Replication of figures in Del Negro and Primiceri (2015)

Fabian Krüger, fabian.krueger83@gmail.com

November 26, 2015

This code uses the R package `bvarsv` (https://github.com/FK83/bvarsv) to replicate several figures from Del Negro and Primiceri ("Time Varying Structural Vector Autoregressions and Monetary Policy: A Corrigendum", *Review of Economic Studies* 82, 1342-1345, 2015.) The figures appear in the online appendix for the paper, which is openly available at http://restud.oxfordjournals.org/content/82/4/1342/suppl/DC1. Note that the MCMC algorithm implemented in `bvarsv` is called **Algorithm 2** by Del Negro and Primiceri (2015).

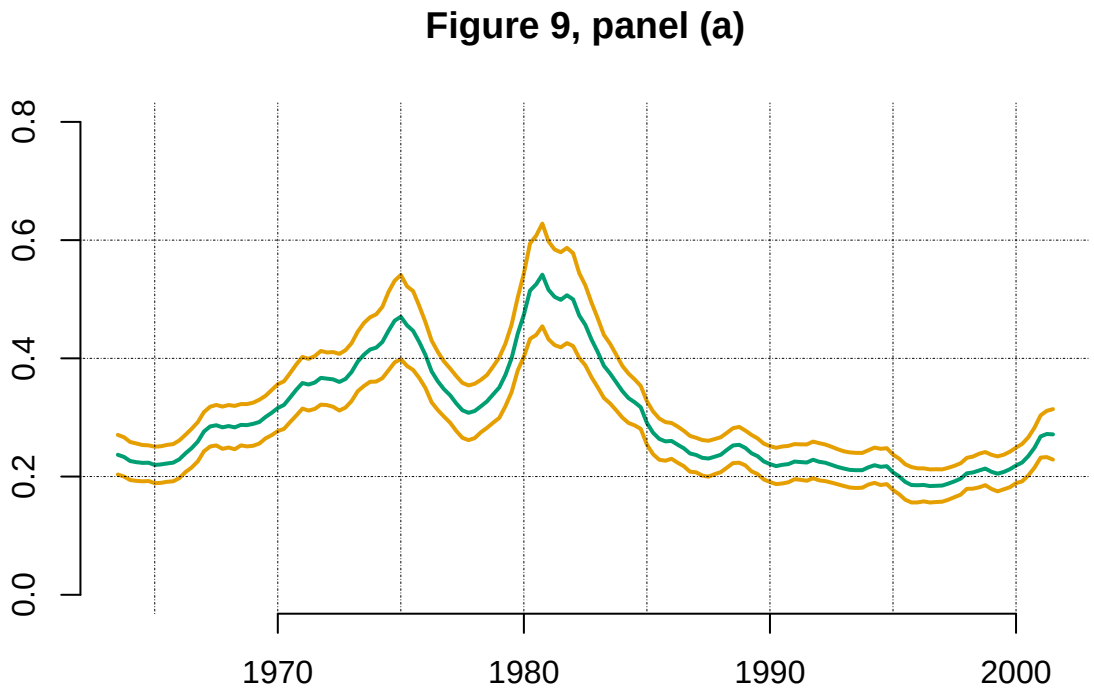
```
# Load package
library(bvarsv)

# Fix random seed
set.seed(12)

# Load data
data(usmacro)

# Run Model
fit <- bvar.sv.tvp(usmacro, p = 2)
```

```
## [1] "2015-11-26 09:46:35 -- now starting MCMC"
## [1] "2015-11-26 09:47:22 -- now at iteration 5000"
## [1] "2015-11-26 09:48:59 -- now at iteration 15000"
## [1] "2015-11-26 09:50:36 -- now at iteration 25000"
## [1] "2015-11-26 09:52:14 -- now at iteration 35000"
## [1] "2015-11-26 09:53:51 -- now at iteration 45000"
## [1] "2015-11-26 09:55:28 -- now at iteration 55000"
```

