How cv.ts works

# Initial parameters

> set\_current\_directory()

[1] "E:/R/r\_forecasting/statistics.com - onlineclass/assignments/assignment2"

--Australian Wine data

assignment2\_q3\_karao.R

# load excel data

workbook <- loadWorkbook("AustralianWines.xls")

xdata <- readWorksheet(workbook, sheet = "Sheet1", region = "A1:G181",header = TRUE)

xdata2 <- as.ts(xdata)

xdata2[is.na(xdata2)] <- 0

xdata2 <- as.data.frame(xdata2)

xdata <- cbind(Month = xdata$Month, xdata2[,-1])

data\_1 <- ts(xdata$Fortified, start=c(1980,01), frequency=12)

data\_2 <- ts(xdata$Red., start=c(1980,01), frequency=12)

data\_3 <- ts(xdata$Rose., start=c(1980,01), frequency=12)

data\_4 <- ts(xdata$sparkling., start=c(1980,01), frequency=12)

data\_5 <- ts(xdata$Sweet.white, start=c(1980,01), frequency=12)

data\_6 <- ts(xdata$Dry.white, start=c(1980,01), frequency=12)

tsControl <- tseriesControl(stepSize=1, maxHorizon=12, minObs=12, fixedWindow=TRUE)

ctrl <- tseriesControl(stepSize=1, maxHorizon=12, minObs=12, fixedWindow=TRUE)

models <- list()

models$arima = cv.ts(

x, auto.arimaForecast, tsControl=ctrl,

ic='aicc', stepwise=FALSE)

# The data

--Training

> x

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

1980 2585 3368 3210 3111 3756 4216 5225 4426 3932 3816 3661 3795

1981 2285 2934 2985 3646 4198 4935 5618 5454 3624 2898 3802 3629

1982 2369 2511 3079 3728 4151 4326 5054 5138 3310 3508 3790 3446

1983 2127 2523 3017 3265 3822 4027 4420 5255 4009 3074 3465 3718

1984 1954 2604 3626 2836 4042 3584 4225 4523 2892 2876 3420 3159

1985 2101 2181 2724 2954 4092 3470 3990 4239 2855 2897 3433 3307

1986 1914 2214 2320 2714 3633 3295 4377 4442 2774 2840 2828 3758

1987 1610 1968 2248 3262 3164 2972 4041 3402 2898 2555 3056 3717

1988 1755 2193 2198 2777 3076 3389 4231 3118 2524 2280 2862 3502

1989 1558 1940 2226 2676 3145 3224 4117 3446 2482 2349 2986 3163

1990 1651 1725 2622 2316 2976 3263 3951 2917 2380 2458 2883 2579

1991 1330 1686 2457 2514 2834 2757 3425 3006 2369 2017 2507 3168

1992 1545 1643 2112 2415 2862 2822 3260 2606 2264 2250 2545 2856

1993 1208 1412 1964 2018 2329 2660 2923 2626 2132 1772 2526 2755

>

>

> class(x)

[1] "ts"

> length(x)

[1] 168

>

>

-- Validation

> test\_x

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

1994 1154 1568 1965 2659 2354 2592 2714 2294 2416 2016 2799 2467

# The output

* The package produces 3 matrix objects tied to the model list
  + models$arima$actuals – the actual values of each case
  + models$arima$forecasts – the forecast for each case
  + models$arima$results – the result for the 12 and the average of ALL

# Define additional parameters

* Using tsp function
* Get the date 1980-10-31

> st <- tsp(x)[1]+(minObs-2)/freq

> st

[1] 1980.833

> tsp(x)[1]+(minObs-2)/freq

[1] 1980.833

> tsp(x)[1]

[1] 1980

> (minObs-2)

[1] 10

> tsp(x)[1]+(minObs-2)/freq

[1] 1980.833

> as.Date(as.POSIXct(date\_decimal(st)))

[1] "1980-10-31"

