

Internet Appendix for “The Economic Drivers of Differences in House Price Inflation Rates across MSAs”

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January 12, 2016

Abstract

This study examines why monetary policy at the national level can have vastly different effects on appreciation rates of single family houses across metropolitan statistical areas (MSAs). The study employs Case/Shiller monthly house price index data for 19 MSAs from 1992:06 to 2014:12 and FHFA quarterly house price index data for 94 MSAs from 1992:3 to 2014:4. We model the importance of MSA-specific demand and supply characteristics through a set of interaction terms between these factors and monetary policy. The empirical analysis is cast in terms of a state-space approach with a stochastic trend component to absorb the impact of omitted variables. Robustness checks use panel data estimators with interaction terms. A lower federal funds rate is associated with home price run-ups in MSAs that are characterized by higher demand and tighter supply conditions.

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STATA input code

* Table 2 – Model (3) – lag 8

```
constraint 21 [z1]L.z1 = 1

constraint 1 [ld_atxrsa]z1 = 1
constraint 2 [ld_boxrsa]z1 = 1
constraint 3 [ld_cexrsa]z1 = 1
constraint 4 [ld_chxrsa]z1 = 1
constraint 5 [ld_crxrsa]z1 = 1
constraint 6 [ld_dexrsa]z1 = 1
constraint 7 [ld_dnxrsa]z1 = 1
constraint 8 [ld_lvxrsa]z1 = 1
constraint 9 [ld_lxxrsa]z1 = 1
constraint 10 [ld_mixrsa]z1 = 1
constraint 11 [ld_mnxrsa]z1 = 1
constraint 12 [ld_nyxrsa]z1 = 1
constraint 13 [ld_phxrsa]z1 = 1
constraint 14 [ld_poxrsa]z1 = 1
constraint 15 [ld_sdxrsa]z1 = 1
constraint 16 [ld_sexrsa]z1 = 1
constraint 17 [ld_sfxrsa]z1 = 1
constraint 18 [ld_tpxrsa]z1 = 1
constraint 19 [ld_wdxrsa]z1 = 1

constraint 40 [ld_atxrsa]L8.1_fedfunds = [ld_boxrsa]L8.1_fedfunds
constraint 41 [ld_atxrsa]L8.1_fedfunds = [ld_cexrsa]L8.1_fedfunds
constraint 42 [ld_atxrsa]L8.1_fedfunds = [ld_chxrsa]L8.1_fedfunds
constraint 43 [ld_atxrsa]L8.1_fedfunds = [ld_crxrsa]L8.1_fedfunds
constraint 44 [ld_atxrsa]L8.1_fedfunds = [ld_dexrsa]L8.1_fedfunds
constraint 45 [ld_atxrsa]L8.1_fedfunds = [ld_dnxrsa]L8.1_fedfunds
constraint 46 [ld_atxrsa]L8.1_fedfunds = [ld_lvxrsa]L8.1_fedfunds
constraint 47 [ld_atxrsa]L8.1_fedfunds = [ld_lxxrsa]L8.1_fedfunds
