



Statistics
Canada Statistique
Canada

Canada



Statistics Canada
www.statcan.gc.ca

Using Hedonics to Create Land and Structure Condominium Price Indexes

Kate Burnett-Isaacs
Ottawa Group Meeting
May 21, 2015



Introduction

- Statistics Canada is developing a New Condominium Apartment Price Index (NCAPI)
- Require separate land and structure components
- Standard hedonic methods do not produce this land-structure split
- Goal of this study is to determine if a suitable and feasible land-structure split can be produced using a non-linear hedonic model for Ottawa condos



Considerations

- Condo units share structural space with the rest of the condo building
- Condo units share the land the building is built upon
- Land size for a condo unit can be thought as either a two dimensional space or a three dimensional space



Data

- Residential property price research dataset for new and resale condo apartments in Ottawa for the five year period of 2005 to 2009
- Only contains high rise condos
- Characteristic variables include number of rooms, unit square footage and 3 digit postal codes
- Does not contain a variable for land size



Methodology

- Based on Diewert and Shimizu (2013) and Diewert, de Haan and Hendriks (2011)
- One hedonic regression can be constructed with separate land and structure components
- Assume that the main driver of condo land prices is the location
- Multicollinearity between land and structure variables can make it difficult to truly separate the two components in a hedonic regression



Apartment Building Construction Price Index

- Use a construction cost index to help remove multicollinearity
- The ABCPI is an output construction price index based on a model approach. It tracks the cost of all components excluding land
- Assume that the movement of condo unit construction costs are the same as those for apartment buildings
- ABCPI can be used as a reasonable proxy for structure component



Basic Model

$$P_i^t = \alpha^t \left(\sum_{j=1}^J \omega_j^t D_{ij}^t \right) + \beta^t (1 - \delta A_i^t) (1 + \gamma R_i^t) S_i^t + \varepsilon_i^t$$



Land Component

$$P_i^t = \alpha^t \left(\sum_{j=1}^J \omega_j^t D_{ij}^t \right) + \beta^t (1 - \delta A_i^t) (1 + \gamma R_i^t) S_i^t + \varepsilon_i^t$$



Structure Component

$$P_i^t = \alpha^t \left(\sum_{j=1}^J \omega_j^t D_{ij}^t \right) + \beta^t (1 - \delta A_i^t) (1 + \gamma R_i^t) S_i^t + \varepsilon_i^t$$



