Housing Rent and Japanese CPI

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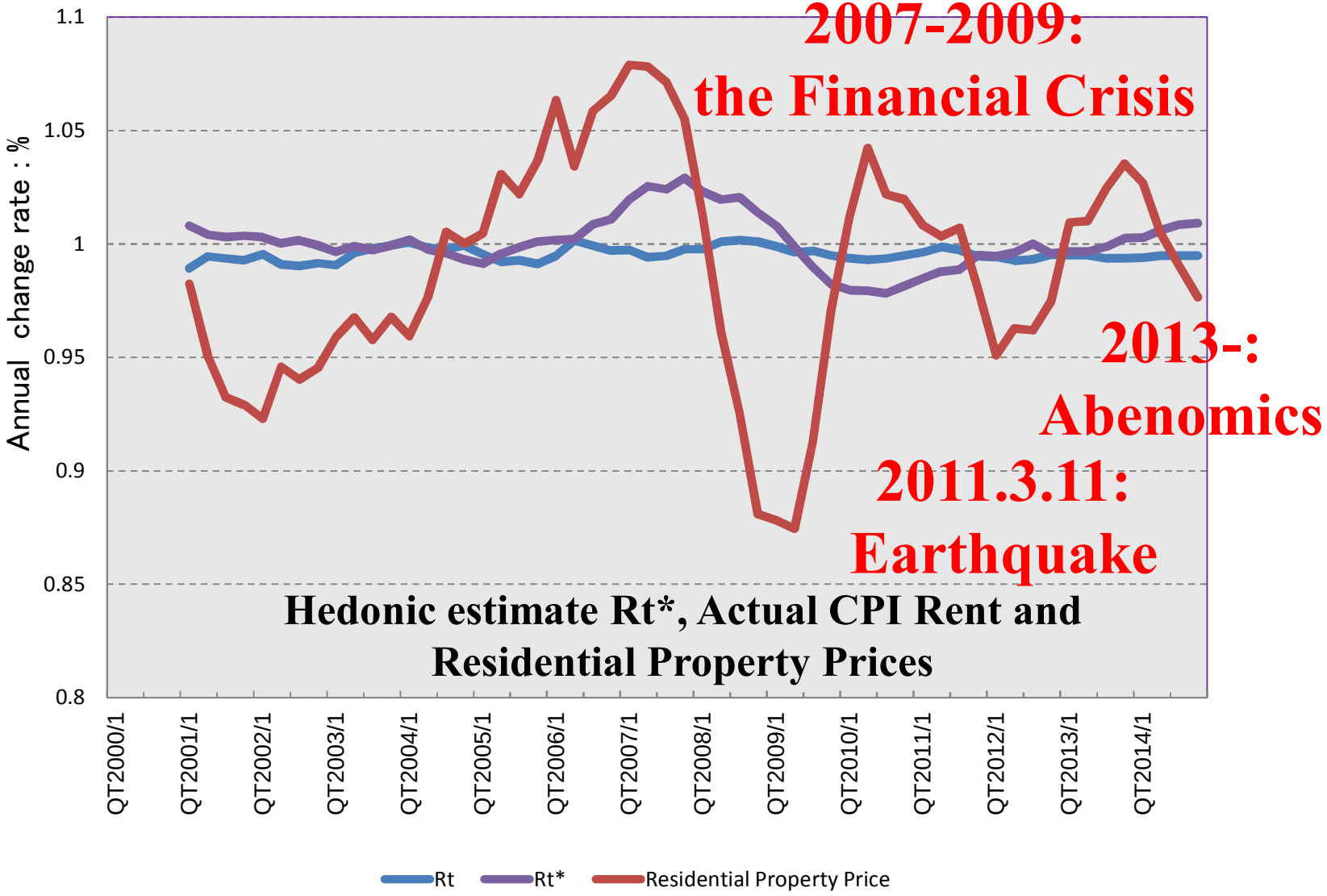
2007-2009:
the Financial Crisis
2013-:
Abenomics
2011.3.11:
Earthquake
Hedonic estimate Rt*, Actual CPI Rent and
Residential Property Prices
Annual change rate : %
1.1
1.05
1
0.95
0.9
0.85
0.8
QT2000/1
QT2001/1
QT2002/1
QT2003/1
QT2004/1
QT2005/1
QT2006/1
QT2007/1
QT2008/1
QT2009/1
QT2010/1
QT2011/1
QT2012/1
QT2013/1
QT2014/1
Rt
Rt*
Residential Property Price

1. Introduction

Outline or Questions

- **Why do goods and services prices not fluctuate significantly even if asset prices fluctuate?**
- **How should we estimate the housing rent in CPI ?**

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"

- In estimating rental costs for durable goods, statistical agencies usually use the ***acquisition approach***. It will be useful to many users if, in addition to the ***acquisitions approach***, the statistical agency would implement a variant of either the ***rental equivalence approach*** or the ***user cost approach*** for long lived consumer durables. Users can then decide which approach best suits their purposes. Any one of the three main approaches could be chosen as the approach that would be used in the ñheadlineò CPI. (Diewert (2015))

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Disadvantages of the rental equivalence approach

- Homeowners may not be able to provide very accurate estimates for the rental value of their dwelling unit.
- On the other hand, if the statistical agency tries to match the characteristics of an owned dwelling unit with a comparable unit that is rented in order to obtain **the imputed rent for the owned unit**, there may be ***difficulties in finding such comparable units***. (***Quality adjustment bias***)
- The statistical agency should make an adjustment to these estimated rents over time in order to take into account the effects of ***depreciation***. (***Depreciation bias***)
- Care must be taken to determine exactly what extra services are included in the homeownerôs estimated rent.

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Rent Control Bias: ñMarket Rentò and ñContract rentò

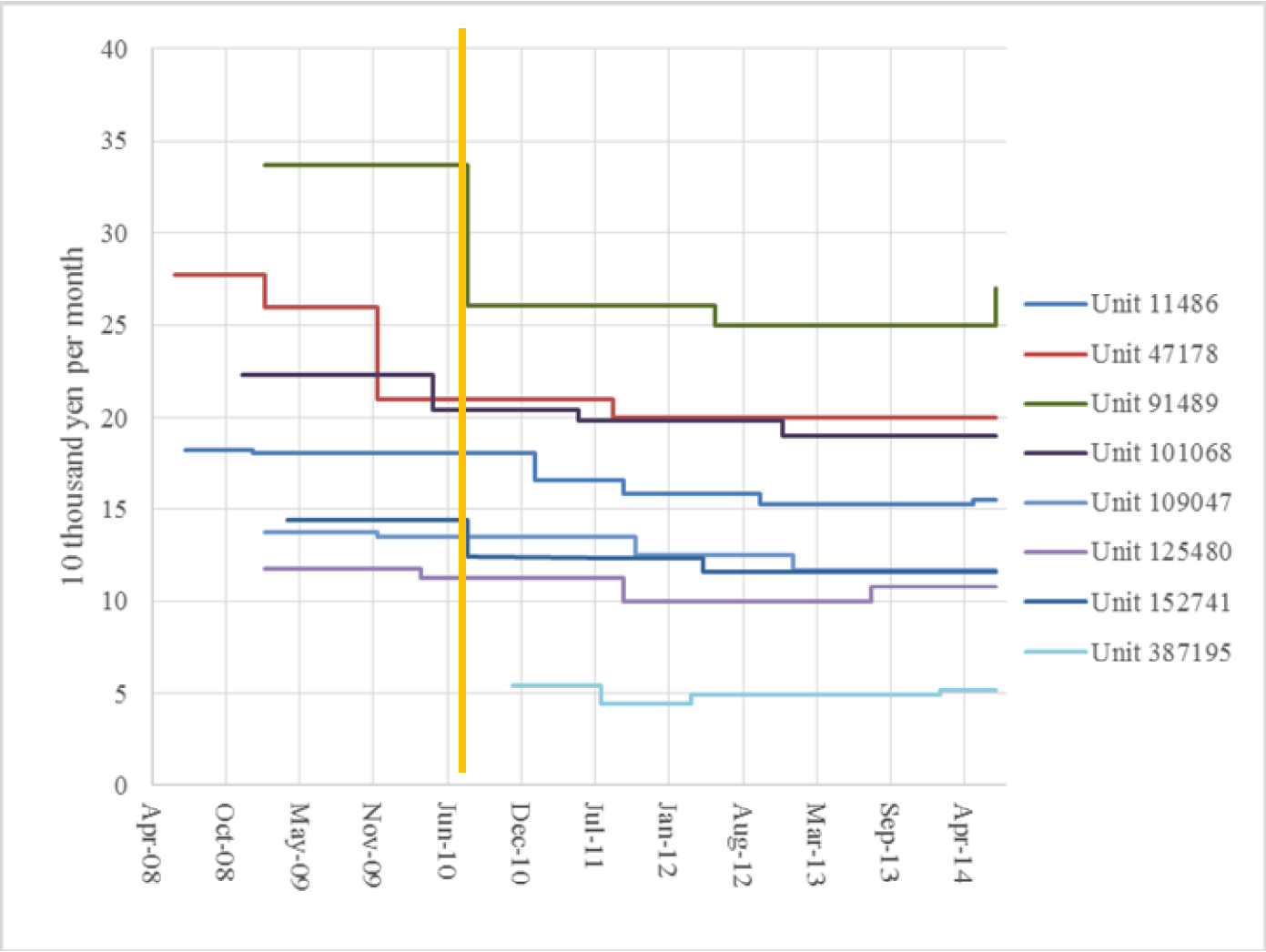
- In addition to the above possible biases in using the rental equivalence approach to the valuation of the services of OOH, there are differences between ñcontract rentò and ñmarket rentò.

