Transaction-Based Commercial Real Estate Indices and the Role of Portfolio Sales

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Objectives

- There is currently limited information available on price trends for commercial real estate in Australia (or in many countries).
    - The most widely used CPPI (commercial property price index) in Australia is that from MSCI. It uses appraised values for the subset of buildings held by large REITs.
- The focus of the project is to develop data and methods and construct some CPPIs for Australia.
- This presentation is on ongoing work focused in two areas:
    - Constructing quarterly CPPI using a hedonic (double) imputation approach.
    - Exploring portfolio vs single sales.

Brief Selected Literature

- Related to CPPI
  - Hill and Steurer (2020), "Commercial Property Price Indices and Indicators: Review and Discussion of Issues Raised in the CPPI Statistical Report of Eurostat (2017)," *Review of Income and Wealth*.
  - Diewert, W. E. and C. Shimizu (2017), "Alternative Approaches to Commercial Property Price Indexes for Tokyo," *Review of Income and Wealth*.
  - Deng, Y., D. P. McMillen and T. F. Sing (2014), "Matching Indices for Thinly-Traded Commercial Real Estate in Singapore," *Regional Science and Urban Economics*.
- Related to portfolio vs single sales
  - Ishaak, Farley Fayaz (2025), Improving commercial property price statistics. PhD Dissertation, Delft University of Technology.

Data

- We have obtained data from all the major Australian states on commercial property sales from Valuer Generals.
- In this work we focus on NSW data from 2023Q1:2025Q1
- What is available:
  - Transaction *purchase prices*: for single sales or a portfolio sale.
  - *Contract date* (dd/mm/yy)
  - *Identifier of single/portfolio*, and *number of items in the portfolio* sale
  - *Address* and *coordinates*
  - *area* (sq m/ hectare)
  - *primary_purpose*: This is a field transcribing the hand entry by the notary (conveyancing solicitor) at the time of the registration of the purchase.
- We use the words in the ***primary_purpose*** field to sort transactions into:
  - "Offices", "Shops/Retail", "Industrial", "Other".

Non-Residential Transactions for New South Wales (NSW)

and **Greater Sydney** as defined by the Australian Bureau of Statistics

Table: Number of Units – All Types

Transactions	Single	Portfolio	Total	Total with *area*
NSW	305,663	67,817	373,480	241,602 (65%)
Greater Sydney	142,265	37,873	180,138	78,295 (43.5%)

Table: Number of Units – Offices

Transactions	Single	Portfolio	Total	Total with *area*
NSW	12,647	5,034	17,681	6,062 (34.3%)
Greater Sydney	9,260	4,431	13,691	3,337 (24.4%)

Table: Number of Units – Retail/Commercial

Transactions	Single	Portfolio	Total	Total with *area*
NSW	101,698	31,673	133,404	76,496 (57.3%)
Greater Sydney	61,485	23,013	84,516	37,613 (44.5%)

Further on data ..

- Stats on number of items in a sale in Greater Sydney:
  1. Retail/Commercial: Min =1, Max = 195, Mean = 4
  2. Offices: Min =1, Max = 58, Mean = 3
- Postcodes: 244 in NSW; 225 Greater Sydney (GS)
- We have NSW "districts" as designated by the NSW Valuer General. There are 55 for the GS data.
- We have used the coordinates to construct the following potential explanatory variables:
  1. "Distance to the Opera House in metres",
  2. " Counts of bus stops within 500 metres radius", within 1000 metres radius",
  3. " Counts of rail stops within 500 metres radius", within 1000 metres radius",
  4. " Counts of ferry stops within 500 metres radius",
  5. "Counts of residential sales within 1 km radius in the previous three quarters" (separately)
  6. "Counts of vacant land sales within 1 km radius in the previous three quarters" (separately)