Indexes

Land Index

$$P_L^t = \frac{\hat{\alpha}^t}{\hat{\alpha}^0}$$

Structure Index

$$P_S^t = \frac{\hat{\beta}^t}{\hat{\beta}^0}$$

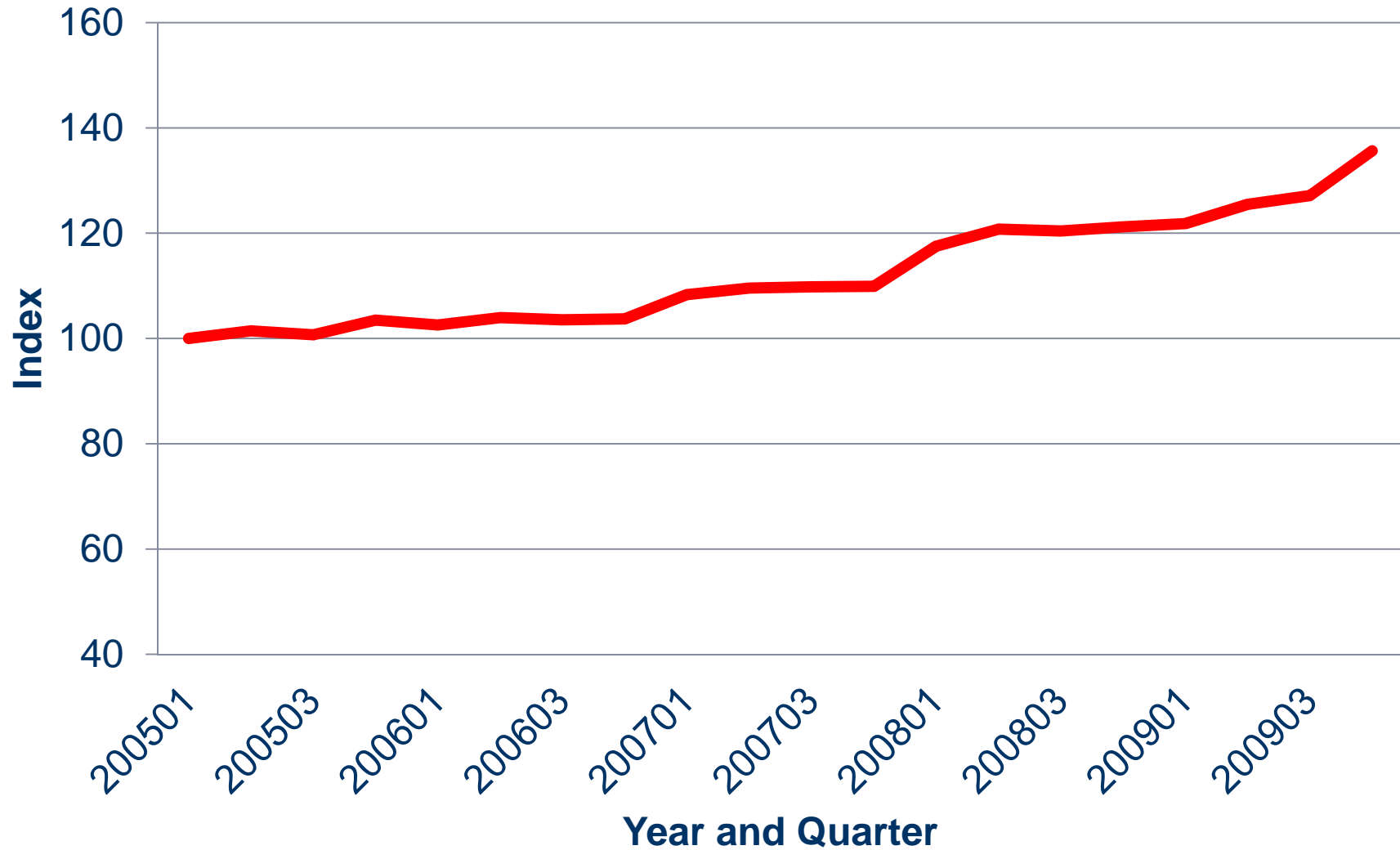


Total Laspeyres Index Calculation

$$I^t = \frac{P_L^t \alpha^0 \sum_{i=1}^N (\sum_{j=1}^J \omega_j^0 D_{ij}^0) + P_S^t \beta^0 (\sum_{i=1}^N (1 - \delta A_i^0) (1 + \gamma R_i^0) S_i^0)}{P_L^0 \alpha^0 \sum_{i=1}^N (\sum_{j=1}^J \omega_j^0 D_{ij}^0) + P_S^0 \beta^0 (\sum_{i=1}^N (1 - \delta A_i^0) (1 + \gamma R_i^0) S_i^0)}$$

