741 4.1080 0.0911 s.e. 0.0128 1.3383 0.0593

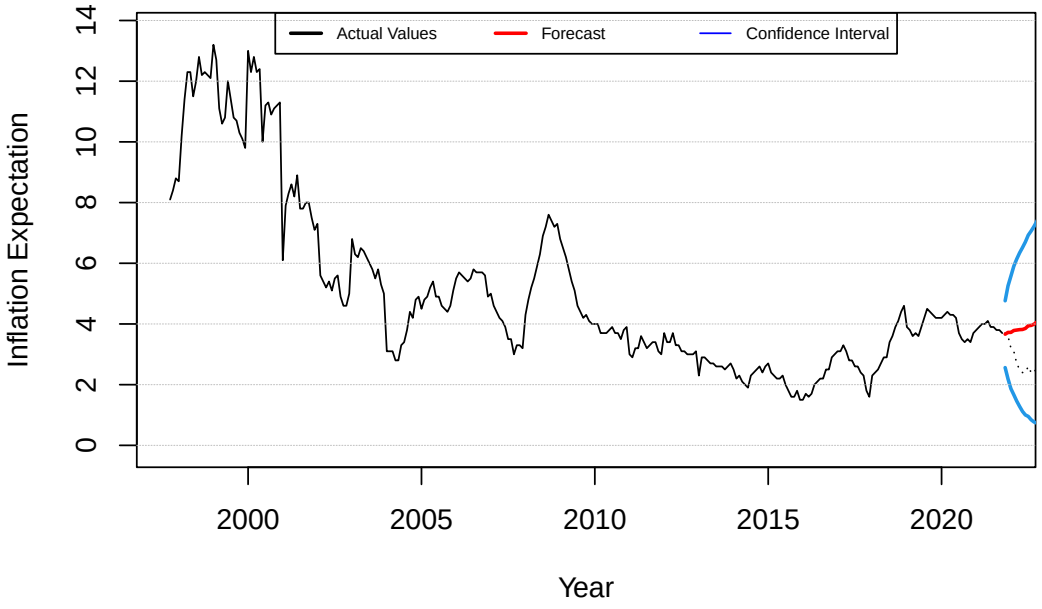
sigma^2 estimated as 0.3152: log likelihood = -245.59, aic = 499.18

Training set error measures: ME RMSE MAE MPE MAPE MASE Training set -0.009605748 0.5614679 0.3123851 -1.366346 6.522576 1.010966 ACF1 Training set -0.08598341

2−year Forecast for HEALTH Inflation Expectation



Forecast for HEALTH Inflation Expectation

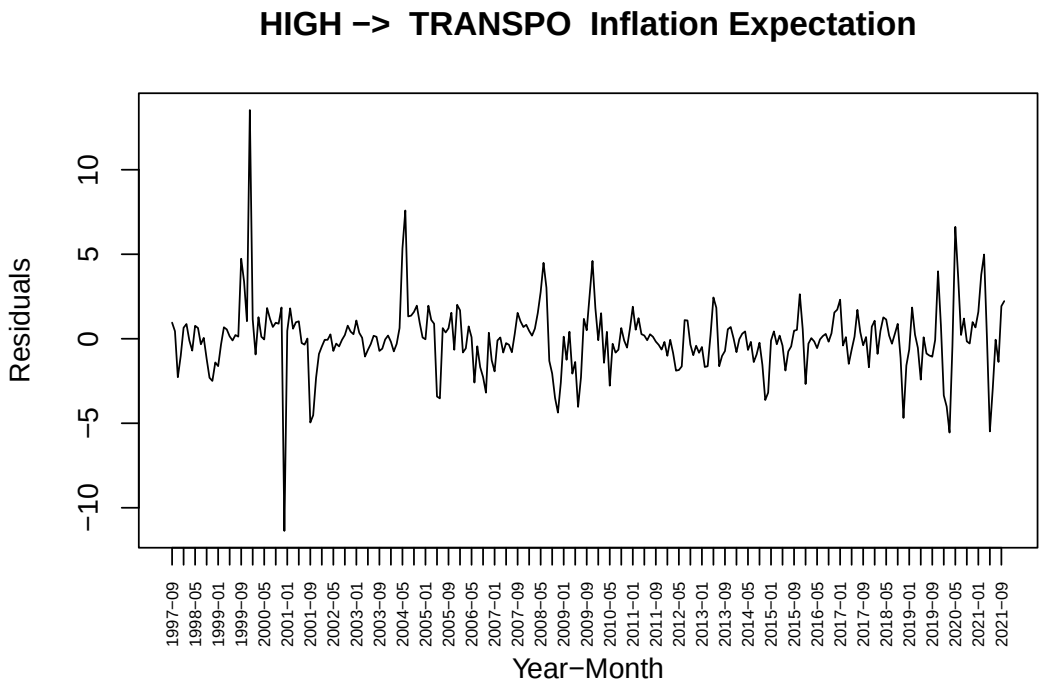


Appendix 13

FORECASTING TRANSPORT INFLATION EXPECTATION WITH HIGH LENDING RATE

HIGH -> TRANSPO Inflation Expectation

——— RESIDUALS TIME PLOT ———-



——— HETEROCEDASTICITY TEST ———-

studentized Breusch-Pagan test

data: lm(dataset[2:290, inf_exp] ~ dataset[2:290, “high”] + dataset[1:289, inf_exp]) BP = 7.4519, df = 2, p-value = 0.02409

————— NORMALITY TEST ——————-

Jarque Bera Test

data: ar_residuals X-squared = 1429.3, df = 2, p-value < 2.2e-16

——— AUTOCORRELATION TEST ———-

Box-Ljung test

data: ar_residuals X-squared = 53.294, df = 10, p-value = 6.565e-08

——— FORECASTING SUMMARY ———-

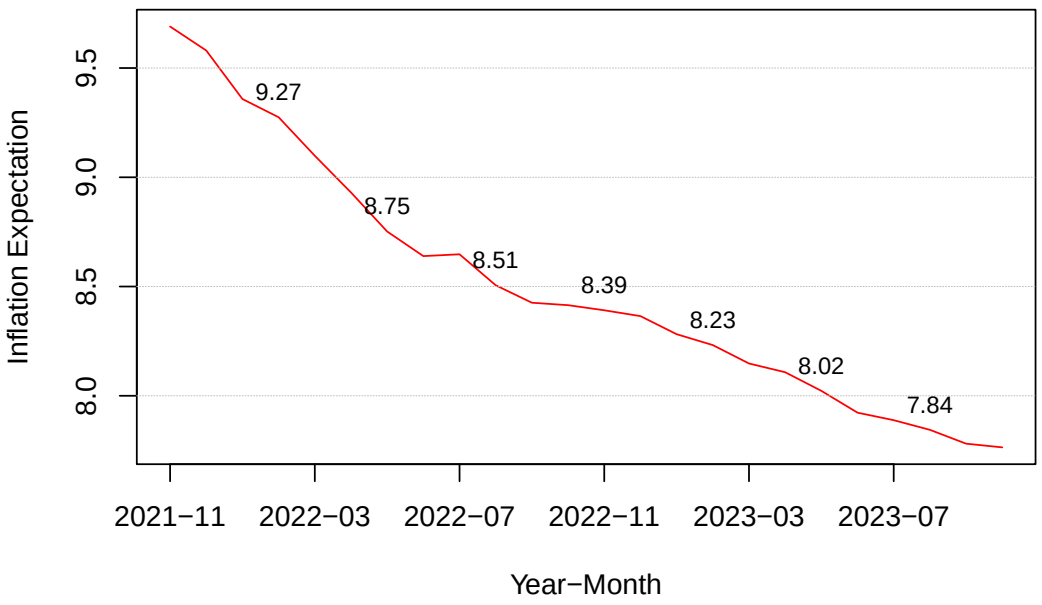
Call: arima(x = ts_inf_exp, order = c(1, 0, 0), xreg = ts_high)

Coefficients: ar1 intercept ts_high 0.9539 4.3144 0.1882 s.e. 0.0173 3.3163 0.1987

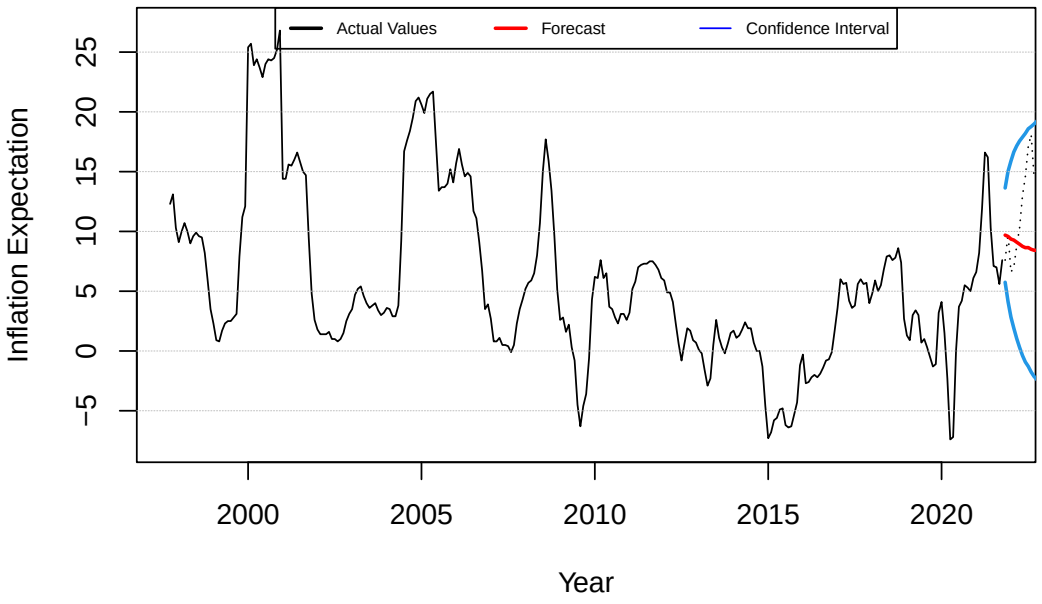
sigma^2 estimated as 4.046: log likelihood = -615.35, aic = 1238.7

Training set error measures: ME RMSE MAE MPE MAPE MASE ACF1 Training set -0.0171687 2.011371 1.256957 NaN Inf 1.00487 0.3789652

2−year Forecast for TRANSPO Inflation Expectation



Forecast for TRANSPO Inflation Expectation

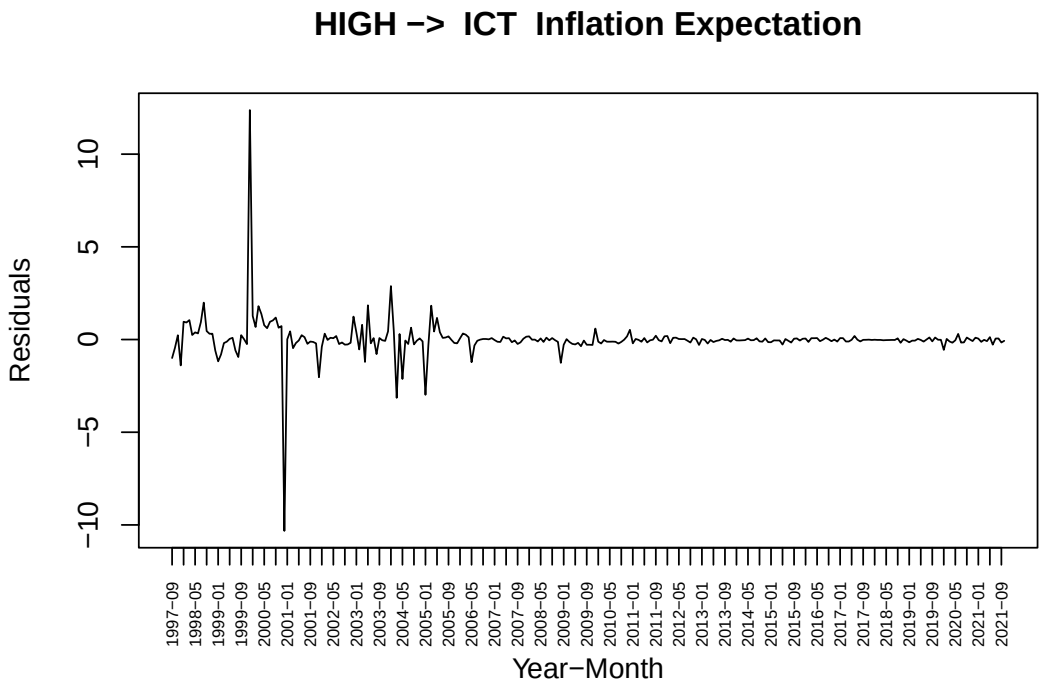


Appendix 14

FORECASTING INFORMATION AND COMMUNICATION INFLATION EXPECTATION WITH HIGH LENDING RATE

HIGH -> ICT Inflation Expectation

——— RESIDUALS TIME PLOT ———-



——— HETEROCEDASTICITY TEST ———-

studentized Breusch-Pagan test

data: lm(dataset[2:290, inf_exp] ~ dataset[2:290, “high”] + dataset[1:289, inf_exp]) BP = 9.0621, df = 2, p-value = 0.01077

