

# The inclusion of portfolio sales in real estate price indices

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*Farley Ishaak*



# Introduction

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- Transactions in commercial real estate take more different form than in owner occupied housing:
  - Share deals ... (Ishaak, Van Schie, De Haan & Remoy, 2023)
  - Multiple buyers and sellers ...
  - ... and: **portfolio sales**



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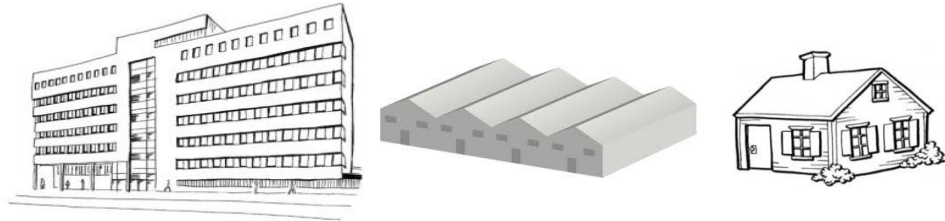
Single  
property  
sale



€ 300,000

1 real estate property

Portfolio  
sale



€ 10,000,000

> 1 real estate property

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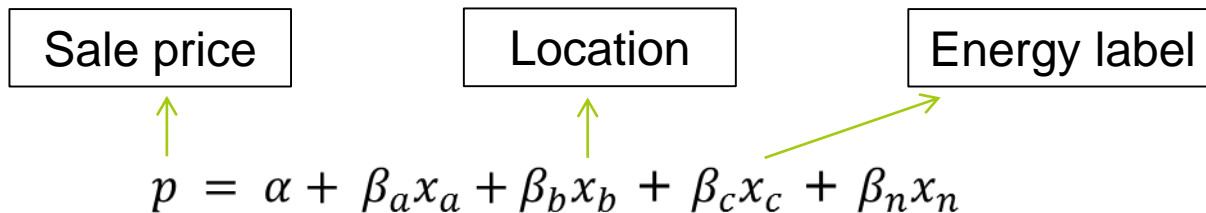
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This is problematic, because ...

- ... portfolio's can include **multiple** property **types**;
- ... the **characteristics** of portfolio elements **can differ** and this does not fit a hedonic model



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This is problematic, because ...

- ... portfolio's can include **multiple** property **types**;
- ... the **characteristics** of portfolio elements **can differ** and this does not fit a hedonic model
- ... the **unit of measurement** is different and this disrupts a price index model.

Unit is portfolio or single property



$$p = \alpha + \beta_a x_a + \beta_b x_b + \beta_c x_c + \beta_n x_n$$

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Research questions:

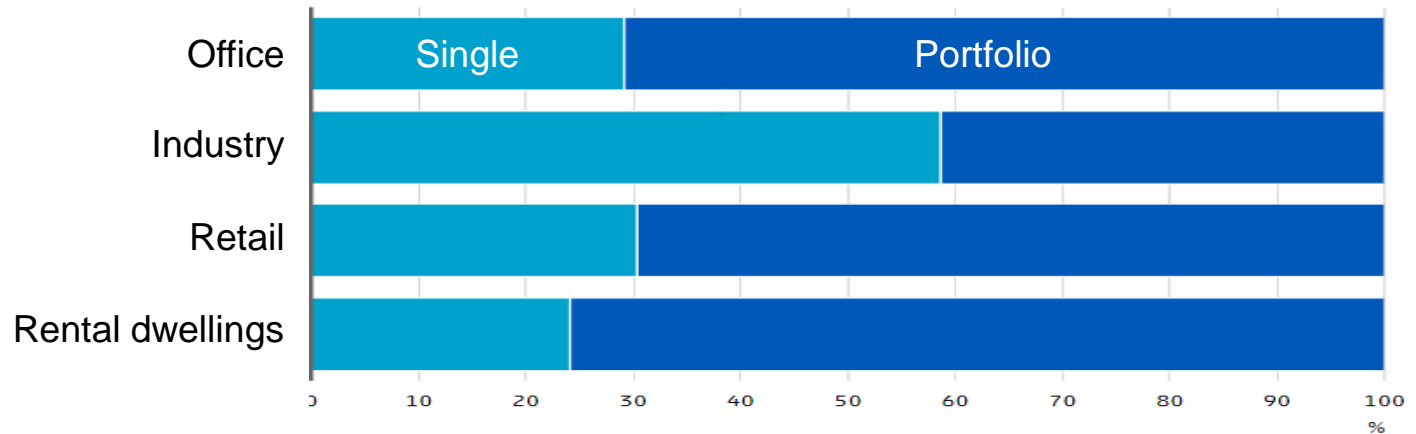
- What is the **impact** of portfolio sales **on** Commercial Property Price Indices (**CPPIs**)?
- What are legitimate **methods to process** portfolio sales in the compilation of CPPIs?



