An Extrapolative Model of House Price Dynamics

Edward L. Glaeser and Charles G. Nathanson

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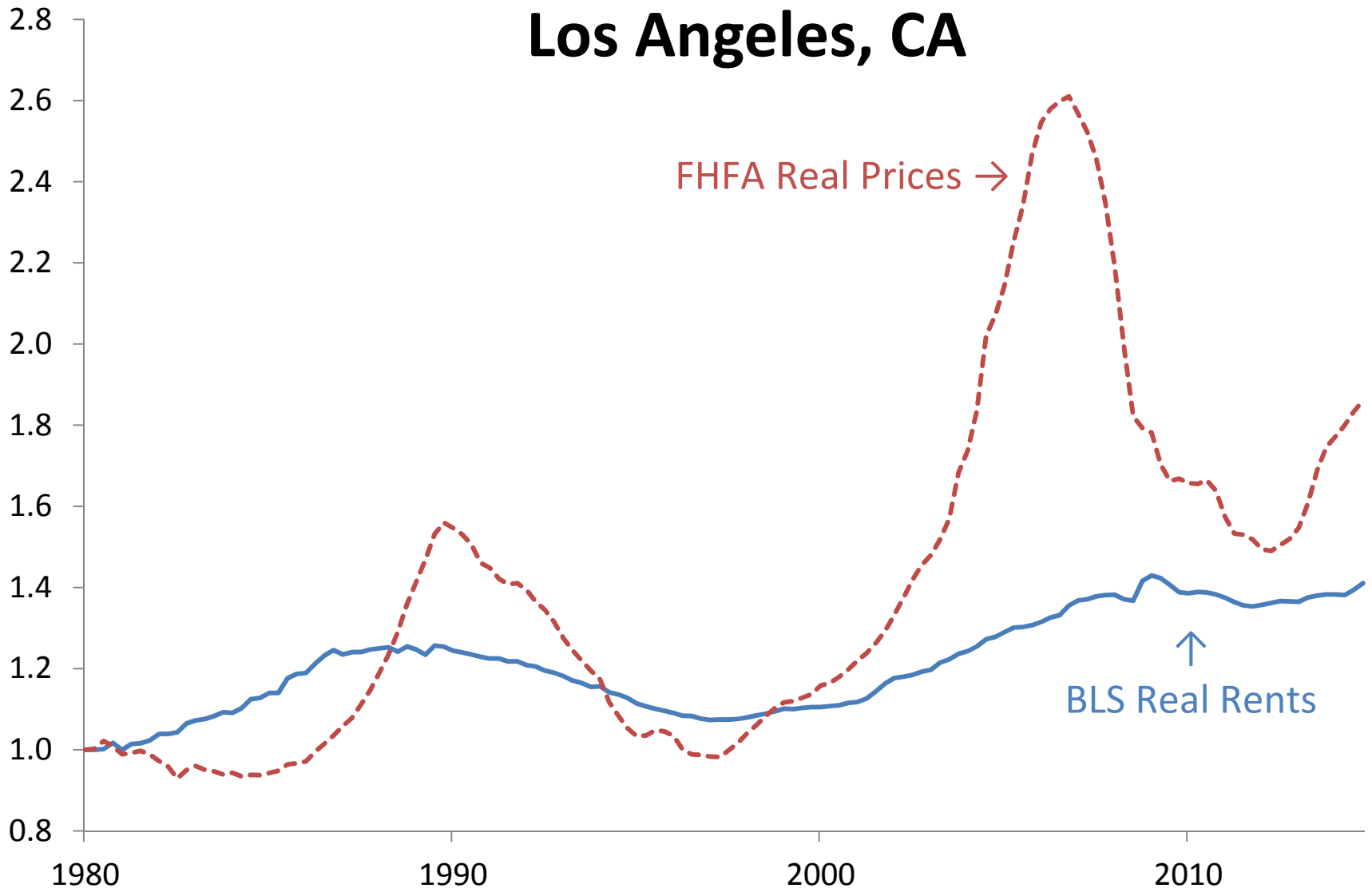
NORTHWESTERN UNIVERSITY

