

Study estimates low long-run discount rates using Singapore condominium transactions

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A view of urban skyscrapers at sunset in Singapore. Credit: National University of Singapore

Climate change mitigation and other long-term infrastructure projects such as housing and public transportation networks are costly investments but they provide benefits to society for decades or even centuries in the future. By being able to conduct cost-benefit analyses accurately, policymakers determine which policies are beneficial to

society over the long run.

Estimates of long-run discount rates, that is, the rate at which economic agents discount future cash flows and other benefits, is an essential ingredient for such policy analyses. A study by researchers from the National University of Singapore (NUS) found low and declining discount rates using data on Singapore condominium sales from 1995 to 2015. Using housing assets that pay benefits over very long but varying horizons, they estimated a substantial price premium of property as the ownership duration increases, concluding that market discount rates are declining to levels that are lower than estimated previously. This raises the value society places on costly policy changes and investments made today that provide benefits in the far-distant future.

Associate Professor Alberto Salvo from the Department of Economics at the NUS Faculty of Arts and Social Sciences and an author of the study, said, "There has been little research that has estimated long-run market discount rates. However, these are essential for climate-change policy analysis as well as evaluating other long-run investments such as electrifying Singapore's public bus fleet or building a new MRT line, which typically cost a lot initially and provide benefits for many years in the future. Our study is able to estimate long-run discount rates using market prices of Singapore condominiums, given how these residential assets are one of few that have long and varying horizons—where housing is owned either for decades, centuries or in freehold."

The results of the study were published in the *Journal of Applied Econometrics*.

Low long-run discount rates imply premium placed on long-run assets

The research team, which included Assoc Prof Liu Haoming from the NUS Department of Economics and Assoc Prof Eric Fesselmeyer who was formerly from the Department and now at Monmouth University, used statistical models that compared the prices paid for properties with different lease lengths—99-year and 999-year leasehold properties, as well as freehold (perpetual) properties—to estimate the discount rate.

"People buy property today—a costly investment—because this gives them housing benefits many years into the future: and this is what the price of a home captures. The premium paid for a freehold property over a 99-year or a 999-year leasehold property tells us about how people value the future, because the utility provided by a freehold property extends beyond that of a 99-year or even a 999-year leasehold property. Less discounting of the future means you value it more," explained Assoc Prof Liu.

Applying nonlinear panel regression analysis to condominium sales data, the team estimated discount rates that start at about 2.5 to 4 percent per year for the first 100 years, and fall to 0.5 to 1.5 percent per year by the fourth century. This explains why a freehold property typically sells for 15 to 20 percent more than a 99 year leasehold property and about 3 to 5 percent more than a 999 year leasehold property. To isolate price differentials due to differences in lease length, the team was careful to control for housing features that also drove price differences, such as the apartment's neighbourhood, floor space, and storey.

Assoc Prof Fesselmeyer shared, "Singapore's residential property buyers show us through their actual choices that they are surprisingly patient, that they value the future, and are willing to pay a premium for very long-run assets. It is like paying a premium out of today's consumption to safeguard the environment in the future—and in this case, it is their housing in a safe, clean, and liveable Singapore."

The team noted that the discount rates they inferred from their research are significantly lower than the rates typically used to evaluate public policy. Equipped with lower discount rates that attach more value to protecting its future, society around the world can, for example, more emphatically choose renewables over environmentally dirty coal to generate electricity, clean transportation over dirty diesel to power urban trains and buses, or investment in [carbon sequestration](#) over current consumption.

Assoc Prof Salvo observed, "Our finding of discount rates declining to 0.5 to 1.5 percent per year implies greater value for public investments made today that provide returns to society many years in the future. This is important because using a constant discount rate of say 4 percent yearly means that benefits realised in just a few decades from now are rendered worthless in today's dollars in a cost-benefit calculation, incorrectly undervaluing the benefits of slowing climate change or investing in long-term infrastructure."

The team noted that as lower and declining [discount](#) rates imply higher carbon prices—the so-called 'social cost of carbon' – this translates into the notion that governments should act in concert globally to raise carbon prices substantially, for the benefit of future generations.

The researchers hope that these findings can guide policymakers in the use of cost-benefit analysis, especially to appropriately value costly [climate-change mitigation](#) policies. To take the project further, they are exploring the collection of residential market data from more recent years and in different jurisdictions such as the United Kingdom which has a similar ownership lease structure to Singapore's—as there may be interesting cultural and demographic differences in how the future is discounted in favour of the present.

More information: Eric Fesselmeyer et al, Declining Discount Rates

in Singapore's Market for Privately Developed Apartments, *Journal of Applied Econometrics* (2021). [DOI: 10.1002/jae.2867](https://doi.org/10.1002/jae.2867)

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