constraint 48 [ld_atxrsa]L8.1_fedfunds = [ld_mixrsa]L8.1_fedfunds
constraint 49 [ld_atxrsa]L8.1_fedfunds = [ld_mnxrsa]L8.1_fedfunds
constraint 50 [ld_atxrsa]L8.1_fedfunds = [ld_nyxrsa]L8.1_fedfunds
constraint 51 [ld_atxrsa]L8.1_fedfunds = [ld_phxrsa]L8.1_fedfunds
constraint 52 [ld_atxrsa]L8.1_fedfunds = [ld_poxrsa]L8.1_fedfunds
constraint 53 [ld_atxrsa]L8.1_fedfunds = [ld_sdxrsa]L8.1_fedfunds
constraint 54 [ld_atxrsa]L8.1_fedfunds = [ld_sexrsa]L8.1_fedfunds
constraint 55 [ld_atxrsa]L8.1_fedfunds = [ld_sfxrsa]L8.1_fedfunds
constraint 56 [ld_atxrsa]L8.1_fedfunds = [ld_tpxrsa]L8.1_fedfunds
constraint 57 [ld_atxrsa]L8.1_fedfunds = [ld_wdxrsa]L8.1_fedfunds

constraint 60 [ld_atxrsa]L8.1_fedfunds_umat = [ld_boxrsa]L8.1_fedfunds_udbo
constraint 61 [ld_atxrsa]L8.1_fedfunds_umat = [ld_cexrsa]L8.1_fedfunds_udce
constraint 62 [ld_atxrsa]L8.1_fedfunds_umat = [ld_chxrsa]L8.1_fedfunds_udch
constraint 63 [ld_atxrsa]L8.1_fedfunds_umat = [ld_crxrsa]L8.1_fedfunds_udcr
constraint 64 [ld_atxrsa]L8.1_fedfunds_umat = [ld_dexrsa]L8.1_fedfunds_udde
constraint 65 [ld_atxrsa]L8.1_fedfunds_umat = [ld_dnxrsa]L8.1_fedfunds_uddn
constraint 66 [ld_atxrsa]L8.1_fedfunds_umat = [ld_lvxrsa]L8.1_fedfunds_udlv
constraint 67 [ld_atxrsa]L8.1_fedfunds_umat = [ld_lxxrsa]L8.1_fedfunds_udlx
constraint 68 [ld_atxrsa]L8.1_fedfunds_umat = [ld_mixrsa]L8.1_fedfunds_udmi
constraint 69 [ld_atxrsa]L8.1_fedfunds_umat = [ld_mnxrsa]L8.1_fedfunds_udmn
constraint 70 [ld_atxrsa]L8.1_fedfunds_umat = [ld_nyxrsa]L8.1_fedfunds_udny
constraint 71 [ld_atxrsa]L8.1_fedfunds_umat = [ld_phxrsa]L8.1_fedfunds_udph
constraint 72 [ld_atxrsa]L8.1_fedfunds_umat = [ld_poxrsa]L8.1_fedfunds_udpo
constraint 73 [ld_atxrsa]L8.1_fedfunds_umat = [ld_sdxrsa]L8.1_fedfunds_udsd
constraint 74 [ld_atxrsa]L8.1_fedfunds_umat = [ld_sexrsa]L8.1_fedfunds_udse
constraint 75 [ld_atxrsa]L8.1_fedfunds_umat = [ld_sfxrsa]L8.1_fedfunds_udsf
constraint 76 [ld_atxrsa]L8.1_fedfunds_umat = [ld_tpxrsa]L8.1_fedfunds_udtp
constraint 77 [ld_atxrsa]L8.1_fedfunds_umat = [ld_wdxrsa]L8.1_fedfunds_udwd

constraint 80 [ld_atxrsa]L8.1_fedfunds_pgat = [ld_boxrsa]L8.1_fedfunds_pgbo
constraint 81 [ld_atxrsa]L8.1_fedfunds_pgat = [ld_cexrsa]L8.1_fedfunds_pgce
constraint 82 [ld_atxrsa]L8.1_fedfunds_pgat = [ld_chxrsa]L8.1_fedfunds_pgch
```