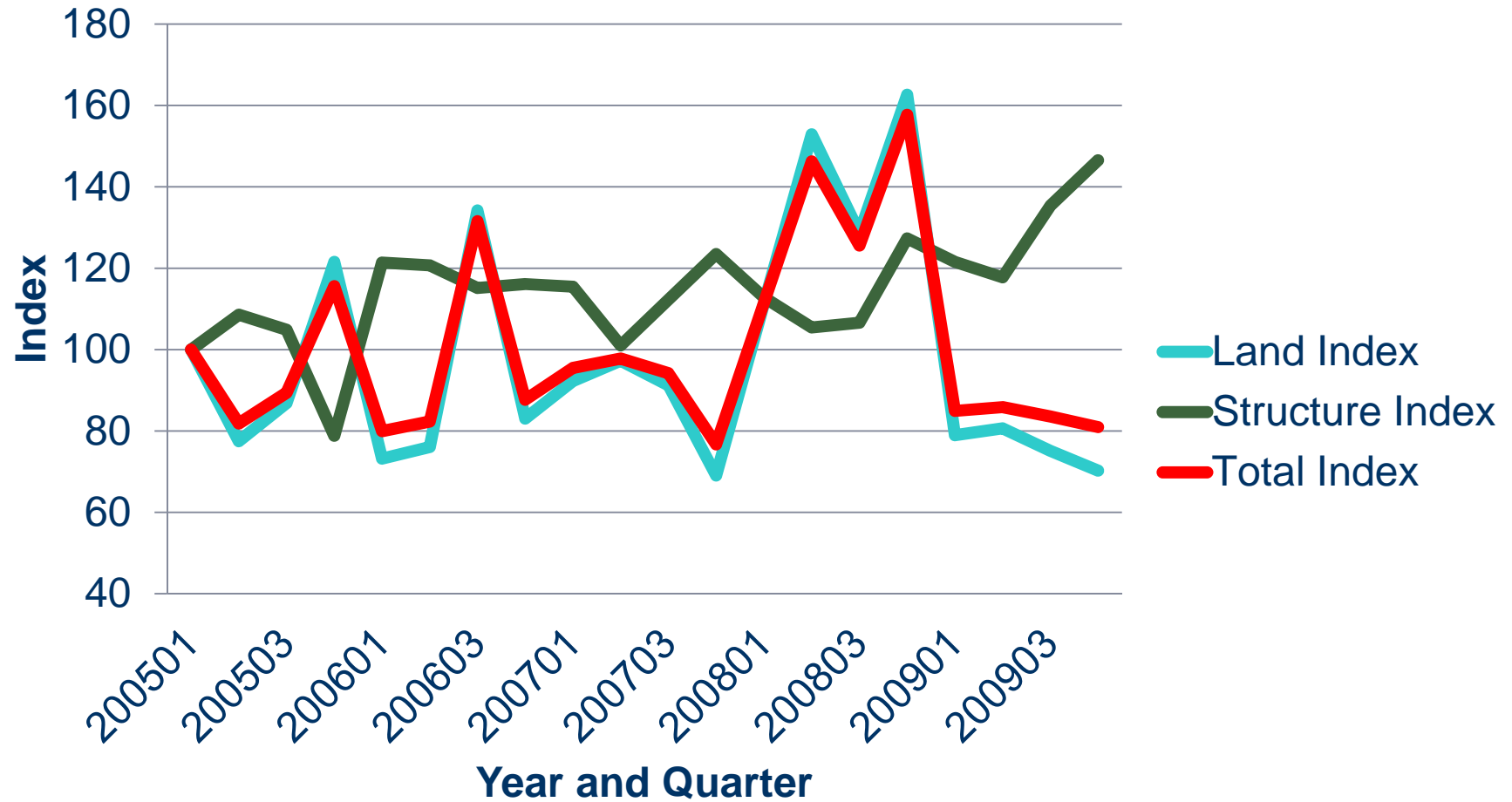


Benchmark Model





Basic Model





ABCPI Model

$$P_i^t = \alpha^t \left(\sum_{j=1}^J \omega_j^t D_{ij}^t \right) + \beta^0 ABCPI^t (1 - \delta A_i^t) (1 + \gamma R_i^t) S_i^t + \varepsilon_i^t$$



