Can Easy Credit Explain the Housing Bubble?

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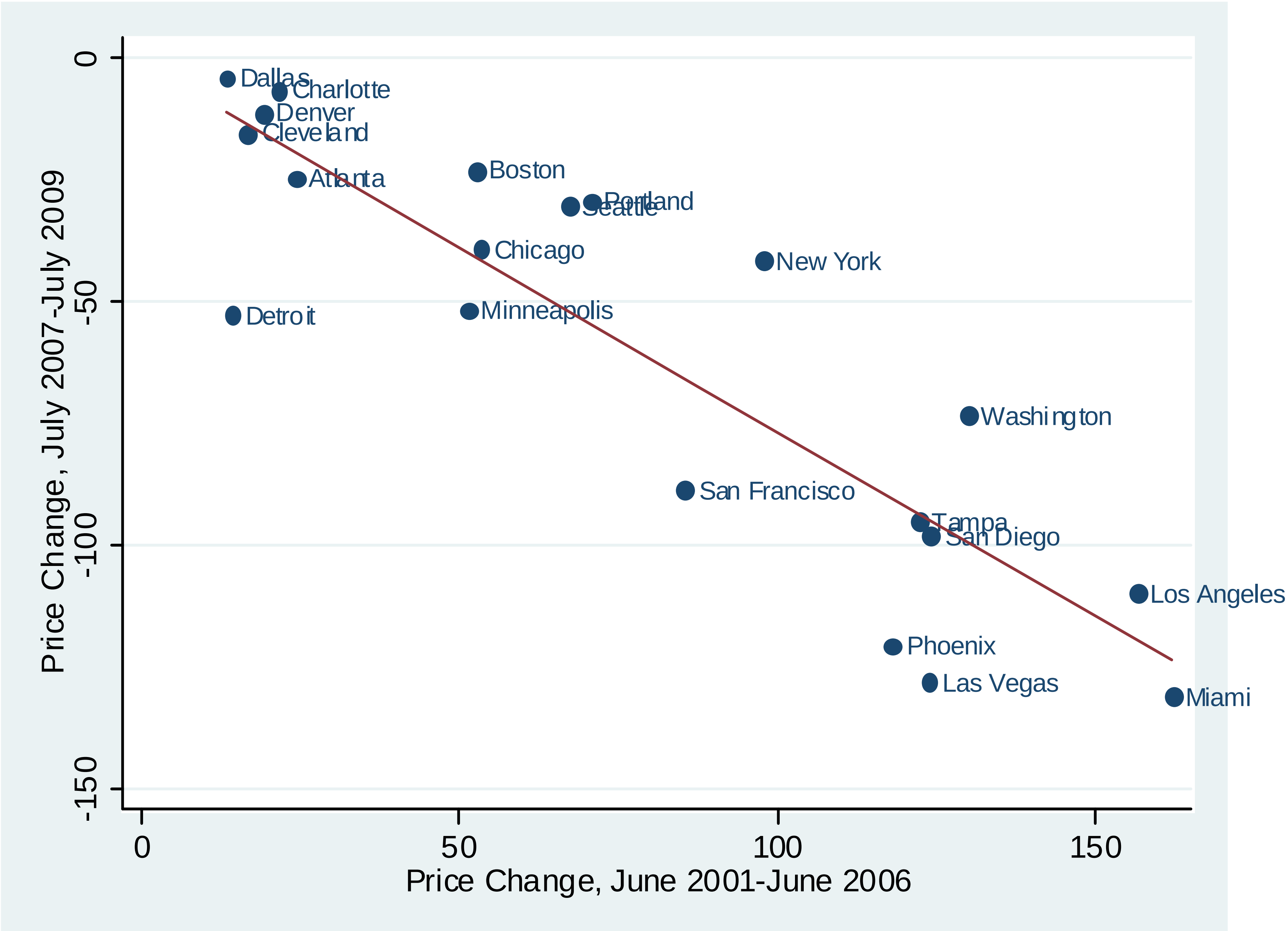

Dallas
Charlotte
Denver
Cleveland
Atlanta
Boston
Portland
Seattle
Chicago
New York
Detroit
Minneapolis
Washington
San Francisco
Tampa
San Diego
Los Angeles
Phoenix
Las Vegas
Miami
0
-50
-100
-150
Price Change, July 2007-July 2009
0
50
100
150
Price Change, June 2001-June 2006

The Credit Market View

- Many prominent economists have been associated with the view that low interest rates are responsible for the bubble.
- Basic logic is that the cost of carrying a home is
  - (Interest Rate+Local Taxes+Etc.) * Prices
- If the cost of renting and ownership are equal, then price rises offset interest rate decline.
- During the boom, this logic justified high prices. (“Bubble Trouble, Not Likely”).

