

Prices, Rents and Speculative Bubbles in the Sydney Housing Market

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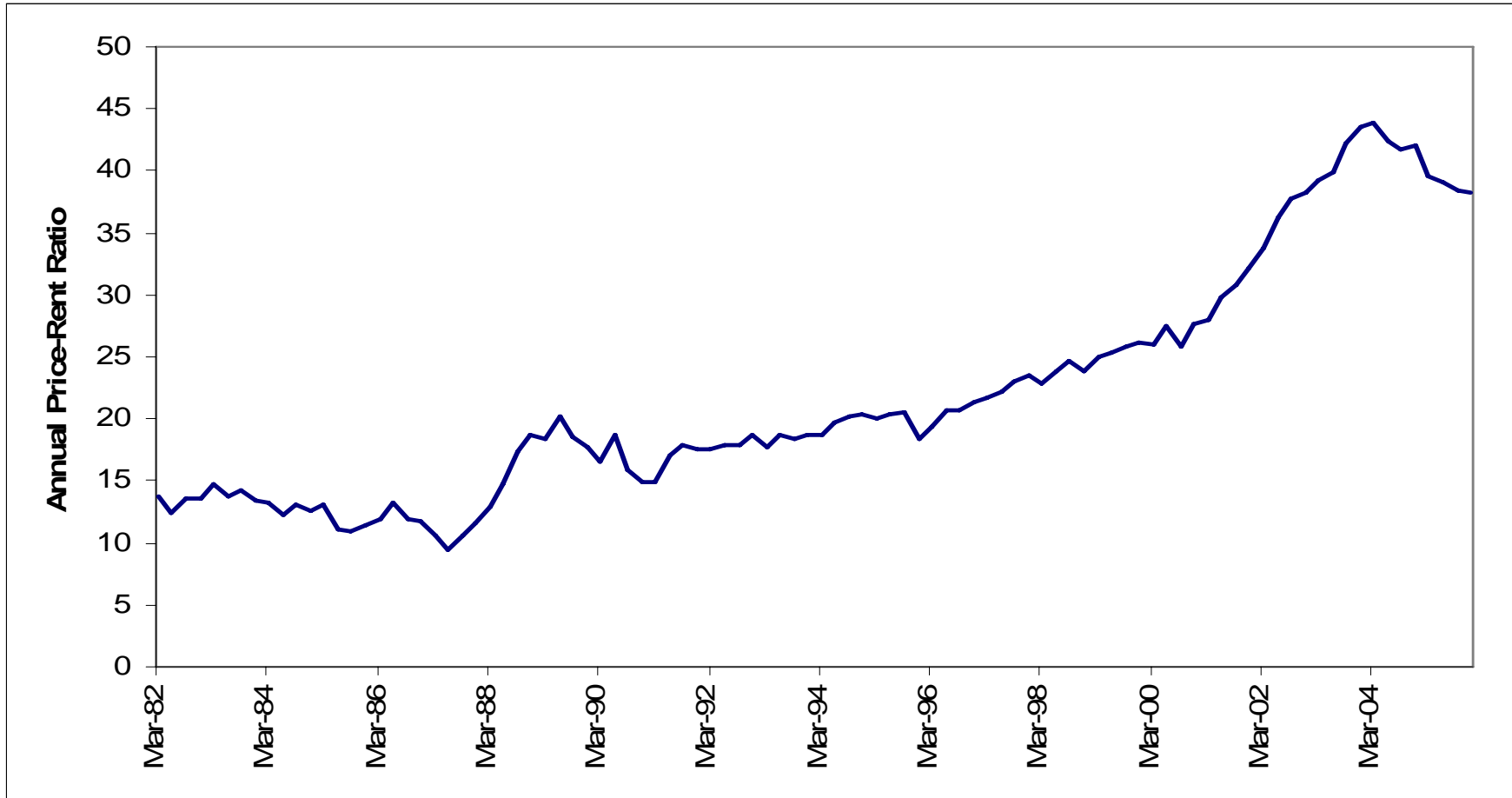
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Hobart

Figure 1: Median Price-Rent Ratio for Established Houses in Sydney (1982-2005)



Source: Real Estate Institute of Australia

Can asset pricing theory explain the rise in Sydney price-rent ratios?