# Background

- The **market of investors** in CRE is characterized by portfolios of real estate

(Brown & Mathyslak, 1995; Geltner D. , 1997).



Source: CBS (2019)

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# Background

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- The **market of investors** in CRE is characterized by portfolios of real estate (Brown & Mathyslak, 1995; Geltner D. , 1997).
- Several studies have identified complexities of portfolios and have suggested methods to deal with it (Kallberg, Liu, & Greig, 1996; Kolodziejczyk, Mielcarz, & Osiichuk, 2019; Goetzmann, 1992)
- It has not been studied how to **split** a portfolio sale.



# Data and methodology

- Transactions → Land Registry Office
- Range: 1995 - 2023

Portfolio A	Transaction price
Property 1	
Property 2	
Property 3	
	€ 10,000,000



# Data and methodology

- 3 imputation methods
- 2 assessment methods

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# Data and methodology

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## 3 imputation methods

Portfolio A	Transaction price
Property 1	
Property 2	
Property 3	
	€ 10,000,000

# Data and methodology

## 3 imputation methods

Portfolio A	Transaction price	M <sup>2</sup>	Valuation	Valuation / M <sup>2</sup> neighbourhood
Property 1				
Property 2				
Property 3				
	€ 10,000,000			



# Data and methodology

## 3 imputation methods

$$\text{Imputation} = \frac{m^2}{\sum m^2} \text{ portfolio price}$$

Portfolio A	Transaction price	M <sup>2</sup>	Valuation	Valuation / M <sup>2</sup> neighbourhood
Property 1		500		
Property 2		100		
Property 3		400		
	€ 10,000.,00			



# Data and methodology

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## 3 imputation methods

$$\text{Imputation} = \frac{m^2}{\sum m^2} \text{ portfolio price}$$

Portfolio A	Transaction price	M <sup>2</sup>	Valuation	Valuation / M <sup>2</sup> neighbourhood
Property 1	€ 5,000,000 ←	500		
Property 2	€ 1,000,000 ←	100		
Property 3	€ 4,000,000 ←	400		
	€ 10,000,000	10,000		

# Data and methodology

## 3 imputation methods

$$\text{Imputation} = \frac{\text{valuation}}{\sum \text{valuation}} \text{ portfolio price}$$

Portfolio A	Transaction price	M <sup>2</sup>	Valuation	Valuation / M <sup>2</sup> neighbourhood
Property 1			€ 8,000,000	
Property 2			€ 8,000,000	
Property 3			€ 4,000,000	
	€ 10,000,000		€ 20,000,000	



# Data and methodology

## 3 imputation methods

$$\text{Imputation} = \frac{\text{valuation}}{\sum \text{valuation}} \text{ portfolio price}$$

Portfolio A	Transaction price	M <sup>2</sup>	Valuation	Valuation / M <sup>2</sup> neighbourhood
Property 1	€ 4,000,000		€ 8,000,000	
Property 2	€ 4,000,000		€ 8,000,000	
Property 3	€ 2,000,000		€ 4,000,000	
	€ 10,000,000		€ 20,000,000	





# Data and methodology

## 3 imputation methods

$$\text{Imputation} = \frac{m_i^2 (V/m_n^2)}{\sum m_i^2 (V/m_n^2)} \text{ portfolio price}$$

Portfolio A	Transaction price	M <sup>2</sup>	Valuation	Valuation / M <sup>2</sup> neighbourhood
Property 1		500		€ 10,000
Property 2		100		€ 8,000
Property 3		400		€ 12,000
	€ 10,000,000			



# Data and methodology

## 3 imputation methods

$$\text{Imputation} = \frac{m_i^2 (V/m_n^2)}{\sum m_i^2 (V/m_n^2)} \text{ portfolio price}$$

Portfolio A	Transaction price	M <sup>2</sup>	Valuation	Valuation / M <sup>2</sup> neighbourhood
Property 1	€ 4,700,000	500		€ 10,000
Property 2	€ 800,000	100		€ 8,000
Property 3	€ 4,500,000	400		€ 12,000
	€ 10,000,000			



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## 2 assessment methods -> resampling

### 1

- Permutation test
- Use single object sales as test set
- Simulate portfolio's with this test set
- Assess the differences with the observed prices (residuals)



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## 2 assessment methods -> resampling

### 2

- Jack-knife cross validation
- Calculate index with and without each imputed portfolio
- Assess the differences for each portfolio (share in index development)



