Untitled

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```
setwd(dirname(rstudioapi::getSourceEditorContext()$path))
# import libs
library(tidyverse)
library(readxl)
library(stargazer)
library(kableExtra)
library(fastDummies)
```

```
df_combo <- read_excel("BDB_Combo.xlsx")
df_player <- read_excel("BDB_Player.xlsx")
```

Player OLS

```
colnames(df_player) <- c('DATASET', 'DATE', 'PLAYER FULL NAME', 'POSITION', 'OWN TEAM',
       'OPP TEAM', 'VENUE', 'MIN', 'FG', 'FGA', '3P', '3PA', 'FT', 'FTA', 'OR',
       'DR', 'TOT', 'A', 'PF', 'ST', 'TO', 'BL', 'PTS', 'PER', 'DATE-DIFF',
       'RR VAL', 'RR SERIES', 'S_PER', 'I_PER', 'SAME_CITY', 'TRAVEL',
       '1_days', '10_days', '11_days', '12_days', '13_days',
       '14+_days', '14_days', '2_days', '3_days', '4_days', '5_days',
       '6_days', '7_days', '8_days', '9_days', 'Season_Start',
       'H', 'R', 'H-M1', 'H-M2', 'H-M3', 'R-M1', 'R-M2', 'R-M3', 'M1', 'M2',
       'M3', 'S_OEFF', 'S_DEFF', 'I_OEFF', 'I_DEFF','Bubble')
```

```
# Omit - Bubble
df_player <- df_player %>% filter( DATASET != '2019-2020 Regular Season') %>% mutate(
  PER_diff = PER - I_PER,
  M1_sq = M1^2,
  M1_cu = M1^3,
  M2_sq = M2^2,
  M2_cu = M2^3
)
```

OLS - compare lockout

```
lockout_lm = lm(
  data = df_player,
  PER_diff ~ H+TRAVEL+I_OEFF+I_DEFF+M1+M2+M3+`1_days`+`2_days`+`3_days`+`4_days`
  )
```

```
without_lockout_lm <- df_player %>% filter(DATASET != '2011-2012 Regular Season') %>% lm( PER_diff ~ H+
)
```

```
knitr::opts_chunk$set(echo = FALSE, warning = FALSE)
stargazer(lockout_lm, without_lockout_lm, type = 'latex', title = "Consider the 11-12 NBA Season")
```

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OLS - Weighting Minutes

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IV

Table 1: Consider the 11-12 NBA Season

	Dependent variable:	
	PER_diff	
	(1)	(2)
H	0.680^{***}	0.681^{***}
	(0.046)	(0.047)
TRAVEL	0.021	0.037
	(0.054)	(0.055)
I_OEFF	-0.042^{***}	-0.038^{***}
	(0.005)	(0.006)
I_DEFF	0.150^{***}	0.156^{***}
	(0.006)	(0.006)
M1	0.001	0.002
	(0.005)	(0.005)
M2	0.005	0.004
	(0.003)	(0.003)
M3	0.001	0.001
	(0.001)	(0.002)
‘1_days‘	−0.014	−0.040
	(0.162)	(0.168)
‘2_days‘	0.031	0.050
	(0.108)	(0.112)
‘3_days‘	0.078	0.069
	(0.085)	(0.087)
‘4_days‘	0.169^{*}	0.165^{*}
	(0.092)	(0.094)
Constant	-12.088^{***}	-13.182^{***}
	(0.850)	(0.907)
Observations	132,159	124,986
R^2	0.008	0.009
Adjusted R^2	0.008	0.008
Residual Std. Error	6.821 (df = 132147)	6.821 (df = 124974)
F Statistic	102.494^{***} (df = 11; 132147)	97.606^{***} (df = 11; 124974)
Note:		*p<0.1; **p<0.05; ***p<0.01

Table 2: Considering Polynomial OLS

	Dependent variable:	
	PER_diff	
	(1)	(2)
H	0.677^{***}	0.677^{***}
	(0.046)	(0.046)
TRAVEL	0.021	0.020
	(0.054)	(0.054)
I_OEFF	-0.042^{***}	-0.042^{***}
	(0.005)	(0.005)
I_DEFF	0.150^{***}	0.150^{***}
	(0.006)	(0.006)
M1_cu	-0.00001^{***}	
	(0.00000)	
M1_sq		-0.0002^{*}
		(0.0001)
M2	0.005	0.005
	(0.003)	(0.003)
M3	0.001	0.001
	(0.001)	(0.001)
‘1_days‘	0.242^{**}	0.236^{*}
	(0.114)	(0.140)
‘2_days‘	0.030	0.030
	(0.108)	(0.108)
‘3_days‘	0.067	0.068
	(0.085)	(0.085)
‘4_days‘	0.168^{*}	0.167^{*}
	(0.092)	(0.092)
Constant	-12.080^{***}	-12.065^{***}
	(0.850)	(0.850)
Observations	132,159	132,159
R^2	0.009	0.008
Adjusted R^2	0.008	0.008
Residual Std. Error (df = 132147)	6.821	6.821
F Statistic (df = 11; 132147)	103.098^{***}	102.785^{***}
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 3: Considering Polynomial OLS - p2

	Dependent variable:	
	PER_diff	
	(1)	(2)
H	0.678^{***}	0.678^{***}
	(0.046)	(0.046)
TRAVEL	0.021	0.021
	(0.054)	(0.054)
I_OEFF	-0.042^{***}	-0.042^{***}
	(0.005)	(0.005)
I_DEFF	0.150^{***}	0.150^{***}
	(0.006)	(0.006)
M1_cu	-0.00001^{***}	-0.00001^{***}
	(0.00000)	(0.00000)
M2_sq	0.0002^{**}	
	(0.0001)	
M2_cu		0.00000^{***}
		(0.00000)
M3	0.001	0.001
	(0.001)	(0.001)
‘1_days‘	0.235^{**}	0.227^{**}
	(0.113)	(0.113)
‘2_days‘	−0.007	0.029
	(0.095)	(0.081)
‘3_days‘	0.063	0.057
	(0.084)	(0.084)
‘4_days‘	0.169^{*}	0.172^{*}
	(0.091)	(0.091)
Constant	-12.078^{***}	-12.066^{***}
	(0.850)	(0.850)
Observations	132,159	132,159
R^2	0.009	0.009
Adjusted R^2	0.008	0.008
Residual Std. Error (df = 132147)	6.820	6.820
F Statistic (df = 11; 132147)	103.420^{***}	103.510^{***}
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 4: Considering Covariates (Minutes x Game Played)

	Dependent variable:
	PER_diff
H	0.686^{***}
	(0.046)
TRAVEL	0.023
	(0.054)
I_OEFF	-0.042^{***}
	(0.005)
I_DEFF	0.150^{***}
	(0.006)
M1	0.011^{*}
	(0.006)
‘1_days‘	0.781^{***}
	(0.282)
M2	0.0002
	(0.004)
‘2_days‘	-0.305
	(0.186)
M3	0.001
	(0.001)
‘3_days‘	0.337
	(0.302)
‘4_days‘	0.185^{**}
	(0.092)
M1:‘1_days‘	-0.034^{***}
	(0.010)
M2:‘2_days‘	0.015^{**}
	(0.007)
M3:‘3_days‘	-0.008
	(0.009)
Constant	-12.129^{***}
	(0.851)
Observations	132,159
R^2	0.009
Adjusted R^2	0.008
Residual Std. Error	6.820 (df = 132144)
F Statistic	81.882^{***} (df = 14; 132144)
Note:	*p$\leq$0.1; **p<0.05; ***p<0.01

Model