Methodology I

Aim at computing Quarterly Double Imputation Hedonic Price Indices

$$J_{t-1,t} \quad = \quad \sqrt{\left[\prod_{n=1}^{N_{t-1}}\left(\left[\frac{\hat{p}^{t-1}_{t,n}}{\hat{p}^{t-1}_{t-1,n}}\right]^{\frac{1}{N_{t-1}}}\right)\right]\left[\prod_{n=1}^{N_t}\left(\left[\frac{\hat{p}^{t}_{t,n})}{\hat{p}^{t}_{t-1,n})}\right]^{\frac{1}{N_t}}\right)\right]} \qquad (1)$$

where,
$\hat{p}^s_{s,n}$, $s = t, t-1$ is a predicted purchase price from a hedonic model, e.g

$\hat{p}^t_{t,n} = \exp(y_{t,n})$

Methodology II

- We consider hedonic specifications to deal and study portfolio sales:
  - Portfolio and single sales sample + include as control variables: "indicator that the item is part of a portfolio sale", "the number of items in the sale"
  - Single sales sample: Exclude portfolio sales
  - To explore the effect of a unit being sold as part of a portfolio sale
    - ★ Single sales + Portfolio sales with price averaged per item

$$\frac{portfolio\_purchase\_price}{number\_of\_items\_in\_sale}$$

+ include as control variable: "indicator that the item is part of a portfolio sale" and construct an estimated confidence interval.

Methodology III

To aid the prediction ability of the models,

- Regressions regressing $\ln(purchaseprice)$, (X):
  - *distance to opera*, *bus stops counts within 500m*,*rail stops counts within 500m*,
  - *counts of residential sales*, *counts of vacant land sales*,
  - *district dummies*
  - *area in sq mts* if sample permits
  - *portfolio sale indicator (binary)*, *number of sales in a dealing*,
- Regressions regressing $\ln(\text{average item purchase price})$, (X):
  - same as above
  - $\rightarrow$ *portfolio sale indicator* (binary variable)

Methodology IV

- The models are estimated using a state-space representation of the hedonic regression. (see Rambaldi and Fletcher (2014), *Review of Income and Wealth*).

$$
\begin{aligned}
y_t = &\ \mathbf{Z}_t \alpha_t + \epsilon_t && (2) \\
\alpha_t = &\ \alpha_{t-1} + \eta_t && (3)
\end{aligned}
$$

$\mathbf{Z}_t = \begin{bmatrix} \mathbf{1} & X_t & D_t \end{bmatrix}$ an $N_t \times m$ matrix, and $\mathbf{1}$ is an $N_t \times 1$ vector of ones.

$\alpha_t = \begin{bmatrix} \mu_t & \beta_t & \delta_t \end{bmatrix}'$; $\epsilon_t \sim N(0, \sigma_\epsilon^2 \mathbf{I})$; $\eta_t \sim N(0, \mathbf{Q})$; $\alpha_0 \sim N(a_0, \mathbf{\Omega}_0)$ initial condition.

$$
\hat{\alpha}_{\tau|\tau} = \hat{\alpha}_{\tau-1|\tau-1} + \mathbf{G}_\tau \nu_\tau \qquad (4)
$$

$\nu_\tau = y_\tau - \mathbf{Z}_\tau \hat{\alpha}_{\tau-1|\tau-1}$ prediction error using the parameter estimates at $\tau - 1$,
$\mathbf{G}_\tau$ is known form function of $\sigma_\epsilon^2, \mathbf{Q}, \mathbf{\Omega}_0$. The (Kalman) **G**ain captures the information gain from $\tau - 1$ to τ.