> x

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

1980 2585 3368 3210 3111 3756 4216 5225 4426 3932 3816 3661 3795

1981 2285 2934 2985 3646 4198 4935 5618 5454 3624 2898 3802 3629

1982 2369 2511 3079 3728 4151 4326 5054 5138 3310 3508 3790 3446

1983 2127 2523 3017 3265 3822 4027 4420 5255 4009 3074 3465 3718

1984 1954 2604 3626 2836 4042 3584 4225 4523 2892 2876 3420 3159

1985 2101 2181 2724 2954 4092 3470 3990 4239 2855 2897 3433 3307

1986 1914 2214 2320 2714 3633 3295 4377 4442 2774 2840 2828 3758

1987 1610 1968 2248 3262 3164 2972 4041 3402 2898 2555 3056 3717

1988 1755 2193 2198 2777 3076 3389 4231 3118 2524 2280 2862 3502

1989 1558 1940 2226 2676 3145 3224 4117 3446 2482 2349 2986 3163

1990 1651 1725 2622 2316 2976 3263 3951 2917 2380 2458 2883 2579

1991 1330 1686 2457 2514 2834 2757 3425 3006 2369 2017 2507 3168

1992 1545 1643 2112 2415 2862 2822 3260 2606 2264 2250 2545 2856

1993 1208 1412 1964 2018 2329 2660 2923 2626 2132 1772 2526

# Create a matrix of actual values

actuals <- outer(seq\_along(x), seq\_len(maxHorizon), FUN="+")

actuals <- apply(actuals,2,function(a) x[a])

actuals

actuals <- formatActuals(x,maxHorizon)

actuals <- actuals[minObs:(length(x)-1),,drop=FALSE]

> formatActuals(x,maxHorizon)

[,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10] [,11] [,12]

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[6,] 5225 4426 3932 3816 3661 3795 2285 2934 2985 3646 4198 4935

[7,] 4426 3932 3816 3661 3795 2285 2934 2985 3646 4198 4935 5618

[8,] 3932 3816 3661 3795 2285 2934 2985 3646 4198 4935 5618 5454

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[139,] 3006 2369 2017 2507 3168 1545 1643 2112 2415 2862 2822 3260

[140,] 2369 2017 2507 3168 1545 1643 2112 2415 2862 2822 3260 2606

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[142,] 2507 3168 1545 1643 2112 2415 2862 2822 3260 2606 2264 2250

[143,] 3168 1545 1643 2112 2415 2862 2822 3260 2606 2264 2250 2545

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[147,] 2415 2862 2822 3260 2606 2264 2250 2545 2856 1208 1412 1964

[148,] 2862 2822 3260 2606 2264 2250 2545 2856 1208 1412 1964 2018

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[167,] 2755 NA NA NA NA NA NA NA NA NA NA NA

[168,] NA NA NA NA NA NA NA NA NA NA NA NA

> actuals[minObs:(length(x)-1),,drop=FALSE]

[,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10] [,11] [,12]

[1,] 2285 2934 2985 3646 4198 4935 5618 5454 3624 2898 3802 3629

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[50,] 2181 2724 2954 4092 3470 3990 4239 2855 2897 3433 3307 1914