Four Forces that Reduce the Interest Rate-Housing Price Connection

- Elastic Housing Supply
- Interest Rates Change and People will think about selling.
- Interest Rates Change and people can refinance.
- People don't necessarily value future price gains more if interest rates fall.
- These effects can reduce the expected interest rate-house connection by more than ¾.

Partial Equilibrium Calculation

- Assume that rents are constant– perhaps pinned by down by spatial equilibrium
- Expected cost of housing should be equal between renting and owning (Poterba, 1984, Glaeser and Gyourko, 2009).
- Cost of renting is or

$$\sum_{j=1}^{\infty}\left(\frac{1-\delta}{1+\rho_t^{t+j}}\right)^j \frac{1}{1-\delta} R_{t+j-1} \qquad \frac{R_t}{\rho_t+\delta+\delta g-g}$$

Cost of Owning

- Expected cost of owning is

$$P_t + \sum_{j=1}^{\infty} \left(\frac{1-\delta}{1+\rho_t^{t+j}} \right)^j \frac{1}{1-\delta} \left\{ \begin{matrix} r_{t+j}(1-\varphi)(1-\theta)P_t + \tau(1+g)^{j-1}P_t \\ \delta[P_{t+j} \quad (1 \quad \theta)P_t] \end{matrix} \right\}$$

- Or with constant parameter values the Price/Rent ratio is

$$\frac{R_t}{P_t} = \theta\hat{\rho}(\hat{r}) - \varphi\pi + (1-\theta)(1-\varphi)\hat{r} - \hat{g} + \tau + (\hat{g}+\pi)(1-\theta)(1-\delta)\frac{\hat{\rho}(\hat{r}) - (1-\varphi)\hat{r}}{\hat{\rho}(\hat{r}) + (1-\varphi)\pi + \delta}$$

The Impact of Interest Rates on Prices

- Real growth housing is one percent.
- Real interest rate is four percent.
- Inflation is 3.2 percent.
- Marginal tax rate is 25 percent.
- Downpayment requirement is 20 percent.
- Non-interest costs are 3.5 percent per year.
- Six percent chance of mobility.

The relationship between private and market rates

- In the usual setting, the value of $(1-\phi)r=\rho$
- But that need not be the case if people are credit constrained– we are particularly interested in decoupling the derivative.
- If $(1-\phi)r=\rho=.03$, the semi-elasticity is $8.2+10.3*\rho'(r)$.
- If growth equals 2 percent, then the formula is $9.3+14.7*\rho'(r)$.

Relationship with Downpayments

- If people are not credit constrained (i.e. if $(1-\phi)r=\rho$), then the downpayment requirement doesn't impact prices.
- If this is not the case, and $(1-\phi)r=.03$, but $\rho=.06$, then the semi-elasticity is .37. So a ten percent change in downpayment is 3.7 percent in prices.
- Changes in approval are demand shifts – unless the buyers differ in willingness to pay.

Simulations for stochastic interest rates

- Cox-Ingersoll-Ross interest rate process
- r(t+1)=.25*r(t)+.75*.067+e
- Average nominal rate of 6.7 percent (3.5 percent real), and parameters based on Cairns (2004).
- We give results both assuming that $(1-\phi)r=\rho$ and not. Results when they are decoupled are always modest.