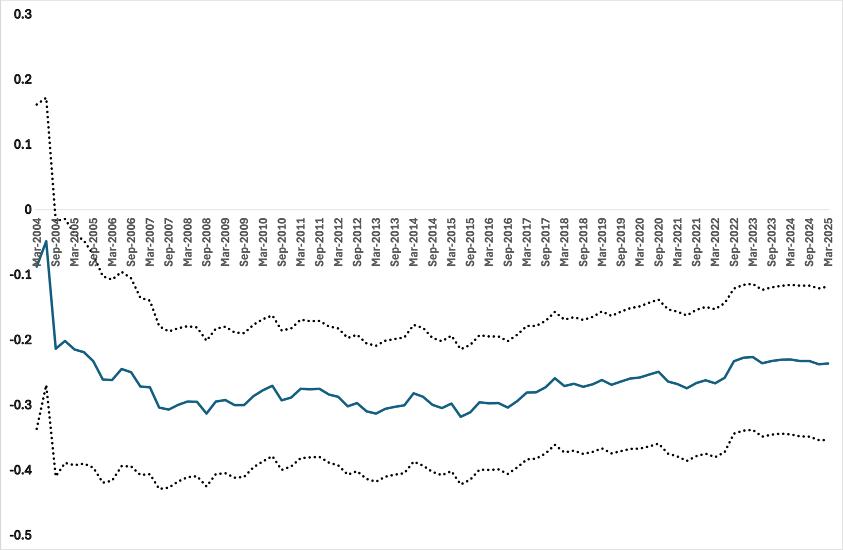
Empirical Results

- On advice from NSW VG we eliminate the year 2000. Data for years 2001 and 2002 are included in the estimation but we construct the index from 2003.
- Results presented here are using the **Greater Sydney sample**
- The estimations are carried out with trimmed data – (0.05,0.95) quantiles (purchase price)
- We experiment with hedonic characteristics and find that:
  - using the smaller sample that contains "area_sqm" increases the generalised Rsq by about 20%

Preliminary evidence of the effect of portfolio sales

Estimated $\hat{\alpha}_t$ of Portfolio Sales Indicator (Offices)

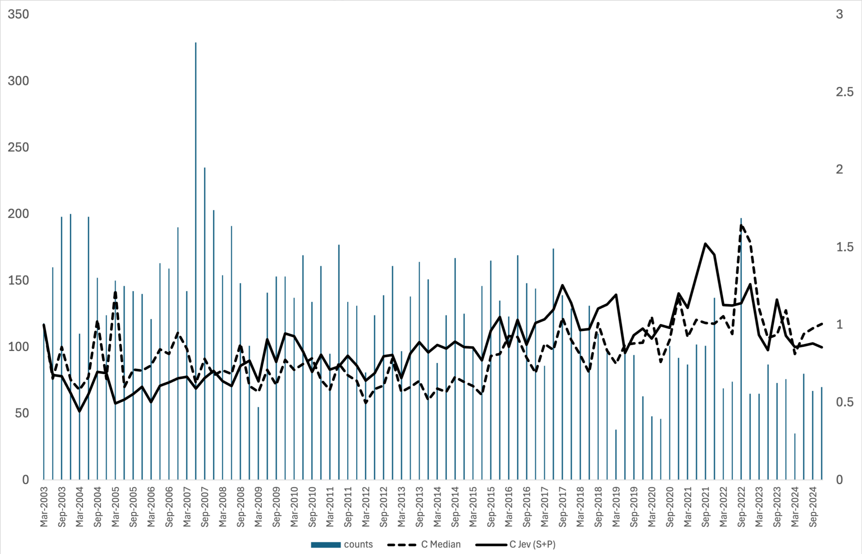
Model $y = \ln(\text{average item price})$



