Research Methodology 06
-Writing Report-

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0. Outline of Today’s Lecture

1. Writing Report.
2. Project

Today’s Stat: Additional Topics in Regression Analysis

Today’s Case:

“Housing Rent and Japanese CPI: Nominal Rigidity of Rents,”
1. Writing Report

- How to structure a research report?
- How to find your own writing style?
- How to develop your skills in academic writing?
- How to write to different audiences?

- The question of research writing has been discussed by many researchers during the past decades.

- Although there is no single answer to the question of how we should represent and write research, there are some common issues that we find relevant.
Scientific writing.

• A central issue for many researchers is that writing differs from what we call scientific writing, which is closely related to the positivist research tradition.

• *Statistics is “The Grammar of Science” Karl Pearson.*

• Whereas scientific writing aims to be objective by using impersonal pronouns and the passive voice, writers allow themselves to be present in their writing.

• It is also common in research that the authors reflect on their writing process and choice of style in their research report.

• In addition, writers rely on vivid description, storytelling, and metaphorical language to carry meaning and hold their readers’ attention.
Think like a novelist.

• One way to understand the specific nature of scientific writing is to start *thinking like a novelist*, that is, someone who creates a setting in which to place the characters and events that produce a plot (Ellis, 2004; Marvasti, 2011).

• You can think about your research process *as a story*: it started in some place;
• the data were collected at some locality and with some people; and
• the research text started with some context.
Choose your intended audience.

• The success of your writing depends on how well your writing mode and style speaks to the readers.

• This is why good writing is rarely produced without attention to the audience (Richardson, 1990).

• There are at least two types of audience in any kind of research: real and intended.

• →The real audience is anyone who reads your research texts, and the intended audience is the target group that you have in mind when planning your writing.

• Who? the other students; instructors, supervisors and examiners; business practitioners; and the business media.
The structure of the research report.

- Many researchers begin to write a research report with crafting an outline, including a table of contents. When writing these, it is necessary to make some decisions about the structure of the research report.

- It is common to make a distinction between \textit{the macro-and micro-structure} of a research report.

- The macro-structure refers to how the main sections or chapters are organized in the report, and the micro-structure indicates what the more detailed structural choices are.
Good research report.

• In the same way as any good research report, scientific writing deals with the following tasks:

  • a) introducing the purpose of the research,
  • b) critically reviewing and referring to the literature;
  • c) describing the methods used, analyses made, and
  • d) discoveries achieved, as well as providing discussion and
  • e) conclusions about the topic studied (Marvasti, 2011).
Titling work.

• In titling work, researchers often use imagination and creativity.

• It is quite typical to combine a vivid phrase or a question followed by a more descriptive sub-title.

• Try to select a title for your work that will encourage the readers to want to read it and let them know in advance what it is about.
(1) Introduction

• The introduction is where you give your intended audience reasons to read your research text.

• Therefore, you should be able to convince the reader that your research is important and relevant to them.
(2) Literature Review

• When introducing your research, you usually position your research within the prior research done by other researchers on the same topic, and within a specific theoretical approach (see Lecture 2).

• Wolcott (2009) argues, however, that the conventional organization of the literature in *one separate section* in the beginning of your research report is unhelpful to most qualitative researchers.
(3) Describing methodology and methods

• A description of your methodology and methods should give a detailed account of the research process:
  • a) what was done;
  • b) how and why.
• This is most often done in a separate section outlining the methodological approach and the specific methods used, the collection of empirical materials and their analysis, and the problems or issues that were raised during the study.

• Method : Hypothesis and Theory → Lecture 2
• Data collecting → Lecture 3
(4) Presenting analysis

• One central issue concerning the structure of your research report is to decide *how you want to present your empirical analysis and your findings*.

• While there is no one answer to this, you need to consider *which way of presenting is suitable to your research design and research questions*, and which way of presenting would appeal to your audience.

• Analyzing data→Lecture 4
• Interpretation and Validation→Lecture 5
(5) Conclusions

• A conclusions section can be as short as a few paragraphs or as long as several pages; the length will depend on the complexity of your focus and results.

• The conclusion often includes a discussion of any new insights the research can contribute to the broader literature.

• Additionally, any limitations of your research should be stated, as well as the suggestions;

• Suggestions that you would have for future research.
2. Project

• Project1: A report on “Aging and Housing Prices”.

• Project2: Literature Review.

• Deadline: March 20, 2016 5:00pm.

• File Name: Student Matric No+Name.docx
  Exp: 149076ChihiroShimizu.docx

• IVLE folder.
Project 1: A report on “Aging and Housing Prices”.

• 1. Motivation as Introduction

• 2. Literature Review (at least 10 papers)

• 3. Data collection
  • Pick up 10 countries from database. (Please pick up your favorite 10 countries)
  • Data: T02_PanelData.csv
  • If you need to add several variables to this data, please find new variables and revise your data. (Not necessarily)
  • Ex. interest rate, housing starts, etc
• 4. Empirical Model

Make figures, Summary stat, run OLS model based;

\[ Pit = \alpha_i + \beta_1i \ GDPPC_it + \beta_2i \ OLDDEP_it + \beta_3i \ TPOP_it + e_it \]

- \( Pit \): land prices,
- \( GDPPC_it \): per capita GDP
- \( OLDDEP_it \): old age dependency ratio
- \( TPOP_it \): total population,

• Interpretation and validation your empirical results.

