```
(2 vars, 157 obs)
      name:  <unnamed>
       log:  C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMESTER 2\E
> CO475\Term Paper\475 Term Paper Log.smcl
  log type:  smcl
 opened on:  11 Apr 2025, 15:45:30

. do "C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMESTER 2\ECO475\T
> erm Paper\475 Term Paper.do"

. /*
> Student Names: Dhairya Patankar & Li Ping Yu Zeng
> Student Numbers: 1009111934 & 1008126038
> Email Addresses: dhairya.patankar@mail.utoronto.ca & liping.yuzeng@mail.utoron
> to.ca
> */
.
. clear

.
. *import data for the housing price indices of Manhattan, Queens, and Brooklyn
> over a 13 year period
. import delimited "C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMES
> TER 2\ECO475\Term Paper\priceIndex_All.csv"
(encoding automatically selected: ISO-8859-1)
(5 vars, 242 obs)

.
. *format the date and get it ready to merge with other dataset
. gen date = date(month, "YMD")

. replace date = mofd(date)
(242 real changes made)

. format date %tm

. tsset date

Time variable: date, 2005m1 to 2025m2
        Delta: 1 month

.
. *keep only data after Jan 2012 inclusive*
. keep in 85/242
(84 observations deleted)

.
. *remove uncessessary variables*
. drop month nyc

.
. *create dummy variable for covid and set it equal to 1 after March 2020*
. gen covid = 0

. replace covid = 1 if date > 721
(60 real changes made)
```

```
.
. *save data in main working file*
. save "C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMESTER 2\ECO475
> \Term Paper\Term_Paper_Unrestricted.dta", replace
file C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMESTER
    2\ECO475\Term Paper\Term_Paper_Unrestricted.dta saved

.
. *clear cache*
. clear

.
. *import data for the average 30 year fixed mortgage rate across the USA from 2
> 012 January to 2025 February
. import delimited "C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMES
> TER 2\ECO475\Term Paper\MORTGAGE30US.csv"
(encoding automatically selected: ISO-8859-1)
(2 vars, 687 obs)

.
. *format the date to observe the data monthly
. gen date = date(observation_date, "MDY")

. format date %td

. gen month = mofd(date)

. format month %tm

.
. *since the data is in weekly observations, generate the monthly average mortga
> ge rate by taking the average of the weeks in the month
. foreach x in observation_date{
  2.
.         egen mortgage_rate = mean(mortgage30us), by(month)
  3.
. }

.
. *collapse the data to only have each month's average mortgage rate
. collapse mortgage_rate, by(month)

.
. rename month date

.
. *merge the data sets*
. merge 1:1 date using "C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\S
> EMESTER 2\ECO475\Term Paper\Term_Paper_Unrestricted.dta"

    Result                      Number of obs
    -----------------------------------------
    Not matched                             0
    Matched                               158  (_merge==3)
    -----------------------------------------
```

```
. drop _merge

.
. *save merged data in main working file*
. save "C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMESTER 2\ECO475
> \Term Paper\Term_Paper_Unrestricted.dta", replace
file C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMESTER
    2\ECO475\Term Paper\Term_Paper_Unrestricted.dta saved

.
. *clear the cache*
. clear

.
. *import data for the average unemployment rate in New York State from 2012 Jan
> uary to 2025 January
. import delimited "C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMES
> TER 2\ECO475\Term Paper\NYUR.csv"
(encoding automatically selected: ISO-8859-1)
(2 vars, 157 obs)

.
. *format the date to observe the data monthly
. gen date = date(observation_date, "MDY")

. replace date = mofd(date)
(157 real changes made)

. format date %tm

. drop observation_date

.
. *merge the data sets*
. merge 1:1 date using "C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\S
> EMESTER 2\ECO475\Term Paper\Term_Paper_Unrestricted.dta"

    Result                      Number of obs
    -----------------------------------------
    Not matched                             1
        from master                         0  (_merge==1)
        from using                          1  (_merge==2)

    Matched                               157  (_merge==3)
    -----------------------------------------

. drop _merge

.
. *save merged data in main working file*
. save "C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMESTER 2\ECO475
> \Term Paper\Term_Paper_Unrestricted.dta", replace
file C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMESTER
    2\ECO475\Term Paper\Term_Paper_Unrestricted.dta saved
```

```
.