Indexes

Land Index

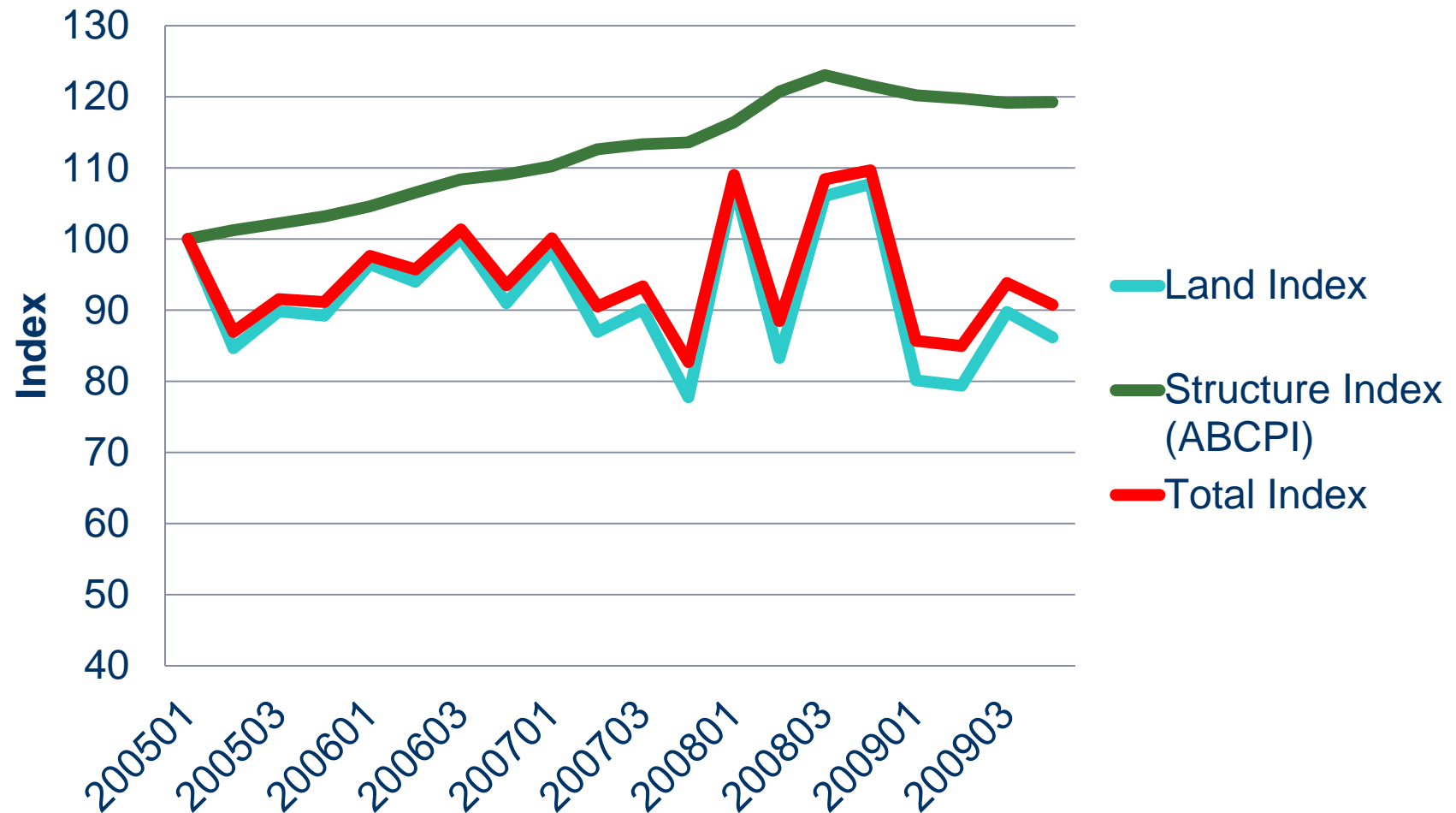
$$P_L^t = \frac{\hat{\alpha}^t}{\hat{\alpha}^0}$$

