

# Panel Data

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```
library(plm)

## Warning: package 'plm' was built under R version 3.5.1

## Loading required package: Formula

library(prediction)

## Warning: package 'prediction' was built under R version 3.5.1

library(Metrics)

## Warning: package 'Metrics' was built under R version 3.5.1

library(tseries)

## Warning: package 'tseries' was built under R version 3.5.1
```

## R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
train_data <- na.omit(read.csv(file="usersessions-with-genre-train.csv", header=TRUE, row.names = NULL,
test_data <- na.omit(read.csv(file="usersessions-with-genre-test.csv", header=TRUE, row.names = NULL,
panel.data.train <- plm.data(train_data, index = c("userid","session_start"))

## Warning: use of 'plm.data' is discouraged, better use 'pdata.frame' instead

panel.data.test <- plm.data(train_data, index = c("userid","session_start"))

## Warning: use of 'plm.data' is discouraged, better use 'pdata.frame' instead

mdl_random <- plm(session_length~age+session_length_mvavg+previous_duration+is_holiday+absence_time, da

##Summaries

summary(mdl_random)
```

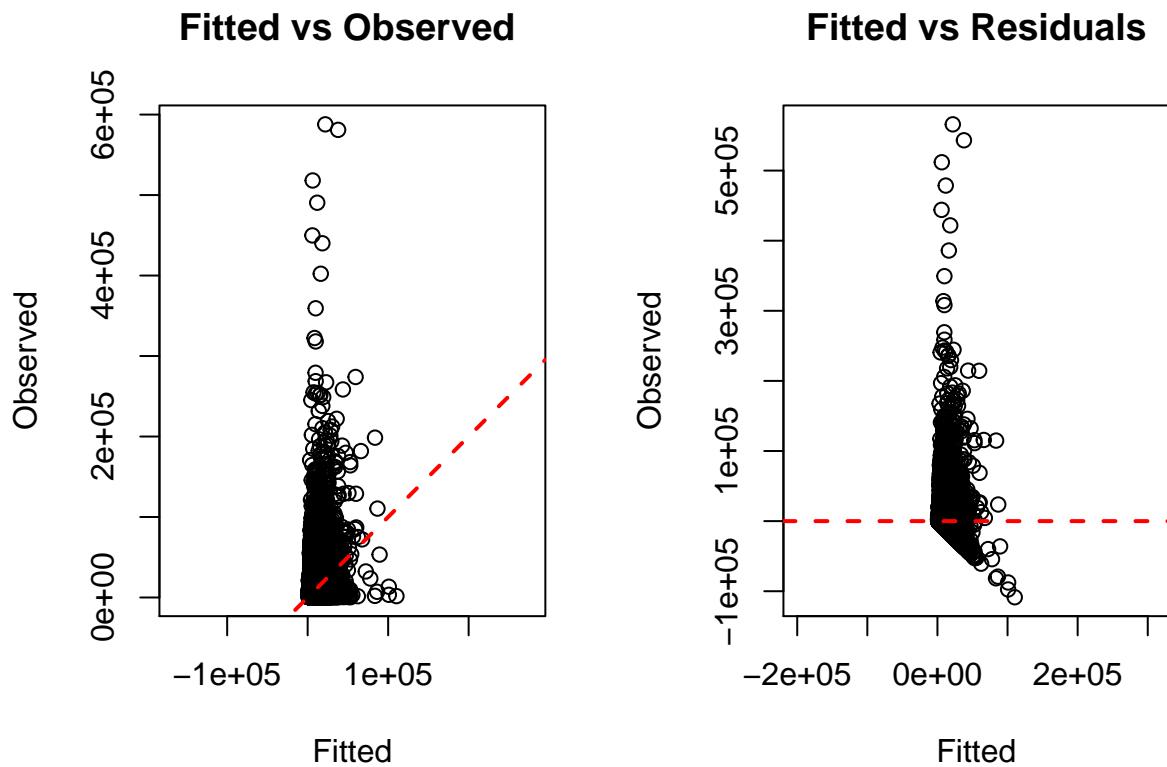
```

## Oneway (individual) effect Random Effect Model
##      (Swamy-Arora's transformation)
##
## Call:
## plm(formula = session_length ~ age + session_length_mvavg + previous_duration +
##       is_holiday + absence_time, data = panel.data.train, model = "random")
##
## Unbalanced Panel: n = 174, T = 19-4312, N = 169556
##
## Effects:
##          var std.dev share
## idiosyncratic 75676771     8699      1
## individual          0        0      0
## theta:
##   Min. 1st Qu. Median   Mean 3rd Qu.   Max.
##   0       0       0       0       0       0
##
## Residuals:
##   Min. 1st Qu. Median 3rd Qu.   Max.
## -108569.3 -3340.8 -1545.0 1475.2 565949.6
##
## Coefficients:
##                               Estimate Std. Error t-value Pr(>|t|)
## (Intercept)             6.3855e+02 1.0102e+02 6.3208 2.609e-10 ***
## age                     3.0953e-01 3.5901e+00 0.0862 0.9313
## session_length_mvavg   6.9506e-01 6.4212e-03 108.2438 < 2.2e-16 ***
## previous_duration       1.6008e-01 2.3733e-03 67.4502 < 2.2e-16 ***
## is_holiday              -2.6509e+01 5.1160e+01 -0.5182 0.6043
## absence_time            -1.4716e-05 4.6387e-05 -0.3173 0.7511
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares: 1.4832e+13
## Residual Sum of Squares: 1.3006e+13
## R-Squared: 0.1231
## Adj. R-Squared: 0.12307
## F-statistic: 4760.3 on 5 and 169550 DF, p-value: < 2.22e-16

#cat(length(panel.data.train$session_length), length(mdl_fd$residuals))
# Fitted vs Observed and Fitted vs Residuals plots
par(mfrow=c(1,2))
plot(panel.data.train$session_length~mdl_random$residuals, panel.data.train$session_length, asp=1, ylab="Observed")
abline(0,0, col='red', lty='dashed', lwd=2)

## Fitted vs Residuals plots
plot(panel.data.train$session_length~mdl_random$residuals,mdl_random$residuals, asp=1, ylab = "Residuals")
abline(0,0, col='red', lty='dashed', lwd=2)

```



```

## MAE and RMSE

mae_random = mean(abs(mdl_random$residuals))
rmse_random = sqrt(mean(abs(mdl_random$residuals)^2))

cat('MAE = ', mae_random, ', RMSE = ', rmse_random)

## MAE = 4355.626 , RMSE = 8758.281

## Prediction
predval <- prediction(mdl_random, data=test_data)
mae_pred = mean(abs(predval$session_length-predval$fitted))

rmse_pred = sqrt(mean(abs(predval$session_length-predval$fitted)^2))

cat('MAE = ', mae_pred, ', RMSE = ', rmse_pred)

## MAE = 3893.95 , RMSE = 7571.409

```