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ASK: NUS ECONOMISTS

Using property prices to guide climate change policies

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How do governments estimate the impact of costs and benefits of strategies to reduce carbon in climate change? What research can guide such estimates of costs and benefits over the very long term?

IN 2013, the Intergovernmental Panel on Climate Change reported that warming of the earth's atmosphere and oceans is "unequivocal" and the dominant cause is human influence.

Among the expected effects of rising atmospheric concentrations of greenhouse gases are heat waves, rising sea levels and coastal flooding and droughts, among other extreme phenomena. Influential reviews such as the one headed by British economist Nick Stern described climate change as "the greatest and widest-ranging market failure ever seen".

In response to such views, governments are considering investments in carbon abatement strategies. These are designed to reduce greenhouse gas emissions, such as by increasing petrol taxes and switching from coal to cleaner but more expensive fuels.

A government's decision to invest in such carbon abatement strategies depends heavily on a cost-benefit analysis. If the benefits of greenhouse gas reduction outweigh the costs, then investment makes financial sense. But abatement strategies have costs and benefits that occur over many decades, centuries even.

Since a dollar today is worth more than a dollar in the future, a cost-benefit study requires all future dollars to be converted into today's equivalent dollars. The rate of conversion used is called the discount rate.

Because costs are mostly concentrated in the first few years whereas benefits are enjoyed possibly many years in the future, the discount rate is a major determinant in whether an investment project is economically justified.

A high discount rate emphasises the present, valuing costs relatively more importantly than benefits, making it less likely that the net payoff to an investment is positive.

Similarly, a low discount rate means costs are treated as relatively less important than benefits, and an investment's net payoff is more likely to be positive.

Cost-benefit analysis can be controversial, particularly when applied to valuing policies to protect the environment, but we will not discuss the controversy here.

Our focus is on how Singapore's property market can guide us on discounting future benefits – or "discounting the future environment" – at a lower rate than currently adopted in many policy circles. Thus, a crucial question is what discount rate to use. The answer depends on how society values the future. If society places a high value on the future, then a low discount rate should be used since society considers a future dollar to be worth almost as much as a current dollar. If, instead, society considers the future relatively unimportant compared to the present, it discounts the future heavily and a high discount rate is appropriate.

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Policymakers and researchers are finding it difficult to decide on the proper discount rate to use to evaluate carbon abatement strategies. One problem is the lack of real-world data indicating how households actually value the far-off future.

Leasehold versus freehold

IN OUR recent paper, we take advantage of a familiar feature of the Singapore property market, namely the co-existence of leasehold and freehold properties, to estimate discount rates far into the future.

Leasehold and freehold properties differ in their tenure length, the number of years until a property reverts to the landowner, often the government. Under leasehold, a property reverts to the landowner at the end of either 99 years or 999 years. A freehold property remains the owner's property in perpetuity.

The premium paid for a freehold property over a 99-year or 999-year leasehold property is partly due to how people value the future, since the utility provided by a freehold property extends beyond that of a 99-year or even a 999-year leasehold property.

Using the differences in prices paid for properties of different tenure lengths, a direct measure of how people value the far-in-the-future utility of freehold properties, we are able to estimate the discount rate.

Since housing units can differ greatly in terms of characteristics that affect price, we were careful to measure people's valuation of longer tenure length and not other differences in housing features.

For example, one might reasonably think that freehold properties are bigger on average than 99-year leasehold properties. If so, looking at simple differences in average price would incorrectly attribute all of the price premium of freehold properties to the difference in tenure length instead of attributing some of it to the extra living space provided by freehold properties.

The statistical method we used, called regression analysis, addresses just such scenarios, allowing us to isolate the price differentials due to differences in tenure by accounting for other characteristics that also drive price differences.

Applying regression analysis to new condominium and apartment sales data, we estimated that a freehold property fetches about 15 to 20 per cent more than a 99-year leasehold property and about 3.5 to 5 per cent more than a 999-year leasehold property. In dollar terms, this means a $1 million freehold property would sell for about $200,000 more than a 99-year leasehold property and about $50,000 more than a 999-year leasehold property because of the differences in tenure length.

Annual discount rate

HOW do these price differentials convert into discount rates?

Assuming that the discount rate is constant over the length of tenure, the price premium of freehold properties over 99-year leasehold properties suggests an annual discount rate of 1.8 per cent. The price differential between a 999-year leasehold and a freehold property suggests a discount rate of only 0.2 per cent.

These rates are much lower than the rates typically used to evaluate public policy. For example, the US Office of Management and Budget recommends using discount rates of up to 7 per cent.

Given our findings, the use of such high discount rates over-emphasises current costs relative to future benefits, which can lead to incorrectly rejecting economically viable investments in greenhouse gas reduction strategies.

Consider, for example, a study by Imperial College London that estimated the annual cost of halving CO_2 emissions by 2050 to about 1 per cent of world gross domestic product (GDP), or $2 trillion per year. For the sake of comparison, let us assume that the annual benefits of such a decrease account for 1.5 per cent of world GDP, $3 trillion, from 2050 onwards.

If we were to apply a discount rate of 4 per cent per year, which to some might seem low, the discounted value of costs over the next 25 years would amount to $31 trillion, compared to discounted benefits of $28 trillion, suggesting that the project to reduce carbon emissions should not be implemented.

By contrast, if we were to apply the discount rate of 1.8 per cent per year that we estimated, discounted costs of $40 trillion would pale in comparison to discounted benefits of $107 trillion, indicating that the payoff to worldwide reduction in carbon emissions would be massive.

We might ponder this the next time we read in the papers that governments around the world are raising petrol taxes.

Leasehold and freehold properties differ in their tenure length. The premium paid for a freehold property over a 99-year or 999-year leasehold property is partly due to how people value the future. PHOTO: BLOOMBERG

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This is a monthly series by the NUS Economics Department. Each month, a panel will address a topical issue. If you have a burning question on economics, write to stopinion@sph.com.sg with "Ask NUS" in the subject field.

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