

New Estimates of U.S. Housing Price Elasticities

The REMI Housing Price Equation

The percentage change in housing prices relative to the United States is related to the percentage change in the real disposable income relative to the United States and to the percentage change in the population relative to the United States. From the literature, growth in household disposable income and growth in population influence the demand for housing, as do other factors such as interest rate, the tax system and regulatory environment. These factors shift housing demand, thus changing the equilibrium housing price, given an elastic supply.

Beginning with version 9.0, the REMI model makes the U.S. elasticities, ϵ_1 and ϵ_2 , in the equation below specific to the regions being modeled by applying scaling factors to them.

$$PH_t = \left\{ \left[\epsilon_1 \left(\frac{RYD_t \div RYD_t^u}{RYD_{t-1} \div RYD_{t-1}^u} - 1 \right) + \epsilon_2 \left(\frac{N_t \div N_t^u}{N_{t-1} \div N_{t-1}^u} - 1 \right) \right] + 1 \right\} * PH_{t-1}$$

PH = Relative housing price

RYD = Real disposable income

N = population

Superscript u = United States

t = year

ϵ_1 = Real disposable income elasticity of relative housing price

ϵ_2 = Population elasticity of relative housing price

The Regression Estimating Equation

To estimate ϵ_1 and ϵ_2 the above equation is written in the following form,

$$\frac{PH_t}{PH_{t-1}} - 1 = \epsilon_1 \left(\frac{RYD_t \div RYD_t^u}{RYD_{t-1} \div RYD_{t-1}^u} - 1 \right) + \epsilon_2 \left(\frac{N_t \div N_t^u}{N_{t-1} \div N_{t-1}^u} - 1 \right)$$

Normally, in regression a constant term is included at the right-hand side to absorb the effects on housing price change of factors not explicitly stated in the equation. It was found, however, that the estimated constant was very close to zero and the estimated ϵ_1 and ϵ_2 were not materially changed by the inclusion of a constant term.

Past Estimates

The U.S. elasticities were last estimated in September 2001 using 1971-1998 data generated by the REMI model.

The regional scaling factors were estimated in September 2007. At that time, price elasticities of housing demand were estimated for each of the 50 states and D.C. and for 116 MSAs using the Freddie Mac Home Price Index for 1998-2004. The change in housing demand was represented by the number of building permits as a percentage of the housing stock. These sub-national elasticities were then transformed into scaling factors that were applied to the U.S. elasticities to make them specific to the regions being modeled.

Current Estimates

The current estimates of U.S. elasticities utilize data for 1990-2007. Three set of estimates are presented. One set relates to the 1990-2007 period. The second set uses the 1990-2003 data, which excludes the effect of the housing price bubble. The third set uses the 1998-2004 data, which excludes the effect of the housing price bubble and also aligns with the previous regional scaling factor estimates. The rationale for the later year exclusion is that since the elasticities are used to forecast trend and not cyclical fluctuations like recessions and bubbles, including the data for the years during the housing price bubble

would over-estimate the elasticities. The housing price index started to jump in 2004, reaching its highest point in the 2nd quarter of 2007.

Factors to convert U.S. elasticities into regional ones are not re-estimated at this time.

For the current estimation, housing price index comes from the Federal Housing Finance Agency website. Population and real disposable income come from the PI+ model.

Below is a table that compares current estimates with those being used in the PI+ model estimated in 2001.

Estimates of U.S. Housing Price Elasticities

	Current, 1990-2007	Current, 1990-2003	Current, 1998-2004	Past (9/2001), used in PI+
RYD elasticity of housing price	0.389 (0.059)	0.337 (0.068)	0.211 (0.118)	0.322 (n.a.)
Population elasticity of housing price	0.793 (0.125)	0.595 (0.131)	0.548 (0.262)	0.429 (n.a.)

Numbers enclosed in () are std errors

Regression Diagnostics

	t (1990- 2007)	t (1990- 2003)	t (1998- 2004)	T (Past estimates)
RYD elasticity of housing price	6.6	5.0	1.8	4.8
Population elasticity of housing price	6.4	4.6	2.1	3.1
N	867	663	306	1275
R-square	0.132	0.120	0.029	0.055

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