Quarterly Price Indices – Some examples

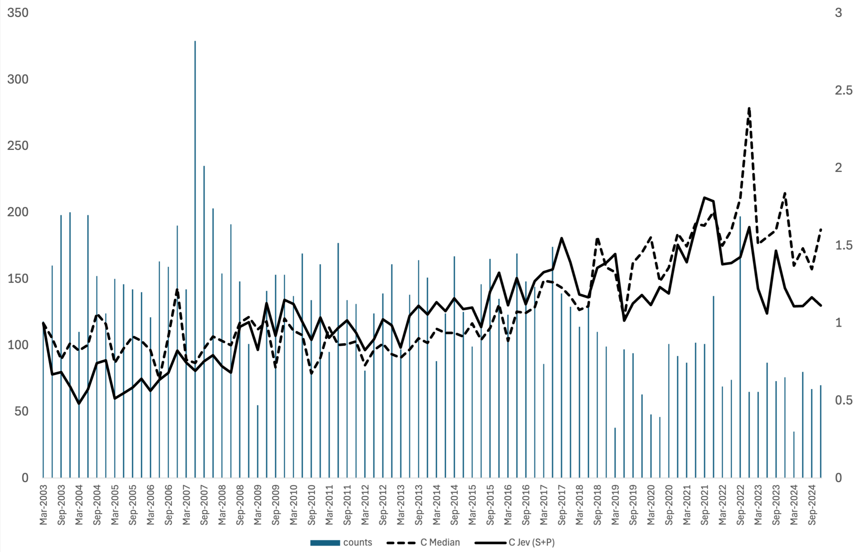
Chained Price Index for Offices

Single and Portfolio Sales



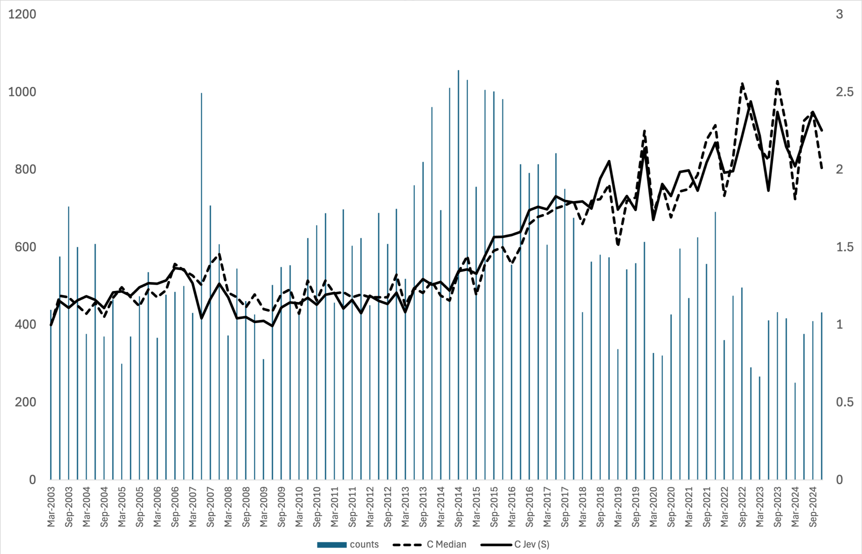
Chained Price Index for Offices

Single and Portfolio Sales (average price)



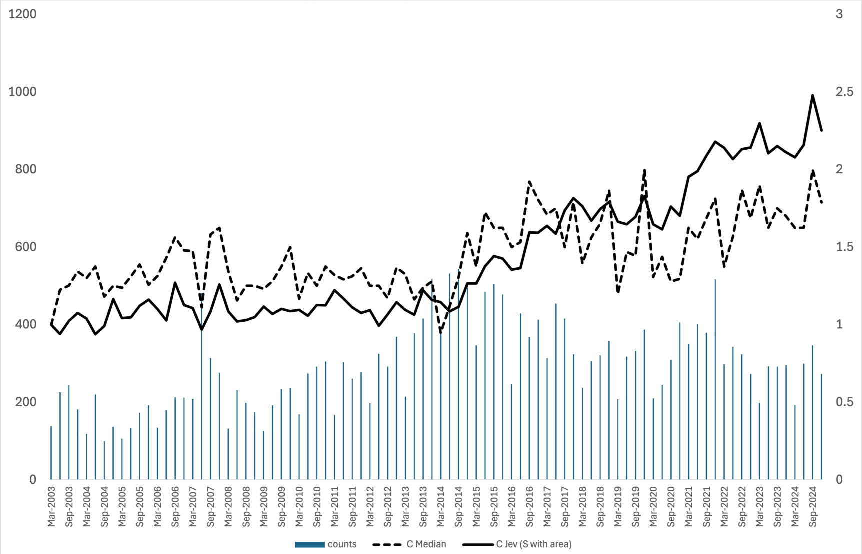
Chained Price Index for Retail/Commercial