. *clear cache*
. clear

.
. *import data for the state minimum wage in New York State*
. import delimited "C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMES
> TER 2\ECO475\Term Paper\STTMINWGNY.csv"
(encoding automatically selected: ISO-8859-1)
(2 vars, 14 obs)

.
. *repeat the data for each year 12 times to simulate monthly data*
. expand 12
(154 observations created)

.
. *format the data in terms of dates*
. gen year = date(observation_date, "YMD")

. replace year = year(year)
(168 real changes made)

.
. *create the month variable assigned to each month's minimum wage*
. bysort observation_date: gen month = _n

. gen date = ym(year, month)

. format date %tm

.
. *drop the last 10 observations as the other data only goes until Feb 2025*
. drop in 160/168
(9 observations deleted)

.
. *remove the unecessary variables*
. drop year month observation_date

.
. rename sttminwgny min_wage

.
. *merge data into main working file*
. merge 1:1 date using "C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\S
> EMESTER 2\ECO475\Term Paper\Term_Paper_Unrestricted.dta"

    Result                      Number of obs
    -----------------------------------------
    Not matched                             1
        from master                         1  (_merge==1)
        from using                          0  (_merge==2)

    Matched                               158  (_merge==3)
    -----------------------------------------
```

```
. drop _merge

.
. *drop feb 2025 data*
. drop in 158/159
(2 observations deleted)

.
. *standardize the minimum wage in terms of 2016 dollars in order to deflate the
> m to match the units of the housing price index*
. gen std_min_wage = min_wage/min_wage[49]

.
. *show the summary statistics of the unrestricted dataset*
. summarize
```

Variable	Obs	Mean	Std. dev.	Min	Max
min_wage	157	10.74076	2.67264	7.25	16.5
date	157	702	45.4661	624	780
nyur	157	5.769427	2.261088	3.8	16.7
mortgage_r~e	157	4.377089	1.249509	2.684	7.62
brooklyn	157	672823.4	65638.45	525312	734978
manhattan	157	1074139	72312.07	890966	1170453
queens	157	477394.4	47145.71	392400	527845
covid	157	.3757962	.4858776	0	1
std_min_wage	157	1.193418	.29696	.8055556	1.833333

```
.
. *save merged data in main working file*
. save "C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMESTER 2\ECO475
> \Term Paper\Term_Paper_Unrestricted.dta", replace
file C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMESTER
    2\ECO475\Term Paper\Term_Paper_Unrestricted.dta saved

.
. *reduce dataset size to restricted version*
. keep in 55/157
(54 observations deleted)

.
. *show summary statistics of the restricted dataset
. summarize
```

Variable	Obs	Mean	Std. dev.	Min	Max
min_wage	103	12.2068	2.087792	9	16.5
date	103	729	29.87753	678	780
nyur	103	5.254369	2.431645	3.8	16.7
mortgage_r~e	103	4.633859	1.463541	2.684	7.62
brooklyn	103	712149.5	14127.66	672522	734978
manhattan	103	1099055	44083.55	1023761	1170453
queens	103	508914.1	16264.97	457433	527845
covid	103	.5728155	.4970884	0	1
std_min_wage	103	1.356311	.2319769	1	1.833333

```
.
. save "C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMESTER 2\ECO475
> \Term Paper\Term_Paper_Restricted.dta", replace
file C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMESTER
    2\ECO475\Term Paper\Term_Paper_Restricted.dta saved

.
. *clear cache*
. clear

.
. *import the housing market characteristics data*
. import delimited "C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMES
> TER 2\ECO475\Term Paper\RDC_Inventory_Core_Metrics_State_History.csv"
(encoding automatically selected: ISO-8859-1)
(40 vars, 5,304 obs)

.
. *remove non-New York Data*
. drop if state_id != "NY"
(5,200 observations deleted)

.
. *only keep the metrics that are needed*
. collapse new_listing_count median_square_feet, by(month_date_yyyymm)

.
. *convert the observation date variable into string type*
. tostring month_date_yyyymm, generate(observation_date)
observation_date generated as str6

. drop month_date_yyyymm

.
