```
* MSBA 635 - Data Analytics II;

* print data;
```
*Multiple regression
* Explain variability in full-time employment as a function of when the minimum wage policy was implemented (if after policy implementation=1, if before=0), geographic regions, restaurant brands, and restaurant ownership

```
proc print data=tmp1.njmin3 (obs=10);
run;
```


Obs	CO_OWNED	SOUTHJ	CENTRALJ	PA1	PA2	DEMP	nj	bk	kfc	roys	wendys	d	d_nj	fte
1	0	0	1	0	0	12.00	1	1	0	0	0	0	0	15.00
2	0	0	1	0	0	6.50	1	1	0	0	0	0	0	15.00
3	0	0	1	0	0	-1.00	1	0	0	1	0	0	0	24.00
4	1	0	0	0	0	2.25	1	0	0	1	0	0	0	19.25
5	0	0	0	0	0	13.00	1	1	0	0	0	0	0	21.50
6	0	0	0	0	0	1.00	1	0	1	0	0	0	0	9.50
7	0	0	0	0	0	-27.50	1	0	0	0	1	0	0	44.00
8	0	0	0	0	0	.	1	1	0	0	0	0	0	.
9	0	0	0	0	0	17.00	1	1	0	0	0	0	0	21.00
10	0	1	0	0	0	8.00	1	0	0	0	1	0	0	28.00

```
* display data attributes;
*
proc contents data=tmp1.njmin3;
run;
```


The CONTENTS Procedure

Data Set Name	TMP1.NJMIN3	Observations	820
Member Type	DATA	Variables	14
Engine	V9	Indexes	0
Created	01/13/2010 13:42:01	Observation Length	112
Last Modified	01/13/2010 13:42:01	Deleted Observations	0
Protection		Compressed	NO
Data Set Type		Sorted	NO
Label			
Data Representation	WINDOWS_32		
Encoding	wlatin1 Western (Windows)		

Engine/Host Dependent Information

Data Set Page Size	12288
Number of Data Set Pages	8
First Data Page	1
Max Obs per Page	109
Obs in First Data Page	85
Number of Data Set Repairs	0
Filename	C:\Users\nxnguy01\Desktop\njmin3.sas7bdat
Release Created	9.0202M0
Host Created	XP_PRO

Alphabetic List of Variables and Attributes

#	Variable	Type	Len	Label
3	CENTRALJ	Num	8	= 1 if in central NJ
1	CO_OWNED	Num	8	= 1 if company owned
6	DEMP	Num	8	change in full time employment
4	PA1	Num	8	= 1 if in PA, northeast suburbs of Phila
5	PA2	Num	8	= 1 if in PA, Easton etc
2	SOUTHJ	Num	8	= 1 if in southern NJ
8	bk	Num	8	= 1 if Burger King
12	d	Num	8	= 1 if after NJ min wage increase
13	d_nj	Num	8	nj*d interaction
14	fte	Num	8	full time-equivalent employees
9	kfc	Num	8	= 1 if Kentucky Fried Chicken
7	nj	Num	8	= 1 if New Jersey
10	roys	Num	8	= 1 if Roy Rodgers
11	wendys	Num	8	= 1 if Wendys

```
* obtain descriptive statistics;
```

*$(NJ_{after} - PA_{after}) - (NJ_{before} - PA_{before})$ ➔ (21.0274 – 21.1656) – (20.4394 – 23.3312)=2.7536. this is the average amount of FTE, we are doing the difference in differences. These values are from the means procedures for all of the proc means .

```
options nolabel;
proc means data=tmp1.njmin3;
var fte;
where d = 0 and nj = 0;
run;
```

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The MEANS Procedure

Analysis Variable : fte

N	Mean	Std Dev	Minimum	Maximum
77	23.3311688	11.8562831	7.5000000	70.5000000

```
* obtain descriptive statistics;
*
options nolabel;
proc means data=tmp1.njmin3;
var fte;
where d = 1 and nj = 0;
run;
```

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The MEANS Procedure

Analysis Variable : fte

N	Mean	Std Dev	Minimum	Maximum
77	21.1655844	8.2767320	0	43.5000000

```
* obtain descriptive statistics;

options nolabel;
proc means data=tmp1.njmin3;
var fte;
where d = 0 and nj = 1;
run;
```