Table 1: Semi-elasticities with Linked Discount Rates and Interest Rates

	(1)	(2)	(3)	(4)	(5)	(6)
Mobility:	0%	0%	6%	6%	6%	6%
Prepayment:	None	Perfect	None	Perfect	Perfect	Perfect
Downpayment:	20%	20%	20%	20%	2%	20%
Growth:	1%	1%	1%	1%	1%	2%
Real r=.03	-26.30	-24.00	-8.03	-5.90	-5.36	-6.72
Real r=.04	-15.90	-12.03	-7.61	-5.57	-5.04	-6.30
Real r=.05	-13.71	-9.55	-7.28	-5.39	-4.88	-6.05
Real r=.06	-12.06	-8.00	-6.90	-5.10	-4.60	-5.70
Real r=.07	-10.76	-7.01	-6.61	-4.90	-4.42	-5.46

Table 2: Semi-elasticities with Discount Rates Delinked from Interest Rates

	(1)	(2)	(3)	(4)	(5)	(6)
Mobility:	0%	0%	6%	6%	6%	6%
Prepayment:	None	Perfect	None	Perfect	Perfect	Perfect
Downpayment:	20%	20%	20%	20%	2%	20%
Growth:	1%	1%	1%	1%	1%	2%
Real r=.03	-4.51	-0.91	-4.13	-1.88	-2.45	-1.81
Real r=.04	-4.31	-0.90	-3.98	-1.74	-2.26	-1.68
Real r=.05	-4.14	-0.91	-3.86	-1.70	-2.19	-1.64
Real r=.06	-3.97	-0.88	-3.71	-1.56	-2.01	-1.51
Real r=.07	-3.82	-0.85	-3.59	-1.47	-1.89	-1.42

Table 3: Price-Rent Ratios with Discount Rates Delinked From Interest Rates

		Changing Discount Rates:				Slopes:
	$\theta \backslash \rho$:	0.03	0.06	0.1	0.2	
Changing	0	3.47	3.25	3.08	2.89	-3.12
Down	0.05	3.44	3.20	3.01	2.76	-3.75
Payments	0.1	3.42	3.15	2.94	2.64	-4.34
	0.2	3.37	3.07	2.81	2.43	-5.28
	Slopes:	-0.45	-0.86	-1.34	-2.31	

Elastic Housing Supply

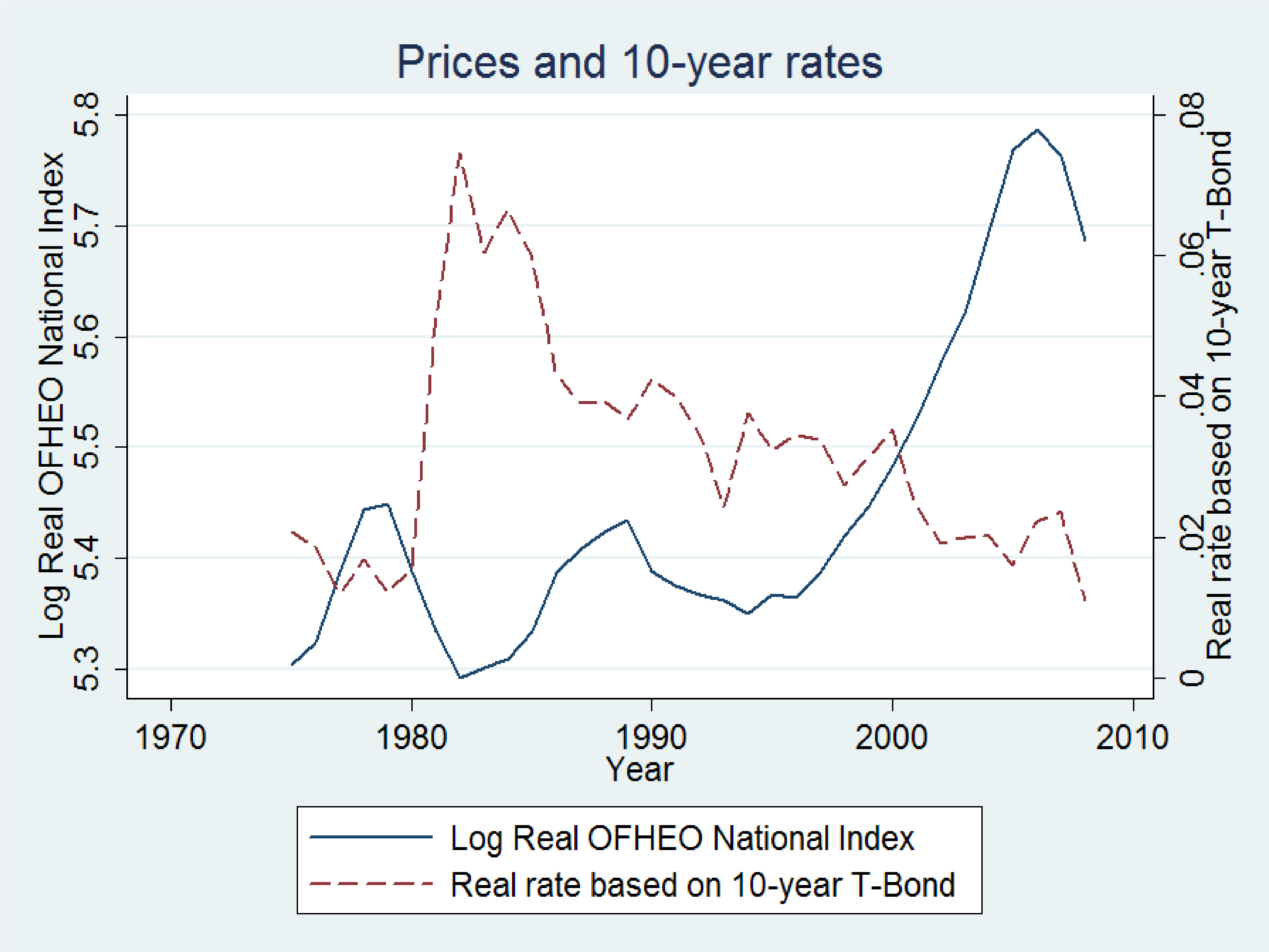
- Cost of production (which must equal price) is equal to a constant c(New Homes)$^{\beta}$
- Flow of utility from the area is declining with the number of buyers (γ slope)
- We assume purchases are permanent.
- Semi-elasticity is $-\beta/(\beta+\gamma)*(2.8+17.5\ \rho'(r))$
- Ratio of inverse-supply elasticity to sum of supply and demand (.5/1.2).