# Results

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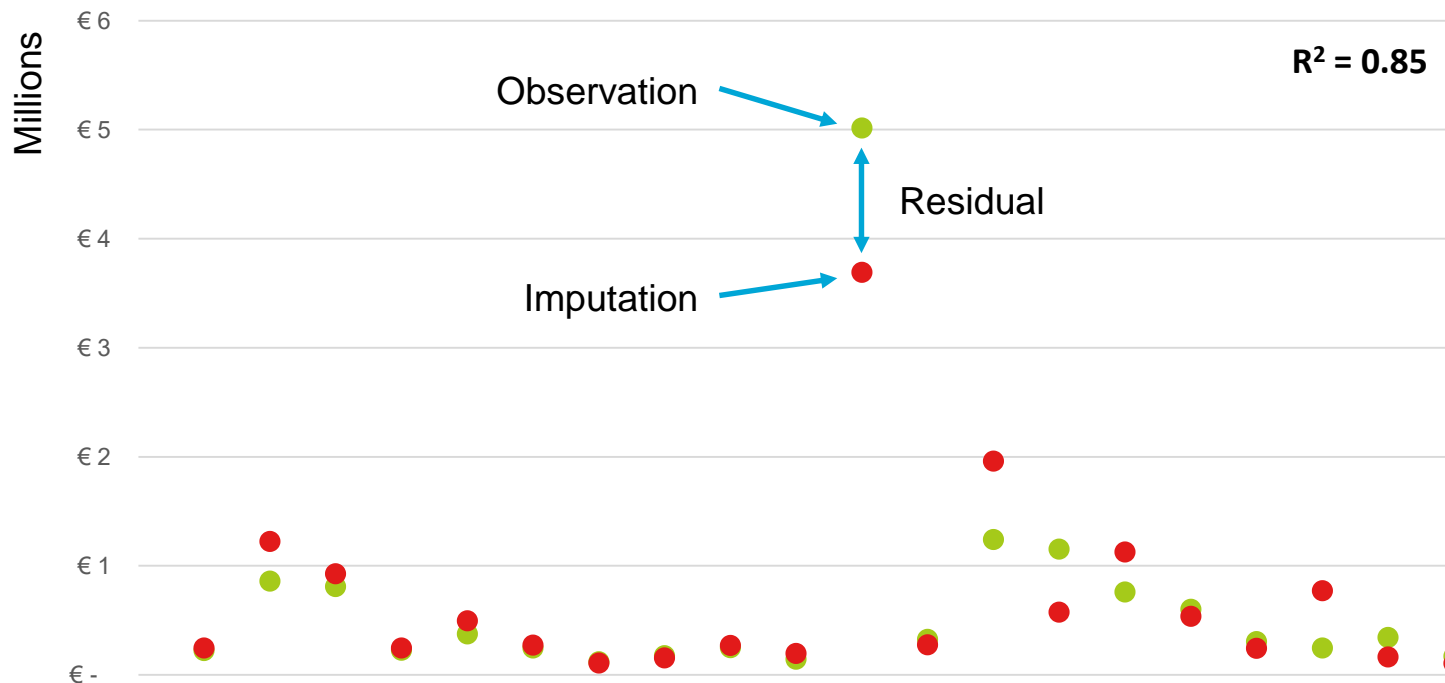
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## Imputation valuations