Kellogg School of Management

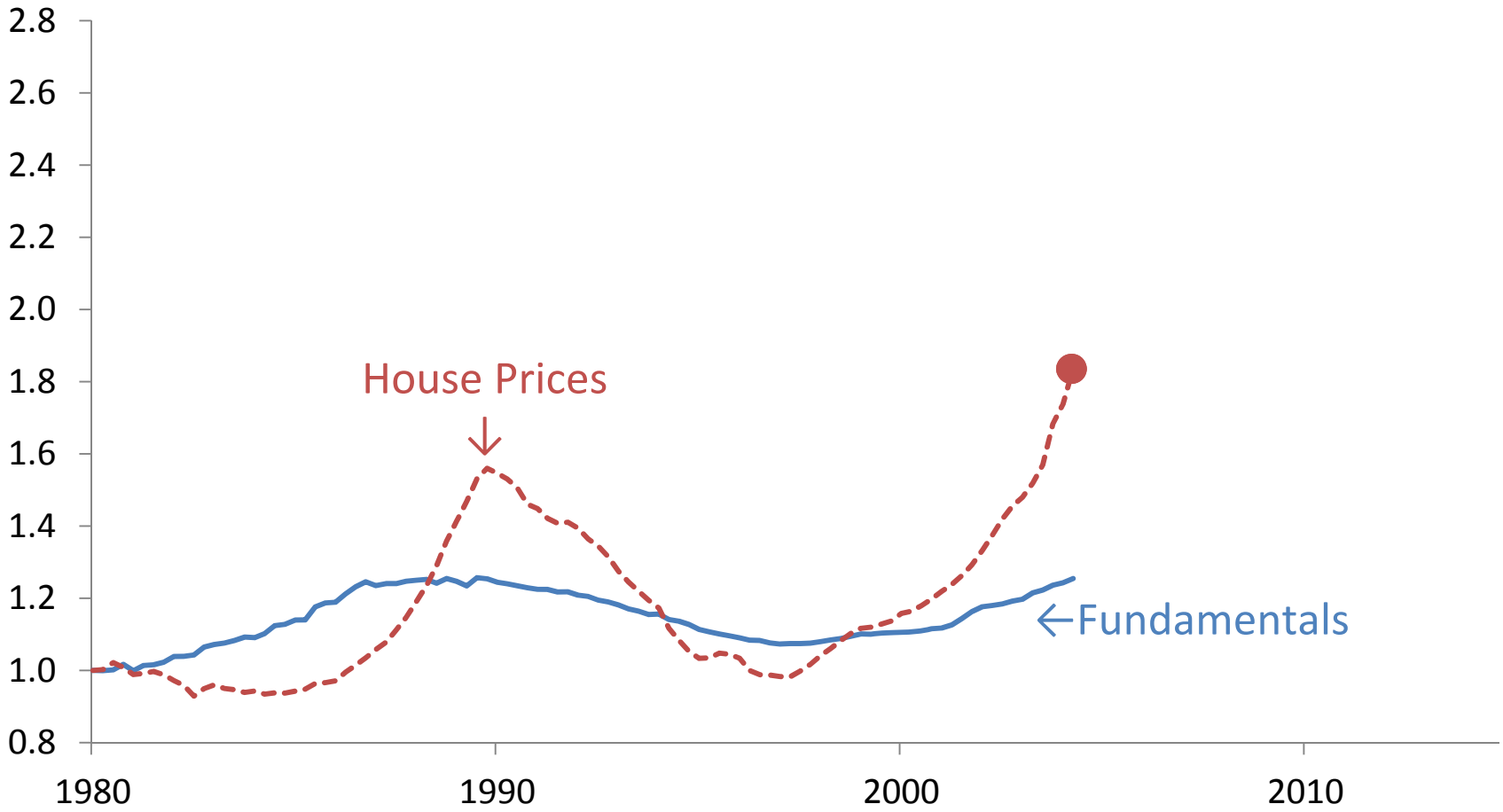

Los Angeles, CA
FHFA Real Prices →
BLS Real Rents
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
1980
1990
2000
2010

Facts about house price dynamics

1. Momentum (70% annual) in changes
   [Case & Shiller, 1989]
2. Longer-term reversals (32% over 5 years)
   [Glaeser, Gyourko, Morales & Nathanson 2014]
3. High volatility (3x income) relative to fundamentals
   [Head, Lloyd-Ellis & Sun 2014]
4. Homeowners extrapolate (23% annual)
   [Case, Shiller & Thompson 2012]

Limited success of rational models in explaining these facts
[*Handbook of Regional & Urban Econ. Vol. 5*]

Our model: “naïve extrapolation”



