

Research findings to Date:

The research is ongoing and has produced several publications, working papers and two (modestly sized) research grants (CDBB, £25K; ZEW SEEK EUR 75K):

Since the last report, two of my papers have been accepted for publication:

- Wan, Wayne Xinwei and T. Lindenthal (conditional accept) "Towards Accountability in Machine Learning Applications: A System-testing Approach" *Real Estate Economics*.
- Clapp, J. and T. Lindenthal (forthcoming). "Urban Land Valuation with Bundled Good and Land Residual Assumptions" *Journal of Housing Economics*

A third paper is still under review

- **"Growth and Predictability of Urban Housing Rents"**, with Piet Eichholtz and Matthijs Korevaar.

This paper studies urban rental prices for half a millennium (1500–2020) and seven cities: Amsterdam, Antwerp, Bruges, Brussels, Ghent, London, and Paris. Based on a dataset of 436,000 rental cash flow observations, we build continuous annual indices of housing rents, which we employ to study the long-term developments in rental cash flows, as well as their predictability. We find that real rent growth has been limited, but with large differences across cities: average annual growth rates range between 0.12 percent for the Belgian cities to 0.30 percent for Paris. At the market level, we show that sluggish supply adjustment implies that past population growth negatively predicts current rental growth. At the individual asset level, we find that past excess rental growth rates are predictive of future rent revisions, and that increasing steepness of the term structure of contract rents is predictive for future rent levels.

Link: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3418495

Other working papers

- *"The Odd One Out: Predicting Price Coarseness"* (with Carolin Schmidt, ZEW Mannheim)
 - Presented at ASSA 2020

- Presented at Weimer School May Session, Homer Hoyt Institute (May 2019, Singer Island, Florida). Conference was on "New data and tools in real estate research"

Links to your research outputs:

- Wan, Wayne Xinwei and T. Lindenthal (Conditional Accept) "Towards Accountability in Machine Learning Applications: A System-testing Approach" *Real Estate Economics*.
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3758451
- Clapp, J. and T. Lindenthal (forthcoming). "Urban Land Valuation with Bundled Good and Land Residual Assumptions" *Journal of Housing Economics*
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4080868
- Piet Eichholtz, Matthijs Korevaar, Thies Lindenthal, Ronan Tallec, (2021) "The Total Return to Residential Real Estate", *The Review of Financial Studies*,
<https://doi.org/10.1093/rfs/hhab042>
- Clapp, J., Cohen, J. and T. Lindenthal (2021). "Are Estimates of Rapid Growth in Urban Land Values an Artifact of the Land Residual Model?". *Journal of Real Estate Finance and Economics*. <https://www.lindenthal.eu/assets/papers/Clapp-Cohen-Lindenthal-JREFE-2021.pdf>
- Lindenthal, T. and E. Johnson (2021). "Machine Learning, Architectural Styles and Property Values". *Journal of Real Estate Finance and Economics*.
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3618293
- Working Paper "500 Years of Housing Rents, Quality and Affordability" (with Matthijs Korevaar, and Piet Eichholtz)
- "Machine Learning and AI in the Built Environment", Final report.
https://www.cdbb.cam.ac.uk/Downloads/ResearchBridgeheadDownloads/CDBBMiniProjectFinalReportThiesLindenthal_edited.pdf
- "The Odd One Out: Predicting Price Coarseness"
<https://www.dropbox.com/s/apzo3r4uvqxnk7/The%20Odd%20One%20Out.pdf?dl=0>

Publications generated during the CERF fellowship(s)

- Piet Eichholtz, Matthijs Korevaar, Thies Lindenthal, Ronan Tallec, (2021) "The Total Return to Residential Real Estate", *The Review of Financial Studies*
- Clapp, J., Cohen, J. and T. Lindenthal (2021). "Are Estimates of Rapid Growth in Urban Land Values an Artifact of the Land Residual Model?" *Journal of Real Estate Finance and Economics*.
- Lindenthal, T. and E. Johnson (2021). "Machine Learning, Architectural Styles and Property Values". *Journal of Real Estate Finance and Economics*.
- Lindenthal, T. "Beauty in the Eye of the Home-Owner: Aesthetic Zoning and Residential Property Values" (2017). *Real Estate Economics*.
- Lindenthal, T., Eichholtz P. and D. Geltner (2017). "Land Assembly in Amsterdam, 1832-2015". *Regional Science and Urban Economics*.
- Lindenthal, T. (2017). "Estimating Supply Elasticities for Residential Real Estate in the UK", in: Huang, B., Cao K. and E. Silva (Eds.) *Comprehensive Geographic Information Systems: Socio-economic applications*. Elsevier.

Seminars, conference presentations (since Aug. 2016)

- AREUEA International Meeting (2022): "Dynamic Preferences for Architecture: Finding Ground Truth with ML Approaches"
- UCL conference: "The Case of Affordable Housing: a global perspective on financing and institutional ownership", presented "500 Years of Urban Rents, Housing Quality and Affordability"
- Weimer School May Session, Homer Hoyt Institute (May 2019, Singer Island, Florida), presented "The Odd One Out: Predicting Price Coarseness"
- Weimer School Session, Homer Hoyt Institute (Jan 2019, Singer Island, Florida). Presented "Machine Learning, Building Vintage and Property Values"
- ASSA/American Real Estate and Urban Economics Association (AREUEA) Annual Meeting, Chicago (Jan. 2019). Presented "Machine Learning, Building Vintage and Property Values"

- Urban Economics Association, Annual Meeting (NYC, Oct. 2018). Paper “*Machine Learning, Building Vintage and Property Values*”
- ReCapNet conference. Presented “Local market power in residential property markets”. (Nov 2018, Mannheim)
- Participated in CERF Cavalcade (23.5.2018) with “Unique Assets, Quality Uncertainty and Noisy Prices”
- ASSA/American Real Estate and Urban Economics Association (AREUEA) Annual Meeting, Chicago (Jan. 2017). Presented research paper titled “Beauty in the Eye of the Home-Owner: Aesthetic Zoning and Residential Property Values”

Press releases and other academic activities

- I am the initiator of the Virtual Real Estate Seminar (<https://seminar.re>), the largest real estate seminar, as far as I know. In recent sessions, we had up to 140 participants.
- I am co-organiser of the *Cambridge/NUS/Florida Real Estate Finance and Investment Symposium* which will be held, again, in November 2022 in Gainesville, Florida. This symposium is linked to a special issue at the *Journal of Real Estate Finance and Economics*. I am an editor for this special issue.