The MEANS Procedure

Analysis Variable : fte

N	Mean	Std Dev	Minimum	Maximum
321	20.4394081	9.1062391	5.0000000	85.0000000

```
* obtain descriptive statistics;

options nolabel;
proc means data=tmp1.njmin3;
var fte;
where d = 1 and nj = 1;
run;
```


The MEANS Procedure

Analysis Variable : fte

N	Mean	Std Dev	Minimum	Maximum
319	21.0274295	9.2930238	0	60.5000000

```
* estimate model using proc reg;
*now you run the regression after you have run all the proc means
*all three of the models for did were run
*2.7536 for d_nj is the value we calculated above
*is this number statistically significant? No. the p-value is 0.1033.
*it said unemployment was unchanged by the increase in minimum wage.
*for model 2(did_ctrl1)- you control for nj versus pa. if d=1 means after
mimimum wage went in.
*the product of d and nj (n_nj) is the treatment effect. They controlled for
it
*for model 3(did_ctrl2) we put in more geography- southj, centralj
*if you see the output see that d_nj is still greater than .05 so raising
minimum wage did not increase unemployment

options nolabel;
proc reg data=tmp1.njmin3;
did: model fte = nj d d_nj;
did_ctrl1: model fte = nj d d_nj kfc roys wendys co_owned;
did_ctrl2: model fte = nj d d_nj kfc roys wendys co_owned southj centralj
pa1;
run;
quit;
```


The REG Procedure
Model: did
Dependent Variable: fte

Number of Observations Read	820
Number of Observations Used	794
Number of Observations with Missing Values	26

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	521.11646	173.70549	1.96	0.1180
Error	790	69888	88.46567		
Corrected Total	793	70409			

Root MSE	9.40562	R-Square	0.0074
Dependent Mean	21.02651	Adj R-Sq	0.0036
Coeff Var	44.73219		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	23.33117	1.07187	21.77	<.0001
nj	1	-2.89176	1.19352	-2.42	0.0156
d	1	-2.16558	1.51585	-1.43	0.1535
d_nj	1	2.75361	1.68841	1.63	0.1033

The REG Procedure
Model: did_ctrl1
Dependent Variable: fte

Number of Observations Read	820
Number of Observations Used	794
Number of Observations with Missing Values	26

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	13830	1975.77611	27.45	<.0001
Error	786	56579	71.98290		
Corrected Total	793	70409			

Root MSE	8.48427	R-Square	0.1964
Dependent Mean	21.02651	Adj R-Sq	0.1893
Coeff Var	40.35036		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	25.95118	1.03822	25.00	<.0001
nj	1	-2.37661	1.07919	-2.20	0.0279
d	1	-2.22357	1.36769	-1.63	0.1044
d_nj	1	2.84507	1.52334	1.87	0.0622
kfc	1	-10.45339	0.84896	-12.31	<.0001
roys	1	-1.62500	0.85980	-1.89	0.0591
wendys	1	-1.06371	0.92915	-1.14	0.2526
CO_OWNED	1	-1.16855	0.71617	-1.63	0.1032

The REG Procedure
Model: did_ctrl2
Dependent Variable: fte

Number of Observations Read	820
Number of Observations Used	794
Number of Observations with Missing Values	26

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	10	15588	1558.82941	22.26	<.0001
Error	783	54821	70.01367		
Corrected Total	793	70409			

Root MSE	8.36742	R-Square	0.2214
Dependent Mean	21.02651	Adj R-Sq	0.2115
Coeff Var	39.79460		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	25.32051	1.21090	20.91	<.0001
nj	1	-0.90796	1.27174	-0.71	0.4755
d	1	-2.21185	1.34886	-1.64	0.1014
d_nj	1	2.81491	1.50238	1.87	0.0614
kfc	1	-10.05800	0.84467	-11.91	<.0001
roys	1	-1.69339	0.85918	-1.97	0.0491
wendys	1	-1.06495	0.92064	-1.16	0.2477
CO_OWNED	1	-0.71631	0.71899	-1.00	0.3194
SOUTHJ	1	-3.70176	0.77995	-4.75	<.0001
CENTRALJ	1	0.00788	0.89749	0.01	0.9930
PA1	1	0.92386	1.38493	0.67	0.5049