

Cyclical Housing Prices in Flatland

J. Williams, Professors Capital

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P. Krugman, 2005, *New York Times Op-Ed.*

“In Flatland, which occupies the middle of the country, it’s easy to build houses. When the demand for houses rises, Flatland metropolitan areas, which don’t really have traditional downtowns, just sprawl some more. As a result, housing prices are basically determined by the cost of construction. In Flatland a housing bubble can’t get started.”

Sand States: 2000-2011

25.5% median difference between annual appreciation rates during expansions vs contractions: Davidoff (2013).

Less price volatility for housing than land: Nathanson & Zwick (2015).

Booms with substantial speculation in SFR supported by subprime loans, etc.

Builders' Comments about Booms

Landowners raise their asking prices aggressively, often ahead of housing market.

Initially, few finished lots for sale. Later, no paper lots for sale. Still later, slow entitlement process.

Scarce skilled labor.

Literature on Real Options

Land prices at outer edge of city increase with expected growth rate of aggregate demand.

Problem: Exogenous Brownian motion inconsistent with (a) construction and endogenous housing prices and (b) low frequency business cycles.

Issue: Low-frequency cycles must have (endogenous) procyclical price-rent ratios.

Minimalist Model

Circular city surrounded by infinite supply of flat buildable land. Households and houses distinguished only by radial distance.

Poisson transitions between contractions & expansions. Low frequency. No early information.

All perfectly competitive agents equally informed. All risk-neutral. No capital constraints. No behavioral biases.

Proportional model: constant elasticities and growth rates.

Equilibrium

Housing rents equate aggregate demand and supply for perishable housing services at all radial distances.

Housing prices equal expected present value of future housing rents and sale prices during both expansions and contractions.

Land prices equal expected present value of future sale prices to developers, conditional on landowners' optimal exercise of their options to sell.

Houses supplied by perfectly competitive developers.

Three Propositions

1 Initial Model: Stagnant cold markets with constant aggregate demand.
Expanding hot markets with growing aggregate demand.

2 Main Model: Contractions with decreasing demand. Expansions with two phases: initial recovery followed by booms.

Recovery: Vacant housing from previous contraction, no construction.

Booms: Construction, no vacancies.

3 Extension: Construction costs increase with aggregate construction.

Results for Flatland

Procyclical housing appreciation and cumulative construction match median values in Sand States during 2000-2011: Davidoff (2013).

Construction only during booms, only at expanding outer edge of city. New house prices equal construction costs plus positive land prices. Positive land prices even as rent gradient approaches zero.

Slower sprawl and faster appreciation with steeper rent gradients or more rapidly increasing construction costs.

Results for All Metro Areas

Procyclical price-rent ratios lead procyclical rents.

Procyclical volatility greater for housing prices than rents.

Procyclical price volatility greater for land than housing.

Procyclical housing speculation. More speculation during booms with longer contractions or expansions or more appreciation during expansions.

Intuition: Price-rent ratios

All new information about future demand revealed to all investors during Poisson transitions. No previous or private information.

Rents depend on current aggregate demand and supply that change only over time. Rents do not change during instantaneous transitions.

Therefore, price-rent ratios change only during transitions. Must move up (down) during transitions to expansions (contractions). Changes anticipate subsequent changes in rents before the next transition.

Price volatility reflects the volatilities of both price-rent ratios and rents.

Intuition: Price volatility of housing vs land

At all times each investor must expect a total rate of return equal to the common, constant discount rate. Total expected return equals the rent-price ratio plus the expected rate of appreciation.

Land has no rent related to perishable housing services. Its expected appreciation during transitions from contractions to expansion must then exceed that of housing. Land's reciprocal fall in value during the reverse transition must also be greater. Therefore, land must have more procyclical price volatility than housing.

Contributions of Paper

Explanation of housing boom and bust in Sand States during 2000-2011 with additional empirical predictions.

First model of real options with a low-frequency business cycle. New solution technique with broader applications.

First model of real options with endogenous price-rent ratios. Other applications: cap rates in commercial real estate, etc.