- *"Contract rent" refers to the rent paid by a renter who has a long term rental contract with the owner of the dwelling unit and "market rent" is the rent paid by the renter in the first period after a rental contract has been negotiated.*

- If we value the services of an owner occupied dwelling at its **current opportunity cost** on the rental market, we should be using **market rent** rather than **contract rent**.

2. Macro-Analysis of Housing Rent

Panel data of rental prices



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Summary Statistics of Housing Rent

Sample period	January 2010 - July 2014					
Frequency	Monthly					
Area	Tokyoôs wards					
Type of data	Paid rent					
Coverage	New and rollover contracts					
Provided by	Recruit					
Number of units	52,524					
Number of samples	All samples		New contracts		Rollover contracts	
	1,529,485		36,832		41,117	
	mean	s.d.	mean	s.d.	mean	s.d.
Monthly rent	101,721.2	46,209.7	100,423.7	45,271.9	102,094.6	46,480.0
Floor space (m^2)	32.4	15.6	32.2	15.6	32.5	15.7
Price per m^2	3,293.3	788.3	3,271.9	756.8	3,292.8	798.1
Age of unit (years)	13.0	9.9	12.3	10.1	13.4	9.8
Time to nearest station (min)	5.1	3.8	5.0	3.7	5.2	3.9
Time to central business district (min)	12.4	6.4	12.1	6.3	12.5	6.4

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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.**

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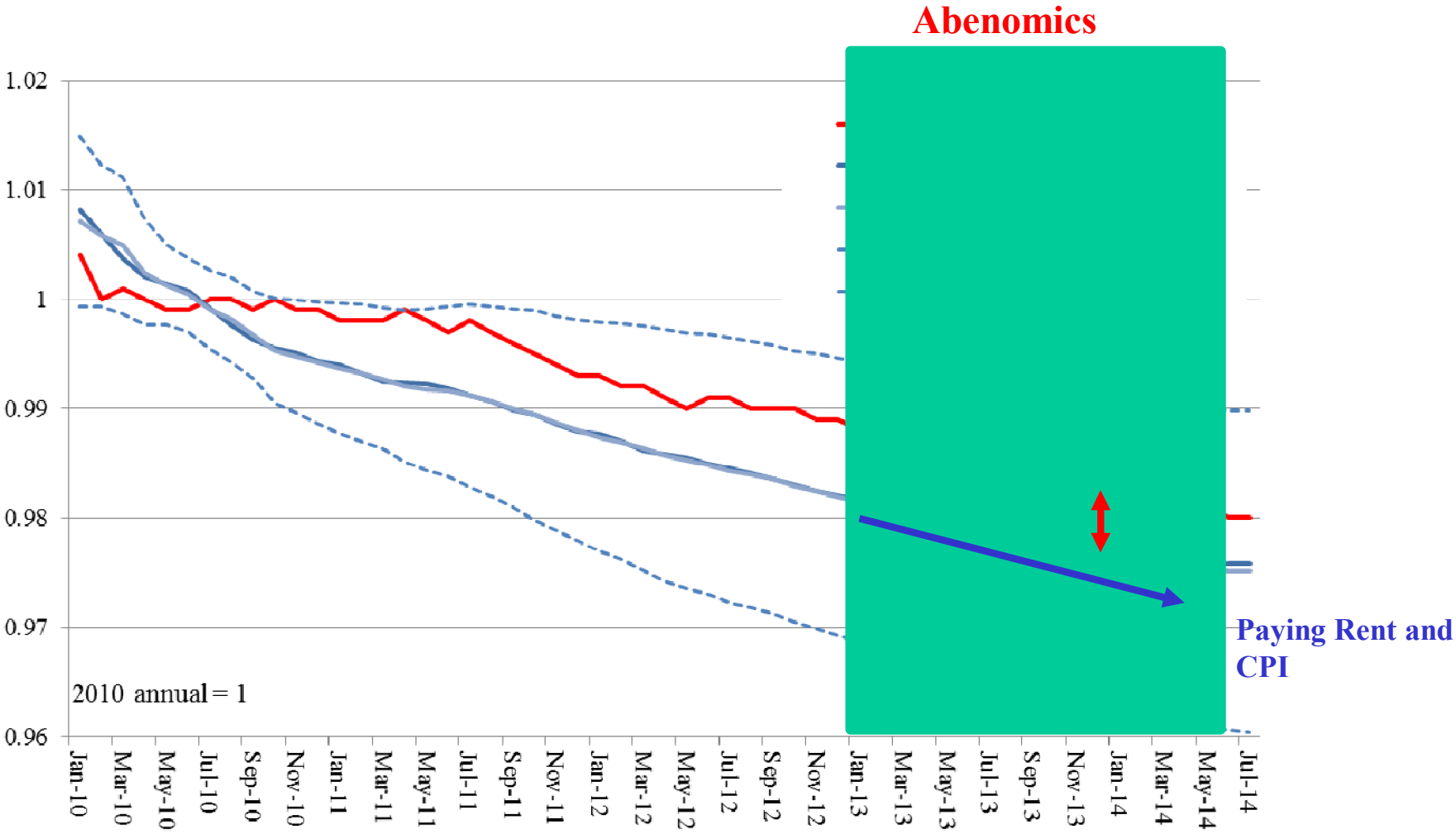
Figure 1: Comparison of Tokyo Ward Area Rent Indices



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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,...,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:

$$\ln R_{it} = \beta_t x_{it} + \varepsilon_{it} \qquad (1)$$

where R_{it} is the rent of house i in period t,

β_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 ε_{it} is an error term

Hedonic estimation for housing rent

Å We run rolling regression using new housing rent with T =12.