[51,] 2724 2954 4092 3470 3990 4239 2855 2897 3433 3307 1914 2214

[52,] 2954 4092 3470 3990 4239 2855 2897 3433 3307 1914 2214 2320

[53,] 4092 3470 3990 4239 2855 2897 3433 3307 1914 2214 2320 2714

[54,] 3470 3990 4239 2855 2897 3433 3307 1914 2214 2320 2714 3633

[55,] 3990 4239 2855 2897 3433 3307 1914 2214 2320 2714 3633 3295

[56,] 4239 2855 2897 3433 3307 1914 2214 2320 2714 3633 3295 4377

[57,] 2855 2897 3433 3307 1914 2214 2320 2714 3633 3295 4377 4442

[58,] 2897 3433 3307 1914 2214 2320 2714 3633 3295 4377 4442 2774

[59,] 3433 3307 1914 2214 2320 2714 3633 3295 4377 4442 2774 2840

[60,] 3307 1914 2214 2320 2714 3633 3295 4377 4442 2774 2840 2828

[61,] 1914 2214 2320 2714 3633 3295 4377 4442 2774 2840 2828 3758

[62,] 2214 2320 2714 3633 3295 4377 4442 2774 2840 2828 3758 1610

[63,] 2320 2714 3633 3295 4377 4442 2774 2840 2828 3758 1610 1968

[64,] 2714 3633 3295 4377 4442 2774 2840 2828 3758 1610 1968 2248

[65,] 3633 3295 4377 4442 2774 2840 2828 3758 1610 1968 2248 3262

[66,] 3295 4377 4442 2774 2840 2828 3758 1610 1968 2248 3262 3164

[67,] 4377 4442 2774 2840 2828 3758 1610 1968 2248 3262 3164 2972

[68,] 4442 2774 2840 2828 3758 1610 1968 2248 3262 3164 2972 4041

[69,] 2774 2840 2828 3758 1610 1968 2248 3262 3164 2972 4041 3402

[70,] 2840 2828 3758 1610 1968 2248 3262 3164 2972 4041 3402 2898

[71,] 2828 3758 1610 1968 2248 3262 3164 2972 4041 3402 2898 2555

[72,] 3758 1610 1968 2248 3262 3164 2972 4041 3402 2898 2555 3056

[73,] 1610 1968 2248 3262 3164 2972 4041 3402 2898 2555 3056 3717

[74,] 1968 2248 3262 3164 2972 4041 3402 2898 2555 3056 3717 1755

[75,] 2248 3262 3164 2972 4041 3402 2898 2555 3056 3717 1755 2193

[76,] 3262 3164 2972 4041 3402 2898 2555 3056 3717 1755 2193 2198

[77,] 3164 2972 4041 3402 2898 2555 3056 3717 1755 2193 2198 2777

[78,] 2972 4041 3402 2898 2555 3056 3717 1755 2193 2198 2777 3076

[79,] 4041 3402 2898 2555 3056 3717 1755 2193 2198 2777 3076 3389

[80,] 3402 2898 2555 3056 3717 1755 2193 2198 2777 3076 3389 4231

[81,] 2898 2555 3056 3717 1755 2193 2198 2777 3076 3389 4231 3118

[82,] 2555 3056 3717 1755 2193 2198 2777 3076 3389 4231 3118 2524

[83,] 3056 3717 1755 2193 2198 2777 3076 3389 4231 3118 2524 2280

[84,] 3717 1755 2193 2198 2777 3076 3389 4231 3118 2524 2280 2862

[85,] 1755 2193 2198 2777 3076 3389 4231 3118 2524 2280 2862 3502

[86,] 2193 2198 2777 3076 3389 4231 3118 2524 2280 2862 3502 1558

[87,] 2198 2777 3076 3389 4231 3118 2524 2280 2862 3502 1558 1940

[88,] 2777 3076 3389 4231 3118 2524 2280 2862 3502 1558 1940 2226

[89,] 3076 3389 4231 3118 2524 2280 2862 3502 1558 1940 2226 2676

[90,] 3389 4231 3118 2524 2280 2862 3502 1558 1940 2226 2676 3145

[91,] 4231 3118 2524 2280 2862 3502 1558 1940 2226 2676 3145 3224

[92,] 3118 2524 2280 2862 3502 1558 1940 2226 2676 3145 3224 4117

[93,] 2524 2280 2862 3502 1558 1940 2226 2676 3145 3224 4117 3446

[94,] 2280 2862 3502 1558 1940 2226 2676 3145 3224 4117 3446 2482

[95,] 2862 3502 1558 1940 2226 2676 3145 3224 4117 3446 2482 2349

[96,] 3502 1558 1940 2226 2676 3145 3224 4117 3446 2482 2349 2986

[97,] 1558 1940 2226 2676 3145 3224 4117 3446 2482 2349 2986 3163

[98,] 1940 2226 2676 3145 3224 4117 3446 2482 2349 2986 3163 1651

[99,] 2226 2676 3145 3224 4117 3446 2482 2349 2986 3163 1651 1725

[100,] 2676 3145 3224 4117 3446 2482 2349 2986 3163 1651 1725 2622

[101,] 3145 3224 4117 3446 2482 2349 2986 3163 1651 1725 2622 2316

[102,] 3224 4117 3446 2482 2349 2986 3163 1651 1725 2622 2316 2976

[103,] 4117 3446 2482 2349 2986 3163 1651 1725 2622 2316 2976 3263

[104,] 3446 2482 2349 2986 3163 1651 1725 2622 2316 2976 3263 3951

[105,] 2482 2349 2986 3163 1651 1725 2622 2316 2976 3263 3951 2917

[106,] 2349 2986 3163 1651 1725 2622 2316 2976 3263 3951 2917 2380

[107,] 2986 3163 1651 1725 2622 2316 2976 3263 3951 2917 2380 2458