• 5. Conclusion

• References
Project2: Literature Review

• 1. Find your research topic.
• Write your motivation.

• 2. Identify 5 keywords.

• 3. Find 10 papers.

• 4. Make “References”.

• 5. Literature Review.
W01. Title Page

• Title: Aging and House Prices
• See. P.15

• (NAME)

• (Student Matric No.)

• Key words: 5 Key words
W02. Introduction-Motivation-

• Motivation to study or importance of study for “Aging and Housing Market”.

Lec02: What is a research problem?

• All progress is born of inquiry. Doubt is any day better than over confidence. *Doubt leads to inquiry and inquiry leads to invention.*

• Thus invention is the out come of research. Research may be motivated by *the desire to know* for the sake of knowing or by *the desire to solve* the practical problems.

• In research process, the first and foremost step is *selecting and defining a research problem.*
• **Conditions:**

• 1. It must be **worth studying**. In other words it must have viability or potentiality to stand as a research problem.

• 2. The study of the problems **must be socially useful**. It must be able to catch the attention of the experts, policy makers, academicians etc. who are familiar with the subject.

• 3. There must be a felt **need for research over the problem**. It should be a problem untouched by other researchers or even if touched must be in need of further research possibility.

• 4. A research problem should **come out with pragmatic solutions to the issue**.

• 5. As far as possible the research problem **should not be stale**. It should be up to date and relevant to the current social happenings.
W03: Literature Survey

• **Lec02 : Literature Survey & Tutorial 1.**

• **Positioning the study through literature**
  • Find and read other’s work throughout your research process
    → The idea is to clarify and sharpen your research questions during the research process.

• Theories, theoretical concepts, and research findings that you read about will assist you with *positioning your study in relation to prior knowledge.*
  → This positioning takes place with the help of prior research and through the development of your own research questions.
W04: Hypothesis & Theory

• **Lec02 : Hypothesis and Theory**

• Although real estate studies emphasizes practical business problems, you must incorporate into the study some *theoretical ideas and concepts*.

• →In theory-driven research you pay a lot of attention to theoretical concepts right at the beginning of the study.

• In *data-driven research* you build the relationship between theoretical concepts and your data at later stages of the project. It is often helpful to make a distinction between theory (theoretical ideas and concepts) and prior research (studies dealing with empirical data).
Example: Project

• Model.
• \( \Delta P_{it} = \alpha_1 + \beta_1 \Delta Y_{1it} + \beta_2 \Delta OLDDEP_{1it} + \beta_3 \Delta TPOP_{it} + \delta_i \)
• \( i = 1, \ldots, I \) \( t = 1, \ldots, T \)
• \( P_{it} \): residential land price (real value)
• \( Y_{it} \): income per capita for the population aged 20–64 (real value)
• \( OLDDEP_{it} \): old-age dependency ratio (= population aged 65+/population aged 20–64)
• \( TPOP_{it} \): total population
• \( \alpha_1, \beta_1, \beta_2, \beta_3 \), parameters to be estimated
• \( \delta_i \): error term
W05: Data

- Lec03: Data Collection
- Lec04: Research Question and Data
- How to collect Data? Data source.
- Primary data or secondary data.

- **Primary data**: The data which are collected from the field under the control and supervision of an investigator is known.
- **Secondary data**: If data are collected from journals, magazines, government publications, annual reports of companies, etc.
- The reliability of managerial decisions depends on the quality of data.
Example: Project

• We made a multinational-level panel data. Our multinational panel data covers 10 developed/developing countries between 1981 and 2013 in annual frequency ($N = 10$, $T = 33$, $N \times T = 330$). The countries covered are; * Asian countries, * Oceania countries, * North American countries, * Africa country, and * European countries.

• Nominal residential price index is gathered from “Residential Property Price Statistics” conducted by the Bank for International Settlements (BIS). Nominal residential price is deflated by CPI. For Real GDP, CPI and Population by age groups we gathered from the World Bank database (data.worldbank.org).
W06. Analyzing Data

- **Lec04**: Research Question and Data
- **Lec04**: Overview of multivariable analysis
- **Lec05**: Machine Learning and Big Data
- & **Tutorial 2**.

Multivariate analysis methods will increasingly influence not only the analytical aspects of research but also the design and approach to data collection for decision making and problem solving.

Although multivariate techniques share many characteristics with their univariate and bivariate counterparts, several key differences arise in the transition to a multivariate analysis.
W07. Interpretation and Validation

• **Lec05**: Interpretation and Simulation.