. *convert observation date to proper date type to be able to merge with restric
> ted data set*
. gen date = date(observation_date, "YM")

. replace date = mofd(date)
(104 real changes made)

. format date %tm

. drop observation_date

.
. *merge new variables with the restricted data set and create a new dataset for
>  comparison*
. merge 1:1 date using "C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\S
> EMESTER 2\ECO475\Term Paper\Term_Paper_Restricted.dta"

    Result                      Number of obs
    -----------------------------------------
    Not matched                             1
        from master                         1  (_merge==1)
        from using                          0  (_merge==2)

    Matched                               103  (_merge==3)
    -----------------------------------------
```

```
. drop _merge

.
. *drop Feb 2025 observation*
. drop in 104/104
(1 observation deleted)

.
. *save the working file*
. save "C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMESTER 2\ECO475
> \Term Paper\Term_Paper_Restricted_Variables.dta", replace
file C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMESTER
    2\ECO475\Term Paper\Term_Paper_Restricted_Variables.dta saved

.
. *show summary statistics of the restricted dataset with the addition of the ne
> w control variables*
. summarize
```

Variable	Obs	Mean	Std. dev.	Min	Max
new_listin~t	103	16504.31	4247.874	7100	26296
median_squ~t	103	1687.01	106.1733	1500	1829
date	103	729	29.87753	678	780
min_wage	103	12.2068	2.087792	9	16.5
nyur	103	5.254369	2.431645	3.8	16.7
mortgage_r~e	103	4.633859	1.463541	2.684	7.62
brooklyn	103	712149.5	14127.66	672522	734978
manhattan	103	1099055	44083.55	1023761	1170453
queens	103	508914.1	16264.97	457433	527845
covid	103	.5728155	.4970884	0	1
std_min_wage	103	1.356311	.2319769	1	1.833333

```
.
. *generate graphs showing the housing market indexes in each borough over time*
. twoway (line manhattan date)

. twoway (line brooklyn date)

. twoway (line queens date)

.
. *test for unit roots in all variables*
. dfuller manhattan

Dickey–Fuller test for unit root          Number of obs  = 102
Variable: manhattan                       Number of lags =   0

H0: Random walk without drift, d = 0

                                        Dickey–Fuller
                    Test          ———————— critical value ————————
                statistic              1%           5%          10%
———————————————————————————————————————————————————————————————
 Z(t)             -1.048         -3.509       -2.890       -2.580
———————————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.7353.
```

```
. dfuller L.manhattan

Dickey–Fuller test for unit root          Number of obs  = 101
Variable: L.manhattan                     Number of lags =   0

H0: Random walk without drift, d = 0

                                          Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -0.958       -3.510       -2.890       -2.580
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.7684.

. dfuller L2.manhattan

Dickey–Fuller test for unit root          Number of obs  = 100
Variable: L2.manhattan                    Number of lags =   0

H0: Random walk without drift, d = 0

                                          Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -0.894       -3.510       -2.890       -2.580
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.7901.

. dfuller L3.manhattan

Dickey–Fuller test for unit root          Number of obs  = 99
Variable: L3.manhattan                    Number of lags =  0

H0: Random walk without drift, d = 0

                                          Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -0.832       -3.511       -2.891       -2.580
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.8095.

. dfuller L4.manhattan

Dickey–Fuller test for unit root          Number of obs  = 98
Variable: L4.manhattan                    Number of lags =  0

H0: Random walk without drift, d = 0

                                          Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -0.951       -3.513       -2.892       -2.581
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.7709.
```

```
. dfuller brooklyn

Dickey–Fuller test for unit root          Number of obs  = 102
Variable: brooklyn                        Number of lags =   0

H0: Random walk without drift, d = 0

                                     Dickey–Fuller
                Test      ———————— critical value ————————
              statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)           -1.562       -3.509       -2.890       -2.580
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.5026.

. dfuller L.brooklyn

Dickey–Fuller test for unit root          Number of obs  = 101
Variable: L.brooklyn                      Number of lags =   0

H0: Random walk without drift, d = 0

                                     Dickey–Fuller
                Test      ———————— critical value ————————
              statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)           -1.622       -3.510       -2.890       -2.580
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.4716.