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constraint 83 [ld_atxrsa]L8.1_fedfunds_pgat = [ld_crxrsa]L8.1_fedfunds_pgr
constraint 84 [ld_atxrsa]L8.1_fedfunds_pgat = [ld_dexrsa]L8.1_fedfunds_pgde
constraint 85 [ld_atxrsa]L8.1_fedfunds_pgat = [ld_dnxrsa]L8.1_fedfunds_pgdn
constraint 86 [ld_atxrsa]L8.1_fedfunds_pgat = [ld_lvrxrsa]L8.1_fedfunds_pglv
constraint 87 [ld_atxrsa]L8.1_fedfunds_pgat = [ld_lxxrsa]L8.1_fedfunds_pglx
constraint 88 [ld_atxrsa]L8.1_fedfunds_pgat = [ld_mixrsa]L8.1_fedfunds_pgmi
constraint 89 [ld_atxrsa]L8.1_fedfunds_pgat = [ld_mnxrsa]L8.1_fedfunds_pgm
constraint 90 [ld_atxrsa]L8.1_fedfunds_pgat = [ld_nyxrsa]L8.1_fedfunds_pgny
constraint 91 [ld_atxrsa]L8.1_fedfunds_pgat = [ld_phxrsa]L8.1_fedfunds_pgph
constraint 92 [ld_atxrsa]L8.1_fedfunds_pgat = [ld_poxrsa]L8.1_fedfunds_pgpo
constraint 93 [ld_atxrsa]L8.1_fedfunds_pgat = [ld_sdxrsa]L8.1_fedfunds_pgsd
constraint 94 [ld_atxrsa]L8.1_fedfunds_pgat = [ld_sexrsa]L8.1_fedfunds_pgse
constraint 95 [ld_atxrsa]L8.1_fedfunds_pgat = [ld_sfxrsa]L8.1_fedfunds_pgsf
constraint 96 [ld_atxrsa]L8.1_fedfunds_pgat = [ld_tpxrsa]L8.1_fedfunds_pgt
constraint 97 [ld_atxrsa]L8.1_fedfunds_pgat = [ld_wdxrsa]L8.1_fedfunds_pgdw

```

```

constraint 100 [ld_atxrsa]L8.1_fedfunds_qlat = [ld_boxrsa]L8.1_fedfunds_qlbo
constraint 101 [ld_atxrsa]L8.1_fedfunds_qlat = [ld_cexrsa]L8.1_fedfunds_qlce
constraint 102 [ld_atxrsa]L8.1_fedfunds_qlat = [ld_chxrsa]L8.1_fedfunds_qlch
constraint 103 [ld_atxrsa]L8.1_fedfunds_qlat = [ld_crxrsa]L8.1_fedfunds_qlcr
constraint 104 [ld_atxrsa]L8.1_fedfunds_qlat = [ld_dexrsa]L8.1_fedfunds_qlde
constraint 105 [ld_atxrsa]L8.1_fedfunds_qlat = [ld_dnxrsa]L8.1_fedfunds_qldn
constraint 106 [ld_atxrsa]L8.1_fedfunds_qlat = [ld_lvrxrsa]L8.1_fedfunds_qllv
constraint 107 [ld_atxrsa]L8.1_fedfunds_qlat = [ld_lxxrsa]L8.1_fedfunds_qllx
constraint 108 [ld_atxrsa]L8.1_fedfunds_qlat = [ld_mixrsa]L8.1_fedfunds_qlmi
constraint 109 [ld_atxrsa]L8.1_fedfunds_qlat = [ld_mnxrsa]L8.1_fedfunds_qlmn
constraint 110 [ld_atxrsa]L8.1_fedfunds_qlat = [ld_nyxrsa]L8.1_fedfunds_qlny
constraint 111 [ld_atxrsa]L8.1_fedfunds_qlat = [ld_phxrsa]L8.1_fedfunds_qlph
constraint 112 [ld_atxrsa]L8.1_fedfunds_qlat = [ld_poxrsa]L8.1_fedfunds_qlpo
constraint 113 [ld_atxrsa]L8.1_fedfunds_qlat = [ld_sdxrsa]L8.1_fedfunds_qlsd
constraint 114 [ld_atxrsa]L8.1_fedfunds_qlat = [ld_sexrsa]L8.1_fedfunds_qlse
constraint 115 [ld_atxrsa]L8.1_fedfunds_qlat = [ld_sfxrsa]L8.1_fedfunds_qlsf
constraint 116 [ld_atxrsa]L8.1_fedfunds_qlat = [ld_tpxrsa]L8.1_fedfunds_qltp
constraint 117 [ld_atxrsa]L8.1_fedfunds_qlat = [ld_wdxrsa]L8.1_fedfunds_qlwd

```