• Interpretation, the meanings and implications of the study become clear. Analysis is not complete without interpretation and interpretation cannot proceed without analysis. Both are thus interdependent. *Interpretation can be conceived of as a part of analysis.*

• Analysis and interpretation occupy *the last stage of the research*, conceptually or in terms of thought, they occupy the first stage, since the necessary theoretical and practical knowledge of the future shape of the result is acquired much before the actual work is undertaken.
Example: Project

<table>
<thead>
<tr>
<th></th>
<th>No. of observations</th>
<th>Adj. R2</th>
<th>GDP per capita</th>
<th>Old dependency ratio</th>
<th>Total population</th>
<th>EC term</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Japan</strong></td>
<td>1,645</td>
<td>0.629</td>
<td>0.2188</td>
<td>-1.3167</td>
<td>0.9177</td>
<td>0.0000</td>
</tr>
<tr>
<td>Standard error/t value</td>
<td></td>
<td></td>
<td>0.058 / 3.76</td>
<td>0.186 / -7.06</td>
<td>0.290 / 3.17</td>
<td>0.009 / -11.33</td>
</tr>
<tr>
<td><strong>U.S.</strong></td>
<td>1,836</td>
<td>0.439</td>
<td>0.4515</td>
<td>-0.9067</td>
<td>0.7514</td>
<td>0.0000</td>
</tr>
<tr>
<td>Standard error/t value</td>
<td></td>
<td></td>
<td>0.042 / 10.66</td>
<td>0.116 / -7.79</td>
<td>0.116 / 6.46</td>
<td>0.010 / -12.29</td>
</tr>
</tbody>
</table>

The coefficient on per capita GDP:
- **Japan** 0.2188, **US** 0.4515, Takáts:0.8842.

Old age dependency ratio:
- **Japan** -1.3167, **US** -0.9067, Takáts:-0.6818.

Total population:
- **Japan** 0.9177 , **U.S.** 0.7514, Takáts: 1.0547.
A revised schematic description of the steps involved in an econometric analysis of economic models.

# Robustness Check Japan

<table>
<thead>
<tr>
<th>Model</th>
<th>No. of observations</th>
<th>Adj. R²</th>
<th>GDP per capita</th>
<th>Old age dependency ratio</th>
<th>Total population</th>
<th>Time fixed effect</th>
<th>Local fixed effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Japan</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base model: BM</td>
<td>1,645</td>
<td>0.629</td>
<td><strong>0.2188</strong></td>
<td>*** -1.3167</td>
<td>*** 0.9177</td>
<td>*** Yes</td>
<td>None</td>
</tr>
<tr>
<td>without time fixed effect</td>
<td>1,645</td>
<td>0.159</td>
<td><strong>0.4401</strong></td>
<td>*** -1.9702</td>
<td>*** 2.5376</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>with local fixed effect</td>
<td>1,645</td>
<td>0.621</td>
<td><strong>0.2302</strong></td>
<td>*** -1.7280</td>
<td>*** 2.0220</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>with local fixed effect and without time fixed effect</td>
<td>1,645</td>
<td>0.182</td>
<td><strong>0.3891</strong></td>
<td>*** -2.2071</td>
<td>*** 4.0806</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>without FC term</td>
<td>1,645</td>
<td>0.602</td>
<td><strong>0.1468</strong></td>
<td>** -1.0790</td>
<td>*** 0.8333</td>
<td>Yes</td>
<td>None</td>
</tr>
<tr>
<td>BM + Interest rate</td>
<td>1,598</td>
<td>0.629</td>
<td><strong>0.1433</strong></td>
<td>** -1.4071</td>
<td>*** 1.0508</td>
<td>Yes</td>
<td>None</td>
</tr>
<tr>
<td>BM + New housing supply</td>
<td>1,645</td>
<td>0.627</td>
<td><strong>0.2297</strong></td>
<td>*** -1.2701</td>
<td>*** 1.1372</td>
<td>Yes</td>
<td>None</td>
</tr>
<tr>
<td>BM + interest rate + new housing supply</td>
<td>1,598</td>
<td>0.629</td>
<td><strong>0.1664</strong></td>
<td>*** -1.3675</td>
<td>*** 1.2517</td>
<td>Yes</td>
<td>None</td>
</tr>
<tr>
<td>BM + interest rate + new housing supply (1 period lag)</td>
<td>1,598</td>
<td>0.628</td>
<td><strong>0.0890</strong></td>
<td>-1.3569</td>
<td>1.1941</td>
<td>Yes</td>
<td>None</td>
</tr>
</tbody>
</table>

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W08. Conclusion

• **Lec06 : Writing Report.**

• A conclusions section can be as short as a few paragraphs or as long as several pages; the length will depend on the complexity of your focus and results.

• The conclusion often includes a discussion of any new insights the research can contribute to the broader literature.

• Additionally, any limitations of your research should be stated, as well as the suggestions;

• Suggestions that you would have for *future research.*
Introduction to Statistics

- Regression model-building methodology
- Dummy variables for categorical
- Lagged values of the dependent variable
- Residuals for heteroscedasticity and autocorrelation

Chapter 13: Additional Topics in Regression Analysis
Today’s Case:


2007-2009: the Financial Crisis

2013-: Abenomics

Figure 6: Hedonic estimate $Rt^*$, $R$-age and Actual CPI
1. Introduction

Outline or Questions

• **Why are housing rents sticky?**
  – Real estate prices and goods & services prices is linked through housing rents. But housing rents did not rise much, and consequently CPI inflation was stable even during the bubble period. This caused delay in monetary tightening
  – How much and why are housing rents sticky?