Estimation Window	Floor space	Age of building	Time to nearest station	Commuting time to CBD	Adjusted R^2	Number of observations
201001 - 201012	0.0188	-0.0109	-0.0087	-0.0058	0.917	17,697
201002 - 201101	0.0188	-0.0109	-0.0088	-0.0058	0.916	16,707
201003 - 201102	0.0188	-0.0109	-0.0089	-0.0059	0.917	15,670
201004 - 201103	0.0188	-0.0110	-0.0090	-0.0059	0.917	14,504
201005 - 201104	0.0188	-0.0110	-0.0092	-0.0058	0.916	13,303
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
201304 - 201403	0.0190	-0.0108	-0.0109	-0.0075	0.919	5,389
201305 - 201404	0.0191	-0.0107	-0.0109	-0.0075	0.918	5,288
201306 - 201405	0.0192	-0.0106	-0.0112	-0.0077	0.918	5,273
201307 - 201406	0.0191	-0.0105	-0.0114	-0.0077	0.916	5,206
201308 - 201407	0.0192	-0.0104	-0.0113	-0.0079	0.915	5,225
Average	**0.0190**	**-0.0110**	**-0.0099**	**-0.0070**	**0.9196**	**7,863**

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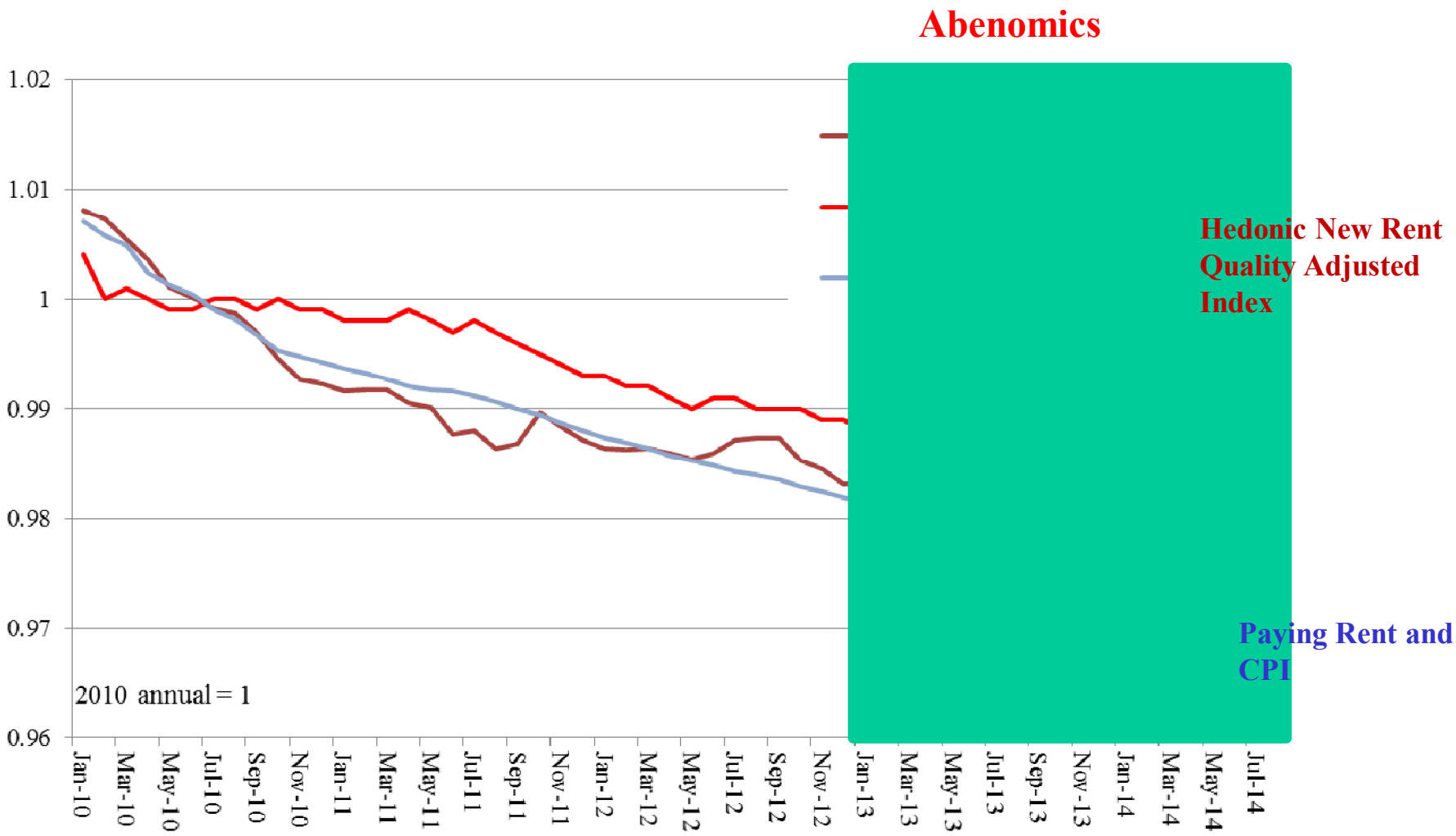
Figure 2: Comparison of actual CPI and estimated indices



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3. Micro-Analysis of Rent

Frequency of Rent Adjustments

Price Change $\Delta R_{it} \equiv R_{it} - R_{it-1}$

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

$$\Pr(\Delta R_{it} = 0) = \left[1 - \Pr(I_{it}^N = 1) - \Pr(I_{it}^R = 1)\right]$$

$$+ \Pr(\Delta R_{it} = 0 \mid I_{it}^N = 1)\Pr(I_{it}^N = 1)$$

$$+ \Pr(\Delta R_{it} = 0 \mid I_{it}^R = 1)\Pr(I_{it}^R = 1)$$

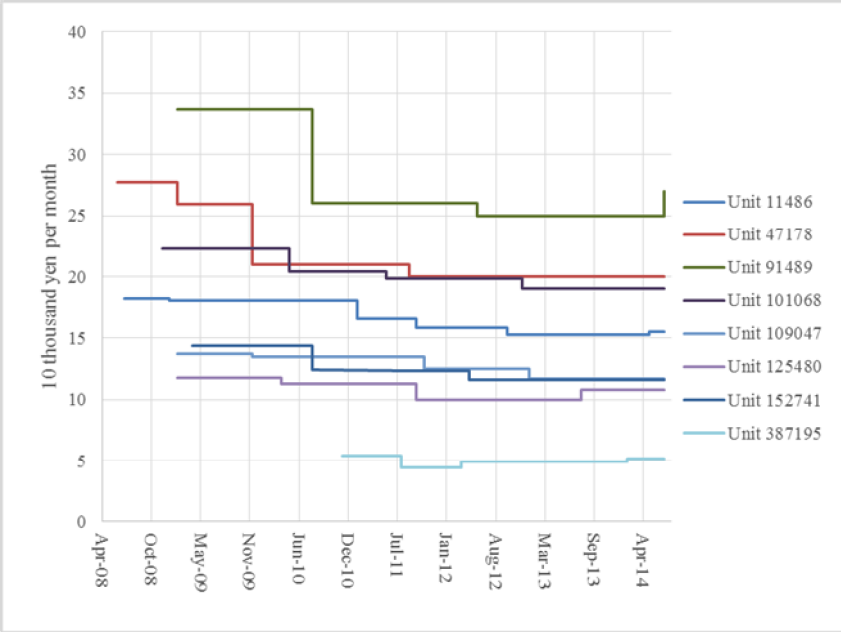

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Table 4: Nominal Rigidity of Rent

		Rent decreased	Rent unchanged	Rent increased	Total	(Rent change)
I^N	Changes accompanying *new contracts*	4,181 (0.114)	31,737 (0.862)	914 (0.025)	36,832 (0.224)	5,095 (0.138)
I^R	Changes accompanying *rollover contracts*	641 (0.016)	40,284 (0.980)	192 (0.005)	41,117 (0.250)	833 (0.020)
	Total contract changes	4,822 (0.029)	72,021 (0.938)	1,106 (0.007)	164,356 (1.000)	5,928 (0.036)

Fraction of housing units without no rent change per year		
US	29%	Estimated by Genesove (2003)
Germany	78%	Estimated by Kurz-Kim (2006)
Japan	90%	Estimated by this research

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Probability of No Rent Adjustments in New Contracts : 2010-2014