```
##
## Call:
## ivreg::ivreg(formula = PER_diff ~ H + TRAVEL + I_OEFF + I_DEFF +
##     `1_days` + `2_days` + `3_days` + `4_days` + (M1 | (TDF_1 +
##     TDF_2 + TDF_3 + TDF_4)) + (M2 | (TDF_1 + TDF_2 + TDF_3 +
##     TDF_4)) + (M3 | (TDF_1 + TDF_2 + TDF_3 + TDF_4)), data = df_final)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -30.6204  -4.6561  -0.3136   4.3331  44.2854
##
## Coefficients:
##                                          Estimate Std. Error t value Pr(>|t|)
## (Intercept)                            -12.090108   0.854236 -14.153  < 2e-16
## H                                        0.681175   0.045876  14.848  < 2e-16
## TRAVEL                                   0.025500   0.053486   0.477   0.6335
## I_OEFF                                  -0.042221   0.005301  -7.965 1.67e-15
## I_DEFF                                   0.149843   0.005652  26.512  < 2e-16
## `1_days`                                -0.007071   0.078246  -0.090   0.9280
## `2_days`                                 0.162190   0.070223   2.310   0.0209
## `3_days`                                 0.060597   0.080312   0.755   0.4505
## `4_days`                                 0.157940   0.097416   1.621   0.1050
## M1 | (TDF_1 + TDF_2 + TDF_3 + TDF_4)TRUE   0.059102   0.123692   0.478   0.6328
## M2 | (TDF_1 + TDF_2 + TDF_3 + TDF_4)TRUE         NA         NA      NA       NA
## M3 | (TDF_1 + TDF_2 + TDF_3 + TDF_4)TRUE         NA         NA      NA       NA
##
## (Intercept)                            ***
## H                                      ***
## TRAVEL
## I_OEFF                                 ***
## I_DEFF                                 ***
## `1_days`
## `2_days`                               *
## `3_days`
## `4_days`
## M1 | (TDF_1 + TDF_2 + TDF_3 + TDF_4)TRUE
## M2 | (TDF_1 + TDF_2 + TDF_3 + TDF_4)TRUE
## M3 | (TDF_1 + TDF_2 + TDF_3 + TDF_4)TRUE
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.82 on 131802 degrees of freedom
## Multiple R-Squared: 0.008425,    Adjusted R-squared: 0.008358
## Wald test: 124.4 on 9 and 131802 DF,  p-value: < 2.2e-16