Standard asset pricing theory provides 3 reasons why price-rent ratios vary over time.

- Changes in the expected future growth rate of real rents
- Changes in the expected future discount factor
- Speculative bubbles

Some combination of these factors should explain price-rent ratios in Sydney?

Approximate Contributions to Rise in Sydney Price-Rent Ratios (percent)

LGA	Growth in Real Rents	Decline in Risk-Free Rate	Decline in Risk Premium	Speculative Bubble
Inner Ring	0	20	80	0
Middle Ring	0	15	55	30
Outer Ring	0	10	40	50

Theoretical Framework

$$P_t^h = E_t[M_{t+1}(P_{t+1}^h + R_{t+1}^h)]$$

M_{t+1} - stochastic discount factor

P_t^h - real house price at time t

R_t^h - real (gross) rent on a house at time t

Present value model for the price-rent ratio

$$\frac{P_t^h}{R_t^h} = E_t \sum_{i=1}^{\infty} \left(\prod_{k=1}^i M_{t+k} G_{t+k}^R \right)$$

$$G_{t+1}^R = \frac{R_{t+1}^h}{R_t^h} - \text{rent growth}$$

$$\lim_{T \rightarrow \infty} E_t \left[\left(\prod_{k=1}^T M_{t+k} \right) P_{t+T}^h \right] - \text{no rational speculative bubbles}$$

Cochrane's (1992) approximation:

$$\frac{P_t^h}{R_t^h} \cong \frac{\Omega}{1-\Omega} + \frac{1}{1-\Omega} E_t \sum_{i=1}^{\infty} \Omega^i (\tilde{g}_{t+i}^R - \tilde{m}_{t+i})$$

$$\tilde{g}_t^R = g_t^R - E(g), \quad g_t^R = \log(G_t^R), \quad \tilde{m}_t = m_t - E(m), \quad m_t = -\log(M_t)$$

$$\Omega = \exp(E(g) - E(m))$$

Price-rent ratio reflects:

- Expected future growth in rents, and/or
- Expected future changes in the discount factor

Does the price-rent ratio predict rents and discount factors?

$$x_t = \mu + \sum_{i=1}^k \alpha_i x_{t-i} + \sum_{i=1}^k \beta_i \frac{P_t^h}{R_t^h} + \omega_t$$

- Joint significance of β_i 's
- Sign and significance of the sum of β_i 's
- Long-run marginal effect $\frac{\sum \beta_i}{1 - \sum \alpha_i}$

A Variance Decomposition

Multiply present value model by $[\frac{P_t^h}{R_t^h} - E(\frac{P^h}{R^h})]$ and take unconditional expectations.

$$V\left(\frac{P_t^h}{R_t^h}\right) \cong \frac{1}{1-\Omega} \sum_{i=1}^{\infty} \Omega^i \left(\text{cov}\left(\frac{P_t^h}{R_t^h}, \tilde{g}_{t+i}^R\right) - \text{cov}\left(\frac{P_t^h}{R_t^h}, \tilde{m}_{t+i}\right) \right)$$

Variance depends on:

- covariance between the current price-rent ratio and future rent growth rates,
- covariance between the current price-rent ratio and future stochastic discount factors

Discount Factors

- real variable mortgage rate
- the real 10 year bond rate
- real equity returns
- $M_t = (1 + r_t^h)^{-1}$ - ex-post real return on housing

In this case present value model is an (approximate) identity, only assumption is the absence of a speculative bubble.