• **How should we estimate CPI more linked to asset price developments?**
  – Defining as the opportunity cost of homeowners, we can estimate rent index measuring the newly contracted rent instead of paying rent
  – The user cost method that many countries started to develop in these days
Background papers.

• **Rigidity of Housing Rent.**

• **Comparison of Residential Property Price Indexes.**

W08. Conclusion

- **Lec05**: Interpretation and Simulation.

- Interpretation, the meanings and implications of the study become clear. Analysis is not complete without interpretation and interpretation cannot proceed without analysis. Both are thus interdependent. *Interpretation can be conceived of as a part of analysis.*

- Analysis and interpretation occupy the *last stage of the research*, conceptually or in terms of thought, they occupy the first stage, since the necessary theoretical and practical knowledge of the future shape of the result is acquired much before the actual work is undertaken.
Macroeconomic Policy and Housing Market.

### Expenditures for housing services: 26.4%
- Housing rents: 4.9%
- Imputed rents from owner occupied housing: 19.4%
- Housing maintenance and others: 2.3%

“Consumer Price Index (CPI) in Tokyo, 2010”

- The most important link between *asset prices* and *goods & services prices* is the one through *housing rents* (Goodhart 2001)

- Housing rents account for more than one *fourth* of personal spending
2. Macro-Analysis of Housing Rent
Panel data of rental prices
## Summary Statistics of Housing Rent

<table>
<thead>
<tr>
<th>Sample period</th>
<th>January 2010 - July 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Monthly</td>
</tr>
<tr>
<td>Area</td>
<td>Tokyo’s wards</td>
</tr>
<tr>
<td>Type of data</td>
<td>Paid rent</td>
</tr>
<tr>
<td>Coverage</td>
<td>New and rollover contracts</td>
</tr>
<tr>
<td>Provided by</td>
<td>Recruit</td>
</tr>
<tr>
<td>Number of units</td>
<td>52,524</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of samples</th>
<th>All samples</th>
<th>New contracts</th>
<th>Rollover contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of units</td>
<td>1,529,485</td>
<td>36,832</td>
<td>41,117</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>mean</th>
<th>s.d.</th>
<th>mean</th>
<th>s.d.</th>
<th>mean</th>
<th>s.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly rent</td>
<td>101,721.2</td>
<td>46,209.7</td>
<td>100,423.7</td>
<td>45,271.9</td>
<td>102,094.6</td>
<td>46,480.0</td>
</tr>
<tr>
<td>Floor space (m²)</td>
<td>32.4</td>
<td>15.6</td>
<td>32.2</td>
<td>15.6</td>
<td>32.5</td>
<td>15.7</td>
</tr>
<tr>
<td>Price per m²</td>
<td>3,293.3</td>
<td>788.3</td>
<td>3,271.9</td>
<td>756.8</td>
<td>3,292.8</td>
<td>798.1</td>
</tr>
<tr>
<td>Age of unit (years)</td>
<td>13.0</td>
<td>9.9</td>
<td>12.3</td>
<td>10.1</td>
<td>13.4</td>
<td>9.8</td>
</tr>
<tr>
<td>Time to nearest station (min)</td>
<td>5.1</td>
<td>3.8</td>
<td>5.0</td>
<td>3.7</td>
<td>5.2</td>
<td>3.9</td>
</tr>
<tr>
<td>Time to central business district (min)</td>
<td>12.4</td>
<td>6.4</td>
<td>12.1</td>
<td>6.3</td>
<td>12.5</td>
<td>6.4</td>
</tr>
</tbody>
</table>

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Hedonic estimation for housing rent

- We have the price and property-characteristics data of houses, pooled for all periods $t=1,2,\ldots,T$, and that the number of data samples in period $t$ is $n_t$.
- A standard hedonic price index is produced from the following house-price estimation model:

$$\ln R_{it} = \beta_t x_{it} + \varepsilon_{it}$$

where $R_{it}$ is the rent of house $i$ in period $t$, 
$\beta_t$ is a vector of parameters associated with residential property characteristics, 
$x_{it}$ is a vector of property characteristic for house $i$ in period $t$, and $\varepsilon_{it}$ is an error term

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Hedonic estimation for housing rent

- we run rolling regression using new housing rent with $T = 12$.
- Table 2 indicates the estimation results of rolling hedonic models.