##
## Call:
## ivreg::ivreg(formula = PER_diff ~ H + TRAVEL + I_OEFF + I_DEFF +
##     `1_days` + `2_days` + `3_days` + `4_days` + (M1_sq | (TDF_1 +
##     TDF_2 + TDF_3 + TDF_4)) + (M2_sq | (TDF_1 + TDF_2 + TDF_3 +
##     TDF_4)) + (M3 | (TDF_1 + TDF_2 + TDF_3 + TDF_4)), data = df_final)
##
```

```
## Residuals:
##      Min       1Q   Median       3Q      Max
## -30.6204  -4.6561  -0.3136   4.3331  44.2854
##
## Coefficients:
##                                                Estimate Std. Error t value
## (Intercept)                                  -12.090108   0.854236 -14.153
## H                                              0.681175   0.045876  14.848
## TRAVEL                                         0.025500   0.053486   0.477
## I_OEFF                                        -0.042221   0.005301  -7.965
## I_DEFF                                         0.149843   0.005652  26.512
## `1_days`                                      -0.007071   0.078246  -0.090
## `2_days`                                       0.162190   0.070223   2.310
## `3_days`                                       0.060597   0.080312   0.755
## `4_days`                                       0.157940   0.097416   1.621
## M1_sq | (TDF_1 + TDF_2 + TDF_3 + TDF_4)TRUE   0.059102   0.123692   0.478
## M2_sq | (TDF_1 + TDF_2 + TDF_3 + TDF_4)TRUE         NA         NA      NA
## M3 | (TDF_1 + TDF_2 + TDF_3 + TDF_4)TRUE           NA         NA      NA
##                                                Pr(>|t|)
## (Intercept)                                     < 2e-16 ***
## H                                               < 2e-16 ***
## TRAVEL                                           0.6335
## I_OEFF                                         1.67e-15 ***
## I_DEFF                                          < 2e-16 ***
## `1_days`                                         0.9280
## `2_days`                                         0.0209 *
## `3_days`                                         0.4505
## `4_days`                                         0.1050
## M1_sq | (TDF_1 + TDF_2 + TDF_3 + TDF_4)TRUE     0.6328
## M2_sq | (TDF_1 + TDF_2 + TDF_3 + TDF_4)TRUE         NA
## M3 | (TDF_1 + TDF_2 + TDF_3 + TDF_4)TRUE           NA
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.82 on 131802 degrees of freedom
## Multiple R-Squared: 0.008425,    Adjusted R-squared: 0.008358
## Wald test: 124.4 on 9 and 131802 DF,  p-value: < 2.2e-16


##
## Call:
## ivreg::ivreg(formula = PER_diff ~ H + TRAVEL + I_OEFF + I_DEFF +
##     `1_days` + `2_days` + `3_days` + `4_days` + (M1_sq | (TDF_1 +
##     TDF_2 + TDF_3 + TDF_4)) + (M2 | (TDF_1 + TDF_2 + TDF_3 +
##     TDF_4)) + (M3 | (TDF_1 + TDF_2 + TDF_3 + TDF_4)), data = df_final)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -30.6204  -4.6561  -0.3136   4.3331  44.2854
##
## Coefficients:
##                                                Estimate Std. Error t value
## (Intercept)                                  -12.090108   0.854236 -14.153
## H                                              0.681175   0.045876  14.848
## TRAVEL                                         0.025500   0.053486   0.477
```

```
## I_OEFF                                          -0.042221   0.005301  -7.965
## I_DEFF                                           0.149843   0.005652  26.512
## `1_days`                                        -0.007071   0.078246  -0.090
## `2_days`                                         0.162190   0.070223   2.310
## `3_days`                                         0.060597   0.080312   0.755
## `4_days`                                         0.157940   0.097416   1.621
## M1_sq | (TDF_1 + TDF_2 + TDF_3 + TDF_4)TRUE     0.059102   0.123692   0.478
## M2 | (TDF_1 + TDF_2 + TDF_3 + TDF_4)TRUE              NA         NA      NA
## M3 | (TDF_1 + TDF_2 + TDF_3 + TDF_4)TRUE              NA         NA      NA
##                                                Pr(>|t|)
## (Intercept)                                     < 2e-16 ***
## H                                               < 2e-16 ***
## TRAVEL                                           0.6335
## I_OEFF                                         1.67e-15 ***
## I_DEFF                                          < 2e-16 ***
## `1_days`                                         0.9280
## `2_days`                                         0.0209 *
## `3_days`                                         0.4505
## `4_days`                                         0.1050
## M1_sq | (TDF_1 + TDF_2 + TDF_3 + TDF_4)TRUE     0.6328
## M2 | (TDF_1 + TDF_2 + TDF_3 + TDF_4)TRUE          NA
## M3 | (TDF_1 + TDF_2 + TDF_3 + TDF_4)TRUE          NA
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.82 on 131802 degrees of freedom
## Multiple R-Squared: 0.008425,    Adjusted R-squared: 0.008358
## Wald test: 124.4 on 9 and 131802 DF,  p-value: < 2.2e-16
```