Price and Rent Data

- *Rent and Sales Reports*, NSW Department of Housing
- 36 Local Government Areas (LGAs) in metropolitan Sydney
- Median rents for houses and for apartments
- Median sales price for strata and for non-strata titles
- Quarterly data, 1991:1 to 2006:3
- Data are aggregated across houses and apartments

Local Government Areas

Inner Ring

Middle Ring

Outer Ring

Ashfield	Auburn	Baulkham Hills
Botany	Bankstown	Blacktown
Lane Cove	Burwood	Blue Mountains
Leichhardt	Canterbury	Campbelltown
Marrickville	Hurstville	Fairfield
North Sydney	Kogarah	Gosford
Randwick	Ku-ring-gai	Hawkesbury
Waverley	Manly	Holroyd
Woollahra	Parramatta	Hornsby
	Rockdale	Liverpool
	Ryde	Penrith
	Strathfield	Sutherland
	Willoughby	Warringah
		Wyong

Empirical Findings

Result #1: An increase in the price-rent ratio does not predict future increases in the growth rate of real rents.

Result #2: An increase in the price-rent ratio predicts declining real returns to housing.

Result #3: An increase in the price-rent ratio predicts declining real interest rates.

Result #4: An increase in the price-rent ratio does not predict declining real equity returns.

Implications

Prediction tests point to an anticipated decline in the discount factor as the explanation for the rise in Sydney price-rent ratios.

However variation in the expected discount factor could reflect either:

- Variation in the risk free rate
- Time variation in the risk-premium on housing

What contributes to the variance of the price-rent ratio?

$$\frac{100}{1 - \hat{\Omega}} \sum_{i=1}^{20} \hat{\Omega}^i \left(\hat{\text{cov}}\left(\frac{P_t^h}{R_t^h}, x_{t+i}\right) \right) \left[\hat{\text{var}}\left(\frac{P_t^h}{R_t^h}\right) \right]^{-1}$$

x_t = real rent growth, housing returns, real bond rate

Contribution to Variance of Price-Rent Ratio (percent)

LGA	Real Rent Growth	Real Housing Returns	Total	Real Bond Rate
Inner Ring	-25	126	101	22
Middle Ring	-3	75	72	13
Outer Ring	-3	56	52	11

In the absence of a speculative bubble the contributions of real rent growth and real housing returns should add to 100 percent.

House prices in outer ring LGAs of Sydney appear to have been partially driven by a speculative bubble.

What explains the difference in the relative contributions of real bond rates and real housing returns?

Time variation in the risk premium

Expected returns to housing

$$E_t(r_{t+1}^h) = r_{t+1}^f - \frac{Cov_t[M_{t+1}, (1 + r_{t+1}^h)]}{E_t M_{t+1}}$$

Real bond rate \approx time-varying risk-free rate

Real housing returns \approx time-varying risk-free rate + time-varying risk premium

Approximate Contributions to Variation in Sydney House Prices (percent)

LGA	Risk Free Rate	Risk Premium	Speculative Bubble
Inner Ring	20	80	0
Middle Ring	15	55	30
Outer Ring	10	40	50

Has the Risk Premium on Sydney Housing Declined?