Conclusions from the Theory

- It’s not interest rates don’t matter, but we shouldn’t be confident about a huge effect
- G.E. effects go in different directions.
  - If IR is exogenous and impacts wealth (low IR, high income) then this could cause prices to rise.
  - If IR are low reflects time when money is valuable, then then this might mean prices are low then.
  - Presence of elasticity in some places mutes the price effect even in inelastic areas.

What Does the Data Say?

- Between 2000 and 2006, real rates fell by 1.3 percentage points and real prices rose by 74 percent (Case/Shiller) or 30 percent (FHFA).
- The longer-term relationship between prices and rates is 6.8 percent per 100 basis points.
- Effect is slightly larger at low rates and in inelastic housing markets (8 percent).
- At best, this gives you a 10.4 percent increase in prices– which doesn’t explain the boom.



Prices and 10-year rates
Log Real OFHEO National Index
5.3
5.4
5.5
5.6
5.7
5.8
Real rate based on 10-year T-Bond
0
.02
.04
.06
.08
1970
1980
1990
2000
2010
Year
Log Real OFHEO National Index
Real rate based on 10-year T-Bond

Table 6: Semi-Elasticity of National House Prices
Dependent variable: log national house prices

VARIABLES	(1) Log Price	(2) Log Price	(3) Log Price	(4) Log Price	(5) Log Price	(6) Log Price	(7) Log Price	(8) Log Price
Real 10-year rate	-6.83**	-1.82	-10.5**	-1.16				
	(1.85)	(.16)	(2.58)	(3.17)				
Change in real 10-year rate					-1.44*			
					(0.53)			
Real 10-year rate, 1.5-3.4%						-13.3**	-8.00	
						(3.73)	(1.98)	
Real 10-year rate, 3.4-7.5%						-3.05**	1.48	
						(0.85)	(1.56)	
Linear time trend		0.012**		0.016			0.012**	
		(0.0036)		(0.0068)			(0.0027)	
Romer and Romer shock								0.36
								(1.37)
Constant	5.70**	5.28**	5.82**	5.16**	0.0081	5.86**	5.44**	0.0075
	(0.088)	(0.10)	(0.096)	(0.24)	(0.0090)	(0.13)	(0.072)	(0.011)
Observations	29	29	24	24	29	29	29	29
R^2	0.50	0.72	0.57	0.71	0.16	0.61	0.81	0.0048
Years	1980-2008	1980-2008	1985-2008	1985-2008	1980-2008	1980-2008	1980-2008	1980-2008

Standard errors, in parenthesis, are adjusted for heteroskedasticity and autocorreleation using the Newey-West method with 2 lags.
**p<0.01 *p<0.05 +p<0.1

Table 7: Differential Elasticities by Saiz's Supply Elasticity

Dependant variables: log average price index for elastic or inelastic cities.