. dfuller L2.brooklyn

Dickey–Fuller test for unit root          Number of obs  = 100
Variable: L2.brooklyn                     Number of lags =   0

H0: Random walk without drift, d = 0

                                     Dickey–Fuller
                Test      ———————— critical value ————————
              statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)           -1.730       -3.510       -2.890       -2.580
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.4157.

. dfuller L3.brooklyn

Dickey–Fuller test for unit root           Number of obs  = 99
Variable: L3.brooklyn                      Number of lags =  0

H0: Random walk without drift, d = 0

                                     Dickey–Fuller
                Test      ———————— critical value ————————
              statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)           -1.850       -3.511       -2.891       -2.580
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.3561.
```

```
. dfuller L4.brooklyn

Dickey–Fuller test for unit root           Number of obs  = 98
Variable: L4.brooklyn                      Number of lags =  0

H0: Random walk without drift, d = 0

                                        Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)           -1.877       -3.513       -2.892       -2.581
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.3429.

. dfuller queens

Dickey–Fuller test for unit root           Number of obs  = 102
Variable: queens                           Number of lags =   0

H0: Random walk without drift, d = 0

                                        Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)           -4.135       -3.509       -2.890       -2.580
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0008.

. dfuller L.queens

Dickey–Fuller test for unit root           Number of obs  = 101
Variable: L.queens                         Number of lags =   0

H0: Random walk without drift, d = 0

                                        Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)           -4.080       -3.510       -2.890       -2.580
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0010.

. dfuller L2.queens

Dickey–Fuller test for unit root           Number of obs  = 100
Variable: L2.queens                        Number of lags =   0

H0: Random walk without drift, d = 0

                                        Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)           -4.086       -3.510       -2.890       -2.580
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0010.
```

```
. dfuller L3.queens

Dickey–Fuller test for unit root           Number of obs   = 99
Variable: L3.queens                        Number of lags  =  0

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -4.100       -3.511       -2.891       -2.580
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0010.

. dfuller L4.queens

Dickey–Fuller test for unit root           Number of obs   = 98
Variable: L4.queens                        Number of lags  =  0

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -4.093       -3.513       -2.892       -2.581
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0010.

. dfuller covid

Dickey–Fuller test for unit root           Number of obs   = 102
Variable: covid                            Number of lags  =   0

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -1.150       -3.509       -2.890       -2.580
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.6947.

. dfuller nyur

Dickey–Fuller test for unit root           Number of obs   = 102
Variable: nyur                             Number of lags  =   0

H0: Random walk without drift, d = 0

                                         Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -2.570       -3.509       -2.890       -2.580
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0994.
```

```
. dfuller std_min_wage

Dickey–Fuller test for unit root          Number of obs  = 102
Variable: std_min_wage                    Number of lags =   0

H0: Random walk without drift, d = 0

                                          Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)             0.125       -3.509       -2.890       -2.580
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.9677.

. dfuller mortgage_rate

Dickey–Fuller test for unit root          Number of obs  = 102
Variable: mortgage_rate                   Number of lags =   0

H0: Random walk without drift, d = 0

                                          Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -0.182       -3.509       -2.890       -2.580
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.9406.

. dfuller new_listing_count

Dickey–Fuller test for unit root          Number of obs  = 102
Variable: new_listing_co~t                Number of lags =   0

H0: Random walk without drift, d = 0

                                          Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -3.569       -3.509       -2.890       -2.580
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.0064.

. dfuller median_square_feet

Dickey–Fuller test for unit root          Number of obs  = 102
Variable: median_square_~t                Number of lags =   0

H0: Random walk without drift, d = 0

                                          Dickey–Fuller
                 Test      ———————— critical value ————————
               statistic           1%           5%          10%
———————————————————————————————————————————————————————————
 Z(t)            -0.534       -3.509       -2.890       -2.580
———————————————————————————————————————————————————————————
MacKinnon approximate p-value for Z(t) = 0.8852.
```

```
.
. *create a time variable to account for time trends in the data*
. gen t = _n

.