Structure Index

$$P_S^t = \frac{\beta^0 ABCPI^t}{\beta^0 ABCPI^0} = \frac{ABCPI^t}{ABCPI^0}$$

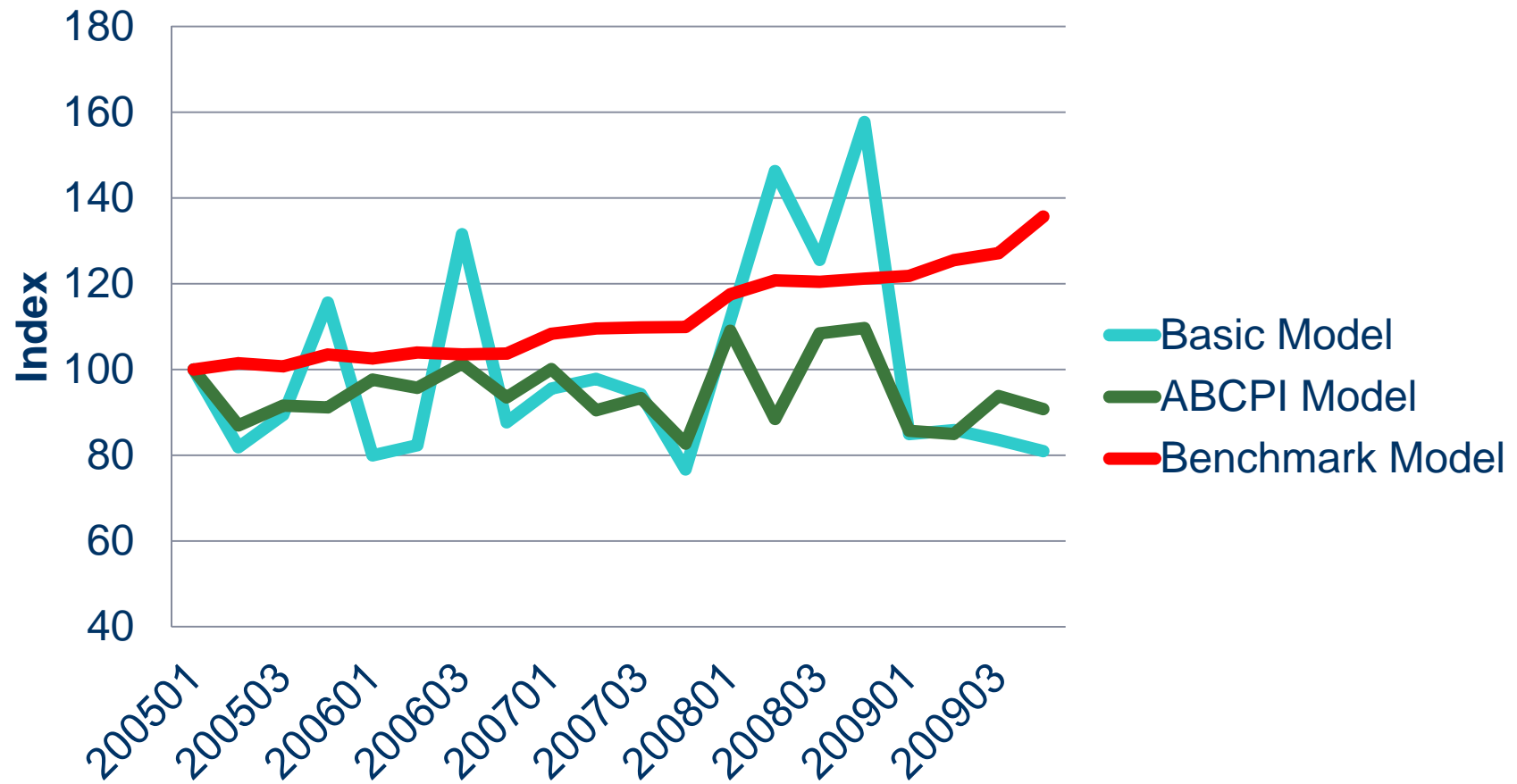


ABCPI Model





Comparison to Benchmark Model





Conclusions and Next Steps

- New Condominium Apartment Price Index is being developed to collect data on common space (land and structure) characteristics and prices
- Consultation and testing reveal some builders have difficulty reporting land cost or land value
- Research continues to find suitable data and variables to derive a land price index for condos



Discussion and Feedback

- How to allocate common areas to a single condo unit?
 - Structural common areas
 - Land common areas
 - Land as a two or three dimensional space
- How to better weight structure and land components in model?
- Suggestions for other approaches to derive a land/structure ratio in the absence of data on land
- Suggestions for ongoing work on condominium price indexes