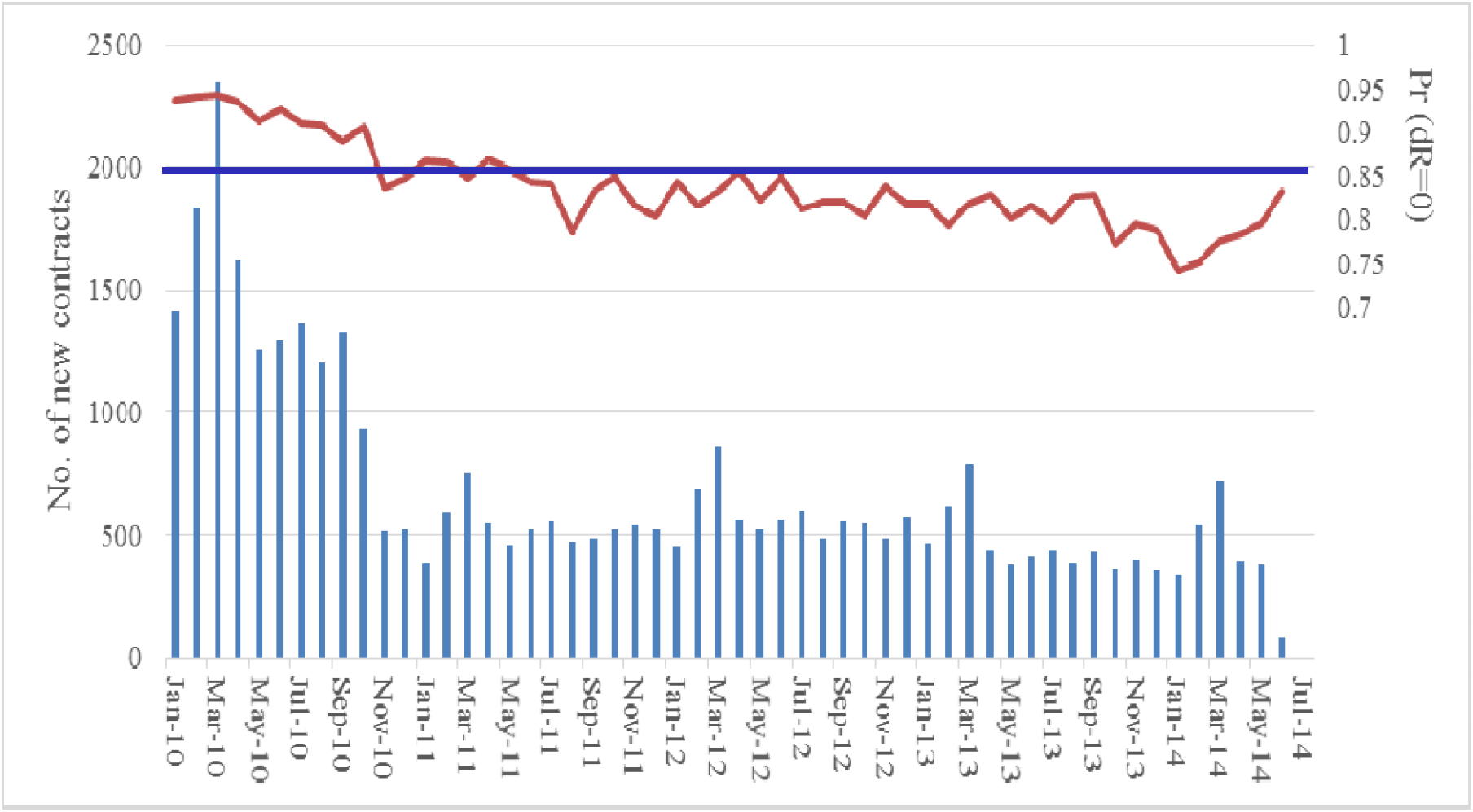

Figure 3: Monthly Changes in Nominal Rigidity of Rent

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Probability of No Rent Adjustments in Rollover Contracts : 2010-2014

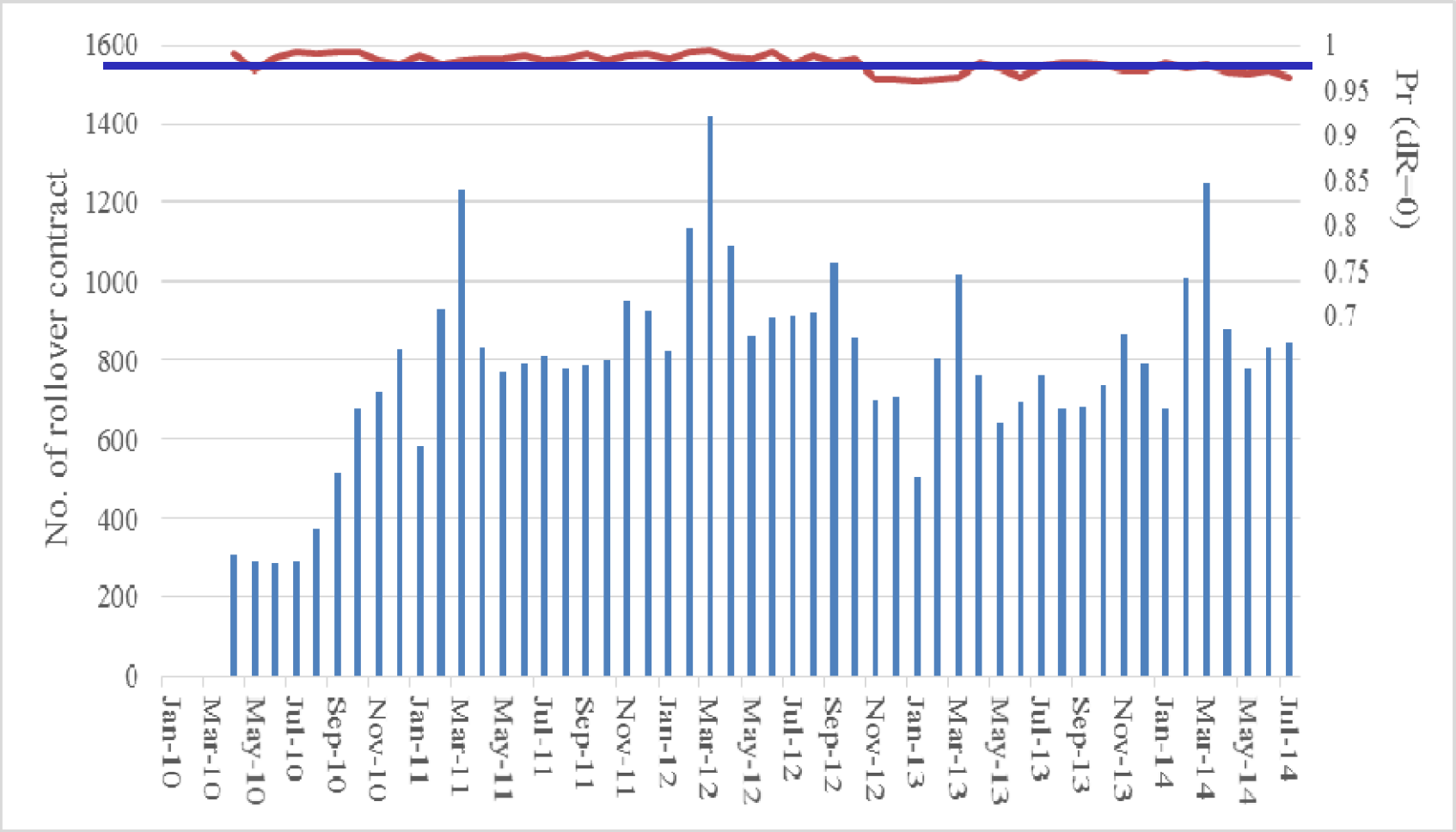

Figure 3: Monthly Changes in Nominal Rigidity of Rent

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Monthly rent change distribution in Turnover Contracts