————— NORMALITY TEST ——————-

Jarque Bera Test

data: ar_residuals X-squared = 81928, df = 2, p-value < 2.2e-16

——— AUTOCORRELATION TEST ———-

Box-Ljung test

data: ar_residuals X-squared = 3.4989, df = 10, p-value = 0.9671

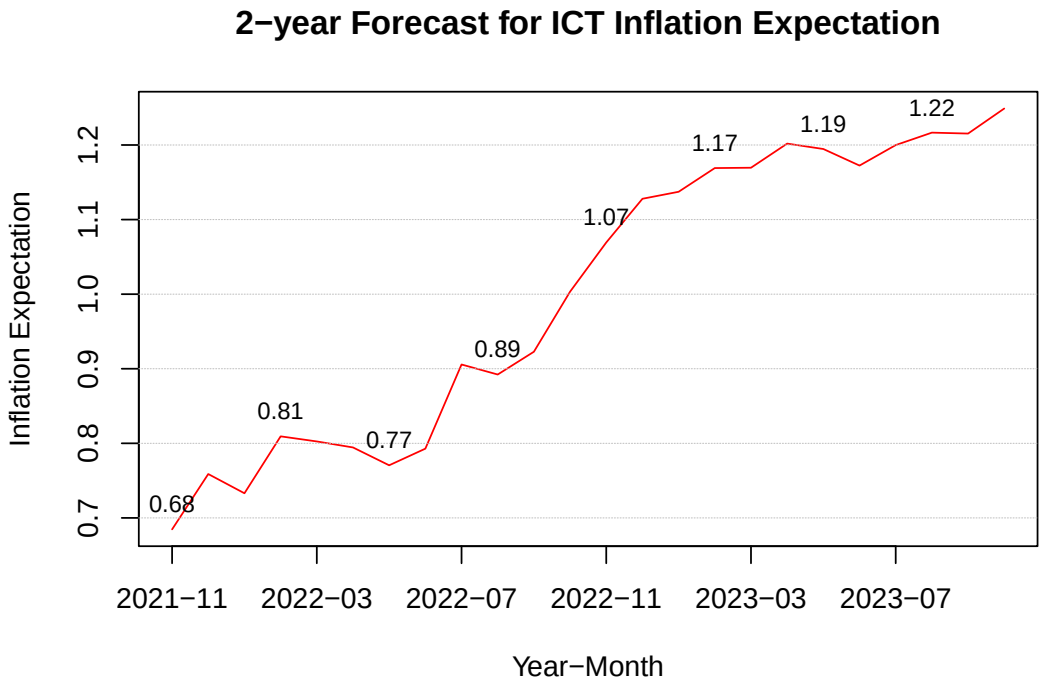
——— FORECASTING SUMMARY ———-

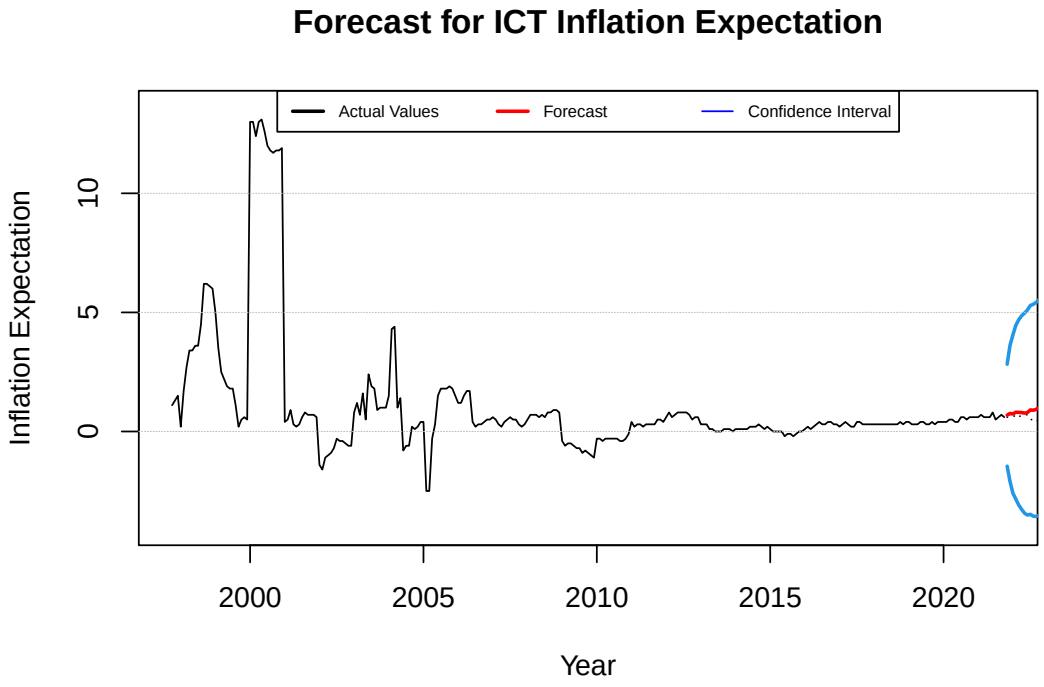
Call: arima(x = ts_inf_exp, order = c(1, 0, 0), xreg = ts_high)

Coefficients: ar1 intercept ts_high 0.8889 -0.5817 0.1511 s.e. 0.0269 1.0803 0.0860

sigma^2 estimated as 1.193: log likelihood = -437.82, aic = 883.64

Training set error measures: ME RMSE MAE MPE MAPE MASE ACF1 Training set 0.01067289 1.092086 0.3576342 NaN Inf 1.137033 0.06208838


2−year Forecast for ICT Inflation Expectation
Inflation Expectation
0.7
0.8
0.9
1.0
1.1
1.2
0.68
0.81
0.77
0.89
1.07
1.17
1.19
1.22
2021−11
2022−03
2022−07
2022−11
2023−03
2023−07
Year−Month

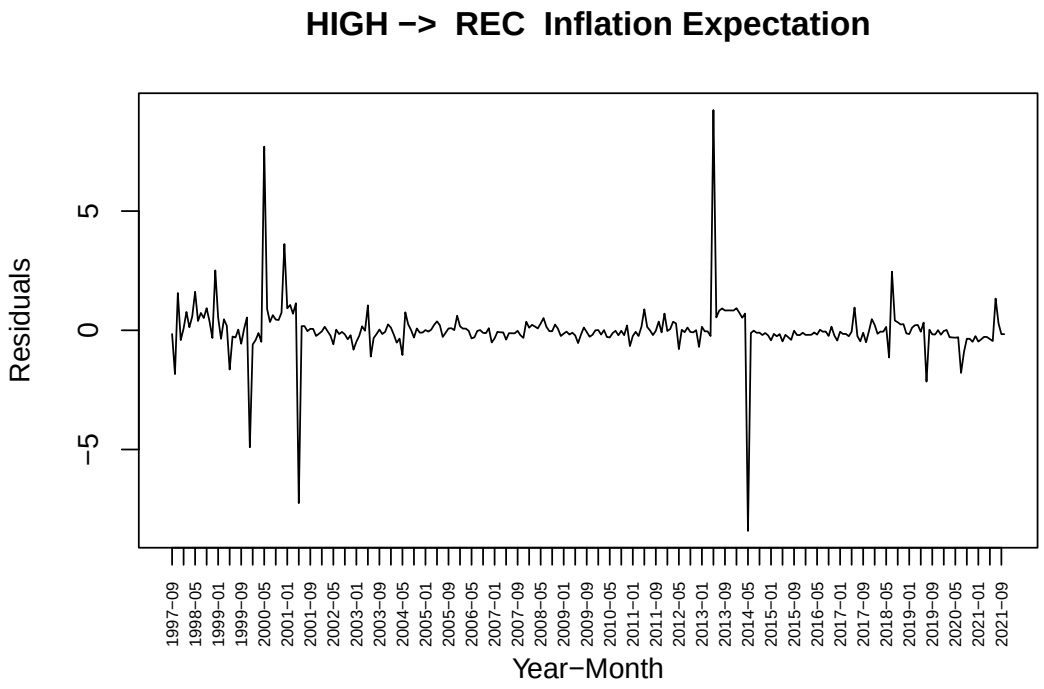

Forecast for ICT Inflation Expectation
Actual Values
Forecast
Confidence Interval
Inflation Expectation
0
5
10
2000
2005
2010
2015
2020
Year

Appendix 15

FORECASTING RECREATION, SPORT AND CULTURE INFLATION EXPECTATION WITH HIGH LENDING RATE

HIGH -> REC Inflation Expectation

——— RESIDUALS TIME PLOT ———-



——— HETEROCEDASTICITY TEST ———-

studentized Breusch-Pagan test

data: lm(dataset[2:290, inf_exp] ~ dataset[2:290, “high”] + dataset[1:289, inf_exp]) BP = 5.7411, df = 2, p-value = 0.05667

————— NORMALITY TEST ——————-

Jarque Bera Test

data: ar_residuals X-squared = 16170, df = 2, p-value < 2.2e-16

——— AUTOCORRELATION TEST ———-

Box-Ljung test

data: ar_residuals X-squared = 15.169, df = 10, p-value = 0.126

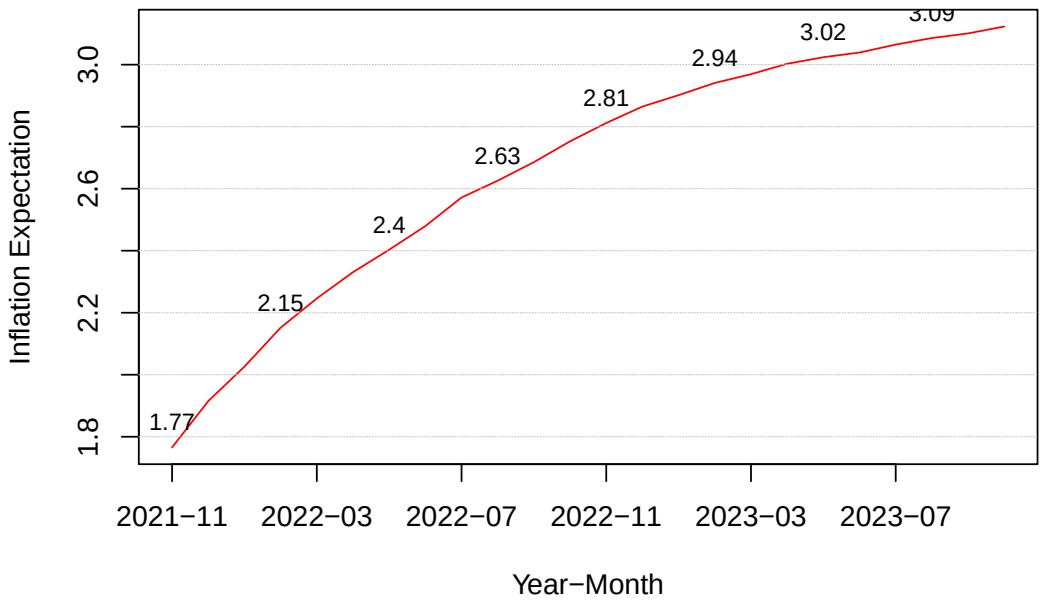
——— FORECASTING SUMMARY ———-

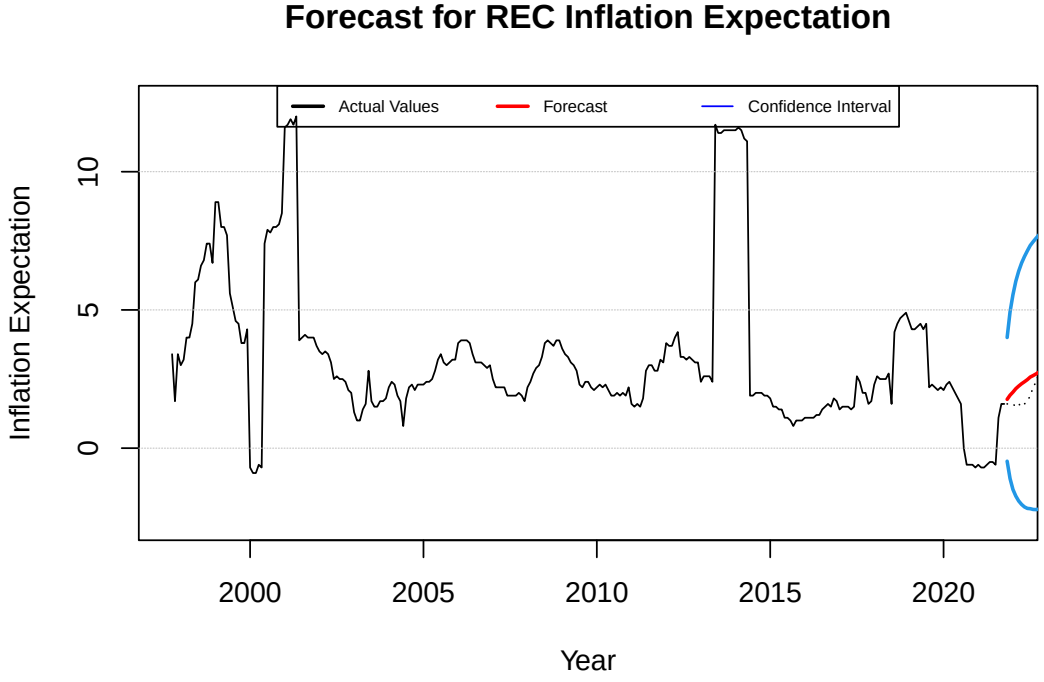
Call: arima(x = ts_inf_exp, order = c(1, 0, 0), xreg = ts_high)

Coefficients: ar1 intercept ts_high 0.9020 2.7904 0.0380 s.e. 0.0255 1.2241 0.0954

sigma^2 estimated as 1.303: log likelihood = -450.74, aic = 909.47

Training set error measures: ME RMSE MAE MPE MAPE MASE ACF1 Training set 0.001834459 1.141597 0.4649273 -Inf Inf 1.182782 0.03295997


2−year Forecast for REC Inflation Expectation
Inflation Expectation
1.8
2.2
2.6
3.0
1.77
2.15
2.4
2.63
2.81
2.94
3.02
3.09
2021−11
2022−03
2022−07
2022−11
2023−03
2023−07
Year−Month

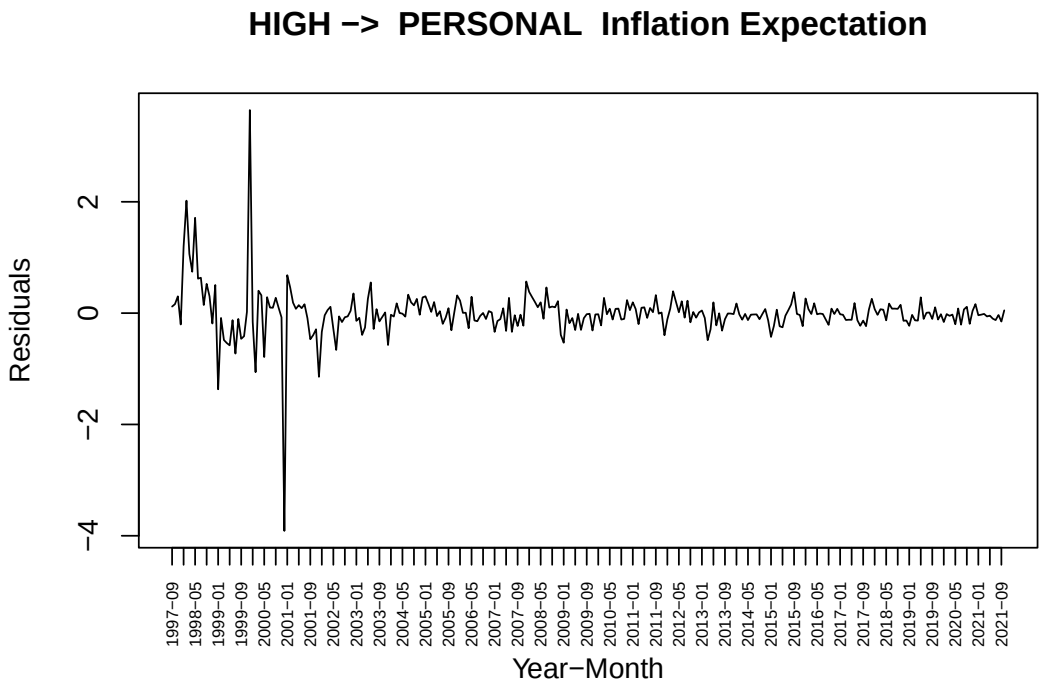

Forecast for REC Inflation Expectation
Actual Values
Forecast
Confidence Interval
Inflation Expectation
0
5
10
2000
2005
2010
2015
2020
Year