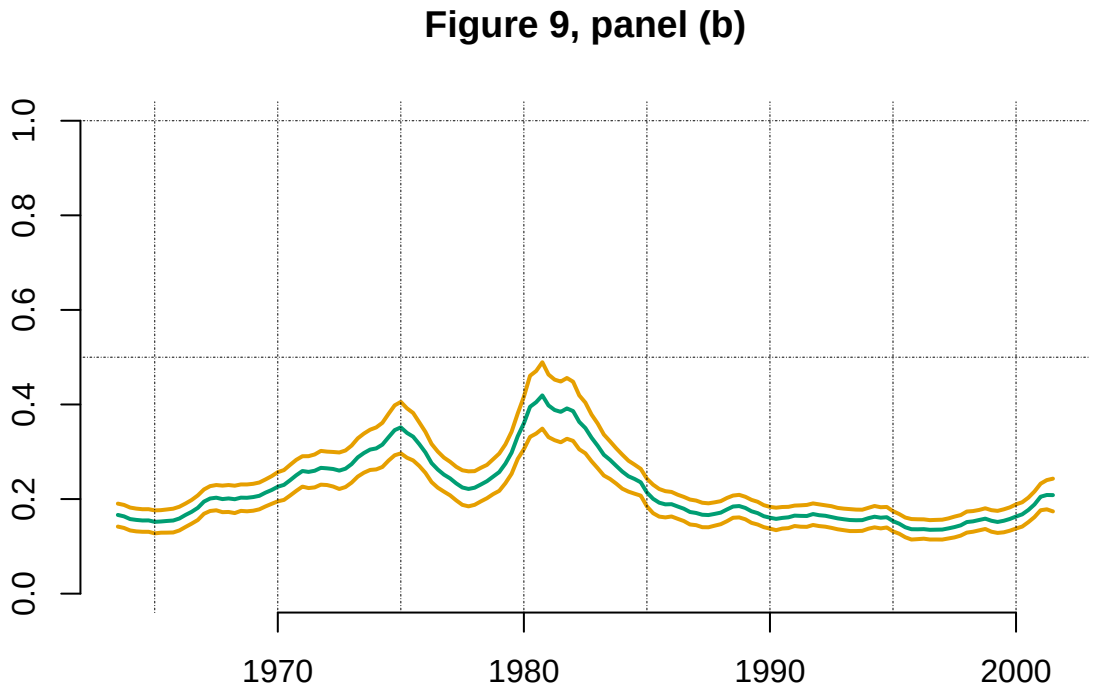
```
# Dates in string format
tml <- paste0(floor(time(usmacro)), "Q", (1 + 4*(time(usmacro) - floor(time(usmacro)))))

# Convenience functions for plotting
matplot2 <- function(x, y, ylim, ...){
  matplot(x = x, y = y, ylim = ylim, type = "l", xlab = "", ylab = "",
          lty = 1, lwd = 2, bty = "n", ...)
}
abline2 <- function(...){
  abline(..., lty = 4, lwd = 0.3)
}
gp <- seq(1965, 2000, 5)

# Color palette, taken from http://www.cookbook-r.com/Graphs/Colors_%28ggplot2%29/
cbPalette <- c("#999999", "#E69F00", "#56B4E9", "#009E73", "#F0E442", "#0072B2",
               "#D55E00", "#CC79A7")
cols1 <- cbPalette[c(2, 4, 2)]
cols2 <- cbPalette[c(2, 4, 6)]
```

Replicate Figure 9 in Del Negro and Primiceri (2015)