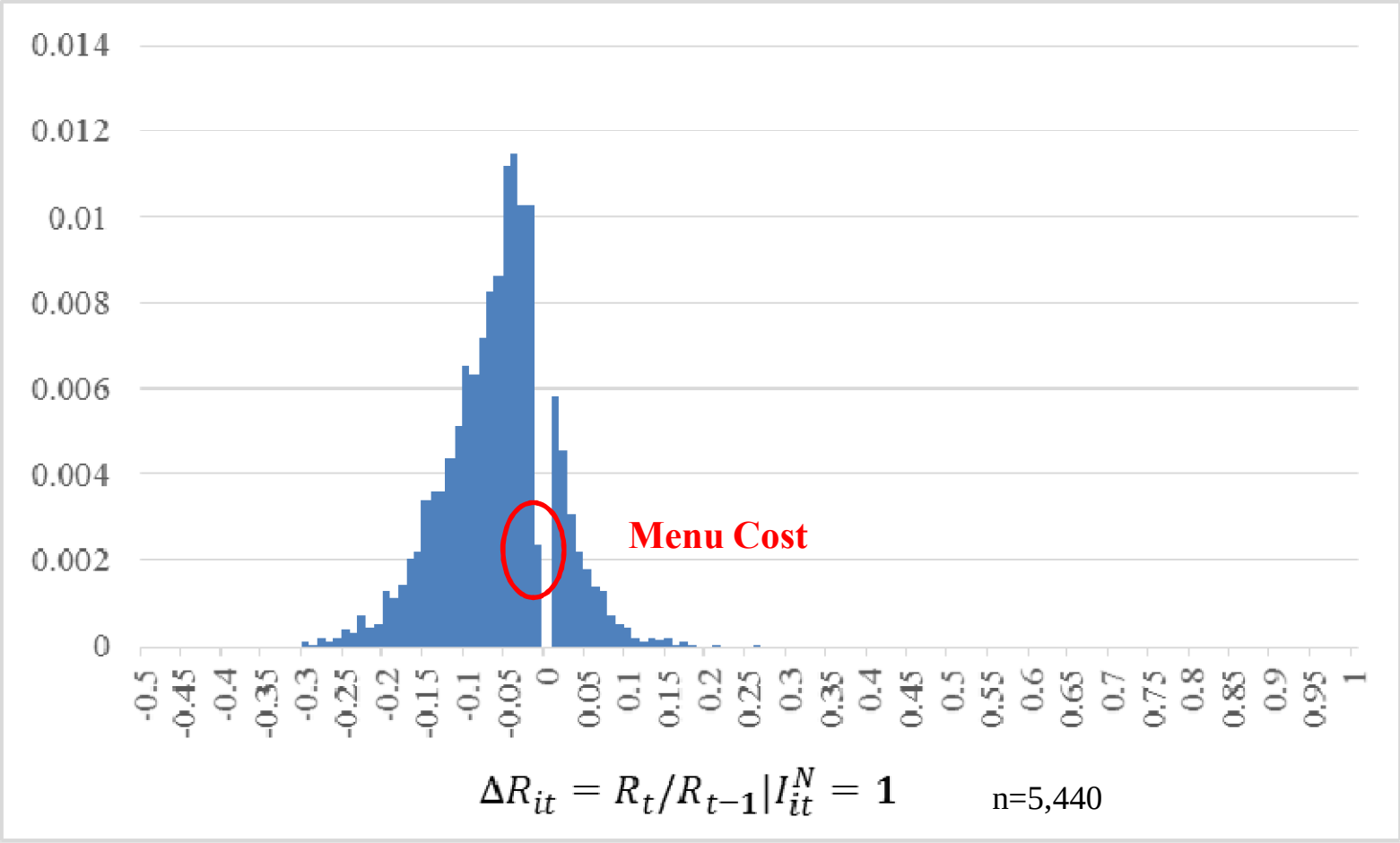

Figure 4: Rent Revision Range Density Distribution

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Monthly rent change distribution in Rollover Contracts

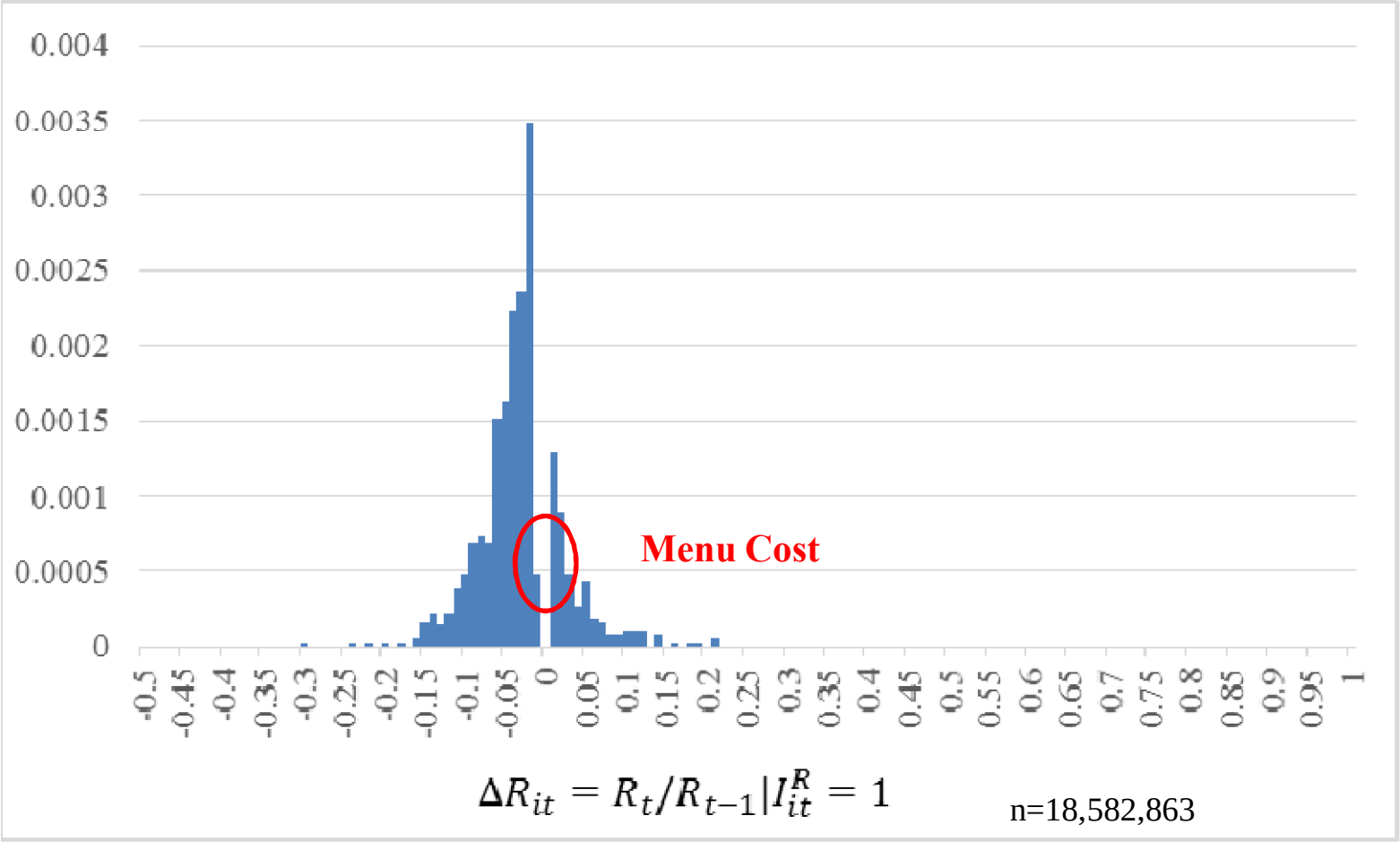

Figure 4: Rent Revision Range Density Distribution

State-Dependent or Time-Dependent Pricing: Caballero-Engelôs definition of price flexibility

Target Rent Level

Price Gap

Probability of rent adjustments

$$\Delta \log R_{it}^{*} = \Delta \xi_t + \nu_{it}$$

$$X_{it} \equiv \log R_{it-1} - \log R_{it}^{*}$$

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

Caballero-Engel(1993)

:Adjustment Hazard Function

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

Caballero-Engel's measure of price flexibility

Intensive margin

Extensive margin

Caballero-Engel(2007)