```

sspace ///
(ld_atxrsa z1 L8.1_fedfunds L8.1_fedfunds_umat L8.1_fedfunds_pgat L8.1_fedfunds_qlat ,noconstant) ///
(ld_boxrsa z1 L8.1_fedfunds L8.1_fedfunds_udbo L8.1_fedfunds_pgbo L8.1_fedfunds_qlbo ,noconstant) ///
(ld_cexrsa z1 L8.1_fedfunds L8.1_fedfunds_udce L8.1_fedfunds_pgce L8.1_fedfunds_qlce ,noconstant) ///
(ld_chxrsa z1 L8.1_fedfunds L8.1_fedfunds_udch L8.1_fedfunds_pgch L8.1_fedfunds_qlch ,noconstant) ///
(ld_crxrsa z1 L8.1_fedfunds L8.1_fedfunds_udcr L8.1_fedfunds_pgr L8.1_fedfunds_qlcr ,noconstant) ///
(ld_dexrsa z1 L8.1_fedfunds L8.1_fedfunds_udde L8.1_fedfunds_pgde L8.1_fedfunds_qlde ,noconstant) ///
(ld_dnxrsa z1 L8.1_fedfunds L8.1_fedfunds_uddn L8.1_fedfunds_pgdn L8.1_fedfunds_qldn ,noconstant) ///
(ld_lvrxrsa z1 L8.1_fedfunds L8.1_fedfunds_udlv L8.1_fedfunds_pglv L8.1_fedfunds_qllv ,noconstant) ///
(ld_lxxrsa z1 L8.1_fedfunds L8.1_fedfunds_udlx L8.1_fedfunds_pglx L8.1_fedfunds_qllx ,noconstant) ///
(ld_mixrsa z1 L8.1_fedfunds L8.1_fedfunds_udmi L8.1_fedfunds_pgmi L8.1_fedfunds_qlmi ,noconstant) ///
(ld_mnxrsa z1 L8.1_fedfunds L8.1_fedfunds_udmn L8.1_fedfunds_pgm L8.1_fedfunds_qlmn ,noconstant) ///
(ld_nyxrsa z1 L8.1_fedfunds L8.1_fedfunds_udny L8.1_fedfunds_pgny L8.1_fedfunds_qlny ,noconstant) ///
(ld_phxrsa z1 L8.1_fedfunds L8.1_fedfunds_udph L8.1_fedfunds_pgph L8.1_fedfunds_qlph ,noconstant) ///
(ld_poxrsa z1 L8.1_fedfunds L8.1_fedfunds_udpo L8.1_fedfunds_pgpo L8.1_fedfunds_qlpo ,noconstant) ///
(ld_sdxrsa z1 L8.1_fedfunds L8.1_fedfunds_uds L8.1_fedfunds_pgsd L8.1_fedfunds_qlsd ,noconstant) ///
(ld_sexrsa z1 L8.1_fedfunds L8.1_fedfunds_udse L8.1_fedfunds_pgse L8.1_fedfunds_qlse ,noconstant) ///
(ld_sfxrsa z1 L8.1_fedfunds L8.1_fedfunds_udsf L8.1_fedfunds_pgsf L8.1_fedfunds_qlsf ,noconstant) ///
(ld_tpxrsa z1 L8.1_fedfunds L8.1_fedfunds_udtp L8.1_fedfunds_pgt L8.1_fedfunds_qltp ,noconstant) ///
(ld_wdxrsa z1 L8.1_fedfunds L8.1_fedfunds_udwd L8.1_fedfunds_pgdw L8.1_fedfunds_qlwd ,noconstant) ///
(z1 L.z1, state noconstant) if tin(1992m5,2008m12), ///
constraints(1/19 21 40/57 60/77 80/97 100/117) covobserved(dscalar) difficult

```

* Table 4 – lag 8