Appendix 16

FORECASTING PERSONAL CARE, AND MISCELLANEOUS GOODS AND SERVICES INFLATION EXPECTATION WITH HIGH LENDING RATE

HIGH -> PERSONAL Inflation Expectation

——— RESIDUALS TIME PLOT ———-



——— HETEROCEDASTICITY TEST ———-

studentized Breusch-Pagan test

data: lm(dataset[2:290, inf_exp] ~ dataset[2:290, “high”] + dataset[1:289, inf_exp]) BP = 17.13, df = 2, p-value = 0.0001907

————— NORMALITY TEST ——————-

Jarque Bera Test

data: ar_residuals X-squared = 16362, df = 2, p-value < 2.2e-16

——— AUTOCORRELATION TEST ———-

Box-Ljung test

data: ar_residuals X-squared = 20.524, df = 10, p-value = 0.02467

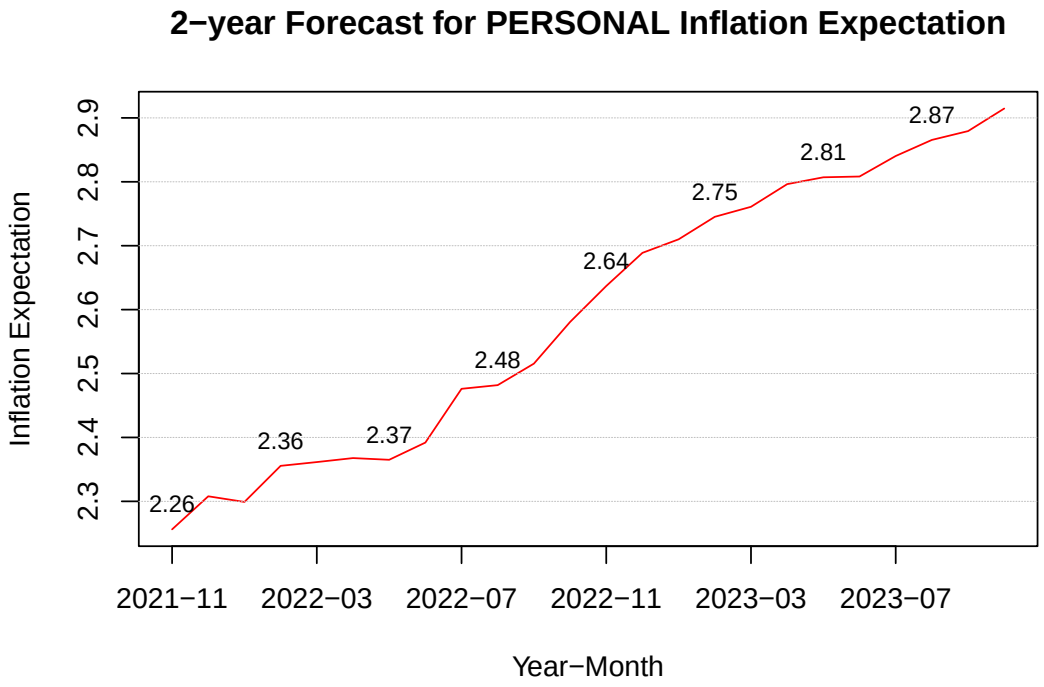
——— FORECASTING SUMMARY ———-

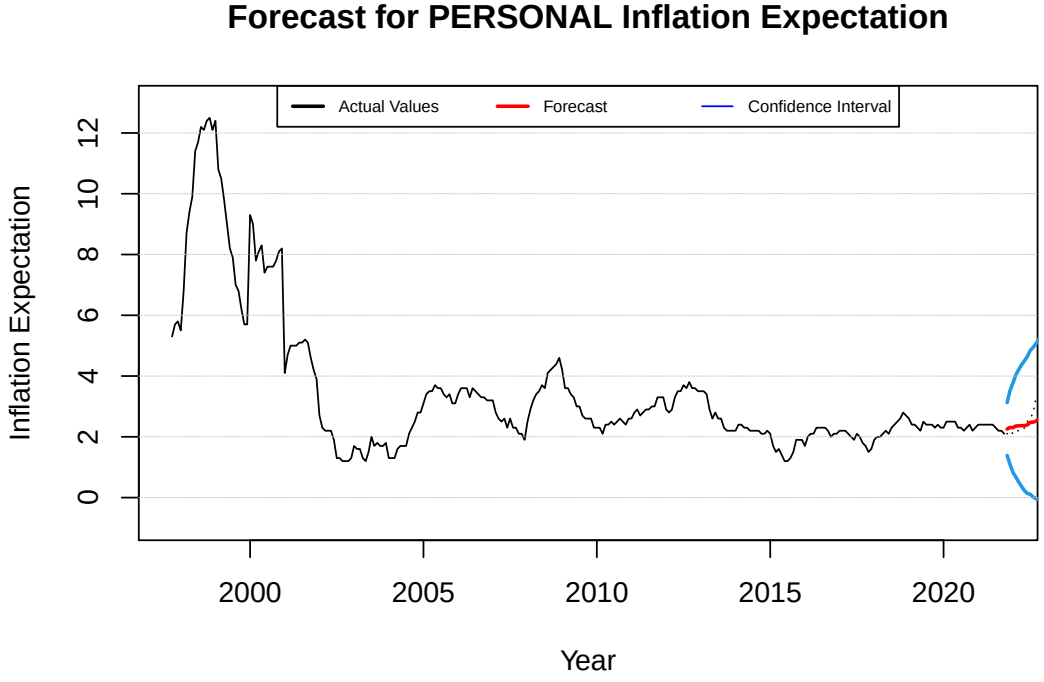
Call: arima(x = ts_inf_exp, order = c(1, 0, 0), xreg = ts_high)

Coefficients: ar1 intercept ts_high 0.9743 2.3672 0.0943 s.e. 0.0123 1.0528 0.0459

sigma^2 estimated as 0.1974: log likelihood = -177.75, aic = 363.49

Training set error measures: ME RMSE MAE MPE MAPE MASE Training set -0.003131361 0.4443425 0.2215848 -1.351764 6.673288 1.031208 ACF1 Training set 0.1363036


2−year Forecast for PERSONAL Inflation Expectation
Inflation Expectation
2.3
2.4
2.5
2.6
2.7
2.8
2.9
2.26
2.36
2.37
2.48
2.64
2.75
2.81
2.87
2021−11
2022−03
2022−07
2022−11
2023−03
2023−07
Year−Month


Forecast for PERSONAL Inflation Expectation
Actual Values
Forecast
Confidence Interval
Inflation Expectation
0
2
4
6
8
10
12
2000
2005
2010
2015
2020
Year

Appendix 17

R PROGRAMMING LANGUAGE ALGORITHM FOR FORECASTING INFLATION EXPECTATIONS WITH LOW LENDING RATE

```
# Loop over each significant variables in Granger Causality Test
low_variables <- c("all", "cloth", "health", "transpo", "ict", "rec", "personal",
    "food", "educ")

fullname <- c("ALL ITEMS", "CLOTHING AND FOOTWEAR", "HEALTH", "TRANSPORT", "INFORMATION AND COMMUNICATION",
    "RECREATION, SPORT AND CULTURE", "PERSONAL CARE, AND MISCELLANEOUS GOODS AND SERVICES",
    "FOOD AND NON-ALCOHOLIC BEVERAGES", "EDUCATION SERVICES")

# Appendix count for the title
Appendix = 18

for (inf_exp in low_variables) {

    # Create a monthly time series object for the variables
    ts_inf_exp <- ts(dataset[1:290, inf_exp], start = c(1997, 9), end = c(2021, 10),
        frequency = 12)
    ts_low <- ts(dataset[1:290, "low"], start = c(1997, 9), end = c(2021, 10), frequency = 12)

    # Create a monthly time series object for data visualization
    actual_inf_exp <- ts(dataset[289:314, inf_exp], start = c(2021, 11), end = c(2023,
        10), frequency = 12)
    actual_inf_exp_long <- ts(dataset[1:290, inf_exp], start = c(1997, 10), end = c(2021,
        10), frequency = 12)

    # Create a monthly time series object for testing forecasting
    actual_low <- ts(dataset[291:314, "low"], start = c(2021, 11), end = c(2023,
        10), frequency = 12)

    cat("\\newpage")
    cat("# Appendix", Appendix, "\n")
    cat("# FORECASTING ", fullname[Appendix - 17], "INFLATION EXPECTATION WITH LOW LENDING RATE\n")
    Appendix = Appendix + 1
    cat(" low -> ", toupper(inf_exp), " Inflation Expectation\n")

    # Linear Regression with Autoregressive term fit
    ar_model <- arima(ts_inf_exp, order = c(1, 0, 0), xreg = ts_low)

    # Extract residuals from the fitted ARIMA model
    ar_residuals <- ts(residuals(ar_model), start = c(1997, 9), end = c(2021, 10),
        frequency = 12)

    cat("\n-------- RESIDUALS TIME PLOT ----------")

    # Setting up the plot
    plot(ar_residuals, ylab = "Residuals", xlab = "Year-Month", xaxt = "n", main = paste("LOW -> ",
        toupper(inf_exp), " Inflation Expectation"))

    dates <- as.Date(time(ar_residuals))
    axis_dates <- time(ar_residuals)[seq(1, length(ar_residuals), by = 4)]
    axis_labels <- format(dates[seq(1, length(ar_residuals), by = 4)], "%Y-%m")

    axis(1, at = axis_dates, labels = axis_labels, las = 2, cex.axis = 0.6)
```

```r
cat("\n\n-------- HETEROCEDASTICITY TEST ----------\n\n")
print(bptest(lm(dataset[2:290, inf_exp] ~ dataset[2:290, "low"] + dataset[1:289,
    inf_exp])))
cat("\n")

cat("\n------------- NORMALITY TEST ---------------\n ")
# Normality
print(jarque.bera.test(ar_residuals))
cat("\n")

cat("\n -------- AUTOCORRELATION TEST ----------\n ")
# Serial Autocorrelation
print(Box.test(ar_residuals, lag = 10, type = "Ljung-Box"))
cat("\n")
cat("\n -------- FORECASTING SUMMARY  ---------- \n ")
print(summary(ar_model))
cat("\n")

# Forecast the inflation expectation from Nov 2021 to Oct 2025
inf_forecast <- predict(ar_model, newxreg = actual_low, n.ahead = 24)
inf_forecast_values <- inf_forecast$pred
inf_forecast_se <- inf_forecast$se

# Extracting dates
dates <- as.Date(time(inf_forecast_values))

# Plotting
plot(inf_forecast_values, main = paste("2-year Forecast for", toupper(inf_exp),
    "Inflation Expectation"), xlab = "Year-Month", ylab = "Inflation Expectation",
    xaxt = "n", col = "red", lty = 1)

# Customize x-axis labels with year-month format
axis(1, at = time(inf_forecast_values)[seq(1, length(inf_forecast_values), by = 4)],
    labels = format(dates[seq(1, length(inf_forecast_values), by = 4)], "%Y-%m"))

# Add thin gray lines matching the y-axis labels
y_ticks <- axTicks(2)
for (y in y_ticks) {
    abline(h = y, col = "gray", lty = 2, lwd = 0.2)
}

# Add value labels every 3 data points
every_third <- seq(1, length(inf_forecast_values), by = 3)
text(x = time(inf_forecast_values)[every_third], y = inf_forecast_values[every_third],
    labels = round(inf_forecast_values[every_third], 2), pos = 3, col = "black",
    cex = 0.8)

# Variables will be used to zoom out the graph
overall_max <- max(max(coredata(inf_forecast_values)), max(actual_inf_exp_long),
    max(inf_forecast_values - 1.96 * inf_forecast_se), max(inf_forecast_values +
        1.96 * inf_forecast_se))
overall_min <- min(min(coredata(inf_forecast_values)), min(actual_inf_exp_long),
    min(inf_forecast_values - 1.96 * inf_forecast_se), min(inf_forecast_values +
        1.96 * inf_forecast_se))

# Plotting the actual values of inflation expectation
plot.ts(actual_inf_exp_long, main = paste("Forecast for", toupper(inf_exp), "Inflation Expectation"),
    xlab = "Year", ylab = "Inflation Expectation", lty = 1, ylim = c(overall_min -
        0.5, overall_max + 0.5))
lines(actual_inf_exp, col = "black", lty = 3)
```

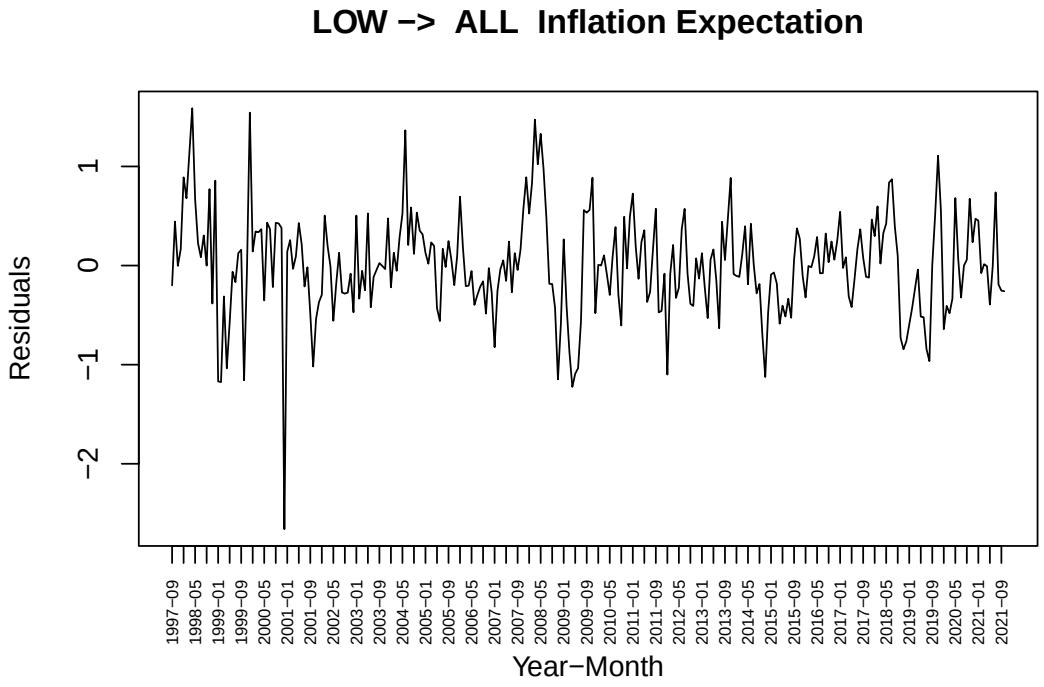
```
    # Add the forecast on the end and confidence intervals
    lines(inf_forecast_values, col = "red", lwd = 2)
    lines(inf_forecast_values - 1.96 * inf_forecast_se, col = 4, lty = 1, lwd = 2)
    lines(inf_forecast_values + 1.96 * inf_forecast_se, col = 4, lty = 1, lwd = 2)

    # Add thin gray lines matching the y-axis labels
    y_ticks <- axTicks(2)
    for (y in y_ticks) {
        abline(h = y, col = "gray", lty = 2, lwd = 0.2)
    }

    # Add legend
    legend("top", legend = c("Actual Values", "Forecast", "Confidence Interval"),
        col = c("black", "red", "blue"), lty = c(1, 1, 1), lwd = c(2, 2, 1), cex = 0.6,
        horiz = TRUE, bg = "transparent")
}
```