	(1) Elastic	(2) Elastic	(3) Elastic	(4) Ineleastic	(5) Inelastic	(6) Inelastic
Real 10-year rate	-1.35	-0.38		-10.9**	-2.41*	
	(1.24)	(1.73)		(2.63)	(0.91)	
Real 10-year rate, 1.5-3.4%			-7.98**			-7.82*
			(1.41)			(3.48)
Real 10-year rate, 3.4-7.5%			3.68**			0.47
			(1.15)			(2.39)
Linear time trend		0.0024	0.0019		0.021**	0.021**
		(0.0039)	(0.0022)		(0.0045)	(0.0042)
Constant	4.89**	4.81**	5.02**	5.25	5.53**	4.68**
	(0.052)	(0.14)	(0.077)	(0.13)	(0.10)	(0.11)
Observations	29	29	29	29	29	29
R^2	0.076	0.11	0.61	0.53	0.78	0.81

Standard errors, in parenthesis, are adjusted for heteroskedasticity and autocorrelation using the Newey-West method with 2 lags. Data are from 1980-2008. $^{**}p<0.01$, $^{*}p<0.05$, $+ p<0.1$

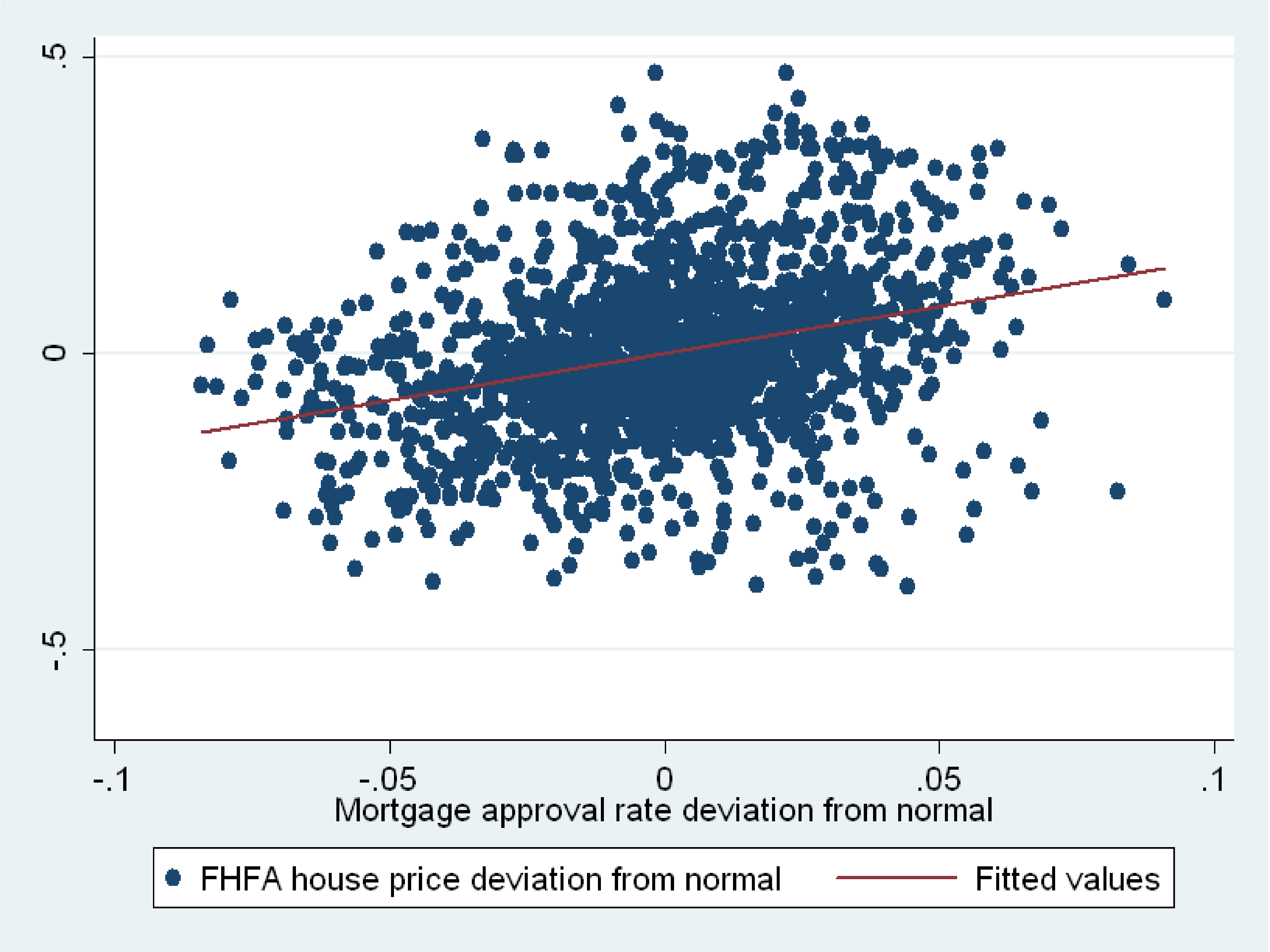

.5
0
-.5
-.1
-.05
0
.05
.1
Mortgage approval rate deviation from normal
FHFA house price deviation from normal
Fitted values

Table 8: Effect of Credit Availability on Prices
Dependent variable: Log MSA house Prices

	(1) OLS	(2) IV	(3) OLS	(4) OLS	(5) IV	(6) OLS	(7) IV
MSA adjusted approval rate	0.77**	2.52**	0.62**	2.10+	3.43+	1.37	1.31
	(0.18)	(0.83)	(0.22)	(1.19)	(1.77)	(1.20)	(2.09)
Mean loan-to-value in MSA				0.54*	0.54*	0.47*	0.39
				(0.26)	(0.23)	(0.20)	(0.24)
Linear trend X January temperature/10	0.0028**	0.00015					
	(0.0010)	(0.0016)					
Linear trend X Wharton regulation index	0.0053**	0.0040*					