```
constraint 21 [z1]L.z1 = 1
```

```
constraint 1 [ld_atxrsa]z1 = 1
constraint 2 [ld_boxrsa]z1 = 1
constraint 3 [ld_cexrsa]z1 = 1
constraint 4 [ld_chxrsa]z1 = 1
constraint 5 [ld_crxrsa]z1 = 1
constraint 6 [ld_dexrsa]z1 = 1
constraint 7 [ld_dnxrsa]z1 = 1
constraint 8 [ld_lvxrsa]z1 = 1
constraint 9 [ld_lxxrsa]z1 = 1
constraint 10 [ld_mixrsa]z1 = 1
constraint 11 [ld_mnxrsa]z1 = 1
constraint 12 [ld_nyxrsa]z1 = 1
constraint 13 [ld_phxrsa]z1 = 1
constraint 14 [ld_poxrsa]z1 = 1
constraint 15 [ld_sdxrsa]z1 = 1
constraint 16 [ld_sexrsa]z1 = 1
constraint 17 [ld_sfxrsa]z1 = 1
constraint 18 [ld_tpxrsa]z1 = 1
constraint 19 [ld_wdxrsa]z1 = 1
```

```
sspace ///
(ld_atxrsa z1 L8.1_fedfunds , noconstant) ///
(ld_boxrsa z1 L8.1_fedfunds , noconstant) ///
(ld_cexrsa z1 L8.1_fedfunds , noconstant) ///
(ld_chxrsa z1 L8.1_fedfunds , noconstant) ///
(ld_crxrsa z1 L8.1_fedfunds , noconstant) ///
(ld_dexrsa z1 L8.1_fedfunds , noconstant) ///
(ld_dnxrsa z1 L8.1_fedfunds , noconstant) ///
(ld_lvxrsa z1 L8.1_fedfunds , noconstant) ///
(ld_lxxrsa z1 L8.1_fedfunds , noconstant) ///
(ld_mixrsa z1 L8.1_fedfunds , noconstant) ///
(ld_mnxrsa z1 L8.1_fedfunds , noconstant) ///
(ld_nyxrsa z1 L8.1_fedfunds , noconstant) ///
(ld_phxrsa z1 L8.1_fedfunds , noconstant) ///
(ld_poxrsa z1 L8.1_fedfunds , noconstant) ///
(ld_sdxrsa z1 L8.1_fedfunds , noconstant) ///
(ld_sexrsa z1 L8.1_fedfunds , noconstant) ///
(ld_sfxrsa z1 L8.1_fedfunds , noconstant) ///
(ld_tpxrsa z1 L8.1_fedfunds , noconstant) ///
(ld_wdxrsa z1 L8.1_fedfunds , noconstant) ///
(z1 L.z1, state noconstant) if tin(1992m5,2008m12), ///
constraints(1/19 21) covobserved(dscalar) difficult
```

Table 6 – lag 8

```
*****
* methods for small N and large T
* quadratic time trend
*****

* common AR(1)
* no correlation or heteroskedasticity allowed across panels

xtregar dln_p L8.l_ff L8.l_ff_ud L8.l_ff_pg L8.l_ff_ql t t2 if tin(1992m5,2008m12), fe

* common AR(1)
* standard errors corrected for heteroskedasticity and correlation across panels

xtpcse dln_p L8.l_ff L8.l_ff_ud L8.l_ff_pg L8.l_ff_ql t t2 if tin(1992m5,2008m12), corr(ar1)

* panel specific AR(1)
* standard errors corrected for heteroskedasticity and correlation across panels

xtpcse dln_p L8.l_ff L8.l_ff_ud L8.l_ff_pg L8.l_ff_ql t t2 if tin(1992m5,2008m12), corr(psar1)

* panel specific AR(1)
* standard errors corrected for heteroskedasticity across panels

xtgls dln_p L8.l_ff L8.l_ff_ud L8.l_ff_pg L8.l_ff_ql t t2 if tin(1992m5,2008m12), corr(psar1) ///
panels(heteroskedastic)
```