<table>
<thead>
<tr>
<th>Estimation Window</th>
<th>Floor space</th>
<th>Age of building</th>
<th>Time to nearest station</th>
<th>Commuting time to CBD</th>
<th>Adjusted R²</th>
<th>Number of observations</th>
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</thead>
<tbody>
<tr>
<td>201001 - 201012</td>
<td>0.0188</td>
<td>-0.0109</td>
<td>-0.0087</td>
<td>-0.0058</td>
<td>0.917</td>
<td>17,697</td>
</tr>
<tr>
<td>201002 - 201101</td>
<td>0.0188</td>
<td>-0.0109</td>
<td>-0.0088</td>
<td>-0.0058</td>
<td>0.916</td>
<td>16,707</td>
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<tr>
<td>201003 - 201102</td>
<td>0.0188</td>
<td>-0.0109</td>
<td>-0.0089</td>
<td>-0.0059</td>
<td>0.917</td>
<td>15,670</td>
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<tr>
<td>201004 - 201103</td>
<td>0.0188</td>
<td>-0.0110</td>
<td>-0.0090</td>
<td>-0.0059</td>
<td>0.917</td>
<td>14,504</td>
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<tr>
<td>201005 - 201104</td>
<td>0.0188</td>
<td>-0.0110</td>
<td>-0.0092</td>
<td>-0.0058</td>
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<td>-0.0094</td>
<td>-0.0058</td>
<td>0.915</td>
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<td>201007 - 201106</td>
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<td>-0.0096</td>
<td>-0.0060</td>
<td>0.914</td>
<td>10,667</td>
</tr>
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<td>201008 - 201107</td>
<td>0.0190</td>
<td>-0.0114</td>
<td>-0.0097</td>
<td>-0.0062</td>
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<td>201009 - 201108</td>
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<td>-0.0065</td>
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<td>-0.0099</td>
<td>-0.0065</td>
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<tr>
<td>201011 - 201110</td>
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<td>-0.0104</td>
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<tr>
<td>201012 - 201111</td>
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<td>-0.0105</td>
<td>-0.0066</td>
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<tr>
<td>201101 - 201112</td>
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<td>-0.0114</td>
<td>-0.0104</td>
<td>-0.0067</td>
<td>0.924</td>
<td>6,490</td>
</tr>
</tbody>
</table>

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**Hedonic estimation for housing rent**

<table>
<thead>
<tr>
<th>Year</th>
<th>Floor Space</th>
<th>Age of Building</th>
<th>Time to Nearest Station</th>
<th>Commuting Time to CBD</th>
<th>Adjusted R²</th>
<th>Number of Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>201102 - 201201</td>
<td>0.0192</td>
<td>-0.0114</td>
<td>-0.0104</td>
<td>-0.0067</td>
<td>0.927</td>
<td>6,446</td>
</tr>
<tr>
<td>201103 - 201202</td>
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<td>-0.0113</td>
<td>-0.0101</td>
<td>-0.0065</td>
<td>0.927</td>
<td>6,485</td>
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<td>201104 - 201203</td>
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<td>-0.0113</td>
<td>-0.0102</td>
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<td>0.927</td>
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<tr>
<td>201105 - 201204</td>
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<td>-0.0113</td>
<td>-0.0099</td>
<td>-0.0071</td>
<td>0.928</td>
<td>6,664</td>
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<tr>
<td>201106 - 201205</td>
<td>0.0194</td>
<td>-0.0112</td>
<td>-0.0096</td>
<td>-0.0075</td>
<td>0.929</td>
<td>6,782</td>
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<tr>
<td>201107 - 201206</td>
<td>0.0194</td>
<td>-0.0110</td>
<td>-0.0095</td>
<td>-0.0074</td>
<td>0.927</td>
<td>6,788</td>
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<tr>
<td>201108 - 201207</td>
<td>0.0193</td>
<td>-0.0110</td>
<td>-0.0096</td>
<td>-0.0071</td>
<td>0.925</td>
<td>6,880</td>
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<tr>
<td>201109 - 201208</td>
<td>0.0193</td>
<td>-0.0109</td>
<td>-0.0098</td>
<td>-0.0068</td>
<td>0.923</td>
<td>6,887</td>
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<tr>
<td>201110 - 201209</td>
<td>0.0191</td>
<td>-0.0109</td>
<td>-0.0096</td>
<td>-0.0071</td>
<td>0.922</td>
<td>6,913</td>
</tr>
<tr>
<td>201111 - 201210</td>
<td>0.0191</td>
<td>-0.0110</td>
<td>-0.0096</td>
<td>-0.0072</td>
<td>0.922</td>
<td>6,920</td>
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<tr>
<td>201112 - 201211</td>
<td>0.0192</td>
<td>-0.0110</td>
<td>-0.0094</td>
<td>-0.0074</td>
<td>0.922</td>
<td>6,988</td>
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<td>201201 - 201212</td>
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<td>-0.0109</td>
<td>-0.0091</td>
<td>-0.0075</td>
<td>0.922</td>
<td>6,963</td>
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<tr>
<td>201202 - 201301</td>
<td>0.0189</td>
<td>-0.0109</td>
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<td>-0.0072</td>
<td>0.918</td>
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<tr>
<td>201203 - 201302</td>
<td>0.0188</td>
<td>-0.0109</td>
<td>-0.0091</td>
<td>-0.0076</td>
<td>0.918</td>
<td>7,000</td>
</tr>
<tr>
<td>201204 - 201303</td>
<td>0.0188</td>
<td>-0.0108</td>
<td>-0.0093</td>
<td>-0.0076</td>
<td>0.918</td>
<td>7,012</td>
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<tr>
<td>201205 - 201304</td>
<td>0.0187</td>
<td>-0.0109</td>
<td>-0.0097</td>
<td>-0.0073</td>
<td>0.917</td>
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<tr>
<td>201206 - 201305</td>
<td>0.0186</td>
<td>-0.0109</td>
<td>-0.0098</td>
<td>-0.0071</td>
<td>0.916</td>
<td>6,785</td>
</tr>
<tr>
<td>201207 - 201306</td>
<td>0.0186</td>
<td>-0.0110</td>
<td>-0.0098</td>
<td>-0.0071</td>
<td>0.917</td>
<td>6,725</td>
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<tr>
<td>201208 - 201307</td>
<td>0.0186</td>
<td>-0.0110</td>
<td>-0.0098</td>
<td>-0.0073</td>
<td>0.918</td>
<td>6,526</td>
</tr>
<tr>
<td>201209 - 201308</td>
<td>0.0186</td>
<td>-0.0110</td>
<td>-0.0097</td>
<td>-0.0075</td>
<td>0.918</td>
<td>6,409</td>
</tr>
<tr>
<td>201210 - 201309</td>
<td>0.0187</td>
<td>-0.0110</td>
<td>-0.0097</td>
<td>-0.0074</td>
<td>0.918</td>
<td>6,260</td>
</tr>
<tr>
<td>201211 - 201310</td>
<td>0.0186</td>
<td>-0.0110</td>
<td>-0.0098</td>
<td>-0.0073</td>
<td>0.916</td>
<td>6,179</td>
</tr>
<tr>
<td>201212 - 201311</td>
<td>0.0186</td>
<td>-0.0110</td>
<td>-0.0099</td>
<td>-0.0073</td>
<td>0.916</td>
<td>6,028</td>
</tr>
<tr>
<td>201301 - 201312</td>
<td>0.0187</td>
<td>-0.0110</td>
<td>-0.0105</td>
<td>-0.0075</td>
<td>0.915</td>
<td>5,869</td>
</tr>
<tr>
<td>201302 - 201401</td>
<td>0.0189</td>
<td>-0.0109</td>
<td>-0.0107</td>
<td>-0.0078</td>
<td>0.918</td>
<td>5,718</td>
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<td>201303 - 201402</td>
<td>0.0191</td>
<td>-0.0108</td>
<td>-0.0110</td>
<td>-0.0077</td>
<td>0.918</td>
<td>5,530</td>
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<tr>
<td>201304 - 201403</td>
<td>0.0190</td>
<td>-0.0108</td>
<td>-0.0109</td>
<td>-0.0075</td>
<td>0.919</td>
<td>5,389</td>
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<tr>
<td>201305 - 201404</td>
<td>0.0191</td>
<td>-0.0107</td>
<td>-0.0109</td>
<td>-0.0075</td>
<td>0.918</td>
<td>5,288</td>
</tr>
<tr>
<td>201306 - 201405</td>
<td>0.0192</td>
<td>-0.0106</td>
<td>-0.0112</td>
<td>-0.0077</td>
<td>0.918</td>
<td>5,273</td>
</tr>
<tr>
<td>201307 - 201406</td>
<td>0.0192</td>
<td>-0.0105</td>
<td>-0.0114</td>
<td>-0.0077</td>
<td>0.916</td>
<td>5,206</td>
</tr>
<tr>
<td>201308 - 201407</td>
<td>0.0192</td>
<td>-0.0104</td>
<td>-0.0113</td>
<td>-0.0079</td>
<td>0.915</td>
<td>5,225</td>
</tr>
</tbody>
</table>