	(0.0011)	(0.0012)					
Log income						1.07**	1.87**
						(0.21)	(0.52)
Observations	2147	2147	2147	616	616	616	616
Adjusted R^2	0.767	0.719	0.821	0.807	0.793	0.943	0.847
Fixed Effects	MSA	MSA	State-Year	MSA	MSA	MSA	MSA
MSAs	113	113	113	56	56	56	56
Years	1990-2008	1990-2008	1990-2008	1998-2008	1998-2008	1998-2008	1998-2008
First-stage F statistic		8.91			7.20		5.49

Standard errors, in parenthesis, are clustered by MSA. All regressions include year fixed effects. Real ten-year interest rate interacted with branch banking regulations and foreclosure speed instruments for approval rate. **p<0.01, *p<0.05, +p<0.1

Table 10: Effect of Credit Availability on Construction
Dependent variable: Log single-family permits in MSA

VARIABLES	(1) OLS	(2) IV	(3) OLS	(4) OLS	(5) IV	(6) OLS	(7) IV
Approval	2.85**	5.73*	-2.50	4.63**	5.81+	2.49**	5.47**
	(0.40)	(2.76)	(3.06)	(0.56)	(2.98)	(0.55)	(2.10)
Trend X temp/10	0.0034	-0.00089					
	(0.0025)	(0.0052)					
Trend X Wharton	-0.017**	-0.019**					
	(0.0023)	(0.0031)					
Mean LTV				-0.43	-0.43	-0.46	-0.72*
				(0.29)	(0.28)	(0.34)	(0.35)
Log inc.						1.07+	-0.17
						(0.56)	(0.71)
Observations	2146	2146	2146	616	616	560	560
Adjusted R^2	0.946	0.939	0.008	0.958	0.957	0.979	0.958
Fixed Effects	MSA	MSA	State-Year	MSA	MSA	MSA	MSA
MSAs	113	113	113	56	56	56	56
From	1990	1990	1990	1998	1998	1998	1998
to	2008	2008	2008	2008	2008	2007	2007
F		8.89			7.20		9.52