. *use the Engle-Granger test to see whether Manhattan and Brooklyn models are c
> ointegrated as they follow a unit root process*
. reg manhattan covid L.manhattan L2.manhattan L3.manhattan L4.manhattan nyur st
> d_min_wage mortgage_rate median_square_feet new_listing_count t
```

Source	SS	df	MS	Number of obs	=	99
				F(11, 87)	=	1014.09
Model	1.8436e+11	11	1.6760e+10	Prob > F	=	0.0000
Residual	1.4378e+09	87	16526746.6	R-squared	=	0.9923
				Adj R-squared	=	0.9913
Total	1.8579e+11	98	1.8958e+09	Root MSE	=	4065.3

manhattan	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
covid	-2627.119	3928.543	-0.67	0.505	-10435.52	5181.286
manhattan						
L1.	1.148968	.1041939	11.03	0.000	.9418718	1.356065
L2.	.1810614	.159618	1.13	0.260	-.1361967	.493195
L3.	-.2664232	.158069	-1.69	0.095	-.5806025	.047561
L4.	-.1460294	.1080303	-1.35	0.180	-.3607514	.066925
nyur	164.1425	395.9414	0.41	0.679	-622.8338	951.1189
std_min_wage	13612.35	10046.19	1.35	0.179	-6355.551	33580.25
mortgage_rate	1475.659	841.071	1.75	0.083	-196.0608	3147.379
median_square_feet	-15.75004	12.26626	-1.28	0.203	-40.13056	8.630486
new_listing_count	.1518282	.1203619	1.26	0.211	-.0874041	.391060
t	-242.0458	108.2027	-2.24	0.028	-457.1104	-26.98125
_cons	102571	42358.85	2.42	0.018	18378.22	186763.8

```
.
. predict mres, residuals
(4 missing values generated)
```

```
. dfuller mres

Dickey-Fuller test for unit root          Number of obs  = 98
Variable: mres                            Number of lags =  0

H0: Random walk without drift, d = 0

                                       Dickey-Fuller
                   Test        ———————— critical value ————————
              statistic           1%           5%          10%
──────────────────────────────────────────────────────────────

 Z(t)            -9.952       -3.513       -2.892       -2.581
──────────────────────────────────────────────────────────────

MacKinnon approximate p-value for Z(t) = 0.0000.

.
. reg brooklyn covid L.brooklyn L2.brooklyn L3.brooklyn L4.brooklyn nyur std_min
> _wage mortgage_rate median_square_feet new_listing_count t

      Source |       SS           df       MS      Number of obs   =        99
─────────────┼──────────────────────────────────   F(11, 87)       =     78.52
       Model |  1.7862e+10        11  1.6239e+09   Prob > F        =    0.0000
    Residual |  1.7993e+09        87  20681267.7   R-squared       =    0.9085
─────────────┼──────────────────────────────────   Adj R-squared   =    0.8969
       Total |  1.9662e+10        98   200630113   Root MSE        =    4547.7

───────────────────┬────────────────────────────────────────────────────────────
> ────
          brooklyn │ Coefficient  Std. err.      t    P>|t|     [95% conf. inter
> val]
───────────────────┼────────────────────────────────────────────────────────────
> ────
             covid │  -160.7492   4421.193    -0.04   0.971    -8948.348     862
> 6.85
                   │
          brooklyn │
               L1. │   .6554831   .1018466     6.44   0.000      .453052    .857
> 9142
               L2. │   .0853469   .1242091     0.69   0.494     -.161532    .332
> 2259
               L3. │   .2554328   .1222629     2.09   0.040     .0124221    .498
> 4436
               L4. │   -.300036   .0951639    -3.15   0.002    -.4891846   -.110
> 8875
                   │
              nyur │  -527.2816   441.8624    -1.19   0.236    -1405.531    350.
> 9677
      std_min_wage │   30992.42   11423.53     2.71   0.008     8286.913    5369
> 7.92
     mortgage_rate │   1456.429   716.8444     2.03   0.045     31.62291    2881
> .235
median_square_feet │   25.93915    17.1759     1.51   0.135    -8.199815    60.0
> 7811
 new_listing_count │   .0639247   .1381338     0.46   0.645    -.2106312    .338
> 4806
                 t │  -220.8594   110.6546    -2.00   0.049    -440.7974   -.921
> 4182
             _cons │   137463.4   42157.75     3.26   0.002     53670.28    2212
> 56.5
───────────────────┴────────────────────────────────────────────────────────────
> ────
```

```
.