| Average       | 0.0190     | -0.0110         | -0.0099                 | -0.0070               | 0.9196      | 7,863                  |

<table>
<thead>
<tr>
<th>Estimation</th>
<th>Floor space</th>
<th>Age of Building</th>
<th>Time to Nearest Station</th>
<th>Commuting Time to CBD</th>
<th>Adjusted R²</th>
<th>Number of Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Window</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Official Residential Rent Index or CPI Rent

• CPI rent survey districts are selected from enumeration districts of the Population Census by probability sampling. The number of house rent survey districts is 1,221.

• Statistics Bureau of Japan says that about 28,000 households are surveyed (see Annual report on the Retail Price Survey 2013).

• The survey districts are allocated according to scale of sample cities, the Tokyo metropolitan area is allocated 54 districts.

• The survey districts are grouped to three groups and one group is surveyed every 3 months.

• Rent index is calculated separately by 4 classification.- Wooden small house, wooden medium house, non-wooden small house and non-wooden medium house.
Figure 1: Comparison of Tokyo Ward Area Rent Indices

<table>
<thead>
<tr>
<th>Hedonic New Contract Rent Index</th>
<th>CPI Rent</th>
<th>Non-Sampled Rent Index</th>
<th>MIC Method Sampled Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>+2σ</td>
<td></td>
<td>-2σ</td>
<td></td>
</tr>
</tbody>
</table>

Abenomics

Paying Rent and CPI

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3. Micro-Analysis of Rent

Frequency of Rent Adjustments

\[ \Delta R_{it} = R_{it} - R_{it-1} \]

Price Change

Probability of event on *New Contract* (\(I^N\))
and *Renewed Contract* (\(I^R\))

\[
\Pr(\Delta R_{it} = 0) = \left[ 1 - \Pr(I^N_{it} = 1) - \Pr(I^R_{it} = 1) \right] + \Pr(\Delta R_{it} = 0 | I^N_{it} = 1) \Pr(I^N_{it} = 1) + \Pr(\Delta R_{it} = 0 | I^R_{it} = 1) \Pr(I^R_{it} = 1)
\]
Table 4: Nominal Rigidity of Rent