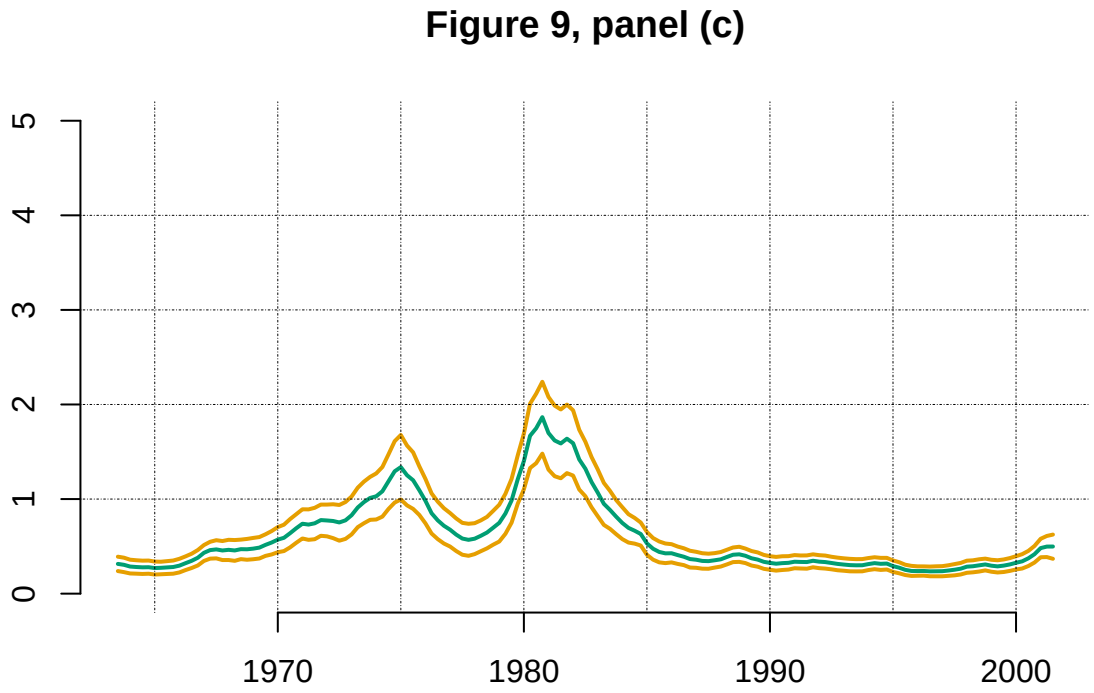
```
# SD of inflation residual
# X axis
xax <- seq(1963.5, 2001.5, 0.25)
# Get posterior draws
aux <- seq(1, 3*153, 3)
x1 <- sqrt(fit$H.draws[1, aux, ])
x1 <- t(apply(x1, 1, function(z) c(mean(z), quantile(z, c(0.16, 0.84)))[c(2, 1, 3)]))
# Plot
matplot2(x = xax, y = x1, ylim = c(0, 0.8), col = cols1,
         main = "Figure 9, panel (a)")
abline2(h = c(0.2, 0.4, 0.6), v = gp)
```



```
# SD of unemployment residual
# Get posterior draws
x2 <- sqrt(fit$H.draws[2, aux + 1, ])
x2 <- t(apply(x2, 1, function(z) c(mean(z), quantile(z, c(0.16, 0.84)))[c(2, 1, 3)]))
# Plot
matplot2(x = xax, y = x2, ylim = c(0, 1), col = cols1,
         main = "Figure 9, panel (b)")
abline2(h = c(0.5, 1), v = gp)
```



```r
# SD of interest rate residual
# Get posterior draws
x3 <- sqrt(fit$H.draws[3, aux + 2, ])
x3 <- t(apply(x3, 1, function(z) c(mean(z), quantile(z, c(0.16, 0.84)))[c(2, 1, 3)]))
# Plot
matplot2(x = xax, y = x3, ylim = c(0, 5), col = cols1,
         main = "Figure 9, panel (c)")
abline2(h = 1:4, v = gp)
```