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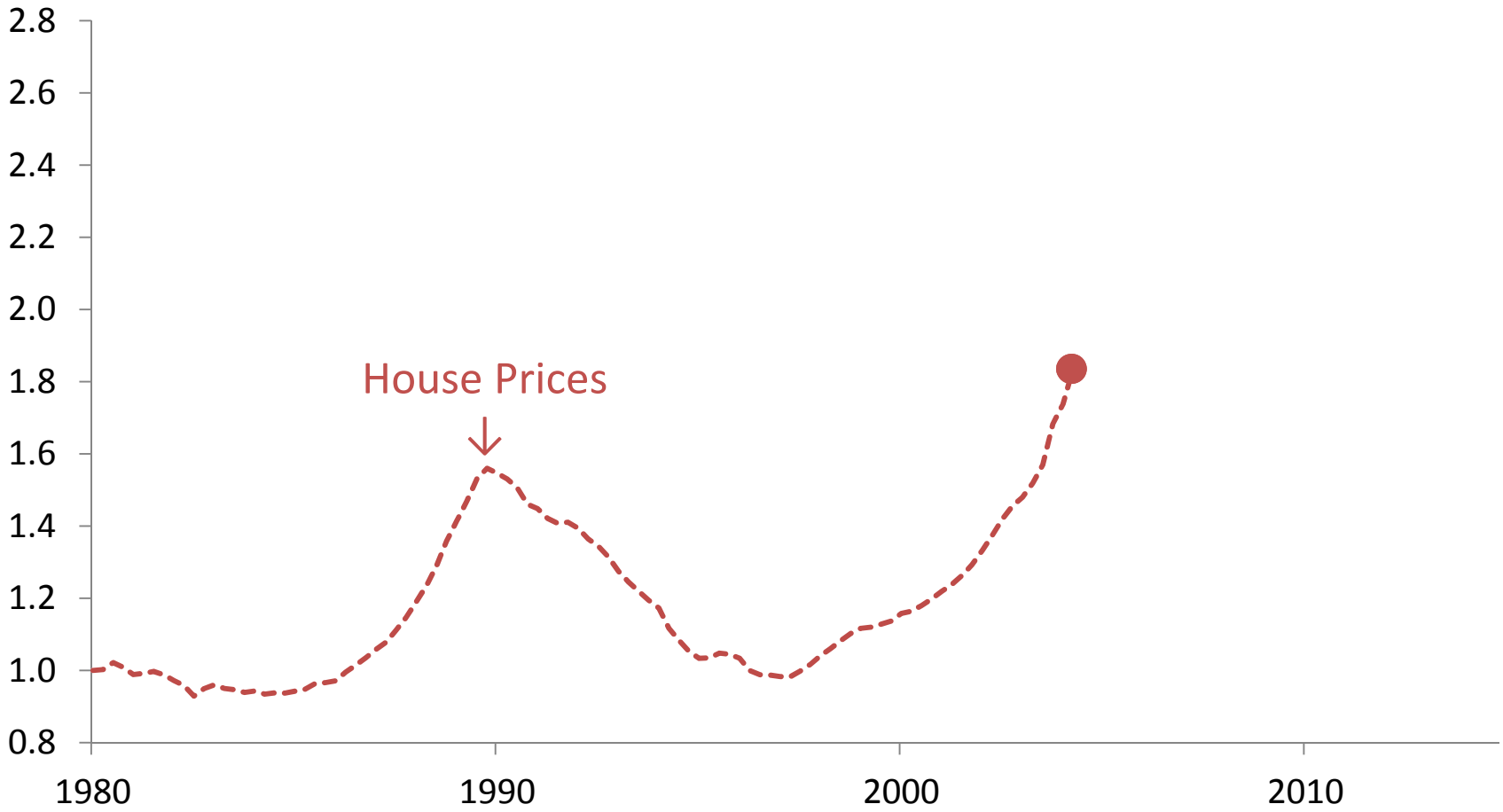