[108,] 3163 1651 1725 2622 2316 2976 3263 3951 2917 2380 2458 2883

[109,] 1651 1725 2622 2316 2976 3263 3951 2917 2380 2458 2883 2579

[110,] 1725 2622 2316 2976 3263 3951 2917 2380 2458 2883 2579 1330

[111,] 2622 2316 2976 3263 3951 2917 2380 2458 2883 2579 1330 1686

[112,] 2316 2976 3263 3951 2917 2380 2458 2883 2579 1330 1686 2457

[113,] 2976 3263 3951 2917 2380 2458 2883 2579 1330 1686 2457 2514

[114,] 3263 3951 2917 2380 2458 2883 2579 1330 1686 2457 2514 2834

[115,] 3951 2917 2380 2458 2883 2579 1330 1686 2457 2514 2834 2757

[116,] 2917 2380 2458 2883 2579 1330 1686 2457 2514 2834 2757 3425

[117,] 2380 2458 2883 2579 1330 1686 2457 2514 2834 2757 3425 3006

[118,] 2458 2883 2579 1330 1686 2457 2514 2834 2757 3425 3006 2369

[119,] 2883 2579 1330 1686 2457 2514 2834 2757 3425 3006 2369 2017

[120,] 2579 1330 1686 2457 2514 2834 2757 3425 3006 2369 2017 2507

[121,] 1330 1686 2457 2514 2834 2757 3425 3006 2369 2017 2507 3168

[122,] 1686 2457 2514 2834 2757 3425 3006 2369 2017 2507 3168 1545

[123,] 2457 2514 2834 2757 3425 3006 2369 2017 2507 3168 1545 1643

[124,] 2514 2834 2757 3425 3006 2369 2017 2507 3168 1545 1643 2112

[125,] 2834 2757 3425 3006 2369 2017 2507 3168 1545 1643 2112 2415

[126,] 2757 3425 3006 2369 2017 2507 3168 1545 1643 2112 2415 2862

[127,] 3425 3006 2369 2017 2507 3168 1545 1643 2112 2415 2862 2822

[128,] 3006 2369 2017 2507 3168 1545 1643 2112 2415 2862 2822 3260

[129,] 2369 2017 2507 3168 1545 1643 2112 2415 2862 2822 3260 2606

[130,] 2017 2507 3168 1545 1643 2112 2415 2862 2822 3260 2606 2264

[131,] 2507 3168 1545 1643 2112 2415 2862 2822 3260 2606 2264 2250

[132,] 3168 1545 1643 2112 2415 2862 2822 3260 2606 2264 2250 2545

[133,] 1545 1643 2112 2415 2862 2822 3260 2606 2264 2250 2545 2856

[134,] 1643 2112 2415 2862 2822 3260 2606 2264 2250 2545 2856 1208

[135,] 2112 2415 2862 2822 3260 2606 2264 2250 2545 2856 1208 1412

[136,] 2415 2862 2822 3260 2606 2264 2250 2545 2856 1208 1412 1964

[137,] 2862 2822 3260 2606 2264 2250 2545 2856 1208 1412 1964 2018

[138,] 2822 3260 2606 2264 2250 2545 2856 1208 1412 1964 2018 2329

[139,] 3260 2606 2264 2250 2545 2856 1208 1412 1964 2018 2329 2660

[140,] 2606 2264 2250 2545 2856 1208 1412 1964 2018 2329 2660 2923

[141,] 2264 2250 2545 2856 1208 1412 1964 2018 2329 2660 2923 2626

[142,] 2250 2545 2856 1208 1412 1964 2018 2329 2660 2923 2626 2132

[143,] 2545 2856 1208 1412 1964 2018 2329 2660 2923 2626 2132 1772

[144,] 2856 1208 1412 1964 2018 2329 2660 2923 2626 2132 1772 2526

[145,] 1208 1412 1964 2018 2329 2660 2923 2626 2132 1772 2526 2755

[146,] 1412 1964 2018 2329 2660 2923 2626 2132 1772 2526 2755 NA

[147,] 1964 2018 2329 2660 2923 2626 2132 1772 2526 2755 NA NA

[148,] 2018 2329 2660 2923 2626 2132 1772 2526 2755 NA NA NA

[149,] 2329 2660 2923 2626 2132 1772 2526 2755 NA NA NA NA

[150,] 2660 2923 2626 2132 1772 2526 2755 NA NA NA NA NA

[151,] 2923 2626 2132 1772 2526 2755 NA NA NA NA NA NA

[152,] 2626 2132 1772 2526 2755 NA NA NA NA NA NA NA

[153,] 2132 1772 2526 2755 NA NA NA NA NA NA NA NA

[154,] 1772 2526 2755 NA NA NA NA NA NA NA NA NA

[155,] 2526 2755 NA NA NA NA NA NA NA NA NA NA

[156,] 2755 NA NA NA NA NA NA NA NA NA NA NA

> x

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

1980 2585 3368 3210 3111 3756 4216 5225 4426 3932 3816 3661 3795

1981 2285 2934 2985 3646 4198 4935 5618 5454 3624 2898 3802 3629

1982 2369 2511 3079 3728 4151 4326 5054 5138 3310 3508 3790 3446

1983 2127 2523 3017 3265 3822 4027 4420 5255 4009 3074 3465 3718

1984 1954 2604 3626 2836 4042 3584 4225 4523 2892 2876 3420 3159

1985 2101 2181 2724 2954 4092 3470 3990 4239 2855 2897 3433 3307

1986 1914 2214 2320 2714 3633 3295 4377 4442 2774 2840 2828 3758

1987 1610 1968 2248 3262 3164 2972 4041 3402 2898 2555 3056 3717