Replicate Figures 10 and 11 in Del Negro and Primiceri (2015)

```
# Dates to be considered
all_dts <- c("1975Q1", "1981Q3", "1996Q1")

# Loop over two response variables
# Inflation (rr = 1) and unemployment (rr = 2)
for (rr in 1:2){
  tmp <- list()
  for (dd in all_dts){
    t <- which(tml == dd) - 42
    t_ind <- which(all_dts == dd)
    # Compute impulse responses
    aux <- impulse.responses(fit, impulse.variable = 3,
                             response.variable = rr, t = t,
                             scenario = 3,
                             draw.plot = FALSE)$irf
    tmp[[t_ind]] <- aux
  }
  # Make data for graph in top left panel of Figure 10, 11
  gdat <- rbind(0, sapply(tmp, function(z) apply(as.matrix(z), 2, median)))
  # Configure and print plot
  if (rr == 1){
    yb <- c(-0.2, 0.05)
  } else {
    yb <- c(-0.05, 0.15)
  }
  plot_title <- paste0("Figure ", 9 + rr, ", panel (a)")
  matplot2(x = 0:20, y = gdat, ylim = yb, col = cols2, main = plot_title)
  abline2(v = seq(5, 20, 5), h = seq(yb[1], yb[2], 0.05))
  if (rr == 1){
    legend_loc <- "bottomleft"
  } else {
    legend_loc <- "bottom"
  }
  legend(legend_loc, legend = all_dts, col = cols2, lty = 1, lwd = 2, bty = "n")

  # Code for other panels in Figures 10, 11
  # cc represent pairwise comparisons among system variables
  for (cc in 1:3){
    if (cc == 1){
      comp <- 1:2
    } else if (cc == 2){
      comp <- c(1, 3)
    } else {
      comp <- c(2, 3)
    }
    # Summarize differences in Impulse Responses
    aux <- t(apply(tmp[[comp[1]]] - tmp[[comp[2]]], 2,
                   function(z) quantile(z, c(0.16, 0.5, 0.84))))
    # Configure and print plot
    plot_title <- paste0("Figure ", 9 + rr, ", panel (", letters[2:4][cc], ")")
    matplot2(x = 0:20, y = rbind(0, aux), ylim = c(-0.1, 0.1), col = cols1,
```

```
            main = plot_title)
    abline2(v = seq(5, 20, 5), h = seq(-0.1, 0.1, 0.05))
  }
}
```

Figure 10, panel (a)

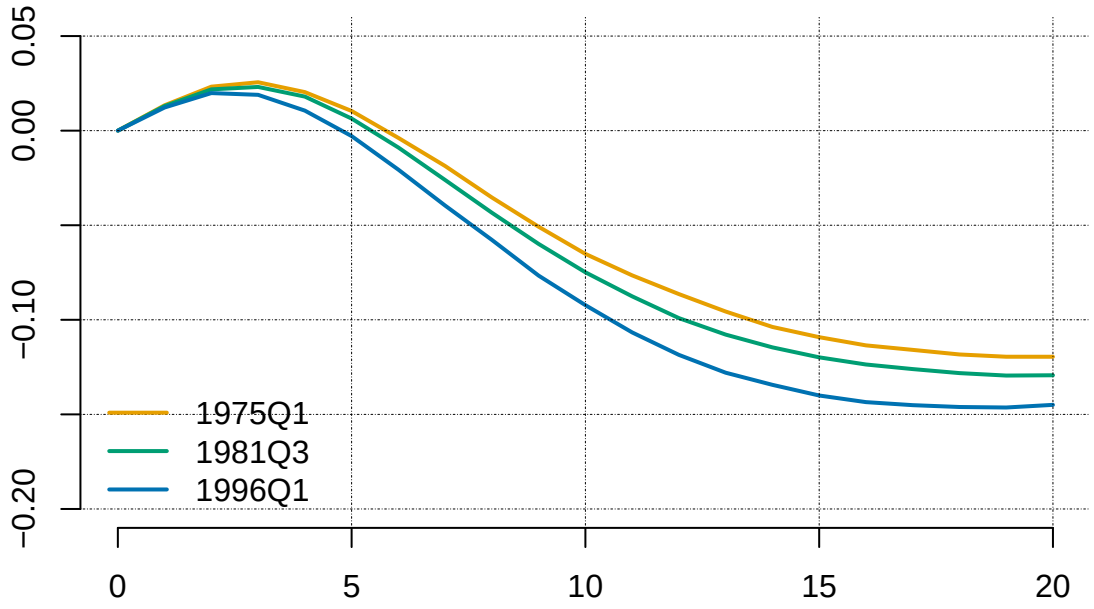


Figure 10, panel (b)