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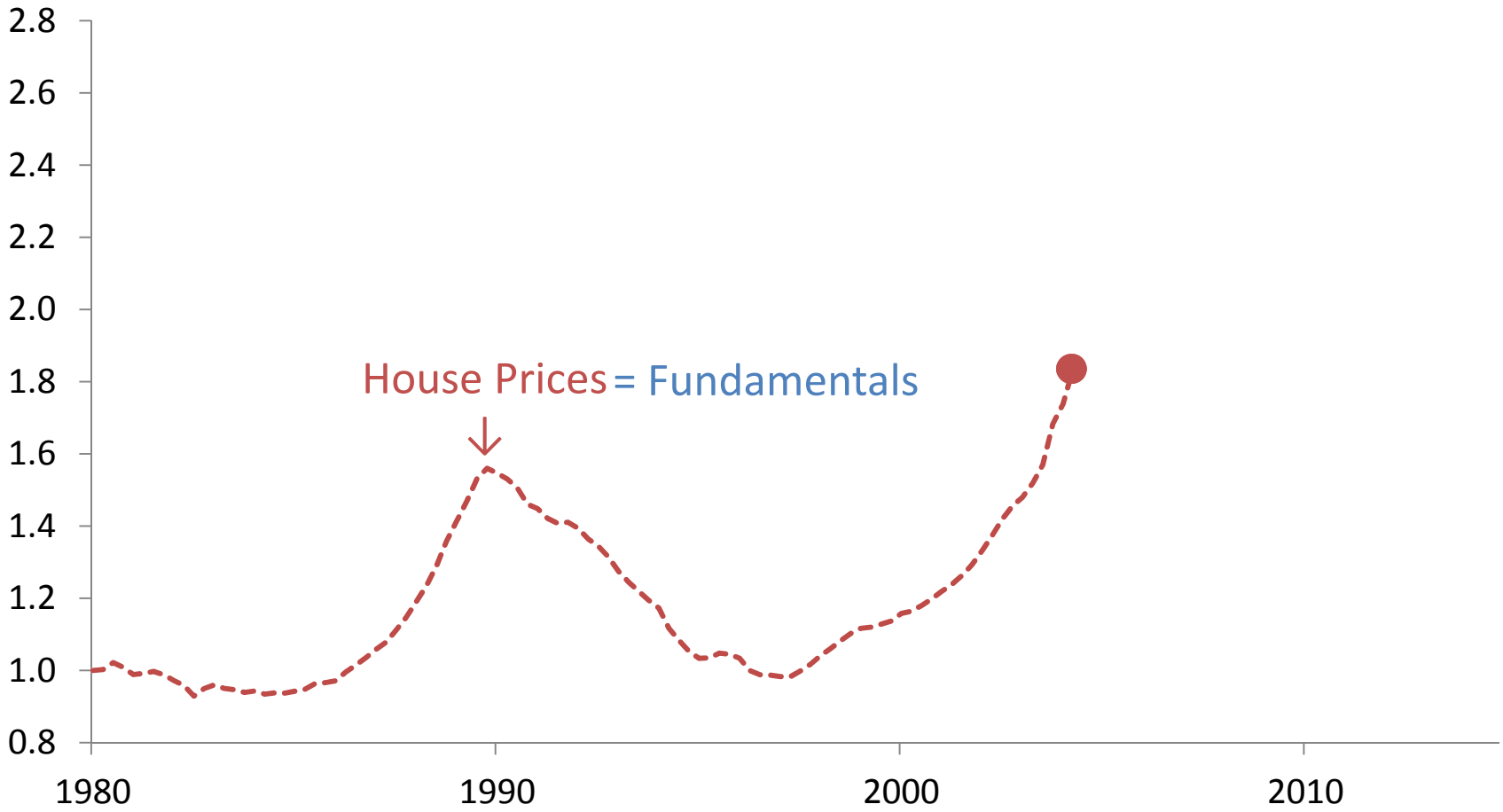