1988 1755 2193 2198 2777 3076 3389 4231 3118 2524 2280 2862 3502

1989 1558 1940 2226 2676 3145 3224 4117 3446 2482 2349 2986 3163

1990 1651 1725 2622 2316 2976 3263 3951 2917 2380 2458 2883 2579

1991 1330 1686 2457 2514 2834 2757 3425 3006 2369 2017 2507 3168

1992 1545 1643 2112 2415 2862 2822 3260 2606 2264 2250 2545 2856

1993 1208 1412 1964 2018 2329 2660 2923 2626 2132 1772 2526 2755

# Create a list of training windows

> n-minObs

[1] 156

> minObs

[1] 12

> stepSize

[1] 1

> seq(1,(n-minObs),by=stepSize)

[1] 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

[20] 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38

[39] 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57

[58] 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76

[77] 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95

[96] 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114

[115] 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133

[134] 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152

[153] 153 154 155 156

> steps <- seq(1,(n-minObs),by=stepSize)

# Set progressbar

combine <- rbind

if (progress) {

f <- function(){

pb <- txtProgressBar(1,length(steps)-1,style=3)

count <- 0

function(...) {

count <<- count + length(list(...)) - 1

setTxtProgressBar(pb,count)

Sys.sleep(0.01)

flush.console()

rbind(...)

}

}

combine <- f()

}

# Forecast

At each point in time, calculate 'maxHorizon' forecasts ahead

i=7

> xshort <- window(x, start=st+(i-minObs+1)/freq, end=st+i/freq) ; xshort

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

1980 5225 4426 3932 3816 3661 3795

1981 2285 2934 2985 3646 4198 4935

> auto.arimaForecast(xshort, h=12, ic='aicc', stepwise=FALSE)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

1981 4718.897 4565.192 4455.869 4378.112 4322.807 4283.471

1982 4255.492 4235.593 4221.439 4211.372 4204.212 4199.119

> forecast(auto.arima(xshort), h=12)

Point Forecast Lo 80 Hi 80 Lo 95 Hi 95

Jul 1981 4718.897 3848.609 5589.185 3387.906 6049.888

Aug 1981 4565.192 3497.222 5633.163 2931.873 6198.512

Sep 1981 4455.869 3300.709 5611.029 2689.204 6222.534

Oct 1981 4378.112 3181.260 5574.964 2547.686 6208.538

Nov 1981 4322.807 3105.408 5540.206 2460.956 6184.658

Dec 1981 4283.471 3055.808 5511.133 2405.923 6161.018

Jan 1982 4255.492 3022.670 5488.315 2370.054 6140.931

Feb 1982 4235.593 3000.169 5471.017 2346.175 6125.011

Mar 1982 4221.439 2984.701 5458.177 2330.011 6112.867

Apr 1982 4211.372 2973.969 5448.775 2318.928 6103.816

May 1982 4204.212 2966.473 5441.950 2311.254 6097.170

Jun 1982 4199.119 2961.211 5437.028 2305.902 6092.337

> P

[1] 3795.000 3733.417 3226.866 2985.000 3646.000 4198.000 4718.897 5295.785 5454.000 3624.000 3213.189 4024.128 3617.061 2167.835

[15] 3392.476 3079.000 4247.388 4013.686 4425.778 5278.017 5138.000 3310.000 4093.916 3515.541 3691.833 2635.250 2523.000 3017.000

[29] 3265.000 3822.000 3786.913 3532.750 5255.000 4009.000 3074.000 3465.000 3718.000 3545.750 3611.260 3573.341 2836.000 4042.000

[43] 3548.917 3532.667 3471.667 3378.583 3362.083 3358.333 3311.750 3324.000 2181.000 2724.000 2954.000 3953.836 3218.083 3198.500

[57] 4239.000 3171.750 3173.500 3174.583 3171.782 3171.333 3174.083 2320.000 2714.000 3633.000 3011.756 3099.833 4442.000 3110.000

[71] 3105.250 3054.833 3444.258 3067.083 3046.583 2248.000 3262.000 3047.167 3020.250 2992.250 2905.583 2915.917 2892.167 2911.167

[85] 3717.000 2919.833 2938.583 2370.406 2551.094 2886.667 2921.417 2937.250 2913.583 2882.417 2859.500 2843.333 3066.484 2809.000

[99] 2787.917 2226.000 2676.000 2787.583 2773.833 2764.333 2791.667 2788.167 2793.917 2804.250 2778.403 2783.750 2765.833 2622.000

[113] 1670.838 2976.000 2758.000 2744.167 2700.083 2691.583 2700.667 2692.083 2565.396 2616.667 1686.000 2457.000 2514.000 2834.000