Appendix 18

FORECASTING ALL ITEMS INFLATION EXPECTATION WITH LOW LENDING RATE

low -> ALL Inflation Expectation

——— RESIDUALS TIME PLOT ———-



——— HETEROCEDASTICITY TEST ———-

studentized Breusch-Pagan test

data: lm(dataset[2:290, inf_exp] ~ dataset[2:290, “low”] + dataset[1:289, inf_exp]) BP = 18.769, df = 2, p-value = 8.402e-05

————— NORMALITY TEST ——————-

Jarque Bera Test

data: ar_residuals X-squared = 83.913, df = 2, p-value < 2.2e-16

——— AUTOCORRELATION TEST ———-

Box-Ljung test

data: ar_residuals X-squared = 88.06, df = 10, p-value = 1.299e-14

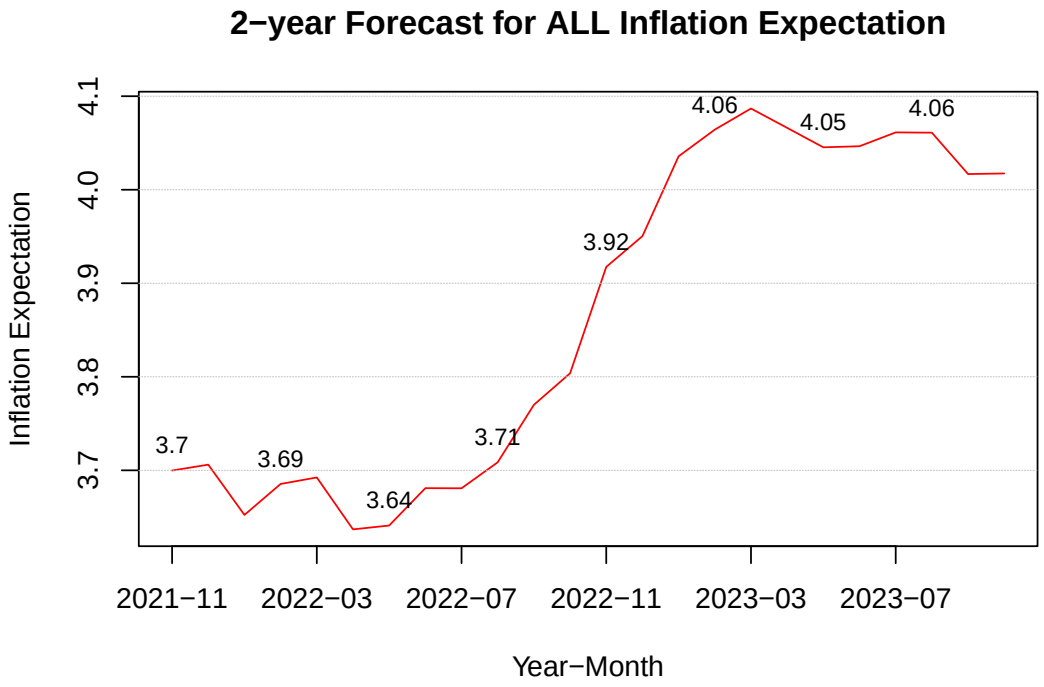
——— FORECASTING SUMMARY ———-

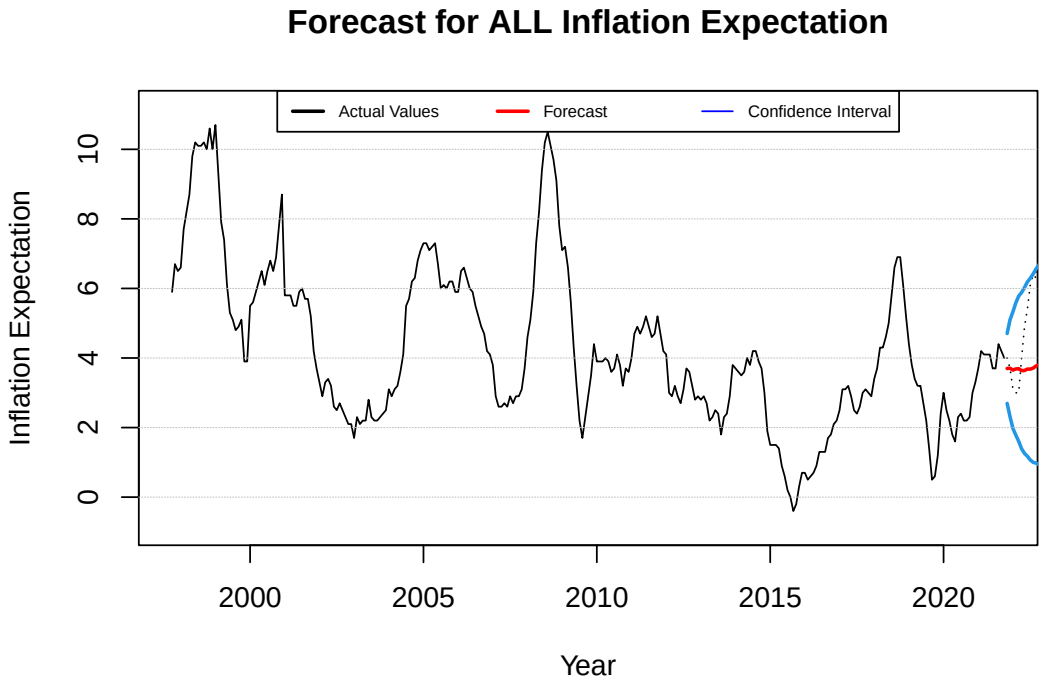
Call: arima(x = ts_inf_exp, order = c(1, 0, 0), xreg = ts_low)

Coefficients: ar1 intercept ts_low 0.9624 2.8937 0.1617 s.e. 0.0150 0.8755 0.0531

sigma^2 estimated as 0.263: log likelihood = -219.13, aic = 446.27

Training set error measures: ME RMSE MAE MPE MAPE MASE ACF1 Training set 0.004139648 0.5128383 0.3793963 -Inf Inf 0.9877977 0.420728


2−year Forecast for ALL Inflation Expectation
Inflation Expectation
4.1
4.0
3.9
3.8
3.7
3.7
3.69
3.64
3.71
3.92
4.06
4.05
4.06
2021−11
2022−03
2022−07
2022−11
2023−03
2023−07
Year−Month

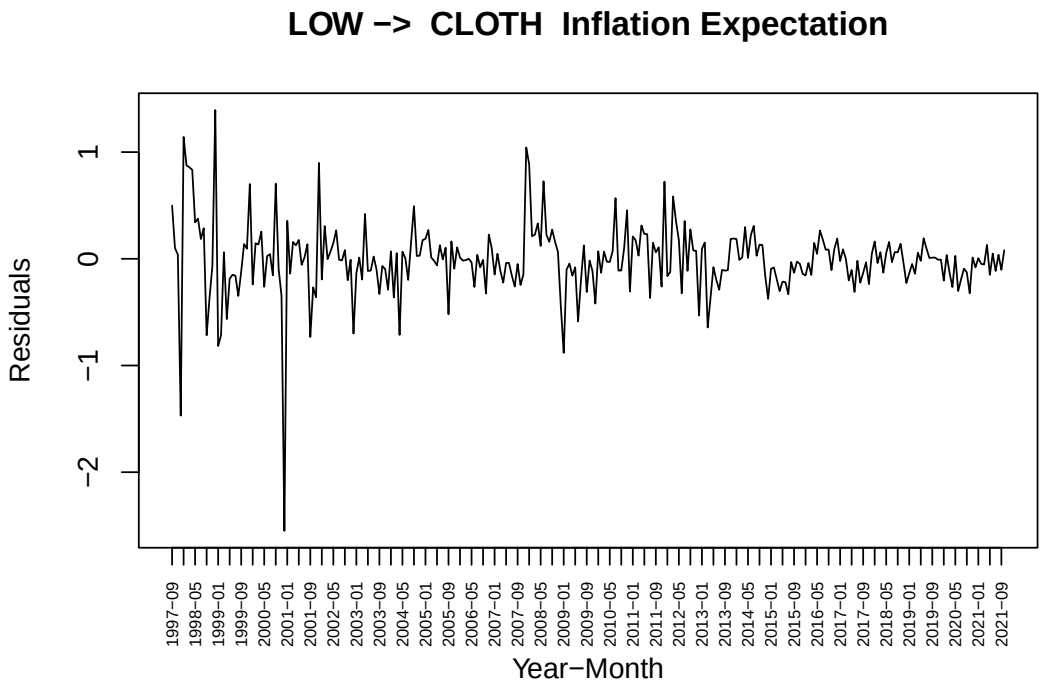

Forecast for ALL Inflation Expectation
Actual Values
Forecast
Confidence Interval
Inflation Expectation
10
8
6
4
2
0
2000
2005
2010
2015
2020
Year

Appendix 19

FORECASTING CLOTHING AND FOOTWEAR INFLATION EXPECTATION WITH LOW LENDING RATE

low -> CLOTH Inflation Expectation

——— RESIDUALS TIME PLOT ———-



——— HETEROCEDASTICITY TEST ———-

studentized Breusch-Pagan test

data: lm(dataset[2:290, inf_exp] ~ dataset[2:290, “low”] + dataset[1:289, inf_exp]) BP = 35.771, df = 2, p-value = 1.708e-08

————— NORMALITY TEST ——————-

Jarque Bera Test

data: ar_residuals X-squared = 1936.3, df = 2, p-value < 2.2e-16

——— AUTOCORRELATION TEST ———-

Box-Ljung test

data: ar_residuals X-squared = 16.404, df = 10, p-value = 0.08865

——— FORECASTING SUMMARY ———-

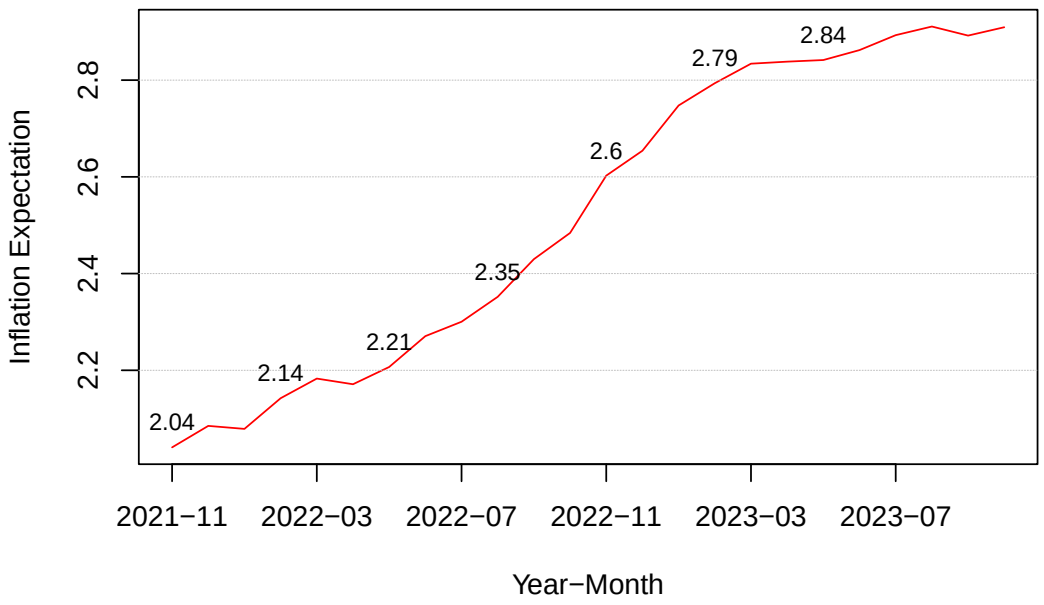
Call: arima(x = ts_inf_exp, order = c(1, 0, 0), xreg = ts_low)

Coefficients: ar1 intercept ts_low 0.9621 2.4158 0.1321 s.e. 0.0168 0.5939 0.0372

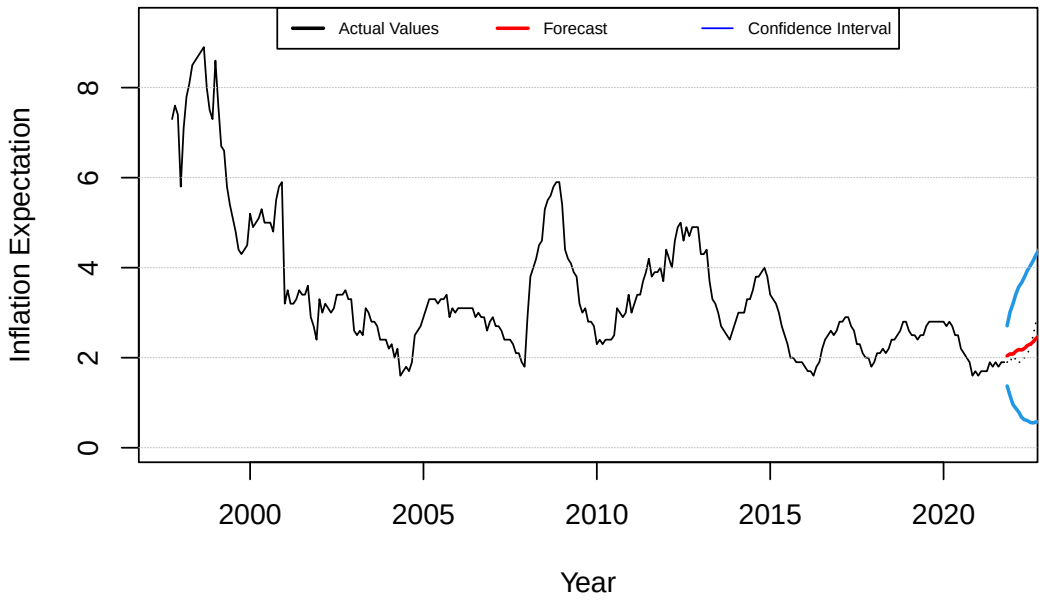
sigma^2 estimated as 0.1167: log likelihood = -101.25, aic = 210.5