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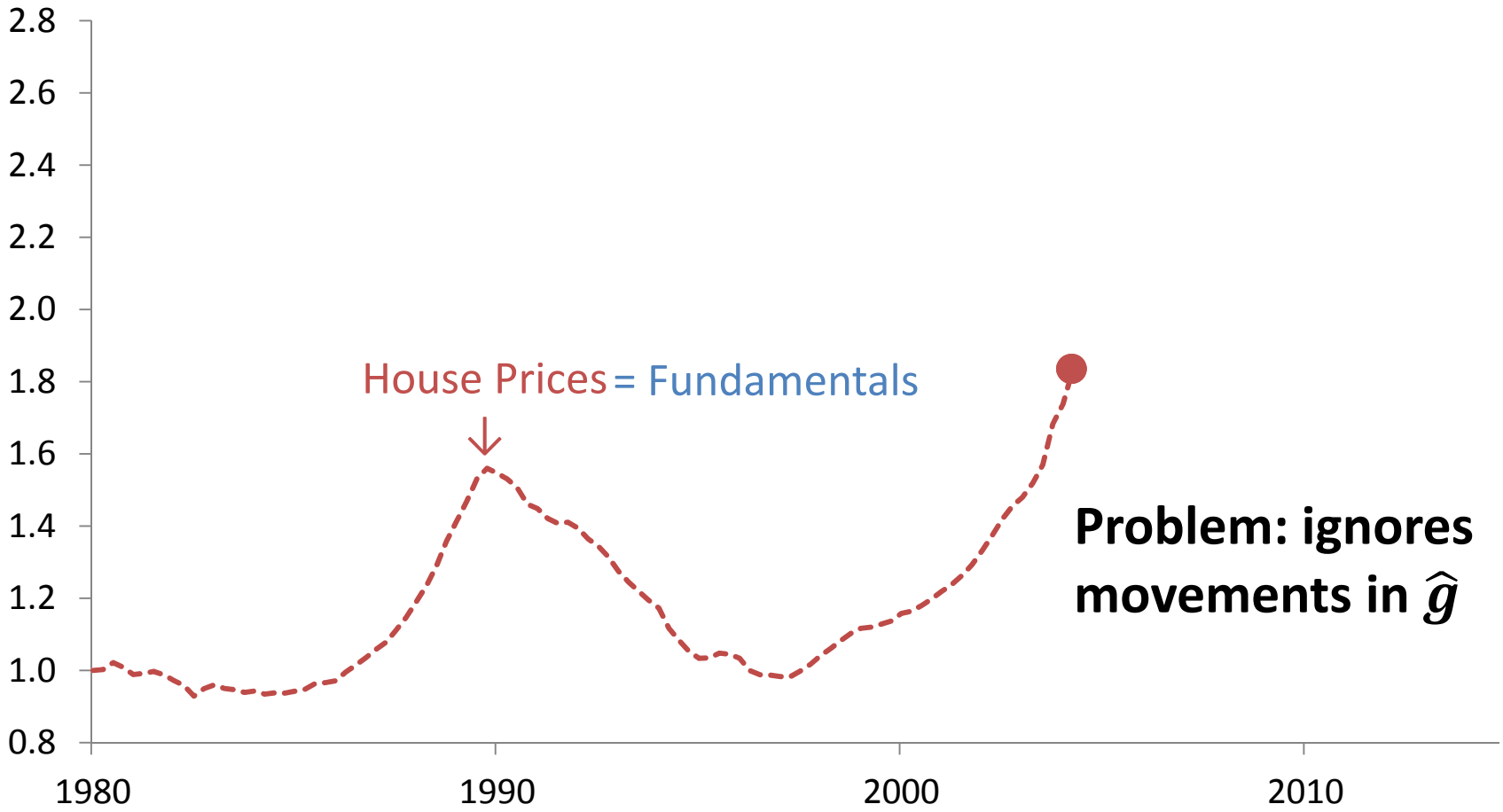
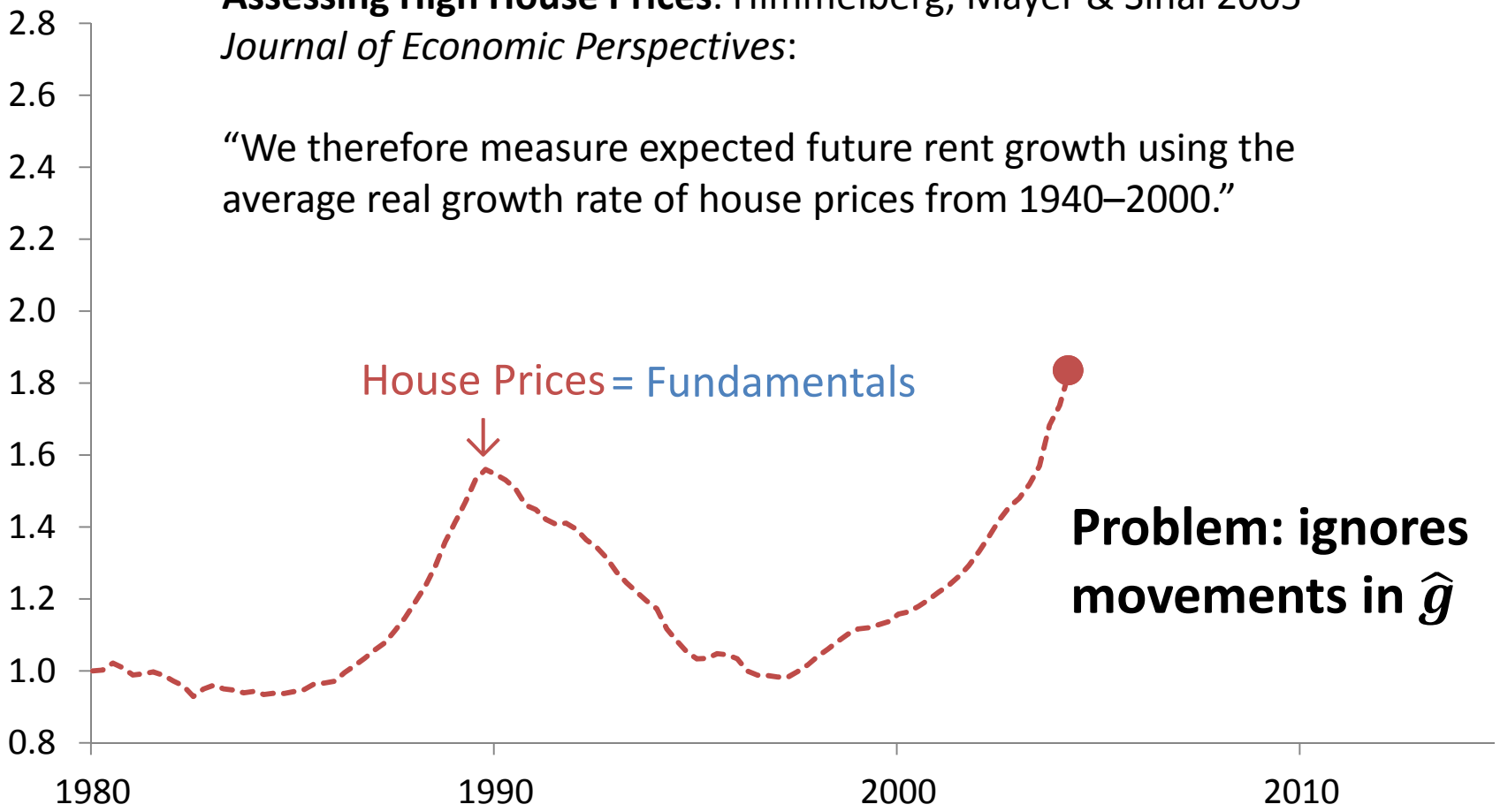