<table>
<thead>
<tr>
<th>Changes accompanying new contracts</th>
<th>Rent decreased</th>
<th>Rent unchanged</th>
<th>Rent increased</th>
<th>Total</th>
<th>(Rent change)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes</td>
<td>4,181</td>
<td>31,737</td>
<td>914</td>
<td>36,832</td>
<td>5,095</td>
</tr>
<tr>
<td>Changes accompanying rollover contracts</td>
<td>(0.114)</td>
<td>(0.862)</td>
<td>(0.025)</td>
<td>(0.224)</td>
<td>(0.138)</td>
</tr>
<tr>
<td>Total changes</td>
<td>4,822</td>
<td>72,021</td>
<td>1,106</td>
<td>164,356</td>
<td>5,928</td>
</tr>
<tr>
<td>Changes</td>
<td>(0.029)</td>
<td>(0.438)</td>
<td>(0.007)</td>
<td>(1.000)</td>
<td>(0.036)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fraction of housing units without no rent change per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
</tr>
<tr>
<td>Japan</td>
</tr>
</tbody>
</table>
Probability of No Rent Adjustments in New Contracts: 2010-2014

Figure 2: Monthly Changes in Nominal Rigidity of Rent
Probability of No Rent Adjustments in Rollover Contracts: 2010-2014

Figure 2: Monthly Changes in Nominal Rigidity of Rent

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Monthly rent change distribution in Turnover Contracts

![Graph: Rent Revision Range Density Distribution]

**Figure 3: Rent Revision Range Density Distribution**

\[ \Delta R_{it} = \frac{R_t}{R_{t-1}} | I_{it}^N = 1 \]

Menu Cost

n=5,440
Monthly rent change distribution in Rollover Contracts

Figure 3: Rent Revision Range Density Distribution
State-Dependent or Time-Dependent Pricing: Caballero-Engel’s definition of price flexibility

Target Rent Level

Price Gap

Probability of rent adjustments

Caballero-Engel’s measure of price flexibility

\[ \Delta \log R_t^* = \Delta \xi_t + \nu_{it} \]

\[ X_{it} = \log R_{i,t-1} - \log R_{it}^* \]

\[ \Lambda(x) = \Pr(\Delta R_{it} \neq 0 \mid X_{it} = x) \]

\[
\lim_{\Delta \xi_t \to 0} \frac{\Delta \log R_t}{\Delta \xi_t} = \int \Lambda(x) h(x) dx + \int x \Lambda'(x) h(x) dx
\]

Intensive margin

Extensive margin

Caballero-Engel (1993)

Caballero-Engel (2007)

\[ \Lambda(x) = \Pr(\Delta R_{it} \neq 0 \mid I_{it}^N = 1, X_{it} = x) \Pr(I_{it}^N = 1 \mid X_{it} = x) \]

\[ + \Pr(\Delta R_{it} \neq 0 \mid I_{it}^R = 1, X_{it} = x) \Pr(I_{it}^R = 1 \mid X_{it} = x) \]

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Distribution of Price Gap in New Contract

Figure 4: Price Gap Distribution

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Distribution of Price Gap in Renewed Contract

Figure 4: Price Gap Distribution

Rollover contracts
Adjustment Hazard Function for **Turnover Units**: Probability of Unit Turnover

\[
\Lambda(x) = \Pr(\Delta R_{it} \neq 0 \mid I_{it}^{N} = 1, X_{it} = x) \Pr(I_{it}^{N} = 1 \mid X_{it} = x) \\
+ \Pr(\Delta R_{it} \neq 0 \mid I_{it}^{R} = 1, X_{it} = x) \Pr(I_{it}^{R} = 1 \mid X_{it} = x)
\]

Figure 5: State-Dependency
Adjustment Hazard Function for **Turnover Units**

\[ \Lambda(x) = \Pr(\Delta R_{it} \neq 0 \mid I_{it}^N = 1, X_{it} = x) \Pr(I_{it}^N = 1 \mid X_{it} = x) \\
+ \Pr(\Delta R_{it} \neq 0 \mid I_{it}^R = 1, X_{it} = x) \Pr(I_{it}^R = 1 \mid X_{it} = x) \]
Adjustment Hazard Function for \textit{Rollover Units}

\begin{equation}
\Lambda(x) = \Pr(\Delta R_{it} \neq 0 \mid I_{it}^N = 1, X_{it} = x) \Pr(I_{it}^N = 1 \mid X_{it} = x) \\
+ \Pr(\Delta R_{it} \neq 0 \mid I_{it}^R = 1, X_{it} = x) \Pr(I_{it}^R = 1 \mid X_{it} = x)
\end{equation}

Figure 5: State-Dependency

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure5}
\end{figure}

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page. 58
Adjustment Hazard Function for *Rollover Units*

\[
\Lambda(x) = \Pr(\Delta R_{it} \neq 0 \mid I_{it}^N = 1, X_{it} = x) \Pr(I_{it}^N = 1 \mid X_{it} = x) \\
+ \Pr(\Delta R_{it} \neq 0 \mid I_{it}^R = 1, X_{it} = x) \Pr(I_{it}^R = 1 \mid X_{it} = x)
\]