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

Distribution of Price Gap in New Contract

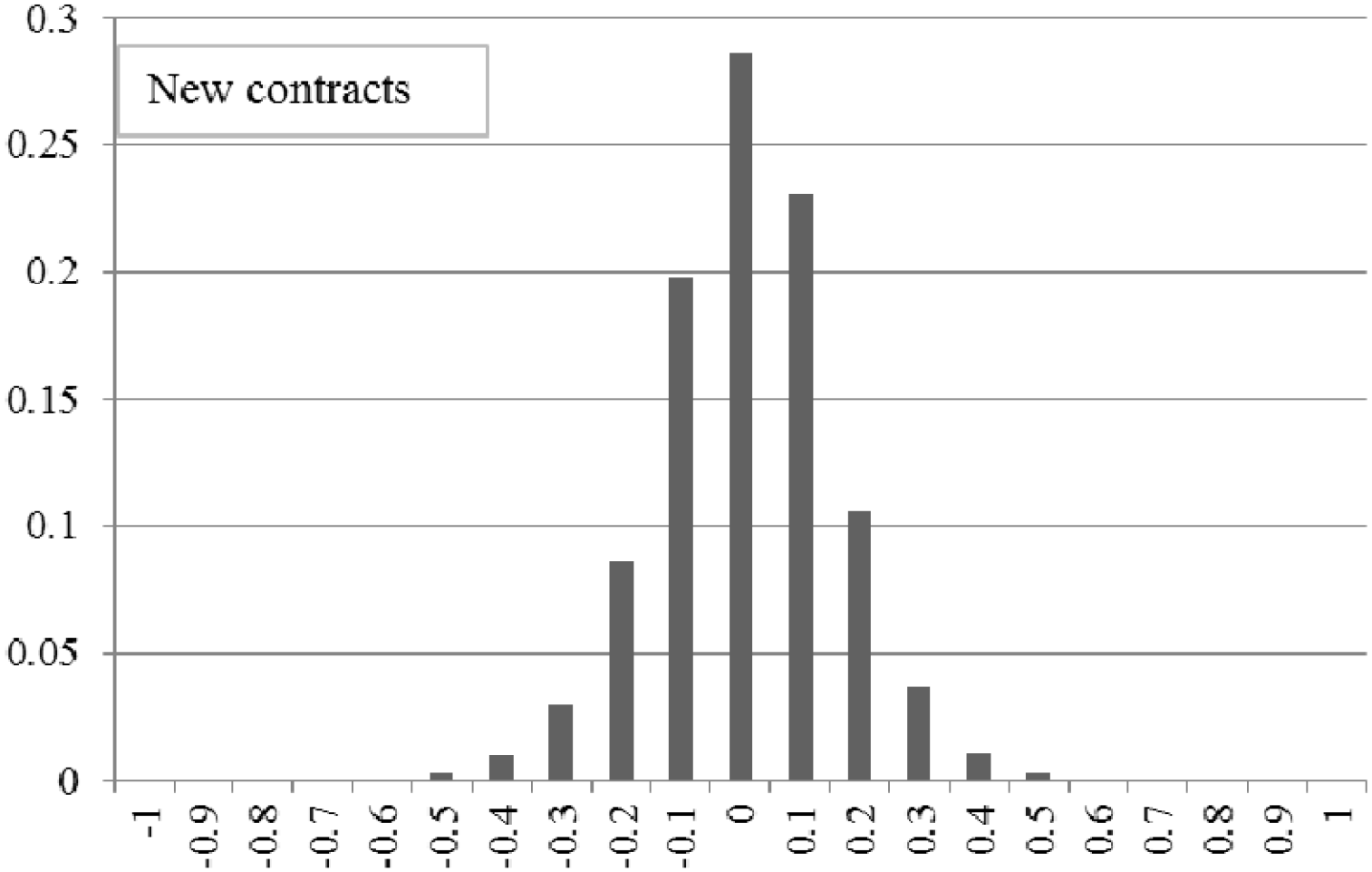

Figure 5: Price Gap Distribution

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Distribution of Price Gap in Renewed Contract