Training set error measures: ME RMSE MAE MPE MAPE MASE Training set -0.01043161 0.341545 0.2141042 -1.183427 6.312125 1.016028 ACF1 Training set 0.08393394

2−year Forecast for CLOTH Inflation Expectation



Forecast for CLOTH Inflation Expectation

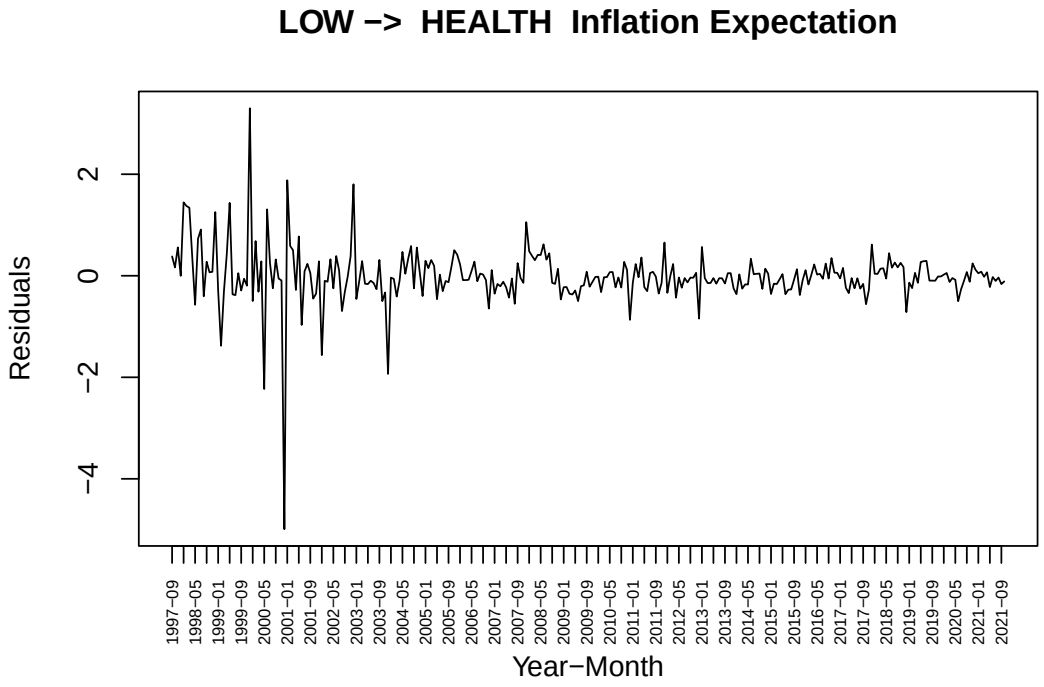


Appendix 20

FORECASTING HEALTH INFLATION EXPECTATION WITH LOW LENDING RATE

low -> HEALTH Inflation Expectation

——— RESIDUALS TIME PLOT ———-



——— HETEROCEDASTICITY TEST ———-

studentized Breusch-Pagan test

data: lm(dataset[2:290, inf_exp] ~ dataset[2:290, “low”] + dataset[1:289, inf_exp]) BP = 16.716, df = 2, p-value = 0.0002345

————— NORMALITY TEST ——————-

Jarque Bera Test

data: ar_residuals X-squared = 8269, df = 2, p-value < 2.2e-16

——— AUTOCORRELATION TEST ———-

Box-Ljung test

data: ar_residuals X-squared = 26.275, df = 10, p-value = 0.003387

——— FORECASTING SUMMARY ———-

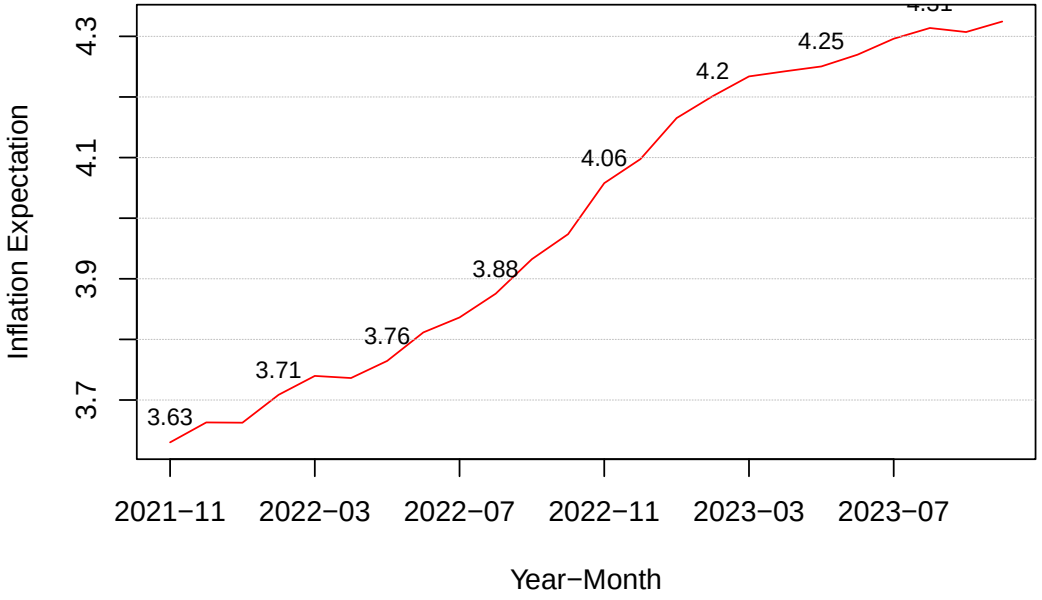
Call: arima(x = ts_inf_exp, order = c(1, 0, 0), xreg = ts_low)

Coefficients: ar1 intercept ts_low 0.9745 4.3727 0.0878 s.e. 0.0127 1.2884 0.0626

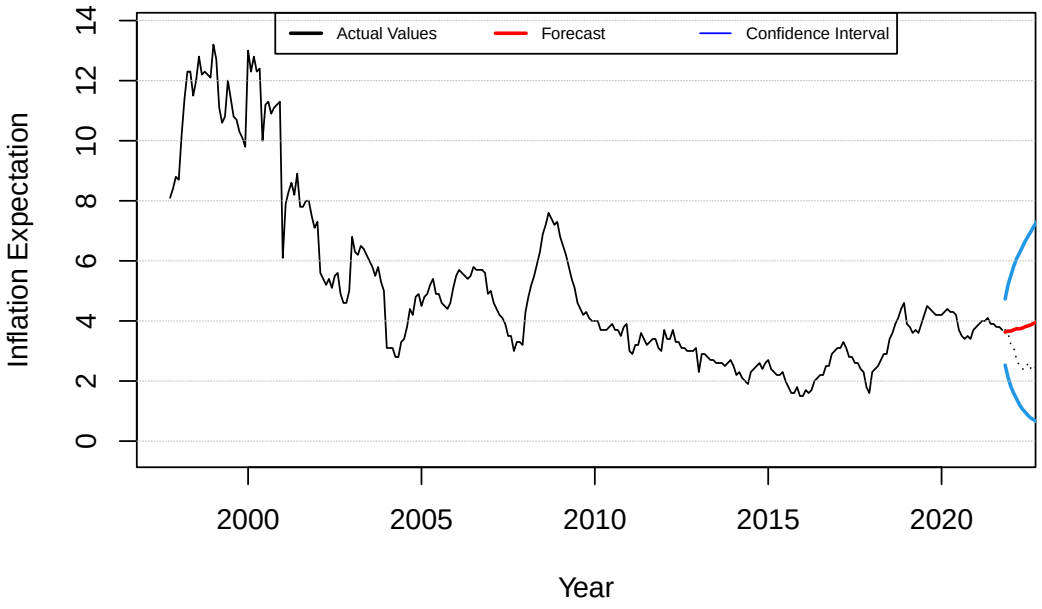
sigma^2 estimated as 0.3156: log likelihood = -245.78, aic = 499.56

Training set error measures: ME RMSE MAE MPE MAPE MASE Training set -0.009568399 0.5618205 0.3118118 -1.355515 6.490169 1.009111 ACF1 Training set -0.07965922

2−year Forecast for HEALTH Inflation Expectation



Forecast for HEALTH Inflation Expectation

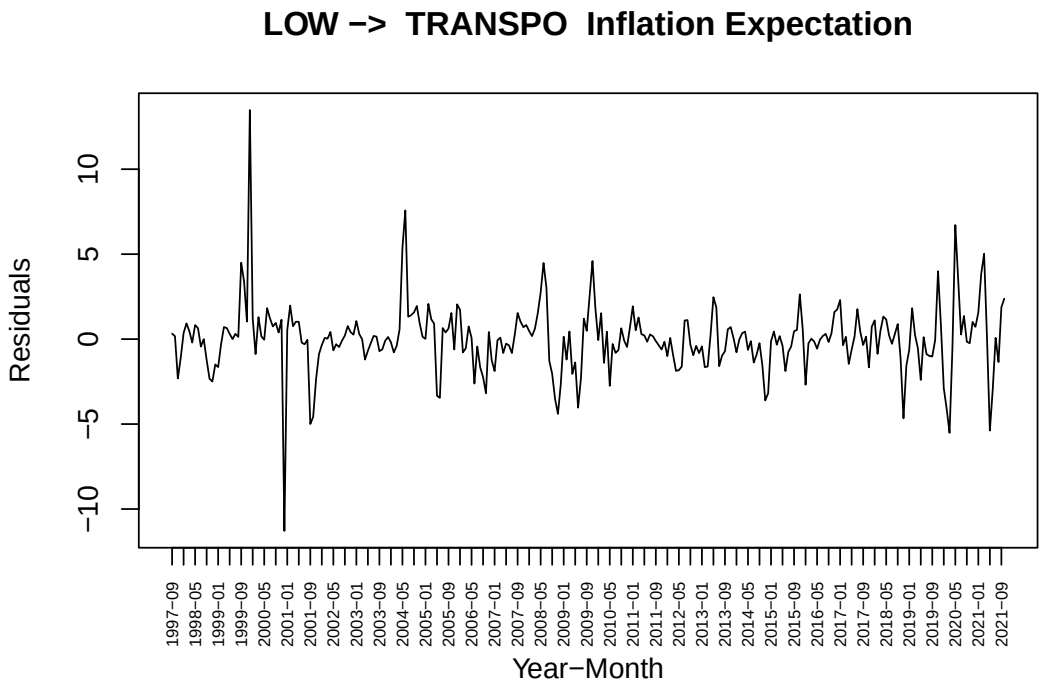


Appendix 21

FORECASTING TRANSPORT INFLATION EXPECTATION WITH LOW LENDING RATE

low -> TRANSPO Inflation Expectation

——— RESIDUALS TIME PLOT ———-



——— HETEROCEDASTICITY TEST ———-

studentized Breusch-Pagan test

data: lm(dataset[2:290, inf_exp] ~ dataset[2:290, “low”] + dataset[1:289, inf_exp]) BP = 6.818, df = 2, p-value = 0.03307

————— NORMALITY TEST ——————-

Jarque Bera Test

data: ar_residuals X-squared = 1411.1, df = 2, p-value < 2.2e-16

——— AUTOCORRELATION TEST ———-

Box-Ljung test

data: ar_residuals X-squared = 55.866, df = 10, p-value = 2.175e-08

——— FORECASTING SUMMARY ———-

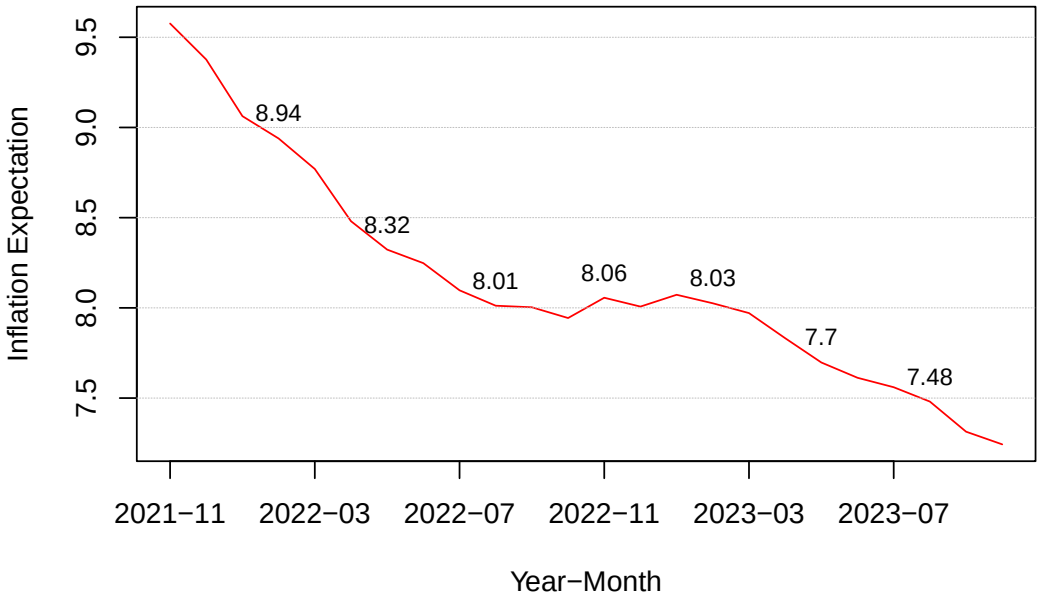
Call: arima(x = ts_inf_exp, order = c(1, 0, 0), xreg = ts_low)

Coefficients: ar1 intercept ts_low 0.9512 3.4975 0.3353 s.e. 0.0175 2.8912 0.2028