. predict bres, residuals
(4 missing values generated)

. dfuller bres

Dickey-Fuller test for unit root           Number of obs   =        98
Variable: bres                             Number of lags  =         0

H0: Random walk without drift, d = 0

                                         Dickey-Fuller
                     Test            critical value
                statistic        1%           5%          10%
------------------------------------------------------------------------------
 Z(t)             -9.621       -3.513       -2.892       -2.581
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000.

.
. *test whether the residuals are stationary by testing for cointegration*
. gen lagmres = L.mres
(5 missing values generated)

. gen deltamres = mres - lagmres
(5 missing values generated)

. reg deltamres lagmres

      Source |       SS           df       MS      Number of obs   =        98
-------------+----------------------------------   F(1, 96)        =     99.04
       Model |  1.4825e+09         1  1.4825e+09   Prob > F        =    0.0000
    Residual |  1.4370e+09        96  14968926.9   R-squared       =    0.5078
-------------+----------------------------------   Adj R-squared   =    0.5027
       Total |  2.9195e+09        97  30098445.3   Root MSE        =      3869

------------------------------------------------------------------------------
   deltamres | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
     lagmres |  -1.021369   .1026304    -9.95   0.000    -1.225089   -.8176495
       _cons |   3.187615   390.8481     0.01   0.994    -772.6398    779.015
------------------------------------------------------------------------------

.
. gen lagbres = L.bres
(5 missing values generated)

. gen deltabres = bres - L.bres
(5 missing values generated)

. reg deltabres lagbres

      Source |       SS           df       MS      Number of obs   =        98
-------------+----------------------------------   F(1, 96)        =     92.56
       Model |  1.7328e+09         1  1.7328e+09   Prob > F        =    0.0000
    Residual |  1.7972e+09        96  18720849.3   R-squared       =    0.4909
-------------+----------------------------------   Adj R-squared   =    0.4856
       Total |  3.5300e+09        97  36391779.2   Root MSE        =    4326.8

------------------------------------------------------------------------------
   deltabres | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
     lagbres |  -.9837087    .102248    -9.62   0.000    -1.186669    -.780748
       _cons |   13.30079   437.0793     0.03   0.976    -854.2948    880.8964
------------------------------------------------------------------------------
```

```
.
. *generate graphs of the residuals for the unit root processes to visually ensu
> re they are stationary*
. twoway (line mres date)

. twoway (line bres date)

.
. *as the residuals are stationary for the unit root processes, and the unit roo
> t processes cointegrate, we can run the OLS regression using HAC-Robust Standa
> rd Errors to estimate the long term effect of COVID-19 regulations on the mont
> hly housing price index for each borough*
. newey manhattan covid L.manhattan L2.manhattan L3.manhattan L4.manhattan nyur
> std_min_wage mortgage_rate median_square_feet new_listing_count t, lag(4)

Regression with Newey-West standard errors      Number of obs     =         99
Maximum lag = 4                                 F( 11,        87) =    2113.51
                                                Prob > F          =     0.0000

------------------------------------------------------------------------------
> ----
             |             Newey-West
   manhattan | Coefficient  std. err.      t    P>|t|     [95% conf. inter
> val]
-------------+----------------------------------------------------------------
> ----
       covid |  -2627.119   2130.284    -1.23   0.221    -6861.289    1607
> .051
             |
   manhattan |
         L1. |   1.148968   .0973479    11.80   0.000     .9554789    1.34
> 2458
         L2. |   .1810614   .1702569     1.06   0.291    -.1573427    .519
> 4655
         L3. |  -.2664232     .17686    -1.51   0.136    -.6179516    .085
> 1052
         L4. |  -.1460294   .1076592    -1.36   0.178    -.3600138    .067
> 9549
             |
        nyur |   164.1425   206.0013     0.80   0.428    -245.3073    573.
> 5924
 std_min_wage |   13612.35   7763.172     1.75   0.083    -1817.798    2904
> 2.49
 mortgage_rate |   1475.659   772.4184     1.91   0.059     -59.6063    3010
> .924
median_square_feet |  -15.75004   7.848798    -2.01   0.048    -31.35037   -.149
> 7006
 new_listing_count |   .1518282   .1149426     1.32   0.190    -.0766326     .38
> 0289
         t |  -242.0458   74.19698    -3.26   0.002    -389.5204   -94.5
> 7127
     _cons |     102571   36641.72     2.80   0.006     29741.62    1754
> 00.4
------------------------------------------------------------------------------
> ----
```

```
.