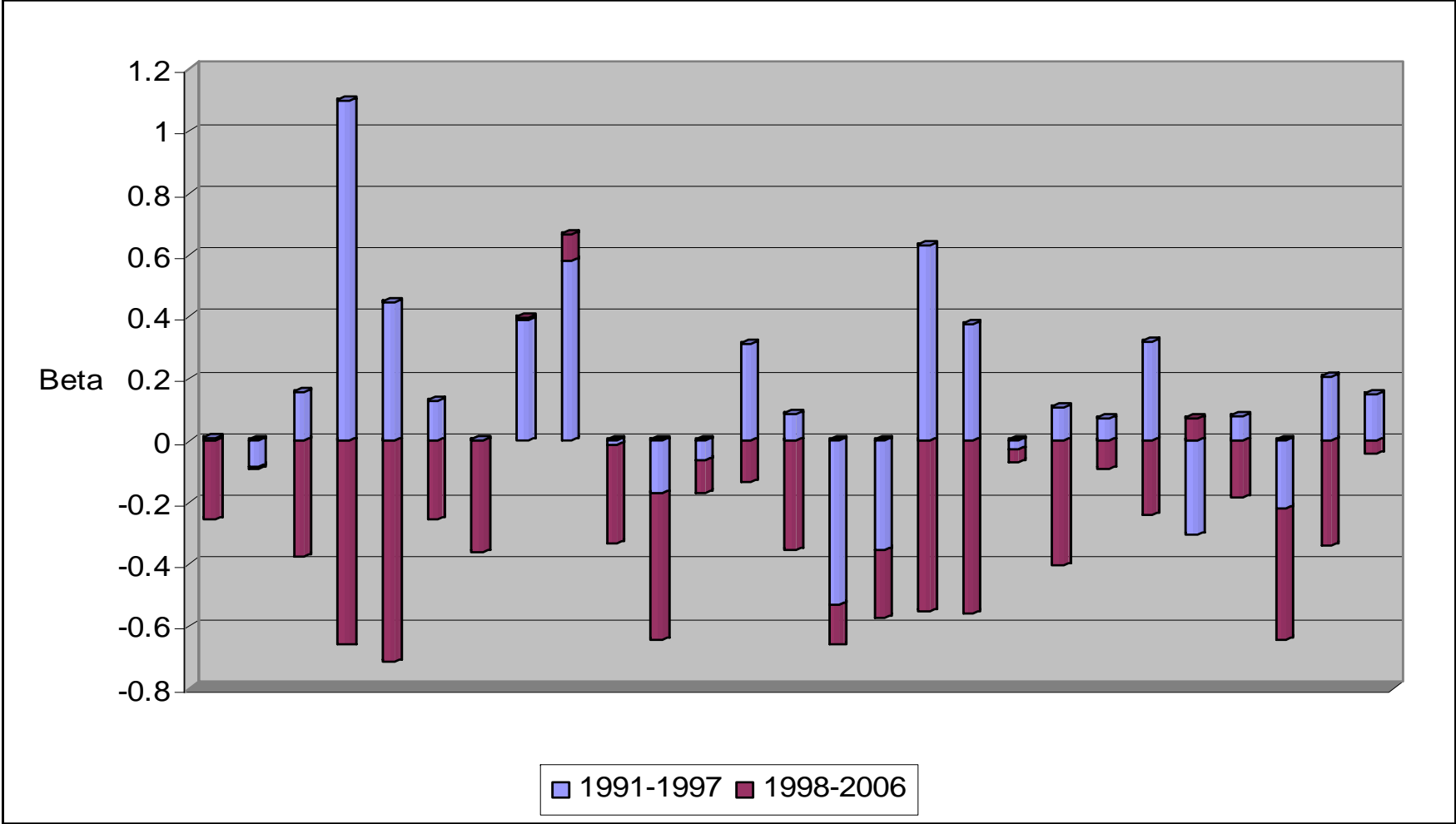
CAPM

$$er_t^h = \alpha + \beta er_t^s + v_t$$

Estimates of β over 2 periods: 1991-1997 and 1998-2006.

Has correlation declined?

Figure 2: Change in Beta for Residential Property in Inner Ring LGAs



Is There a Speculative Bubble in the Outer Ring LGAs?

Use average price-rent ratio for Inner Ring LGAs as the no-bubble control.

Examine deviations for Outer Ring LGAs.