[127] 2562.167 2518.333 2380.452 2508.316 2200.230 2643.721 2811.912 2523.750 2520.167 2112.000 2415.000 2485.500 2490.917 2477.167

[141] 2443.833 2435.083 2454.500 2457.667 2856.000 2403.583 2384.333 1964.000 2018.000 2329.000 2281.000 2252.917 2254.583 2243.583

[155] 2203.750 2202.167

> A

[1] 2285 2934 2985 3646 4198 4935 5618 5454 3624 2898 3802 3629 2369 2511 3079 3728 4151 4326 5054 5138 3310 3508 3790 3446 2127 2523

[27] 3017 3265 3822 4027 4420 5255 4009 3074 3465 3718 1954 2604 3626 2836 4042 3584 4225 4523 2892 2876 3420 3159 2101 2181 2724 2954

[53] 4092 3470 3990 4239 2855 2897 3433 3307 1914 2214 2320 2714 3633 3295 4377 4442 2774 2840 2828 3758 1610 1968 2248 3262 3164 2972

[79] 4041 3402 2898 2555 3056 3717 1755 2193 2198 2777 3076 3389 4231 3118 2524 2280 2862 3502 1558 1940 2226 2676 3145 3224 4117 3446

[105] 2482 2349 2986 3163 1651 1725 2622 2316 2976 3263 3951 2917 2380 2458 2883 2579 1330 1686 2457 2514 2834 2757 3425 3006 2369 2017

[131] 2507 3168 1545 1643 2112 2415 2862 2822 3260 2606 2264 2250 2545 2856 1208 1412 1964 2018 2329 2660 2923 2626 2132 1772 2526 2755

> length(P)

[1] 156

> length(A)

[1] 156

> accuracy(P,A)

ME RMSE MAE MPE MAPE

Test set -58.93564 784.0414 629.1155 -8.079226 24.14878

> data.frame(

+ plyr::ldply(1:maxHorizon,

+ function(horizon) {

+ P <- forecasts[,horizon,drop=FALSE]

+ A <- na.omit(actuals[,horizon,drop=FALSE])

+ P <- P[1:length(A)]

+ P <- na.omit(P)

+ A <- A[1:length(P)]

+ summaryFunc(P,A)

+ }

+ )

+ )

ME RMSE MAE MPE MAPE

1 -58.93564 784.0414 629.1155 -8.079226 24.14878

2 -55.21784 845.2252 698.0000 -8.453922 25.97562

3 -61.09787 855.6773 697.5361 -8.747313 25.49806

4 -64.74040 904.1066 723.2189 -9.190028 26.08401

5 -71.80998 971.0056 723.3727 -10.370525 27.13895

6 -86.02598 904.1306 663.5064 -10.124079 25.08798

7 -105.41329 847.0004 644.7201 -10.292734 24.64047

8 -126.77194 863.1421 700.5430 -11.258487 26.98533

9 -149.48596 811.8409 671.6363 -11.296852 25.42702

10 -162.45187 734.2496 596.8694 -10.849883 22.32194

11 -167.65422 632.1083 489.9627 -10.587075 19.25372

12 -177.60206 639.1357 476.8658 -11.362694 19.71259

# Questions

## What is stepSize

## What is maxHorizon

## What is minObs

## What is fixedWindow

### Fixed window = FALSE (one more than previous, one less than previous)

* For each case training set contains one more value than the previous one. And test set contains one less value than the previous one.

> window(x, end=st + 1/freq)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

1980 2585 3368 3210 3111 3756 4216 5225 4426 3932 3816 3661 3795

> window(x, end=st + 2/freq)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

1980 2585 3368 3210 3111 3756 4216 5225 4426 3932 3816 3661 3795

1981 2285

> window(x, end=st + 3/freq)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

1980 2585 3368 3210 3111 3756 4216 5225 4426 3932 3816 3661 3795

1981 2285 2934

> window(x, end=st + 4/freq)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

1980 2585 3368 3210 3111 3756 4216 5225 4426 3932 3816 3661 3795

1981 2285 2934 2985

> window(x, end=st + 153/freq)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