Single Sales



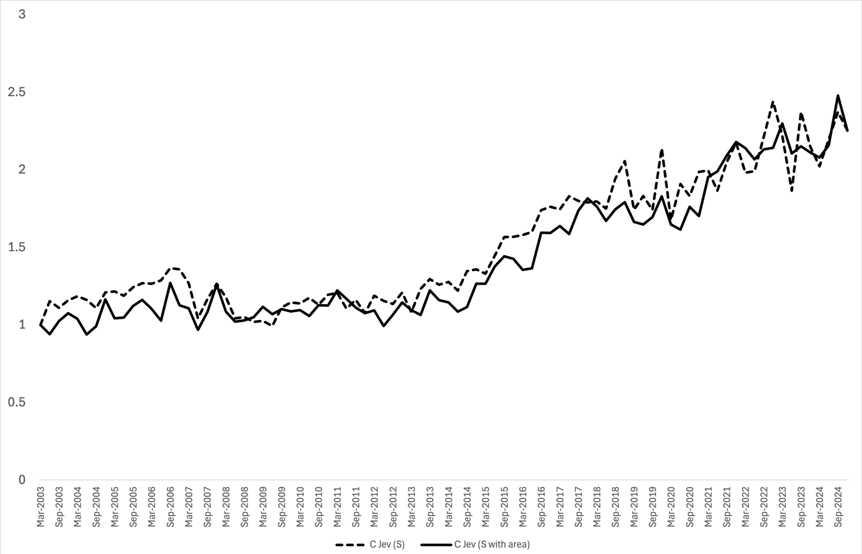
Chained Price Index for Retail/Commercial

Single Sales (Model with Area)



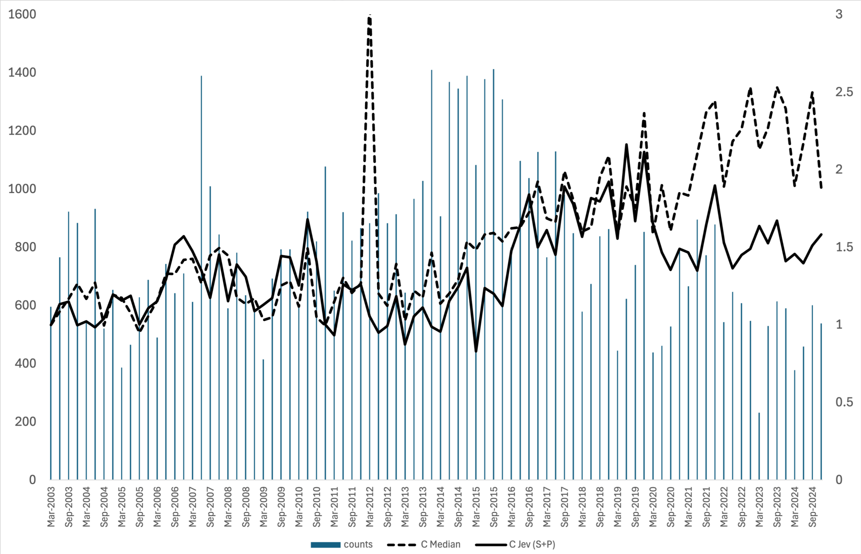
Chained Price Index for Retail/Commercial

Single Sales, Models with and without area



Chained Price Index for Retail/Commercial

Single and Portfolio Sales



Some Conclusions

- There are a number of data challenges:
  - Sorting and grouping by type of commercial real estate type.
  - Lack of hedonic characteristics.
  - low volume of transactions (specially at certain times, e.g. summer)
- Portfolio sales (multiple units sold in a single transaction) seem to place an important part in these markets,
  - we find some preliminary evidence that items in a portfolio seem to be sold with a discount.
- Some reasons to be optimistic, relatively robust quarterly price indices can be computed.
  - Using location and activity in the residential real estate market.
  - Setting up the regressions within a smoothing system.