*Figure 5: State-Dependency*
# Adjustment Hazard Functions

## Table 5: Summary of Estimation Results

<table>
<thead>
<tr>
<th></th>
<th>$x \in [-0.4, -0.2]$</th>
<th>$x \in [-0.2, 0.0)$</th>
<th>$x \in [0.0, 0.2)$</th>
<th>$x \in [0.2, 0.4)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Pr(I_{it}^N = 1</td>
<td>X_{it} = x)$</td>
<td>0.035</td>
<td>0.029</td>
<td>0.023</td>
</tr>
<tr>
<td>$\Pr(I_{it}^R = 1</td>
<td>X_{it} = x)$</td>
<td>0.006</td>
<td>0.026</td>
<td>0.028</td>
</tr>
<tr>
<td>$\Pr(\Delta R_{it} \neq 0</td>
<td>I_{it}^N = 1, X_{it} = x)$</td>
<td>0.131</td>
<td>0.134</td>
<td>0.138</td>
</tr>
<tr>
<td>$\Pr(\Delta R_{it} \neq 0</td>
<td>I_{it}^R = 1, X_{it} = x)$</td>
<td>0.015</td>
<td>0.022</td>
<td>0.020</td>
</tr>
<tr>
<td>$\Lambda(x)$</td>
<td>0.005</td>
<td>0.004</td>
<td>0.004</td>
<td>0.003</td>
</tr>
<tr>
<td>$h(x)$</td>
<td>0.039</td>
<td>0.569</td>
<td>0.337</td>
<td>0.047</td>
</tr>
</tbody>
</table>

### Intensive margin:
\[
\int \Lambda(x) h(x) \, dx = 0.050
\]

### Extensive margin:
\[
\int x \Lambda'(x) h(x) \, dx = 0.0081
\]

### Caballero-Engel’s measure of price flexibility
\[
\lim_{\Delta \xi_t \to 0} \frac{\Delta \log R_t}{\Delta \xi_t} = 0.0581
\]
Summary in “Sticky Housing Rent”

1. About ninety percent of the units in our dataset had no change in rents per year, indicating that rent stickiness is three times as high as in the US.

2. The probability of rent adjustment depends little on the deviation of the actual rent from its target level, suggesting that rent adjustments are not state dependent but time dependent.

3. These two results indicate that both intensive and extensive margins of rent adjustments are small, resulting in a slow response of the CPI rent to aggregate shocks.
4. Re-estimation of CPI
How should we estimate CPI more linked to asset price developments?

• We have seen in the previous sections that the probability of individual rent adjustments is very low and that it depends little on price imbalances.

• These two facts imply that price flexibility in terms of the impulse response function is low, thus causing the CPI for rent to respond only slowly to aggregate shocks.

• We simplify the model.

• We replace the imputed rent for owner-occupied housing in the CPI by our estimate of the market rent $R^*$. 

• We also replace the imputed rent for OOH by our estimate of the depreciation adjusted rent $R_{age}$. 

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2007-2009: the Financial Crisis

2013-: Abenomics

Figure 6: Hedonic estimate \( R_t^* \), R-age and Actual CPI
Figure 7: Reestimates of CPI inflation under Rent for OOH replaced by Rt* and R-age

2007-2009: the Financial Crisis

2013-: Abenomics

Actual CPI
Rent for OOH is replaced by R*
Rent for OOH is replaced by R-age
3. Conclusions:

• Goods and services prices, as represented by consumer price indexes and the like, have not changed all that much in response to fluctuations in asset prices.

• This lack of correlation means that management via fiscal policy and such is difficult.

• Focusing on rents, The obtained results showed that while rents based on new contracts change in an elastic manner, actual paid rents change only gradually, even when market shocks occur.

• In other words, average market rents, which are representative of consumer prices, have a strong tendency to change in a random manner, independently of changes in rents determined freely by the market.
3. Conclusions:

- Also, the rent index of actual CPI is pointed out the problems that aging depreciation is not adjusted properly. In other words, the actual CPI holds a strong downward bias due to mis-adjustment of this aging depreciation.
- However, we found that the effect of paying rent stickiness is much larger than the effect of aging depreciation.
- It is clear that the magnitude of the effect from paying rent stickiness enhances the stickiness of price index.
3. Conclusions:

To address with this problem, we have the following options.

• First, we can consider the price index excluding the owner-occupied housing rent for policy target. However, this way ignores the important factor of expenditure; the housing has the share from 25% to 30% in expenditure.

• Second, defining as the opportunity cost of homeowners, we can estimate rent index measuring the newly contracted rent instead of paying rent.

• Third one is the user cost method that many countries started to develop in these days.
3. Conclusions:

- the United Nations, IMF, OECD, BIS, and ILO have jointly put together international handbook on residential property price indices.

- Many countries in Europe finished this kind of indices and from March 2015,

- It also has been published through the test operation of three years in Japan.

- By using this index, we can estimate owner-occupied housing rent as the user cost base index.
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Website: www.ires.nus.edu.sg