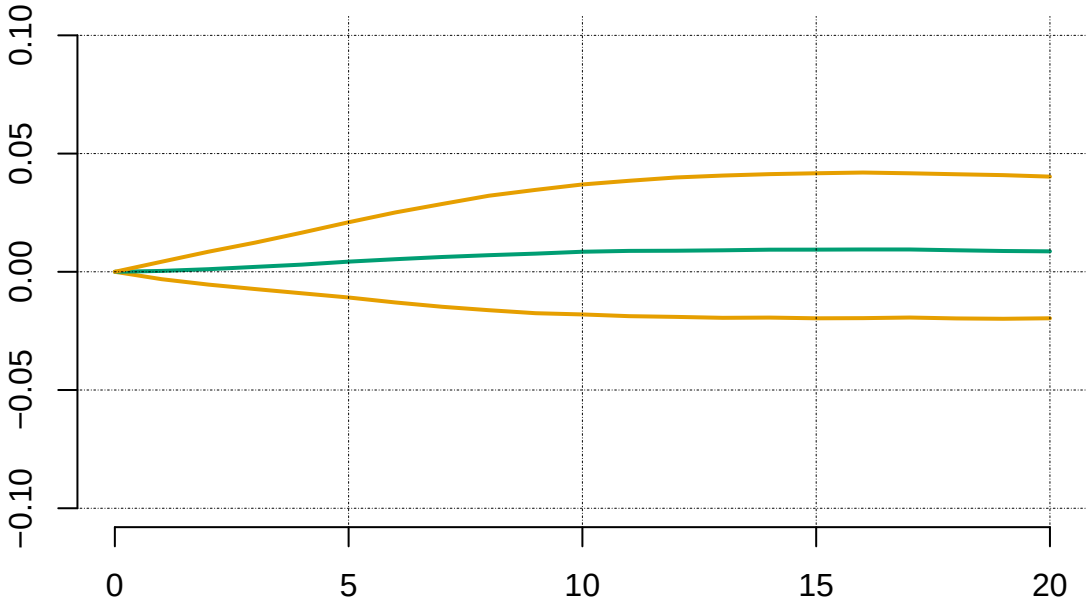


Figure 10, panel (c)

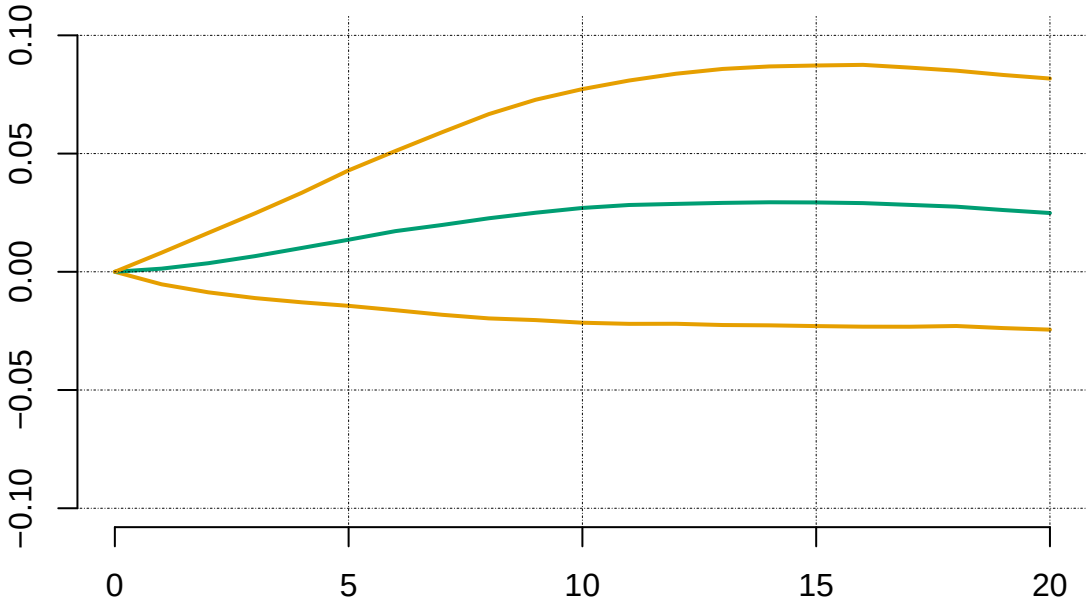


Figure 10, panel (d)