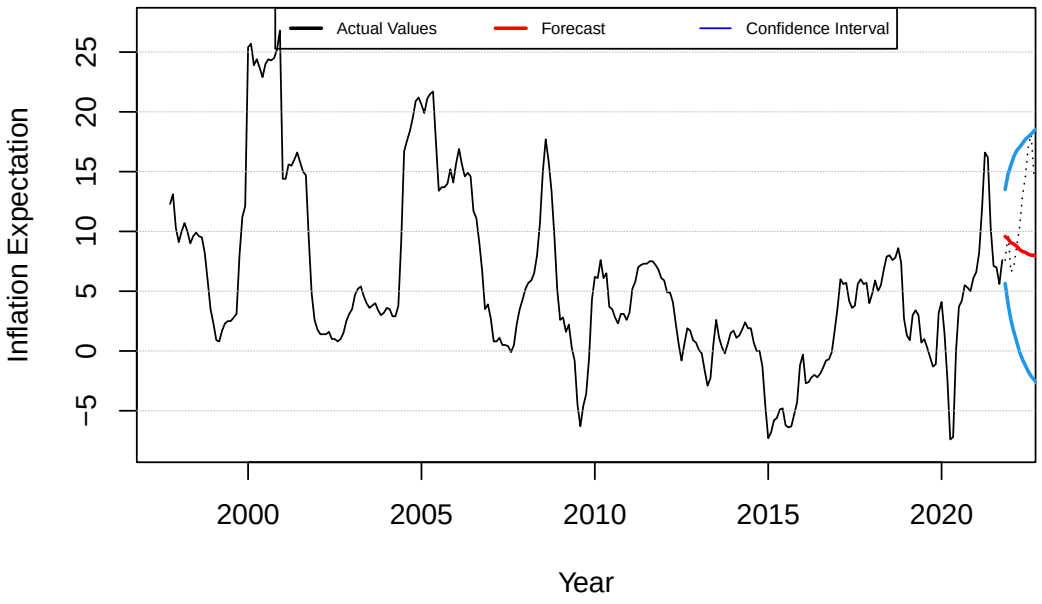
sigma^2 estimated as 4.022: log likelihood = -614.47, aic = 1236.94

Training set error measures: ME RMSE MAE MPE MAPE MASE ACF1 Training set -0.00546585 2.005461 1.253432 NaN Inf 1.002052 0.3877907

2−year Forecast for TRANSPO Inflation Expectation



Forecast for TRANSPO Inflation Expectation

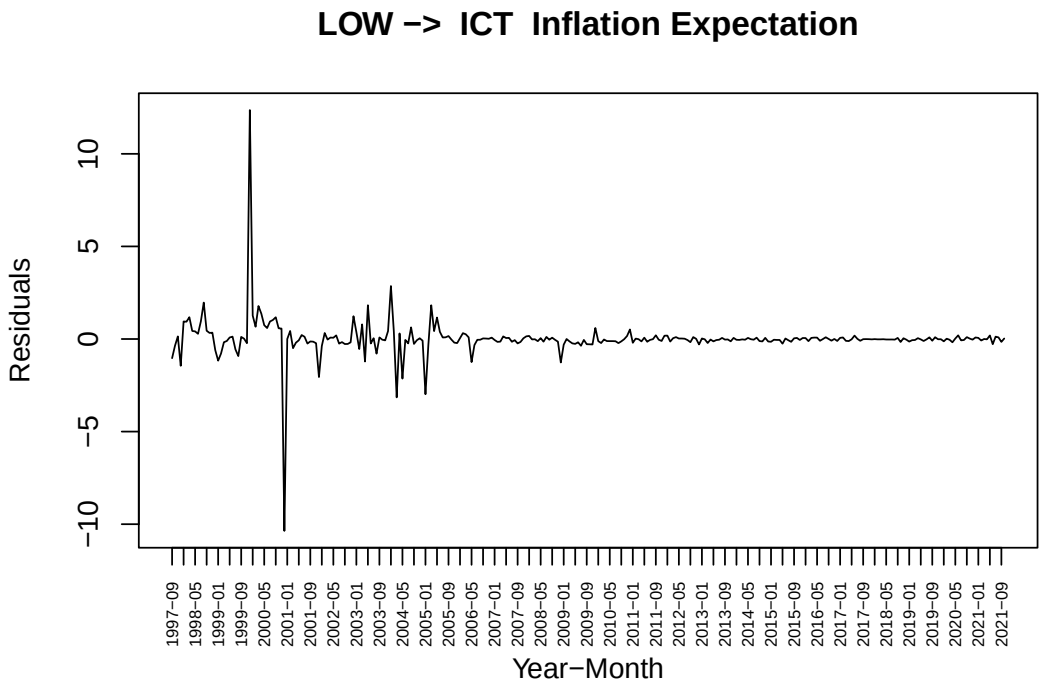


Appendix 22

FORECASTING INFORMATION AND COMMUNICATION INFLATION EXPECTATION WITH LOW LENDING RATE

low -> ICT Inflation Expectation

——— RESIDUALS TIME PLOT ———-



——— HETEROCEDASTICITY TEST ———-

studentized Breusch-Pagan test

data: lm(dataset[2:290, inf_exp] ~ dataset[2:290, “low”] + dataset[1:289, inf_exp]) BP = 9.4742, df = 2, p-value = 0.008764

————— NORMALITY TEST ——————-

Jarque Bera Test

data: ar_residuals X-squared = 82401, df = 2, p-value < 2.2e-16

——— AUTOCORRELATION TEST ———-

Box-Ljung test

data: ar_residuals X-squared = 3.5566, df = 10, p-value = 0.9651

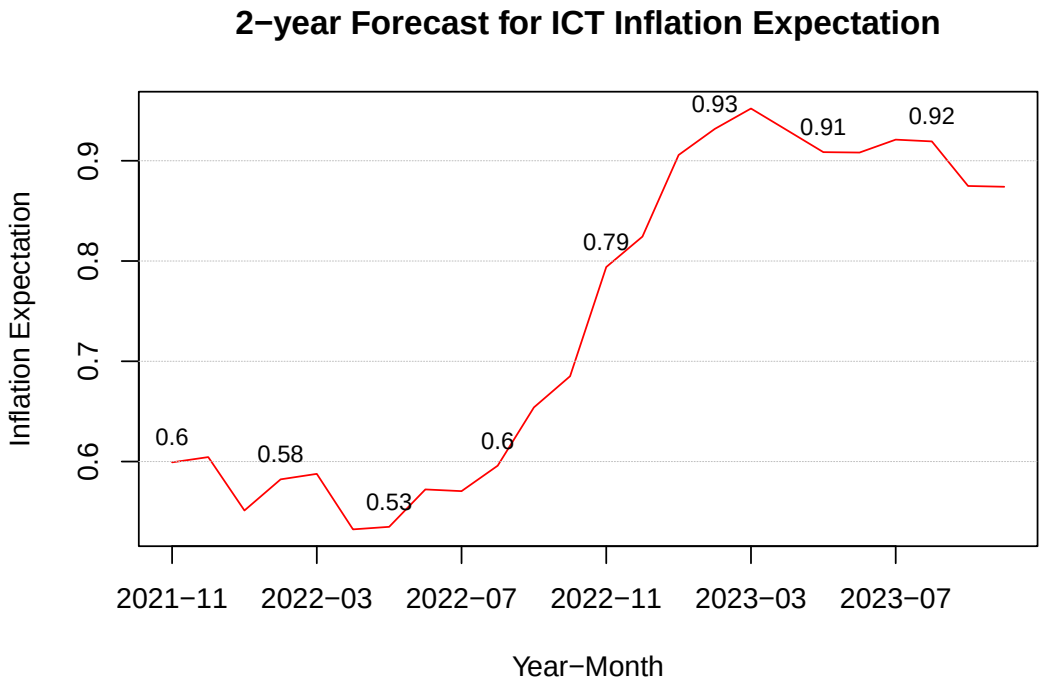
——— FORECASTING SUMMARY ———-

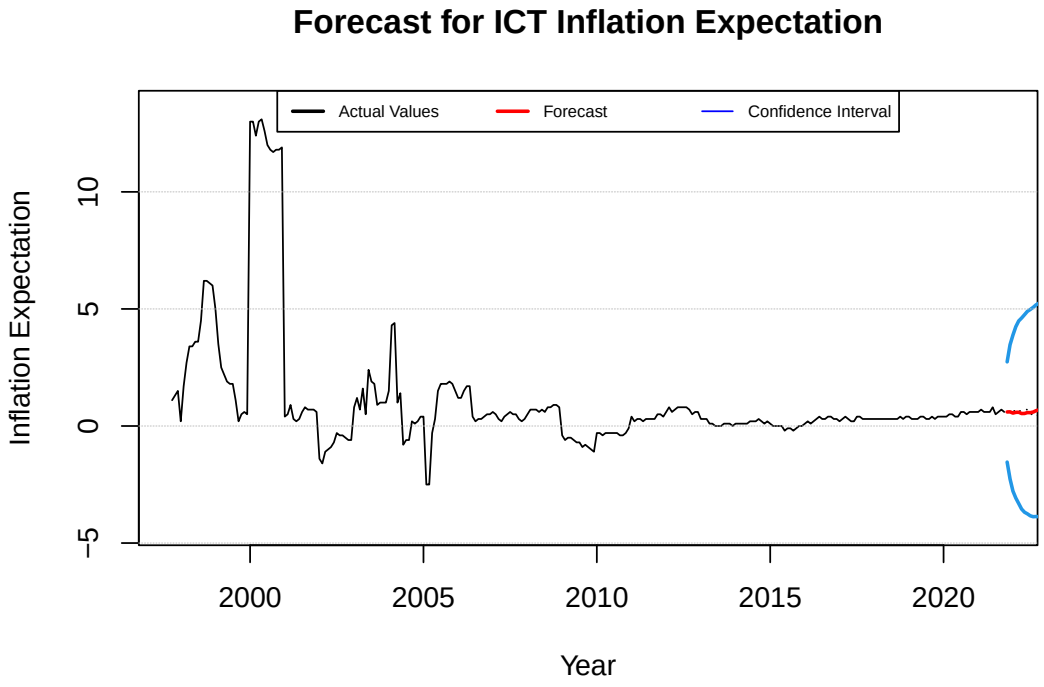
Call: arima(x = ts_inf_exp, order = c(1, 0, 0), xreg = ts_low)

Coefficients: ar1 intercept ts_low 0.8908 -0.2585 0.1572 s.e. 0.0264 0.9293 0.0886

sigma^2 estimated as 1.192: log likelihood = -437.77, aic = 883.55

Training set error measures: ME RMSE MAE MPE MAPE MASE ACF1 Training set 0.01114905 1.091888 0.3530996 NaN Inf 1.122616 0.06776385


2−year Forecast for ICT Inflation Expectation
Inflation Expectation
0.6
0.7
0.8
0.9
0.6
0.58
0.53
0.6
0.79
0.93
0.91
0.92
2021−11
2022−03
2022−07
2022−11
2023−03
2023−07
Year−Month

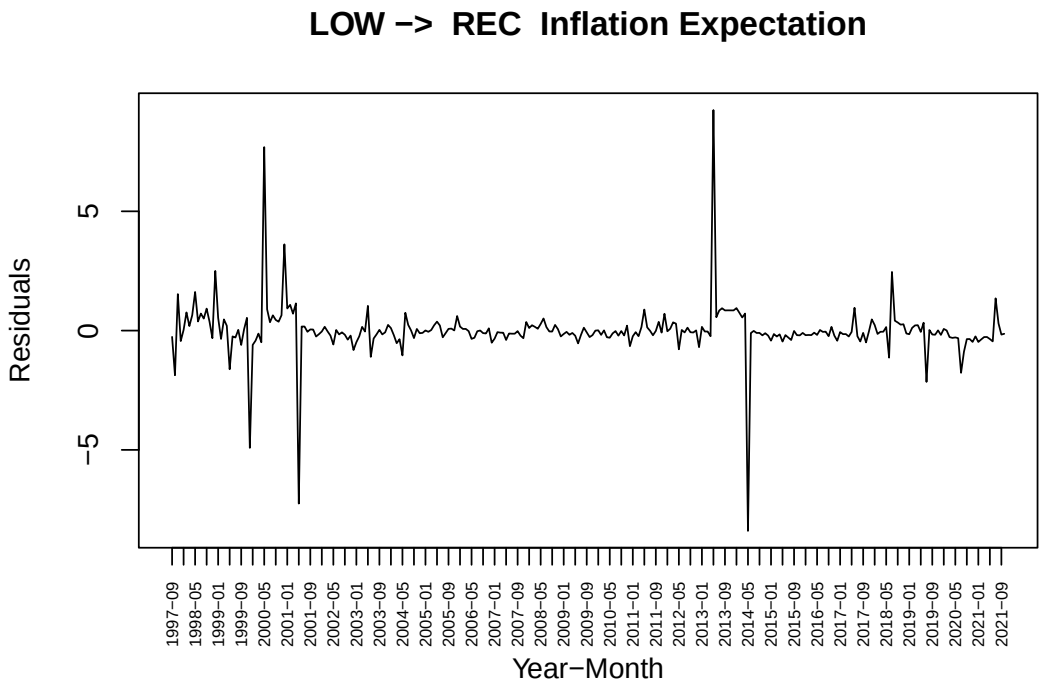

Forecast for ICT Inflation Expectation
Actual Values
Forecast
Confidence Interval
Inflation Expectation
−5
0
5
10
2000
2005
2010
2015
2020
Year

Appendix 23

FORECASTING RECREATION, SPORT AND CULTURE INFLATION EXPECTATION WITH LOW LENDING RATE

low -> REC Inflation Expectation

——— RESIDUALS TIME PLOT ———-



——— HETEROCEDASTICITY TEST ———-

studentized Breusch-Pagan test

data: lm(dataset[2:290, inf_exp] ~ dataset[2:290, “low”] + dataset[1:289, inf_exp]) BP = 5.7791, df = 2, p-value = 0.0556