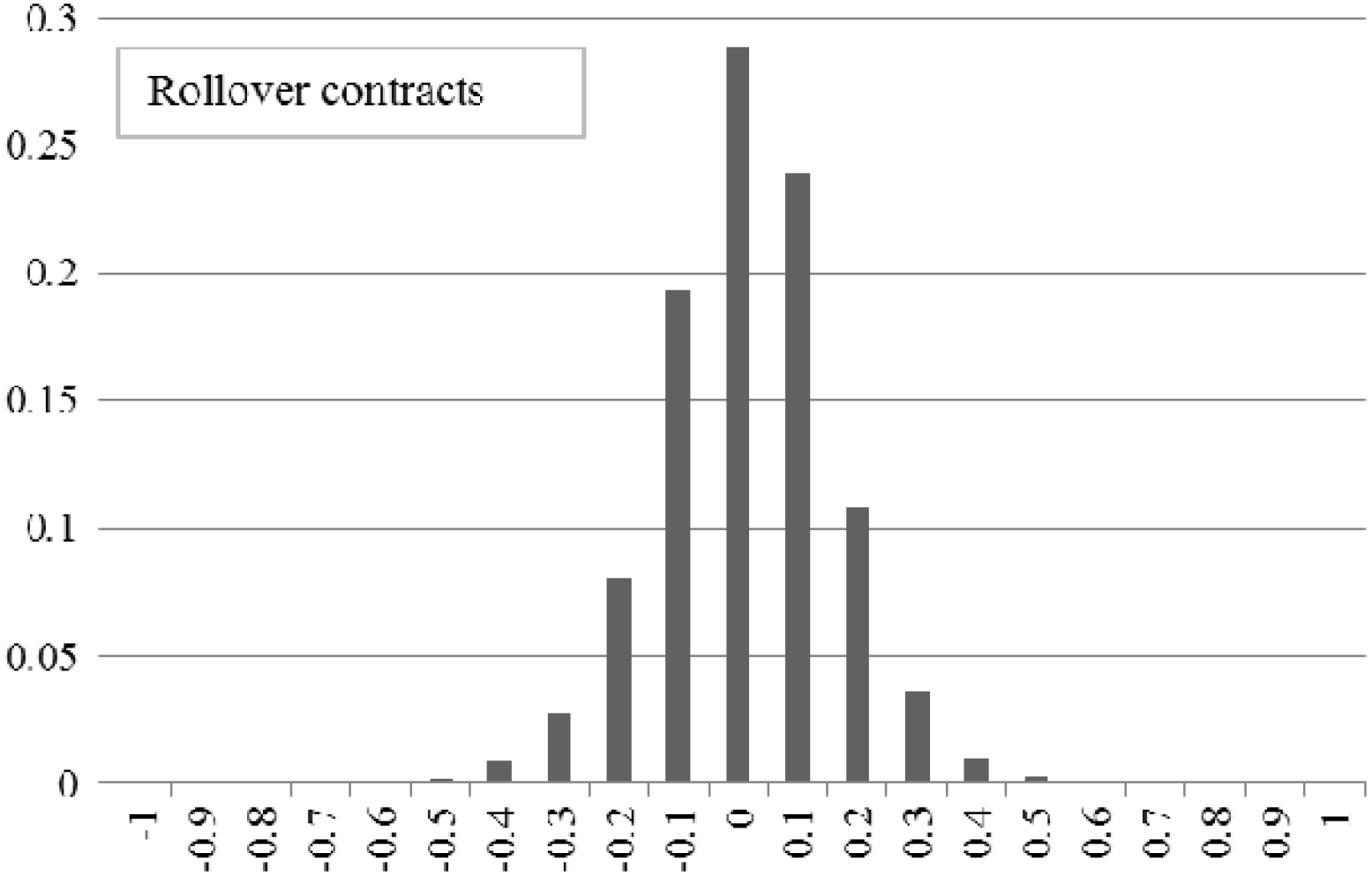

Figure 5: Price Gap Distribution

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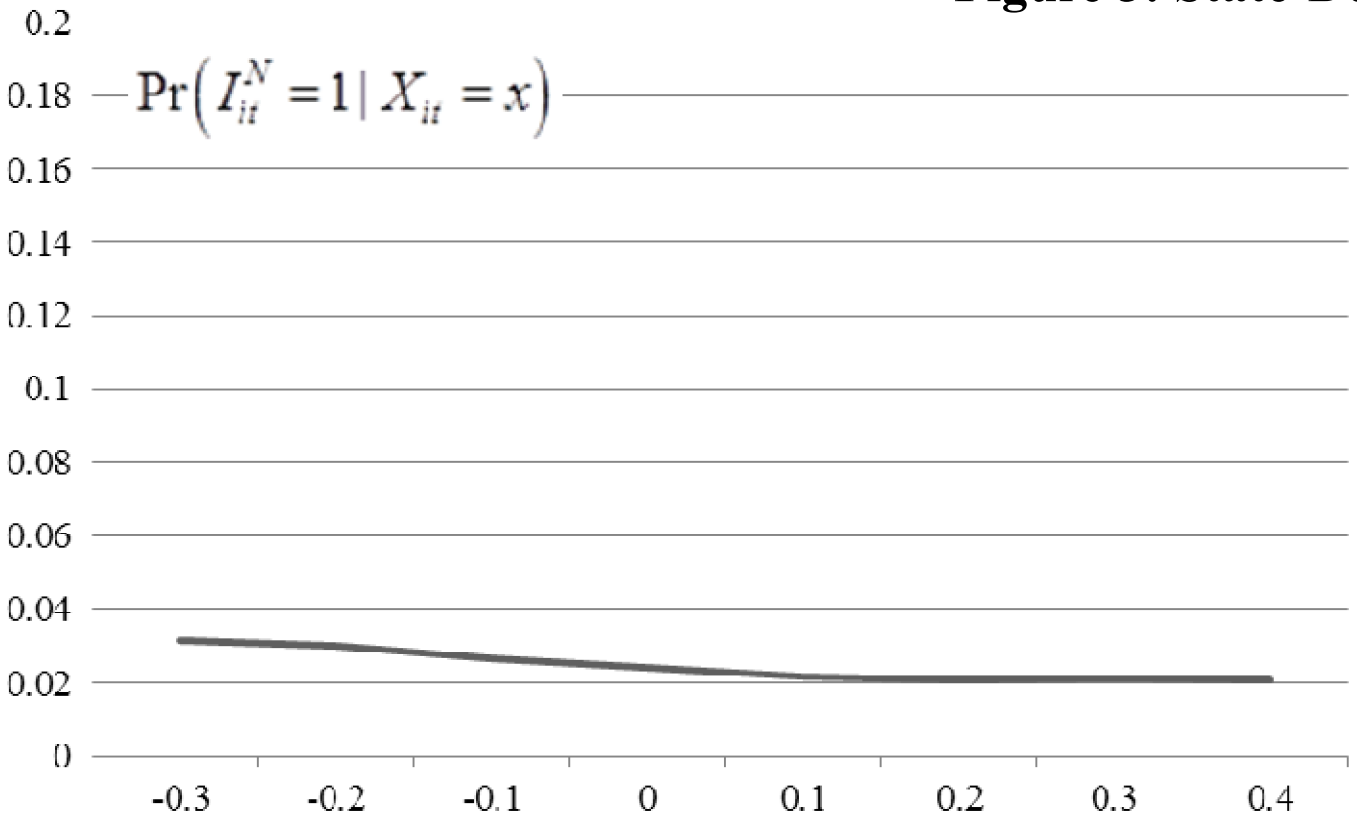
Adjustment Hazard Function for ***Turnover Units***: Probability of Unit Turnover

Figure 5: State-Dependency



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

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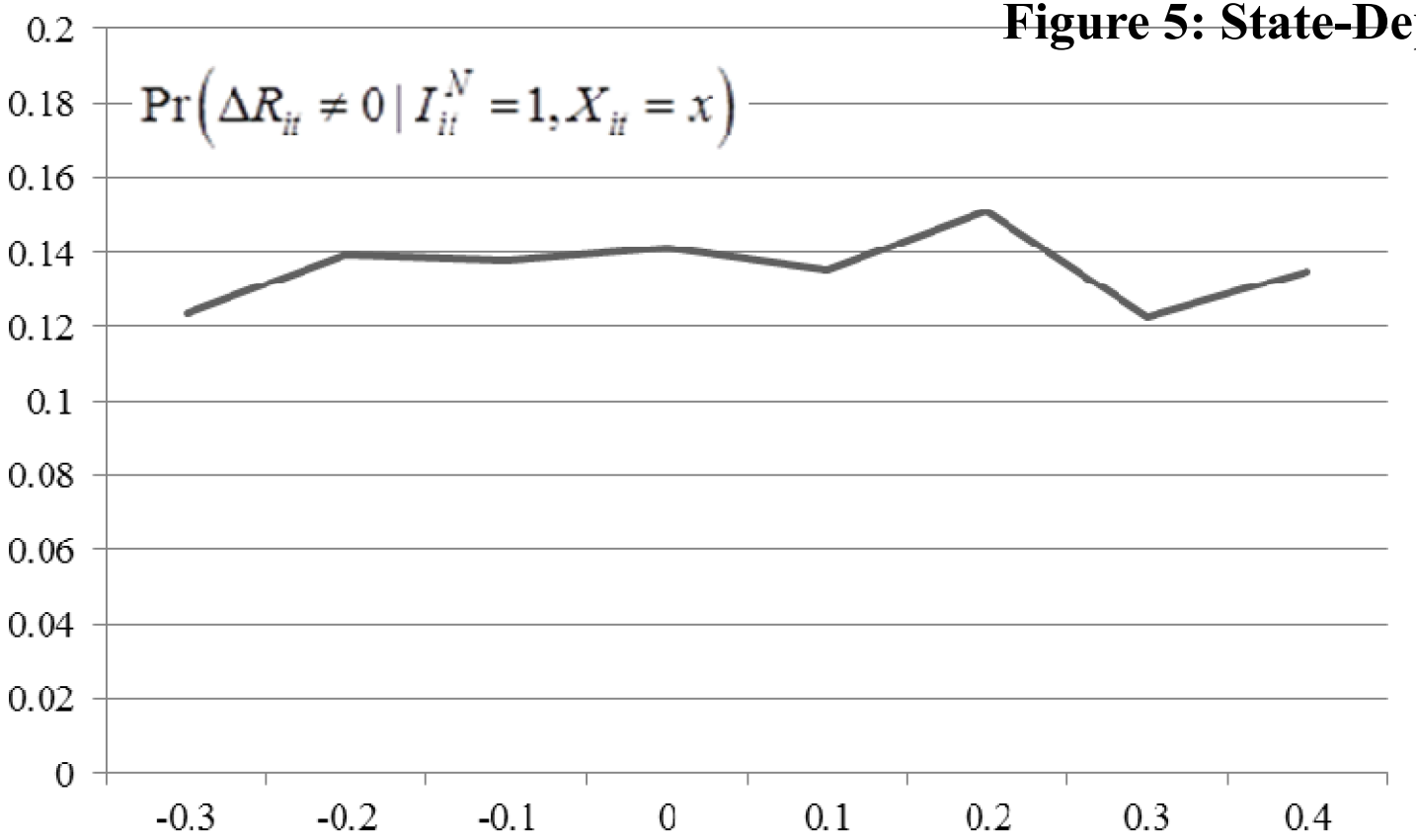
Adjustment Hazard Function for *Turnover Units*