Our model: "naïve extrapolation"

Assessing High House Prices. Himmelberg, Mayer & Sinai 2005 *Journal of Economic Perspectives*:

"We therefore measure expected future rent growth using the average real growth rate of house prices from 1940–2000."



Problem: ignores movements in $\hat{g}$

Theoretical results

- **Sinusoidal** price change autocorrelations:

$$\mathrm{Corr}(\Delta p_t, \Delta p_{t-m\delta}) = A_\zeta e^{-m\delta\lambda_\zeta} + A_\beta \beta_2^{m/2} \cos(m\theta + \omega)$$

- Naïve buyers extrapolate:
  - Expected future price change is geometric weighted average of past price changes [Barberis et al. 2015]
  - Failure to forecast busts after booms
- Rational buyers predict much less change in prices
- Buyers ignore information about demand
  - Mistake for naïve buyers. Correct for rational buyers.
- Naïve buyers display overconfidence

TABLE 1
Calibrated Parameter Values

Demand Parameters		
λ	0.51	Demand growth reversion
σ_g	\$180	Volatility of growth shocks
σ_D	\$190	Volatility of demand shocks
r	0.04	Discount rate
Transaction Parameters		
σ_a	\$3,120	Volatility of idiosyncratic utility
μ	0.075	Probability of forced sale
δ	0.5	Length of period (years)
N	1,130	Sales observed per period
σ_s	\$1,000	Noise in observations of demand