————— NORMALITY TEST —————-

Jarque Bera Test

data: ar_residuals X-squared = 16133, df = 2, p-value < 2.2e-16

——— AUTOCORRELATION TEST ———-

Box-Ljung test

data: ar_residuals X-squared = 15.312, df = 10, p-value = 0.1211

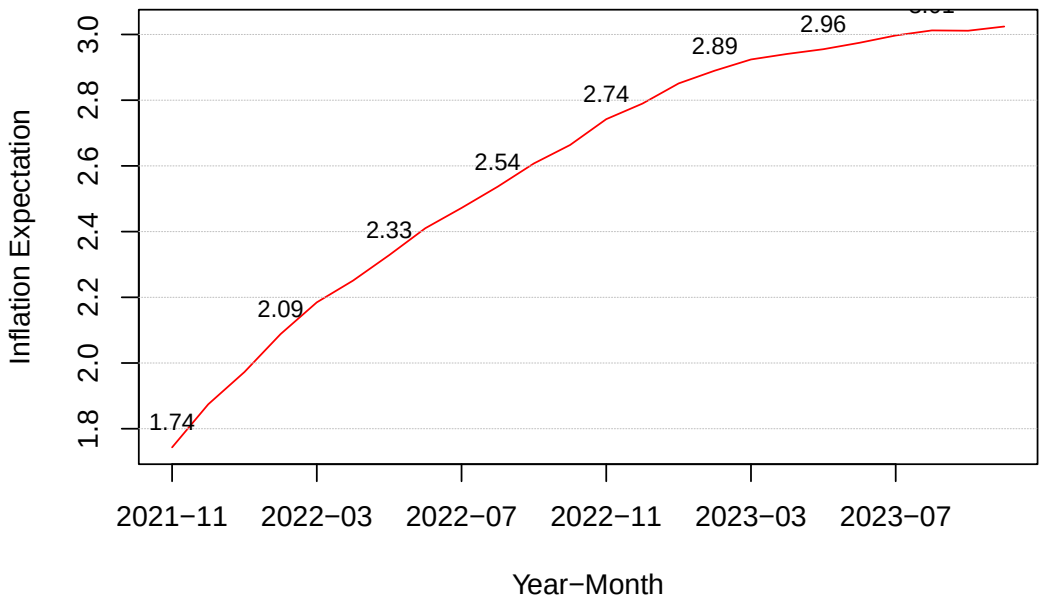
——— FORECASTING SUMMARY ———-

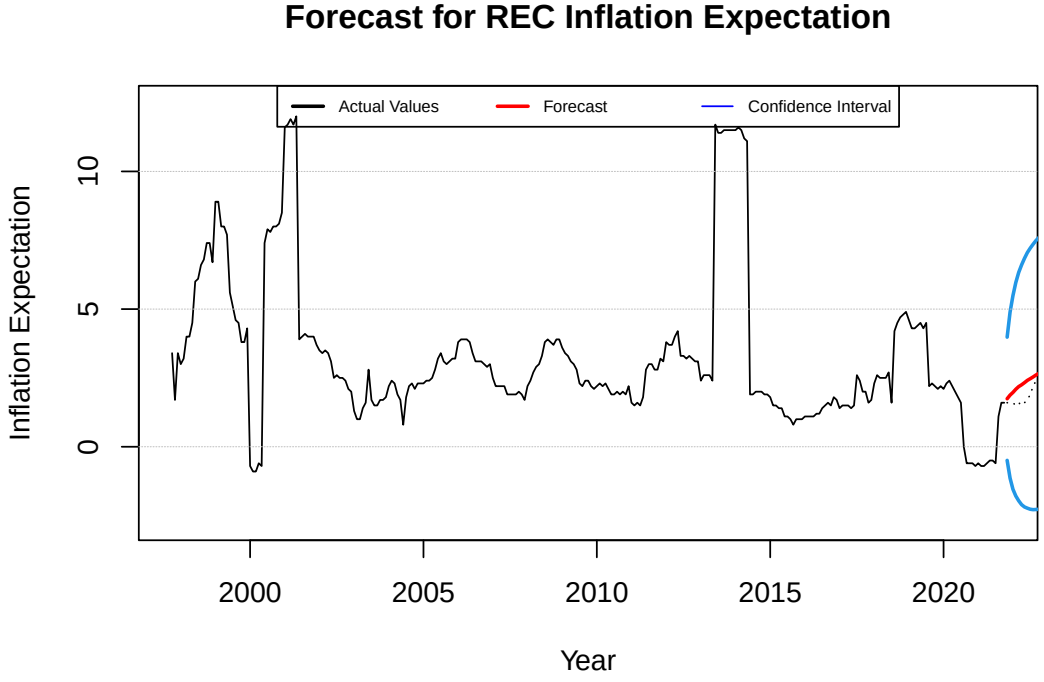
Call: arima(x = ts_inf_exp, order = c(1, 0, 0), xreg = ts_low)

Coefficients: ar1 intercept ts_low 0.9007 2.7512 0.0543 s.e. 0.0257 1.0457 0.0983

sigma^2 estimated as 1.303: log likelihood = -450.67, aic = 909.33

Training set error measures: ME RMSE MAE MPE MAPE MASE ACF1 Training set 0.002937037 1.141341 0.4650348 -Inf Inf 1.183055 0.03311313


2−year Forecast for REC Inflation Expectation
Inflation Expectation
1.8
2.0
2.2
2.4
2.6
2.8
3.0
1.74
2.09
2.33
2.54
2.74
2.89
2.96
2021−11
2022−03
2022−07
2022−11
2023−03
2023−07
Year−Month

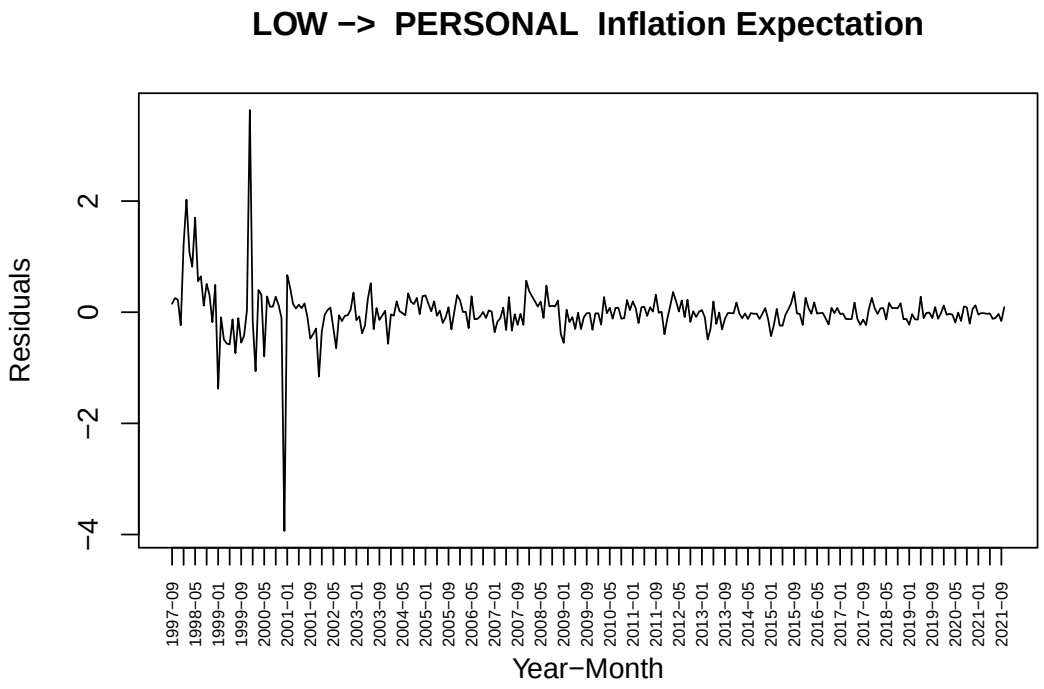

Forecast for REC Inflation Expectation
Actual Values
Forecast
Confidence Interval
Inflation Expectation
0
5
10
2000
2005
2010
2015
2020
Year

Appendix 24

FORECASTING PERSONAL CARE, AND MISCELLANEOUS GOODS AND SERVICES INFLATION EXPECTATION WITH LOW LENDING RATE

low -> PERSONAL Inflation Expectation

——— RESIDUALS TIME PLOT ———-



——— HETEROCEDASTICITY TEST ———-

studentized Breusch-Pagan test

data: lm(dataset[2:290, inf_exp] ~ dataset[2:290, “low”] + dataset[1:289, inf_exp]) BP = 18.376, df = 2, p-value = 0.0001022

————— NORMALITY TEST ——————-

Jarque Bera Test

data: ar_residuals X-squared = 16307, df = 2, p-value < 2.2e-16

——— AUTOCORRELATION TEST ———-

Box-Ljung test

data: ar_residuals X-squared = 20.858, df = 10, p-value = 0.0221

——— FORECASTING SUMMARY ———-

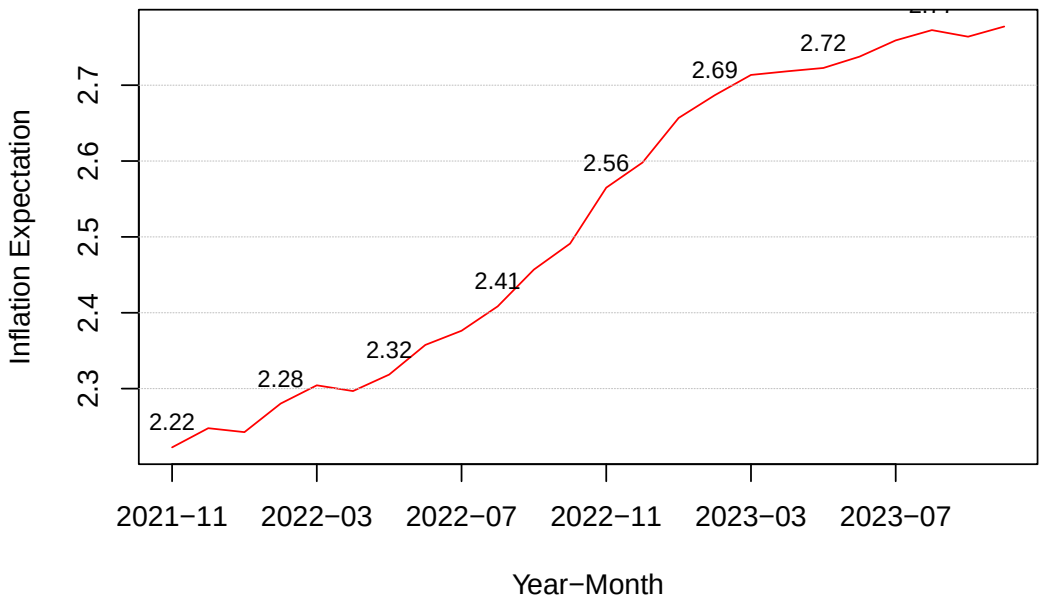
Call: arima(x = ts_inf_exp, order = c(1, 0, 0), xreg = ts_low)

Coefficients: ar1 intercept ts_low 0.9753 2.7448 0.0806 s.e. 0.0120 1.0410 0.0484

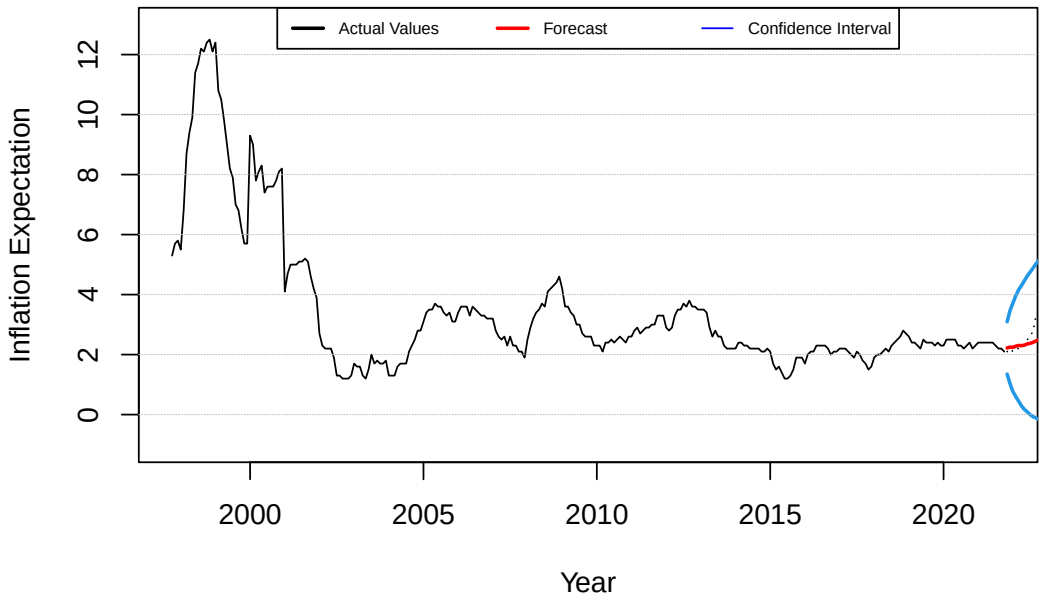
sigma^2 estimated as 0.1984: log likelihood = -178.48, aic = 364.95

Training set error measures: ME RMSE MAE MPE MAPE MASE Training set -0.004199785 0.4454313 0.2213967 -1.356592 6.640492 1.030332 ACF1 Training set 0.143063

2−year Forecast for PERSONAL Inflation Expectation



Forecast for PERSONAL Inflation Expectation

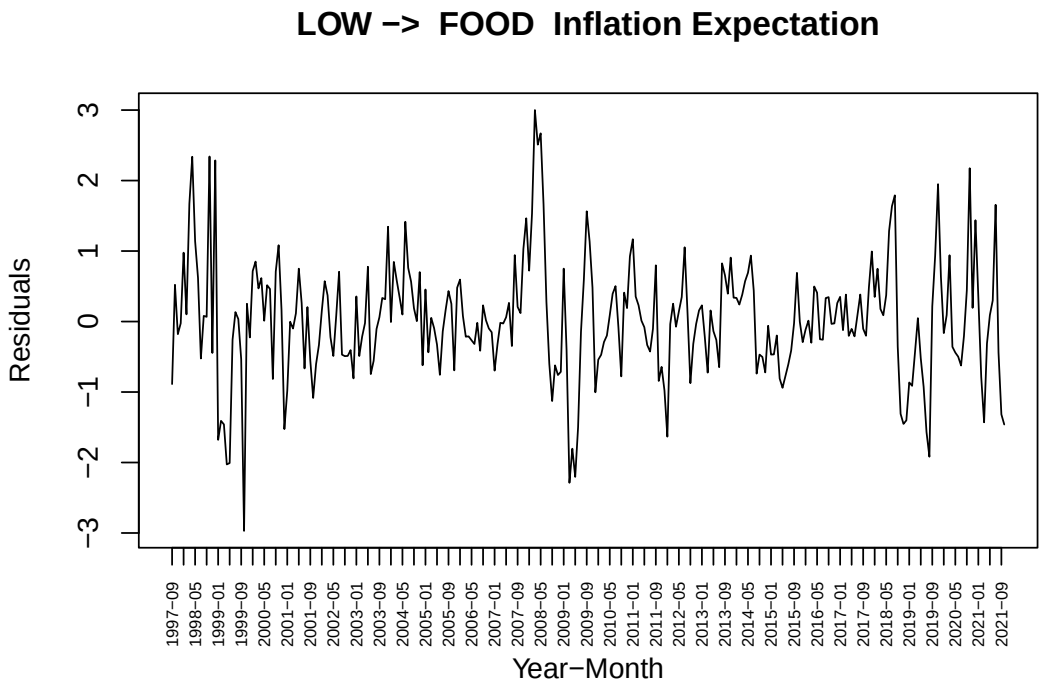


Appendix 25

FORECASTING FOOD AND NON-ALCOHOLIC BEVERAGES INFLATION EXPECTATION WITH LOW LENDING RATE

low -> FOOD Inflation Expectation

——— RESIDUALS TIME PLOT ———-



——— HETEROCEDASTICITY TEST ———-

studentized Breusch-Pagan test

data: lm(dataset[2:290, inf_exp] ~ dataset[2:290, “low”] + dataset[1:289, inf_exp]) BP = 26.959, df = 2, p-value = 1.399e-06