Robust standard errors in parentheses
** $p<0.01$, * $p<0.05$, + $p<0.1$

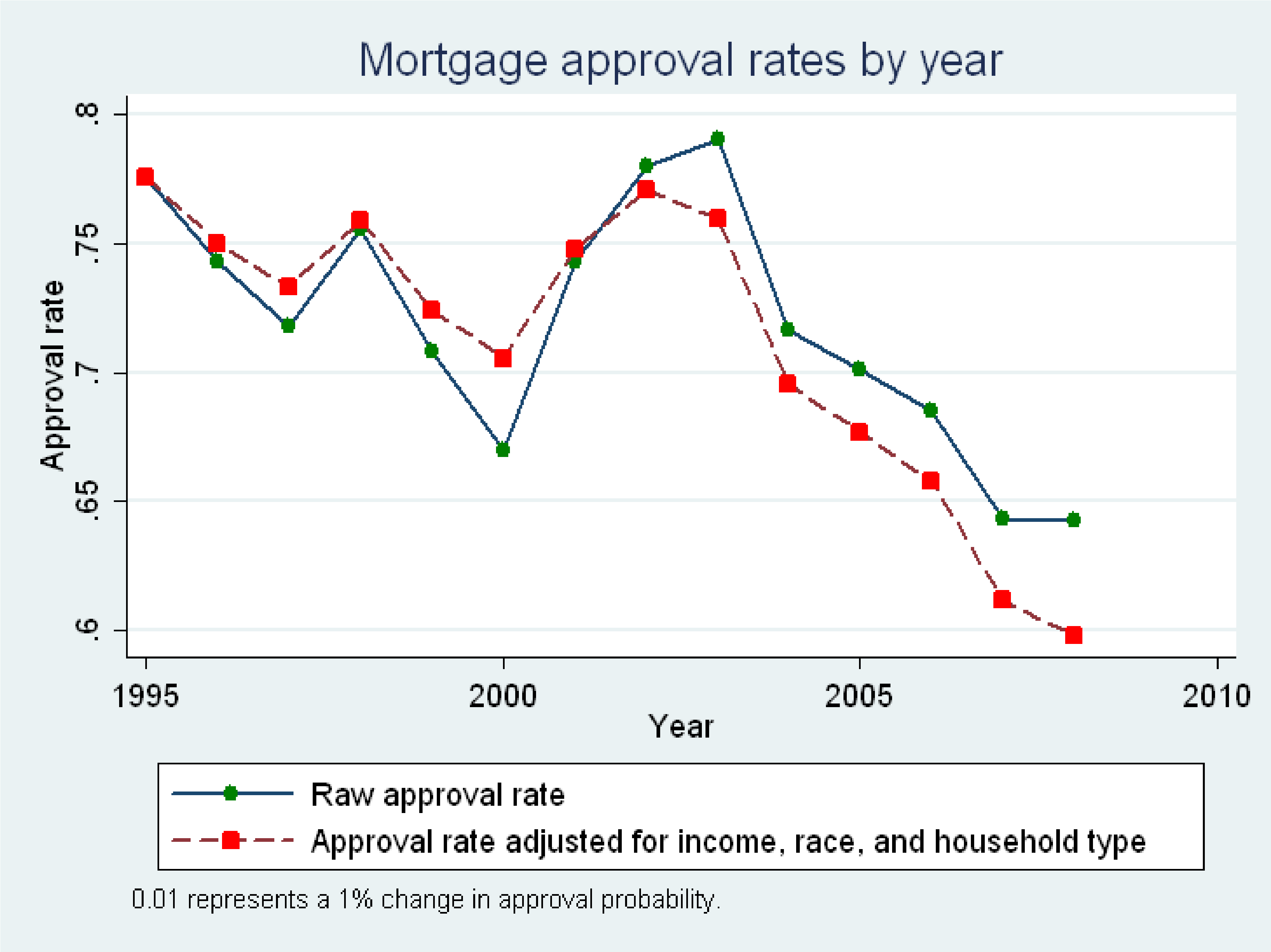

Mortgage approval rates by year
Approval rate
.6
.65
.7
.75
.8
1995
2000
2005
2010
Year
Raw approval rate
Approval rate adjusted for income, race, and household type
0.01 represents a 1% change in approval probability.