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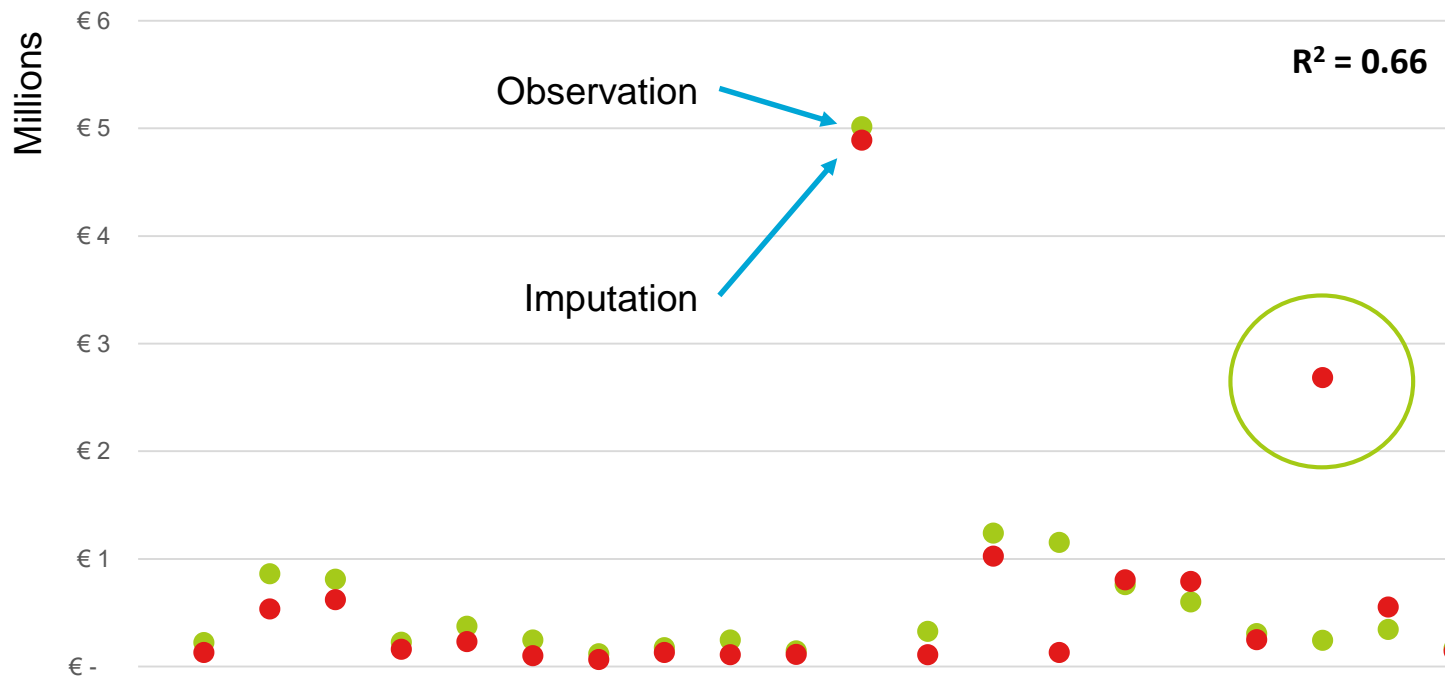
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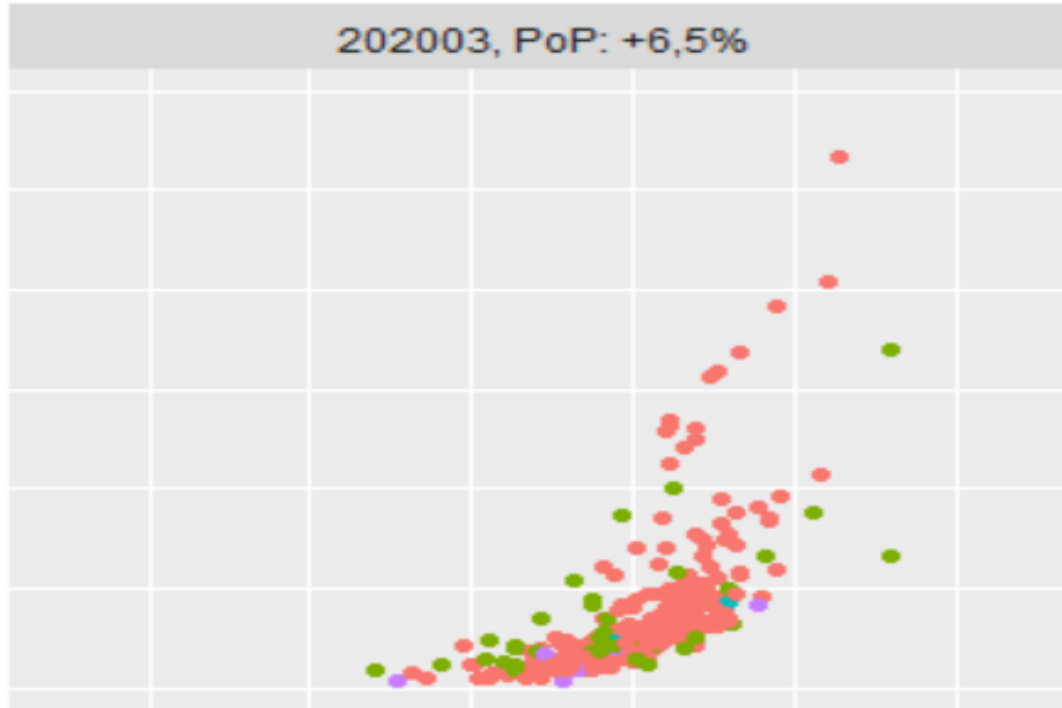
## Imputation m<sup>2</sup>





# Results

## Jack-knife cross validation



- Single sales
- Imputation: valuation
- Imputation neighborhood
- Imputation: valuation+





# Conclusions

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- The volume of portfolio sales indicates that portfolio sales should be included
- The difference in price developments indicates that portfolio sales should be included
- There are methods that approximate realistic individual prices
- For these methods, additional data is required
- The quality of the methods is heavily dependent of the data

# Questions?

*Also conducting research on portfolio sales?*

Please don't hesitate to contact me.

**Farley Ishaak**

PhD candidate @TU Delft

Production manager RE prices @Statistics Netherlands

[f.f.Ishaak@tudelft.nl](mailto:f.f.Ishaak@tudelft.nl)