————— NORMALITY TEST ——————-

Jarque Bera Test

data: ar_residuals X-squared = 31.166, df = 2, p-value = 1.707e-07

——— AUTOCORRELATION TEST ———-

Box-Ljung test

data: ar_residuals X-squared = 113.83, df = 10, p-value < 2.2e-16

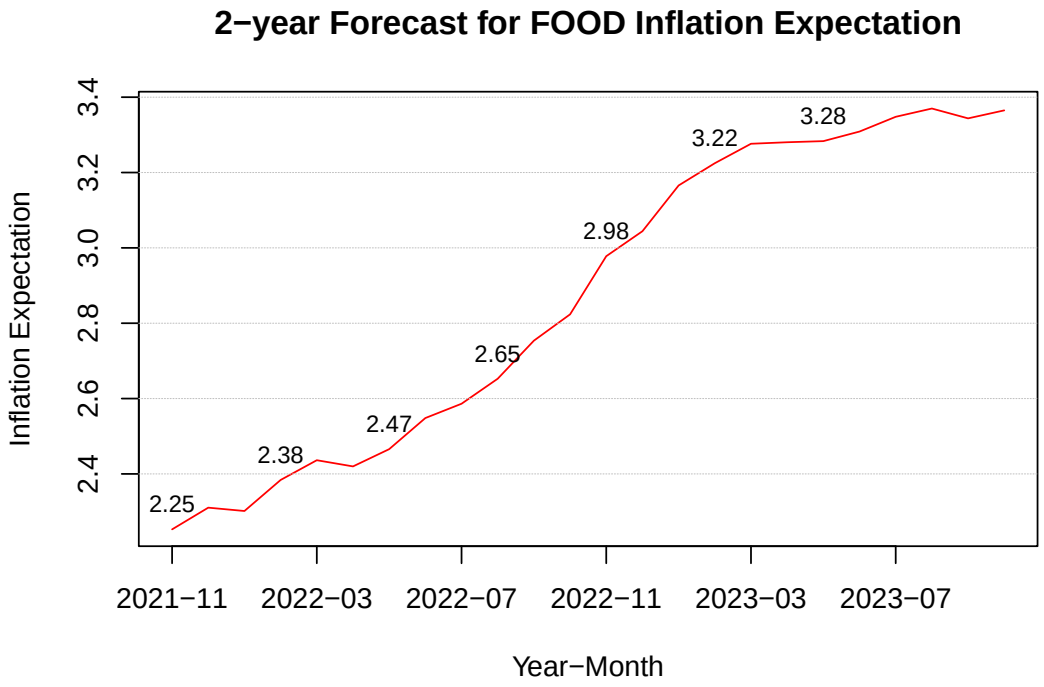
——— FORECASTING SUMMARY ———-

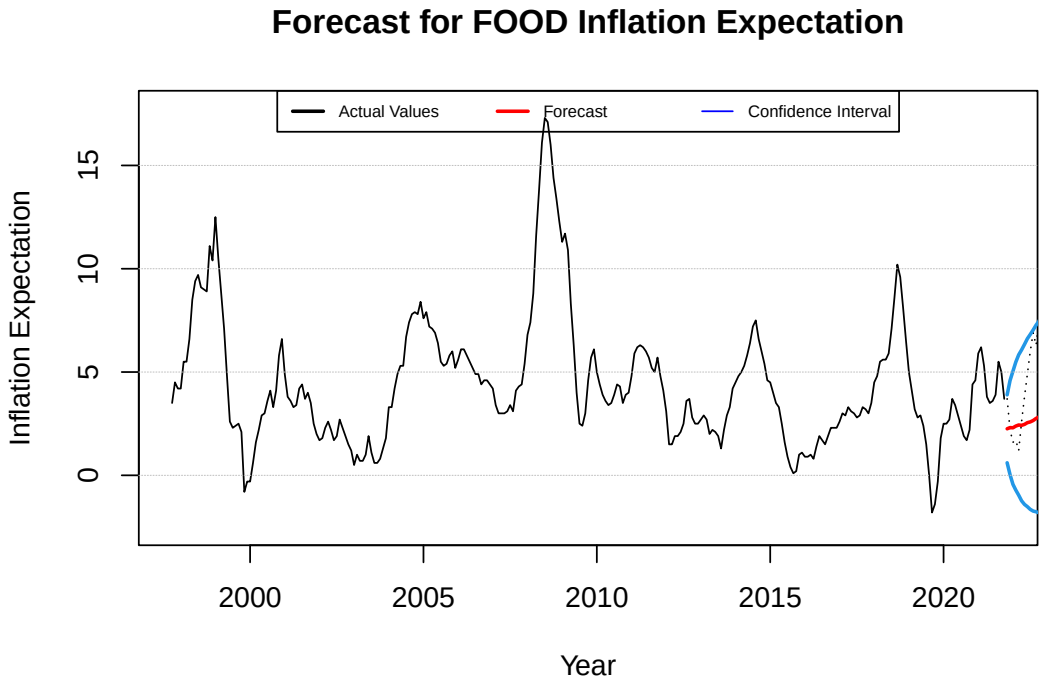
Call: arima(x = ts_inf_exp, order = c(1, 0, 0), xreg = ts_low)

Coefficients: ar1 intercept ts_low 0.9598 2.6461 0.1735 s.e. 0.0158 1.3789 0.0855

sigma^2 estimated as 0.7039: log likelihood = -361.85, aic = 731.7

Training set error measures: ME RMSE MAE MPE MAPE MASE ACF1 Training set 0.01801099 0.8389881 0.6110462 -Inf Inf 0.9708211 0.5077272


2−year Forecast for FOOD Inflation Expectation
Inflation Expectation
2.4
2.6
2.8
3.0
3.2
3.4
2.25
2.38
2.47
2.65
2.98
3.22
3.28
2021−11
2022−03
2022−07
2022−11
2023−03
2023−07
Year−Month

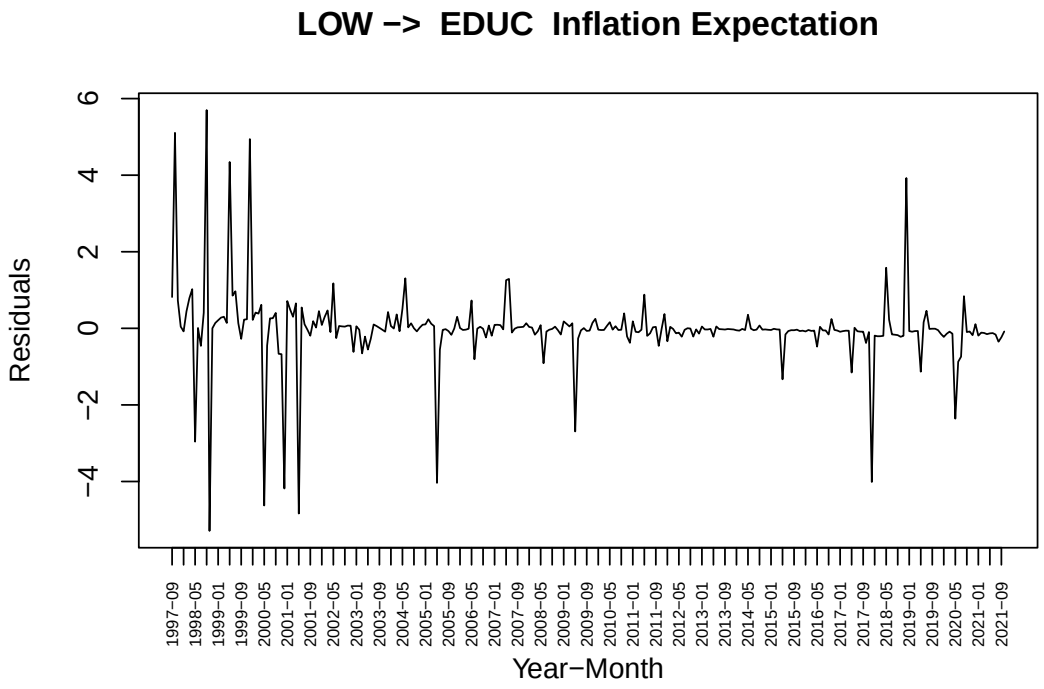

Forecast for FOOD Inflation Expectation
Actual Values
Forecast
Confidence Interval
Inflation Expectation
0
5
10
15
2000
2005
2010
2015
2020
Year

Appendix 26

FORECASTING EDUCATION SERVICES INFLATION EXPECTATION WITH LOW LENDING RATE

low -> EDUC Inflation Expectation

——— RESIDUALS TIME PLOT ———-



——— HETEROCEDASTICITY TEST ———-

studentized Breusch-Pagan test

data: lm(dataset[2:290, inf_exp] ~ dataset[2:290, “low”] + dataset[1:289, inf_exp]) BP = 28.516, df = 2, p-value = 6.425e-07

————— NORMALITY TEST ——————-

Jarque Bera Test

data: ar_residuals X-squared = 3122.7, df = 2, p-value < 2.2e-16

——— AUTOCORRELATION TEST ———-

Box-Ljung test

data: ar_residuals X-squared = 5.4851, df = 10, p-value = 0.8565

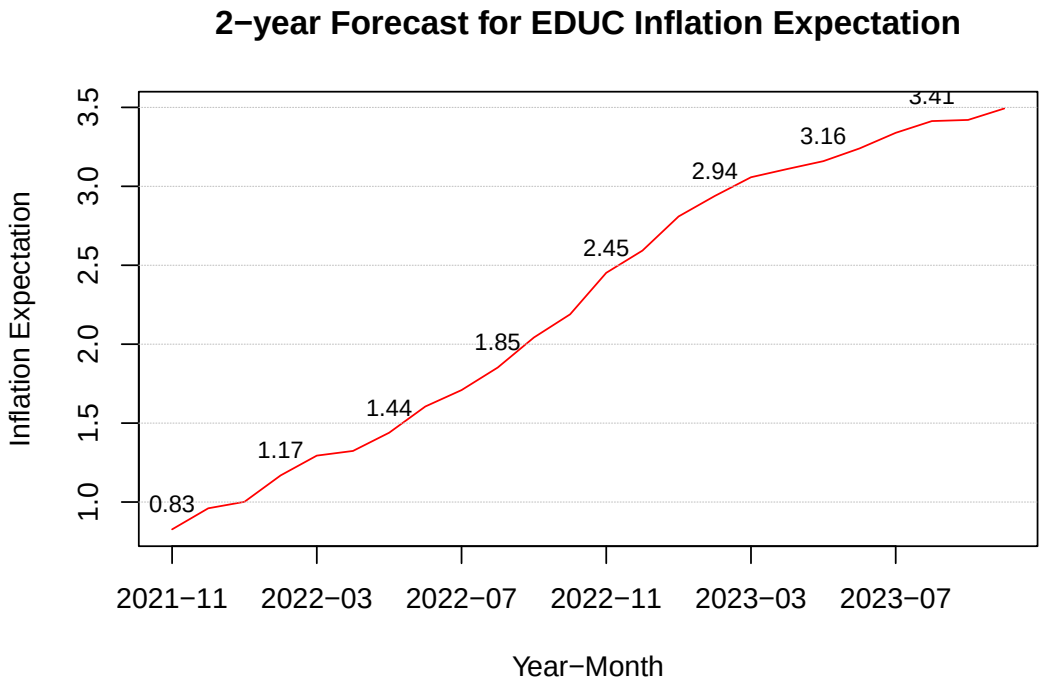
——— FORECASTING SUMMARY ———-

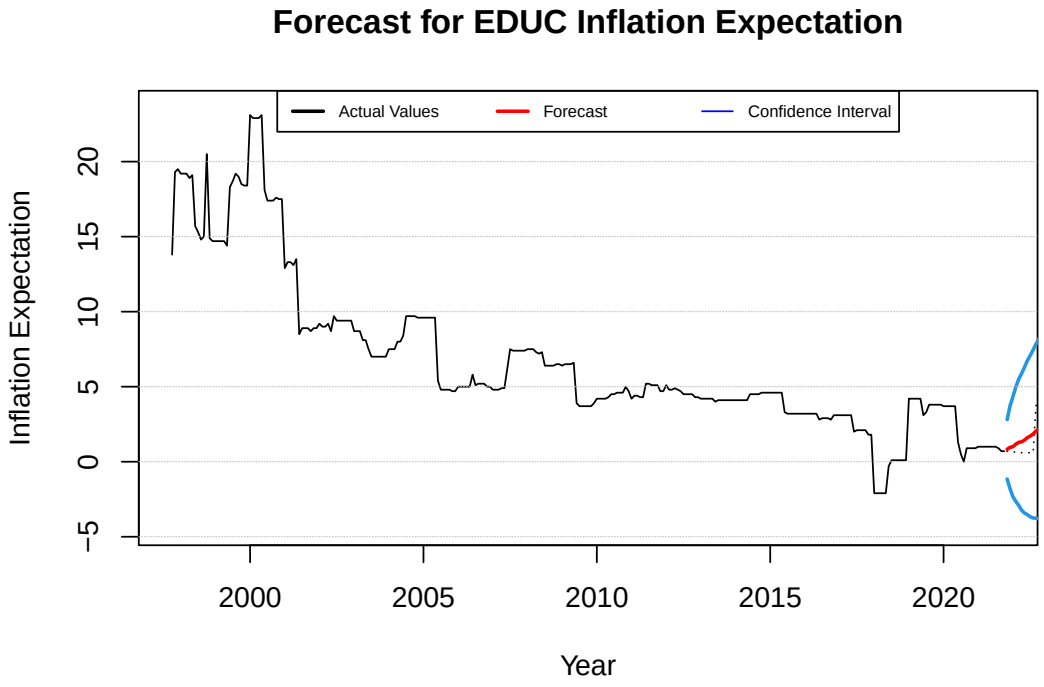
Call: arima(x = ts_inf_exp, order = c(1, 0, 0), xreg = ts_low)

Coefficients: ar1 intercept ts_low 0.9746 4.5851 0.2405 s.e. 0.0132 2.3129 0.1129

sigma^2 estimated as 1.019: log likelihood = -415.68, aic = 839.36

Training set error measures: ME RMSE MAE MPE MAPE MASE ACF1 Training set -0.02202487 1.009324 0.4045172 -Inf Inf 1.167887 -0.04248089


2−year Forecast for EDUC Inflation Expectation
Inflation Expectation
1.0
1.5
2.0
2.5
3.0
3.5
0.83
1.17
1.44
1.85
2.45
2.94
3.16
3.41
2021−11
2022−03
2022−07
2022−11
2023−03
2023−07
Year−Month


Forecast for EDUC Inflation Expectation
Actual Values
Forecast
Confidence Interval
Inflation Expectation
−5
0
5
10
15
20
2000
2005
2010
2015
2020
Year