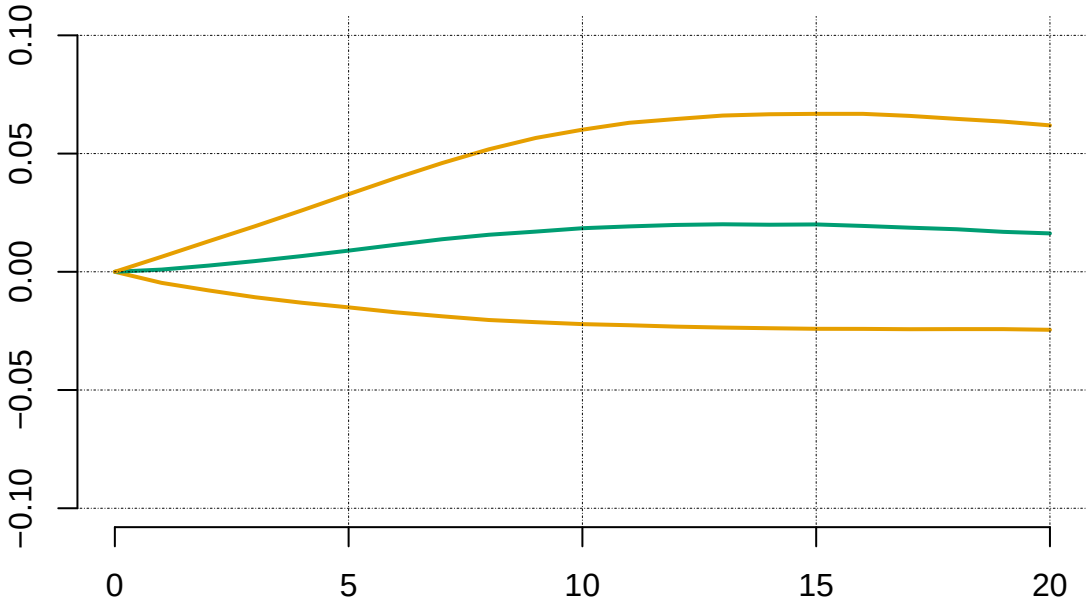


Figure 11, panel (a)

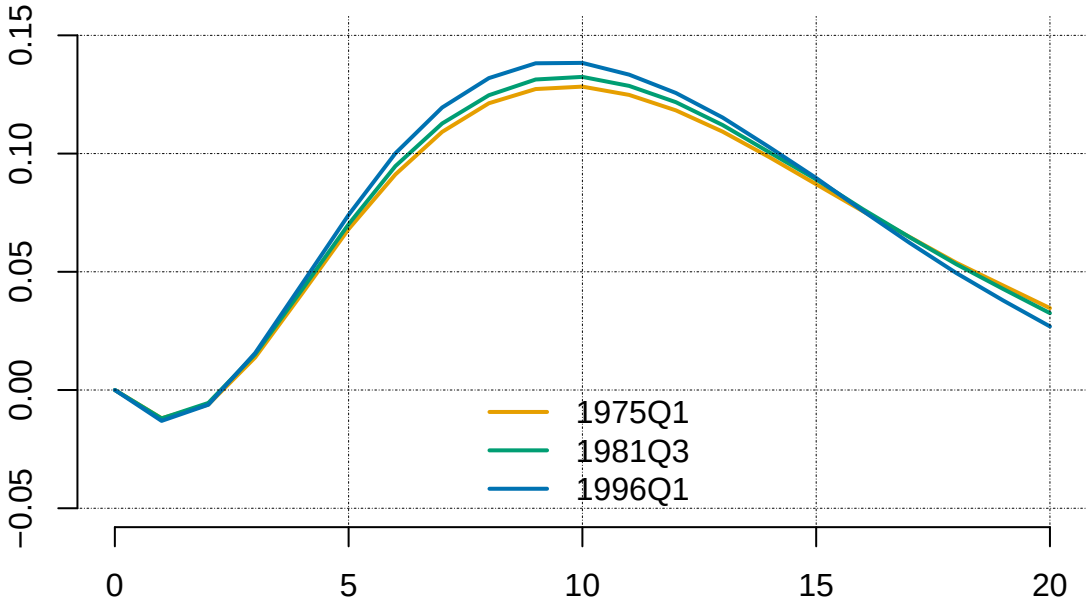


Figure 11, panel (b)