. newey brooklyn covid L.brooklyn L2.brooklyn L3.brooklyn L4.brooklyn nyur std_m
> in_wage mortgage_rate median_square_feet new_listing_count t, lag(4)

Regression with Newey-West standard errors      Number of obs     =         99
Maximum lag = 4                                 F( 11,        87) =     108.59
                                                Prob > F          =     0.0000

------------------------------------------------------------------------------
> ----
             |             Newey-West
    brooklyn | Coefficient  std. err.      t    P>|t|     [95% conf. inter
> val]
-------------+----------------------------------------------------------------
> ----
       covid |  -160.7492   2348.033    -0.07   0.946    -4827.719    4506
> .221
             |
    brooklyn |
         L1. |   .6554831   .1225338     5.35   0.000      .411934    .899
> 0322
         L2. |   .0853469   .1140752     0.75   0.456    -.1413898    .312
> 0837
         L3. |   .2554328   .1195836     2.14   0.035     .0177476    .493
> 1181
         L4. |   -.300036   .0727393    -4.12   0.000    -.4446132   -.155
> 4588
             |
        nyur |  -527.2816   226.5111    -2.33   0.022     -977.497   -77.0
> 6628
 std_min_wage |   30992.42   12357.33     2.51   0.014     6430.878    5555
> 3.95
mortgage_rate |   1456.429   606.3052     2.40   0.018     251.3314    2661
> .526
median_square_feet |   25.93915   10.56826     2.45   0.016     4.933589     46.
> 9447
new_listing_count |   .0639247   .1008243     0.63   0.528    -.1364745    .264
> 3239
        t |  -220.8594   109.1736    -2.02   0.046    -437.8537   -3.86
> 5138
    _cons |   137463.4   30445.79     4.52   0.000     76949.08    1979
> 77.7
------------------------------------------------------------------------------
> ----

.
. newey queens covid L.queens L2.queens L3.queens L4.queens nyur std_min_wage mo
> rtgage_rate median_square_feet new_listing_count t, lag(4)

Regression with Newey-West standard errors      Number of obs     =         99
Maximum lag = 4                                 F( 11,        87) =     309.37
                                                Prob > F          =     0.0000

------------------------------------------------------------------------------
> ----
             |             Newey-West
     queens | Coefficient  std. err.      t    P>|t|     [95% conf. inter
> val]
-------------+----------------------------------------------------------------
> ----
       covid |    4195.22   1020.071     4.11   0.000     2167.719    6222
> .721
             |
     queens |
         L1. |   .8203688   .0846524     9.69   0.000     .6521129    .988
> 6246
         L2. |   .1426008   .1314005     1.09   0.281    -.1185719    .403
```

```
> 7735
               L3. |   .0641183   .1666721     0.38   0.701    -.2671605    .395
> 3971
               L4. |   -.077976   .1247571    -0.63   0.534    -.3259443    .169
> 9923
                   |
             nyur |  -711.7693   94.68445    -7.52   0.000    -899.9648   -523.
> 5737
      std_min_wage |   11200.93   6647.885     1.68   0.096     -2012.46    2441
> 4.32
     mortgage_rate |  -731.8383   301.4012    -2.43   0.017    -1330.906   -132.
> 7709
median_square_feet |   7.801844   6.094647     1.28   0.204    -4.311927    19.9
> 1562
 new_listing_count |  -.0455652   .0594208    -0.77   0.445    -.1636706    .072
> 5401
                 t |  -110.9628   80.97477    -1.37   0.174    -271.9089    49.9
> 8337
             _cons |   9447.802   14100.46     0.67   0.505    -18578.38    3747
> 3.98
-------------------+----------------------------------------------------------------
> ———

.
. *save the working file*
. save "C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMESTER 2\ECO475
> \Term Paper\Term_Paper_Restricted_Variables.dta", replace
file C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMESTER
    2\ECO475\Term Paper\Term_Paper_Restricted_Variables.dta saved

.
end of do-file

. log close
      name:  <unnamed>
       log:  C:\Users\dhair\OneDrive - University of Toronto\YEAR 3\SEMESTER 2\E
> CO475\Term Paper\475 Term Paper Log.smcl
  log type:  smcl
 closed on:  11 Apr 2025, 15:45:48
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