Average price-rent ratio for Inner Ring LGAs

minus

Price-rent ratio for an individual LGA

Figure 3: Mean Deviations for Price-Rent Ratios in Four Outer Ring LGAs from Average Price-Rent Ratio for Inner Ring

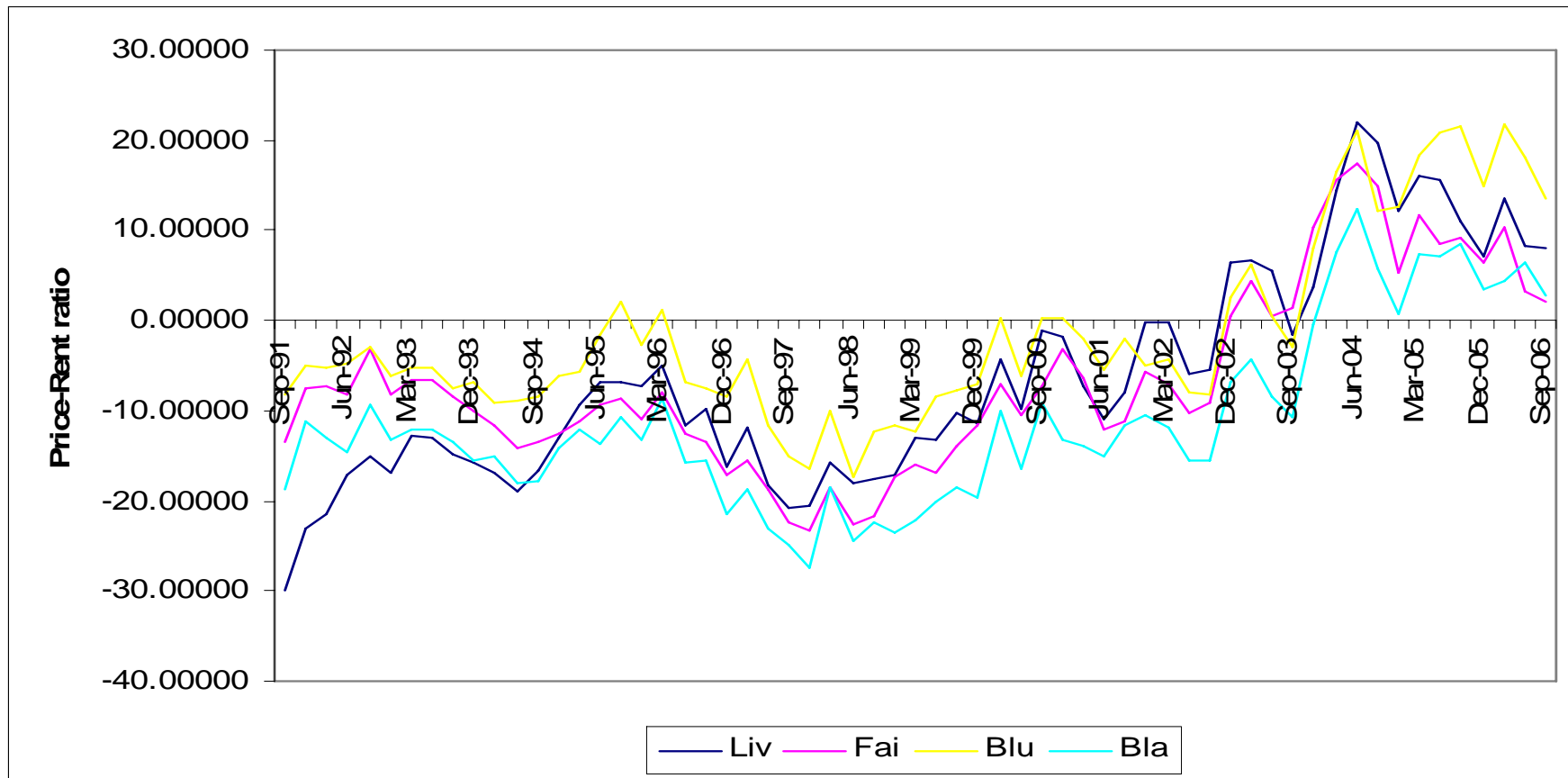


Figure 4: Mean Deviations for Price-Rent Ratios in Inner Ring LGAs