Table 9: Distribution of Loan-to-Value (LTV) Ratios by Year 75 Metropolitan Areas (DataQuick)			
Year	50th Percentile LTV	75th Percentile LTV	90th Percentile LTV
1998	0.84 (0.12)	0.96 (0.04)	1.00 (0.02)
1999	0.86 (0.06)	0.97 (0.04)	1.00 (0.02)
2000	0.85 (0.06)	0.96 (0.04)	1.01 (0.04)
2001	0.86 (0.06)	0.96 (0.03)	1.00 (0.02)
2002	0.84 (0.07)	0.96 (0.03)	1.00 (0.02)
2003	0.84 (0.12)	0.96 (0.03)	1.00 (0.01)
2004	0.83 (0.12)	0.96 (0.04)	1.00 (0.01)
2005	0.86 (0.06)	0.97 (0.04)	1.00 (0.01)
2006	0.88 (0.05)	0.99 (0.03)	1.00 (0.01)
2007	0.86 (0.12)	0.98 (0.03)	1.00 (0.01)
2008	0.80 (0.16)	0.96 (0.05)	0.99 (0.02)

	$d\ln P/dr \times \Delta r =$	Implied ΔP
	Panel A: Overall, 1996-2006	
From simulation with $r = \rho + \pi$:	-3.7 x -1.2% =	4.4%
From simulation with $r \neq \rho + \pi$:	-1.1 x -1.2% =	1.3%
From data:	-6.8 x -1.2% =	8.2%
Actual price growth:		42%
	Panel B: Biggest Change, 2000-2005	
From simulation with $r = \rho + \pi$:	-3.7 x -1.9% =	7.0%
From simulation with $r \neq \rho + \pi$:	-1.1 x -1.9% =	2.1%
From data:	-6.8 x -1.9% =	12.9%
Actual price growth:		29%
	Panel C: Crash, 2006-2008	
From simulation with $r = \rho + \pi$:	-3.7 x -1.1% =	4.1%
From simulation with $r \neq \rho + \pi$:	-1.1 x -1.1% =	1.2%
From data:	-6.8 x -1.1% =	7.5%
Actual price growth:		-10.1%

	dlnP/dr x Δr =	Implied ΔP
Panel A: Overall, 1996-2006		
From simulation with r = ρ + π:	-5.6 x -1.2% =	6.7%
From simulation with r ≠ ρ + π:	-1.7 x -1.2% =	2.0%
From data:	-10.9 x -1.2% =	13.1%
Actual price growth:		63%
Panel B: Biggest Change, 2000-2005		
From simulation with r = ρ + π:	-5.6 x -1.9% =	10.6%
From simulation with r ≠ ρ + π:	-1.7 x -1.9% =	3.2%
From data:	-10.9 x -1.9% =	20.7%
Actual price growth:		42%
Panel C: Crash, 2006-2008		
From simulation with r = ρ + π:	-5.6 x -1.1% =	6.2%
From simulation with r ≠ ρ + π:	-1.7 x -1.1% =	1.9%
From data: (actual is -15)	-6.8 x -1.1% =	12%

	d ln(p)/dw x Δw =	Implied ΔP
Panel A: Overall, 1996-2006		
From OLS estimate:	0.8 x -9.2%	-7.4%
From IV estimate:	2.5 x -9.2%	-23%
Actual price growth:		42%
Biggest Change: 2000-2003		
From OLS estimate:	0.8 x 5.4% =	4.3%
From IV estimate:	2.5 x 5.4% =	13.5%
Actual price growth:		14%
Crash: 2006-2008		
From OLS estimate:	0.8 x -6% =	-4.8%
From IV estimate:	2.5 x -6% =	-15%
Actual price growth:		-10.1%

	d ln(p)/dw x Δw =	Implied ΔP
	Panel A: Overall, 1996-2006	
From OLS estimate:	0.8 x -9.2%	-7.4%
From IV estimate:	2.5 x -9.2%	-23%
Actual price growth:		42%
	Biggest Change: 2000-2003	
From OLS estimate:	0.8 x 5.4% =	4.3%
From IV estimate:	2.5 x 5.4% =	13.5%
Actual price growth:		14%
	Crash: 2006-2008	
From OLS estimate:	0.8 x -6% =	-4.8%
From IV estimate:	2.5 x -6% =	-15%
Actual price growth:		-10.1%