1980 2585 3368 3210 3111 3756 4216 5225 4426 3932 3816 3661 3795

1981 2285 2934 2985 3646 4198 4935 5618 5454 3624 2898 3802 3629

1982 2369 2511 3079 3728 4151 4326 5054 5138 3310 3508 3790 3446

1983 2127 2523 3017 3265 3822 4027 4420 5255 4009 3074 3465 3718

1984 1954 2604 3626 2836 4042 3584 4225 4523 2892 2876 3420 3159

1985 2101 2181 2724 2954 4092 3470 3990 4239 2855 2897 3433 3307

1986 1914 2214 2320 2714 3633 3295 4377 4442 2774 2840 2828 3758

1987 1610 1968 2248 3262 3164 2972 4041 3402 2898 2555 3056 3717

1988 1755 2193 2198 2777 3076 3389 4231 3118 2524 2280 2862 3502

1989 1558 1940 2226 2676 3145 3224 4117 3446 2482 2349 2986 3163

1990 1651 1725 2622 2316 2976 3263 3951 2917 2380 2458 2883 2579

1991 1330 1686 2457 2514 2834 2757 3425 3006 2369 2017 2507 3168

1992 1545 1643 2112 2415 2862 2822 3260 2606 2264 2250 2545 2856

1993 1208 1412 1964 2018 2329 2660 2923 2626

### Fixed window = TRUE (one step forecast)

* Training set contains only one observation in each case

> window(x, start=st+(1-minObs+1)/freq, end=st+1/freq)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

1980 2585 3368 3210 3111 3756 4216 5225 4426 3932 3816 3661 3795

> window(x, start=st+(2-minObs+1)/freq, end=st+2/freq)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

1980 3368 3210 3111 3756 4216 5225 4426 3932 3816 3661 3795

1981 2285

> window(x, start=st+(3-minObs+1)/freq, end=st+3/freq)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

1980 3210 3111 3756 4216 5225 4426 3932 3816 3661 3795

1981 2285 2934

> window(x, start=st+(4-minObs+1)/freq, end=st+4/freq)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

1980 3111 3756 4216 5225 4426 3932 3816 3661 3795

1981 2285 2934 2985

> window(x, start=st+(153-minObs+1)/freq, end=st+153/freq)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

1992 2264 2250 2545 2856

1993 1208 1412 1964 2018 2329 2660 2923 2626

# models$arima$actuals

> models$arima$actuals

[,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10] [,11] [,12]