Evolution of Prices after a Demand Shock

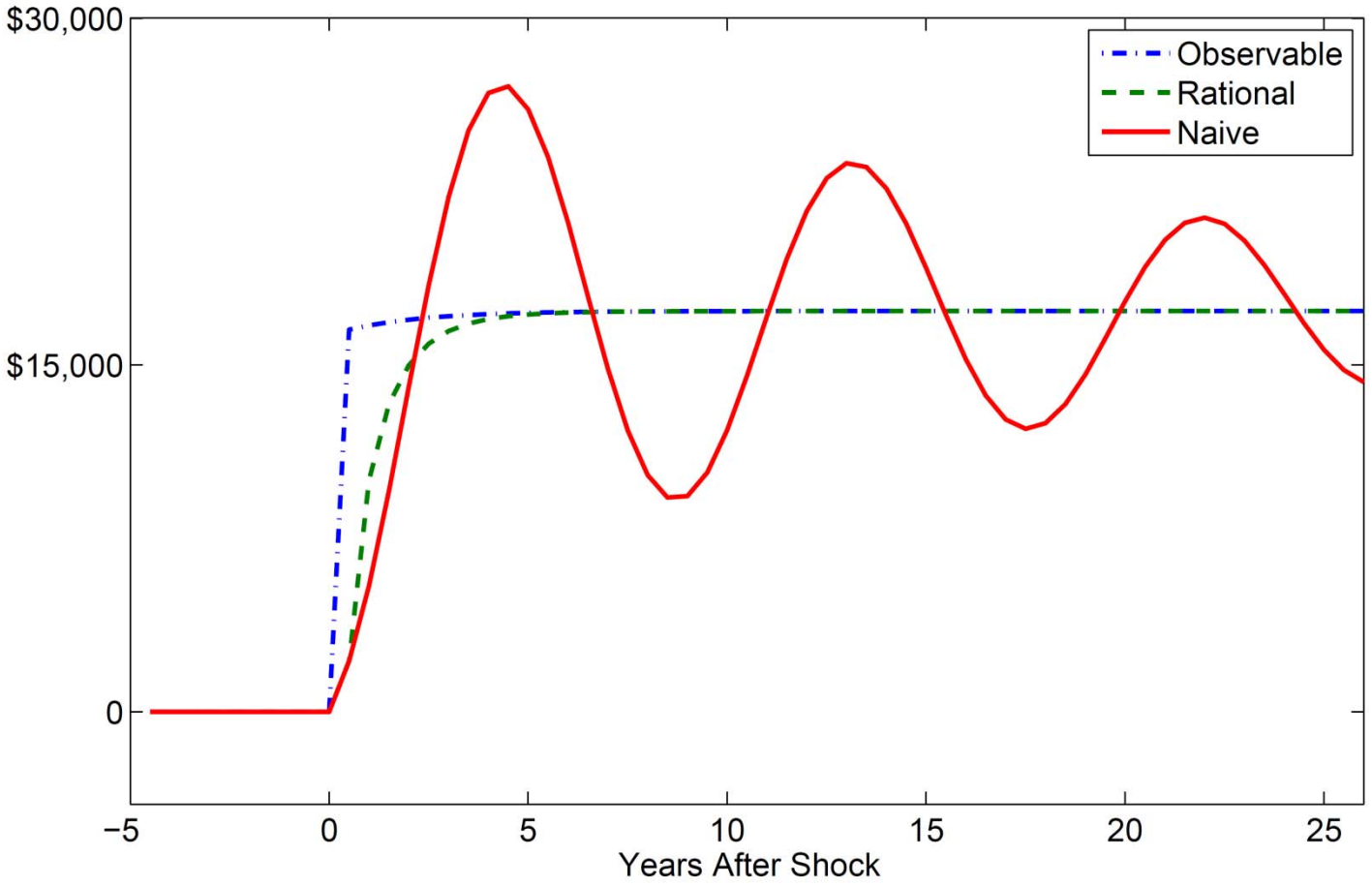


TABLE 2
Autocorrelations in House Price Changes, Annual Frequencies

		Model		
	Data	*Naive*	*Rational*	*Observable*
$\text{Corr}(\Delta p_t, \Delta p_{t+1})$	0.67	0.75	0.11	0.01
$\text{Corr}(\Delta p_t, \Delta p_{t+2})$	0.26	0.20	0.00	0.01
$\text{Corr}(\Delta p_t, \Delta p_{t+3})$	−0.10	−0.37	−0.00	−0.00
$\text{Corr}(\Delta p_t, \Delta p_{t+4})$	−0.26	−0.71	0.01	0.01
$\text{Corr}(\Delta p_t, \Delta p_{t+5})$	−0.28	−0.67	0.01	0.01

TABLE 4
Volatility of Price Changes at Different Horizons

	Horizon		
	1 Year	3 Years	5 Years
Data	\$16,000	\$40,000	\$50,000
Simulated Prices			
Naive	\$16,000	\$41,000	\$51,000
Rational	\$11,000	\$21,000	\$28,000
Observable	\$12,000	\$22,000	\$28,000
Simulated Fundamentals			
D_t/r	\$8,000	\$17,000	\$24,000


Prices and Beliefs After 1−Year Price Increase
Market Values
Expectations
Relative Increase in Market Values
Years
1
0.5
0
−0.5
−1
−1.5
0
2
4
6
8
10