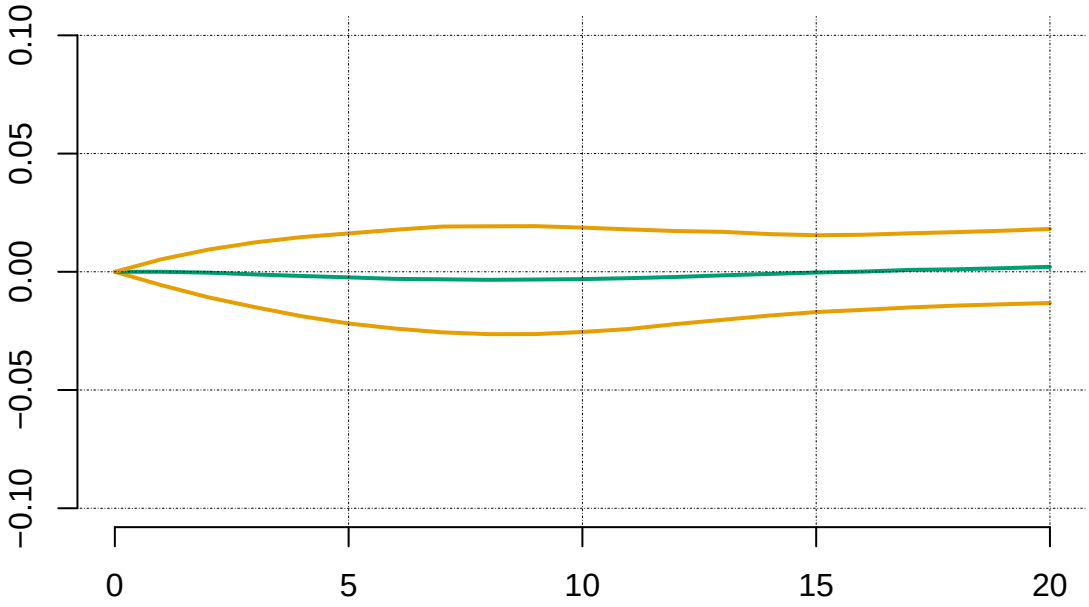


Figure 11, panel (c)

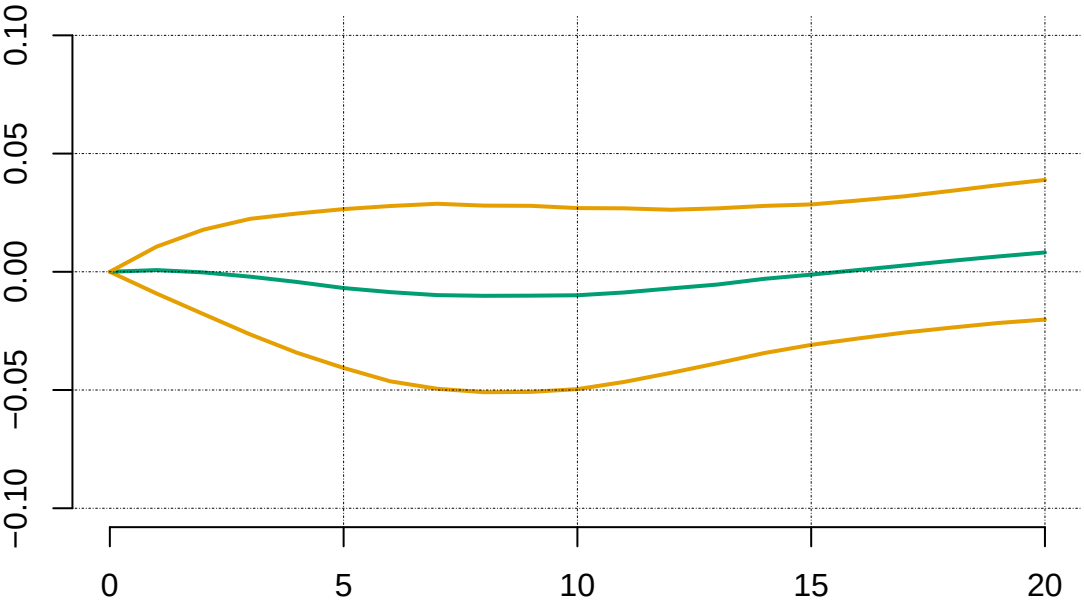


Figure 11, panel (d)