[1,] 2285 2934 2985 3646 4198 4935 5618 5454 3624 2898 3802 3629

[2,] 2934 2985 3646 4198 4935 5618 5454 3624 2898 3802 3629 2369

[3,] 2985 3646 4198 4935 5618 5454 3624 2898 3802 3629 2369 2511

[4,] 3646 4198 4935 5618 5454 3624 2898 3802 3629 2369 2511 3079

[5,] 4198 4935 5618 5454 3624 2898 3802 3629 2369 2511 3079 3728

[6,] 4935 5618 5454 3624 2898 3802 3629 2369 2511 3079 3728 4151

[7,] 5618 5454 3624 2898 3802 3629 2369 2511 3079 3728 4151 4326

[8,] 5454 3624 2898 3802 3629 2369 2511 3079 3728 4151 4326 5054

[9,] 3624 2898 3802 3629 2369 2511 3079 3728 4151 4326 5054 5138

[10,] 2898 3802 3629 2369 2511 3079 3728 4151 4326 5054 5138 3310

[11,] 3802 3629 2369 2511 3079 3728 4151 4326 5054 5138 3310 3508

[12,] 3629 2369 2511 3079 3728 4151 4326 5054 5138 3310 3508 3790

[13,] 2369 2511 3079 3728 4151 4326 5054 5138 3310 3508 3790 3446

[14,] 2511 3079 3728 4151 4326 5054 5138 3310 3508 3790 3446 2127

[15,] 3079 3728 4151 4326 5054 5138 3310 3508 3790 3446 2127 2523

[16,] 3728 4151 4326 5054 5138 3310 3508 3790 3446 2127 2523 3017

[17,] 4151 4326 5054 5138 3310 3508 3790 3446 2127 2523 3017 3265

[18,] 4326 5054 5138 3310 3508 3790 3446 2127 2523 3017 3265 3822

[19,] 5054 5138 3310 3508 3790 3446 2127 2523 3017 3265 3822 4027

[20,] 5138 3310 3508 3790 3446 2127 2523 3017 3265 3822 4027 4420

[21,] 3310 3508 3790 3446 2127 2523 3017 3265 3822 4027 4420 5255

[22,] 3508 3790 3446 2127 2523 3017 3265 3822 4027 4420 5255 4009

[23,] 3790 3446 2127 2523 3017 3265 3822 4027 4420 5255 4009 3074

[24,] 3446 2127 2523 3017 3265 3822 4027 4420 5255 4009 3074 3465

[25,] 2127 2523 3017 3265 3822 4027 4420 5255 4009 3074 3465 3718

[26,] 2523 3017 3265 3822 4027 4420 5255 4009 3074 3465 3718 1954

[27,] 3017 3265 3822 4027 4420 5255 4009 3074 3465 3718 1954 2604

[28,] 3265 3822 4027 4420 5255 4009 3074 3465 3718 1954 2604 3626

[29,] 3822 4027 4420 5255 4009 3074 3465 3718 1954 2604 3626 2836

[30,] 4027 4420 5255 4009 3074 3465 3718 1954 2604 3626 2836 4042

[31,] 4420 5255 4009 3074 3465 3718 1954 2604 3626 2836 4042 3584

[32,] 5255 4009 3074 3465 3718 1954 2604 3626 2836 4042 3584 4225

[33,] 4009 3074 3465 3718 1954 2604 3626 2836 4042 3584 4225 4523

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[35,] 3465 3718 1954 2604 3626 2836 4042 3584 4225 4523 2892 2876

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result.152 2252.917 2252.917 2252.917 2252.917 2252.917 2252.917 2252.917 2252.917 2252.917 2252.917 2252.917 2252.917

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# models$arima$results

> models$arima$results

horizon ME RMSE MAE MPE MAPE

1 1 -58.93564 784.0414 629.1155 -8.079226 24.14878

2 2 -55.21784 845.2252 698.0000 -8.453922 25.97562

3 3 -61.09787 855.6773 697.5361 -8.747313 25.49806

4 4 -64.74040 904.1066 723.2189 -9.190028 26.08401

5 5 -71.80998 971.0056 723.3727 -10.370525 27.13895

6 6 -86.02598 904.1306 663.5064 -10.124079 25.08798

7 7 -105.41329 847.0004 644.7201 -10.292734 24.64047

8 8 -126.77194 863.1421 700.5430 -11.258487 26.98533

9 9 -149.48596 811.8409 671.6363 -11.296852 25.42702

10 10 -162.45187 734.2496 596.8694 -10.849883 22.32194

11 11 -167.65422 632.1083 489.9627 -10.587075 19.25372

12 12 -177.60206 639.1357 476.8658 -11.362694 19.71259

13 All -107.26725 815.9720 642.9456 -10.051068 24.35620

# foreach

> foreach

(i=steps, .combine=combine, .multicombine=FALSE,

+ .packages=c('forecast', 'caret'), .export=c('testObject', 'tsSummary', 'tseriesControl')) %dopar% {

+

+

+ if (fixedWindow) {

+ xshort <- window(x, start=st+(i-minObs+1)/freq, end=st+i/freq)

+

+ } else {

+ xshort <- window(x, end=st + i/freq)

+ }

+

+ out <- auto.arimaForecast(xshort, h=12, ic='aicc', stepwise=FALSE)

+

+ return(out)

+

+ }

[,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10] [,11] [,12]

result.1 3795.000 3795.000 3795.000 3795.000 3795.000 3795.000 3795.000 3795.000 3795.000 3795.000 3795.000 3795.000

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result.7 4718.897 4565.192 4455.869 4378.112 4322.807 4283.471 4255.492 4235.593 4221.439 4211.372 4204.212 4199.119

result.8 5295.785 5050.029 4862.590 4719.629 4610.592 4527.429 4463.999 4415.622 4378.724 4350.581 4329.117 4312.746

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result.11 3213.189 3407.326 3526.902 3600.553 3645.918 3673.860 3691.070 3701.671 3708.200 3712.222 3714.699 3716.224

result.12 4024.128 3907.857 3907.857 3907.857 3907.857 3907.857 3907.857 3907.857 3907.857 3907.857 3907.857 3907.857

result.13 3617.061 3608.712 3602.874 3598.791 3595.935 3593.939 3592.542 3591.566 3590.883 3590.405 3590.071 3589.838

result.14 2167.835 2927.755 3283.593 3450.216 3528.239 3564.773 3581.881 3589.892 3593.643 3595.399 3596.222 3596.607

result.15 3392.476 3536.229 3597.347 3623.332 3634.380 3639.077 3641.074 3641.923 3642.284 3642.438 3642.503 3642.530

result.16 3079.000 3079.000 3079.000 3079.000 3079.000 3079.000 3079.000 3079.000 3079.000 3079.000 3079.000 3079.000

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result.19 4425.778 4120.589 4001.174 3954.449 3936.166 3929.012 3926.213 3925.118 3924.690 3924.522 3924.456 3924.431

result.20 5278.017 4485.728 4043.144 4043.144 4043.144 4043.144 4043.144 4043.144 4043.144 4043.144 4043.144 4043.144

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result.58 3171.750 3171.750 3171.750 3171.750 3171.750 3171.750 3171.750 3171.750 3171.750 3171.750 3171.750 3171.750

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