Implications for consumer education

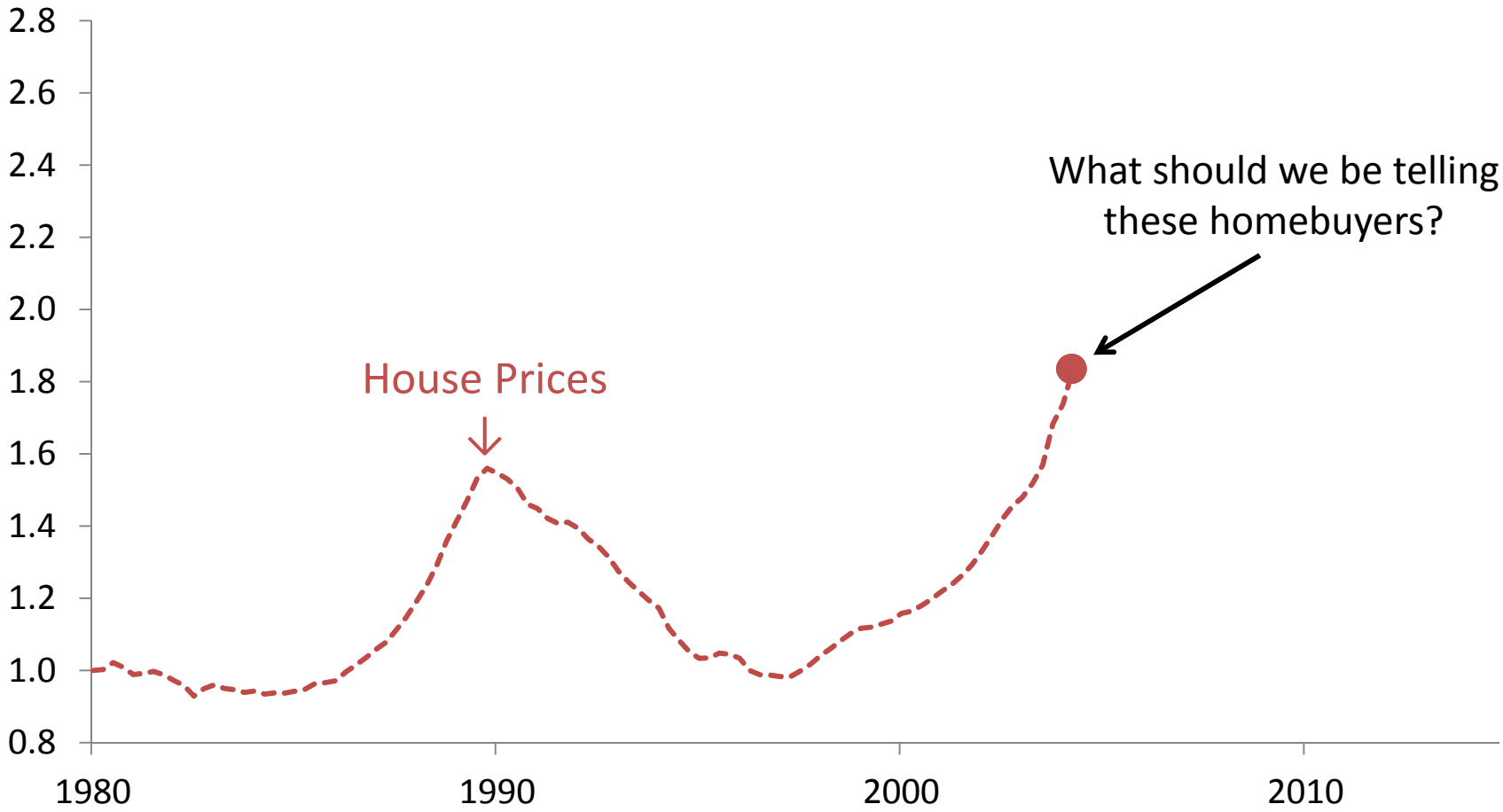


TABLE 6
Forecast Accuracy

		Market	
		Rational	*Naive*
Individual	*Rational*	$11,000	
	Naive		$22,000

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Forecast Accuracy

		Market	
		Rational	*Naive*
Individual	*Rational*	\$11,000	\$600,000,000,000,000,000,000,000,000,000,000
	Naive	\$12,000	\$22,000

Implications for consumer education

- General problem: optimal updating rule depends on what other buyers are doing

- What about teaching people about price dynamics?
  - Zillow is currently providing 1-year price forecasts
  - Could reduce volatility by forecasting reversals
  - Could increase volatility by forecasting momentum

- Another approach: teach how to hedge price risk [Shiller]
  - Could remove resale component of prices
  - Make prices more like rents