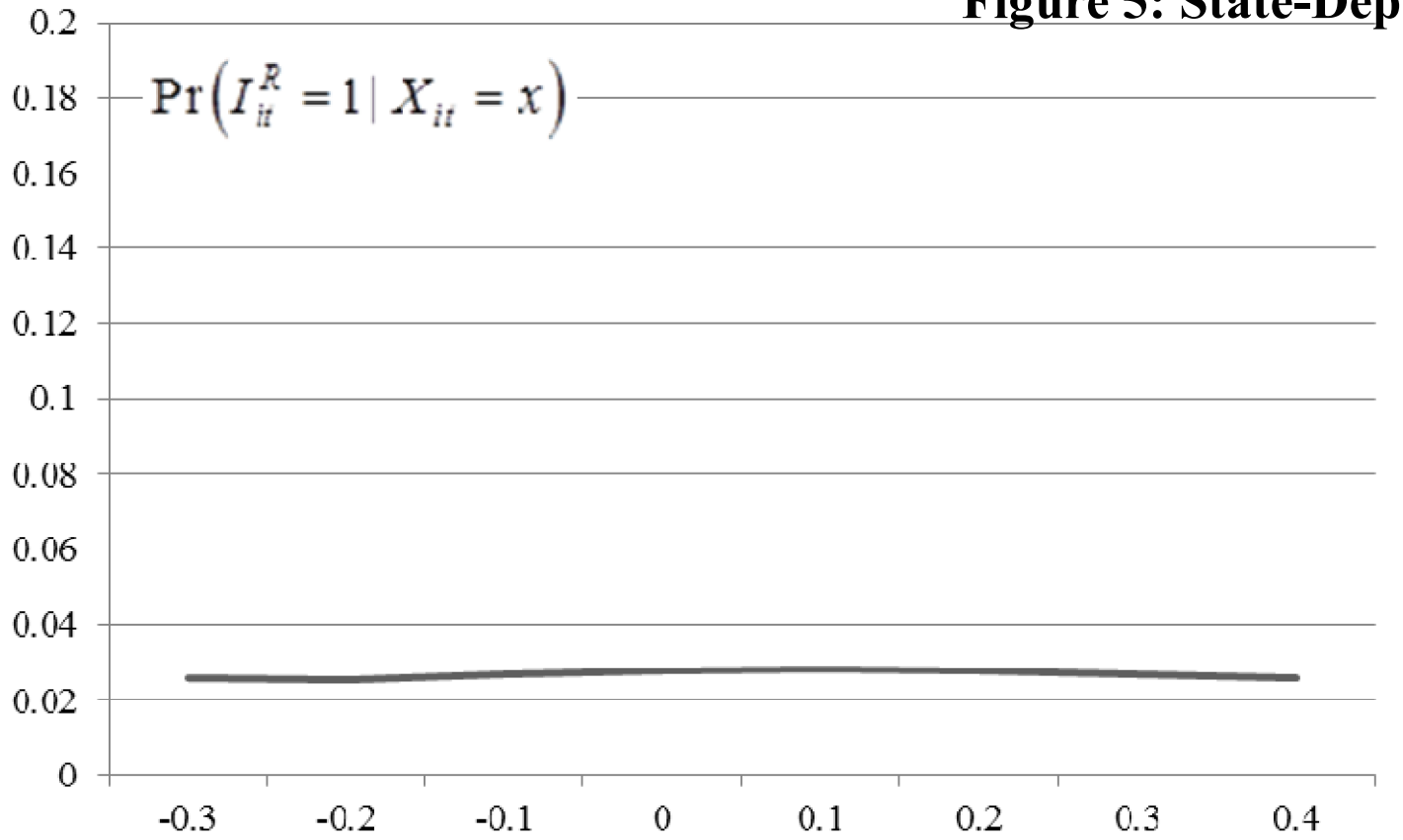
Figure 5: State-Dependency



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

Adjustment Hazard Function for ***Rollover Units***

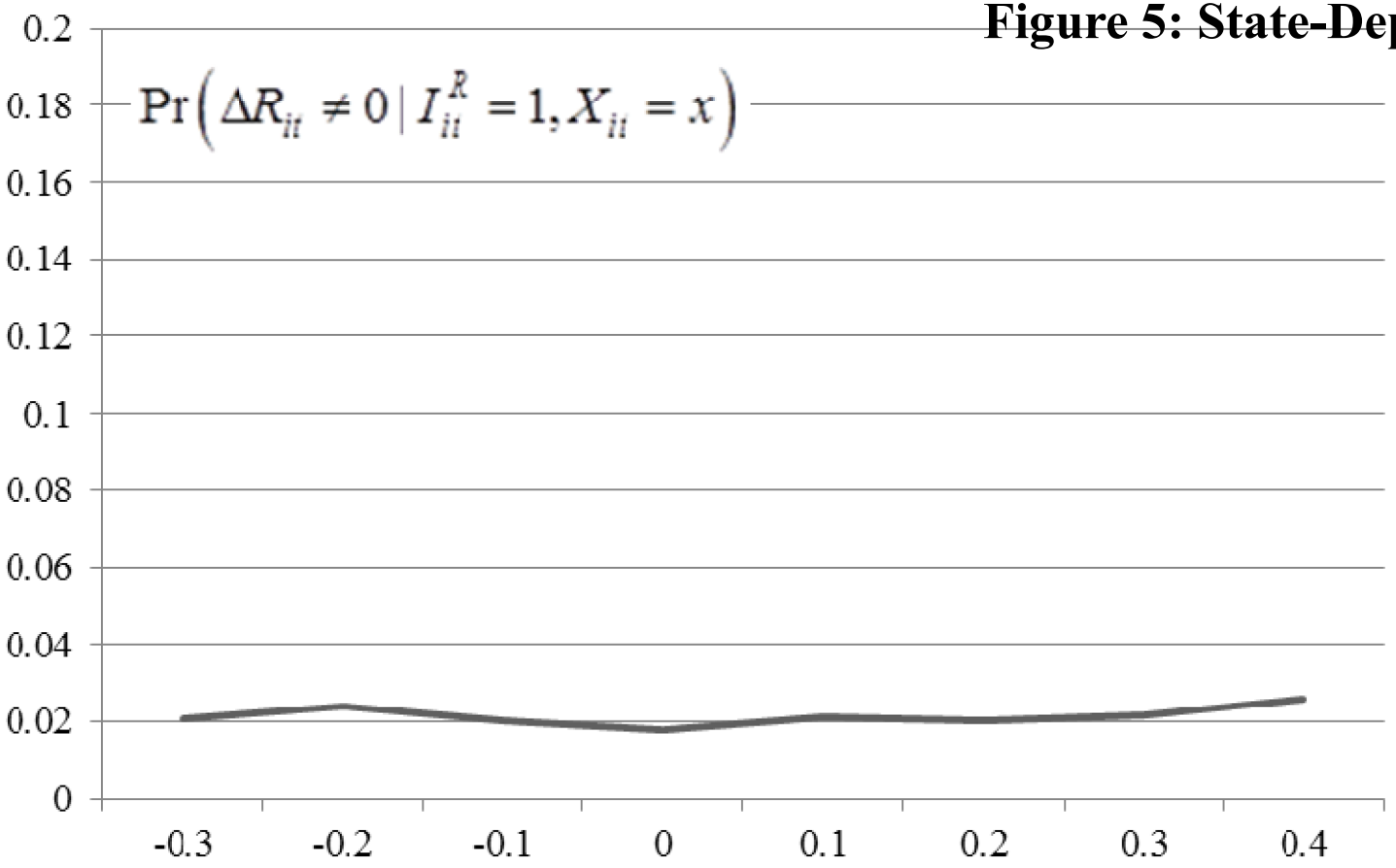
Figure 5: State-Dependency



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

Adjustment Hazard Function for ***Rollover Units***

Figure 5: State-Dependency



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

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Adjustment Hazard Functions

Table 5: Summary of Estimation Results

	□ ∈ □□ 0.4, □ 0.2 □	□ ∈ □□ 0.2,0.0 □	□ ∈ □0.0,0.2 □	□ ∈ □0.2,0.4 □
$\Pr\left(I_{it}^{N}=1 \mid X_{it}=x\right)$	**0.035**	**0.029**	**0.023**	**0.021**
$\Pr\left(I_{it}^{R}=1 \mid X_{it}=x\right)$	**0.006**	**0.026**	**0.028**	**0.027**
$\Pr\left(\Delta R_{it}\neq 0 \mid I_{it}^{N}=1, X_{it}=x\right)$	**0.131**	**0.134**	**0.138**	**0.137**
$\Pr\left(\Delta R_{it}\neq 0 \mid I_{it}^{R}=1, X_{it}=x\right)$	**0.015**	**0.022**	**0.020**	**0.021**
$\Lambda(x)$	**0.005**	**0.004**	**0.004**	**0.003**
$h(x)$	**0.039**	**0.569**	**0.337**	**0.047**

Intensive margin:

$$\int \Lambda(x)h(x)dx = \square$$

Extensive margin:

$$\int x\Lambda'(x)h(x)dx = \square$$

Caballero-Engel's measure of price flexibility

$$\lim_{\Delta\xi_t \to 0} \frac{\Delta \log R_t}{\Delta \xi_t} = \square$$

Summary in ñSticky Housing Rentò

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.

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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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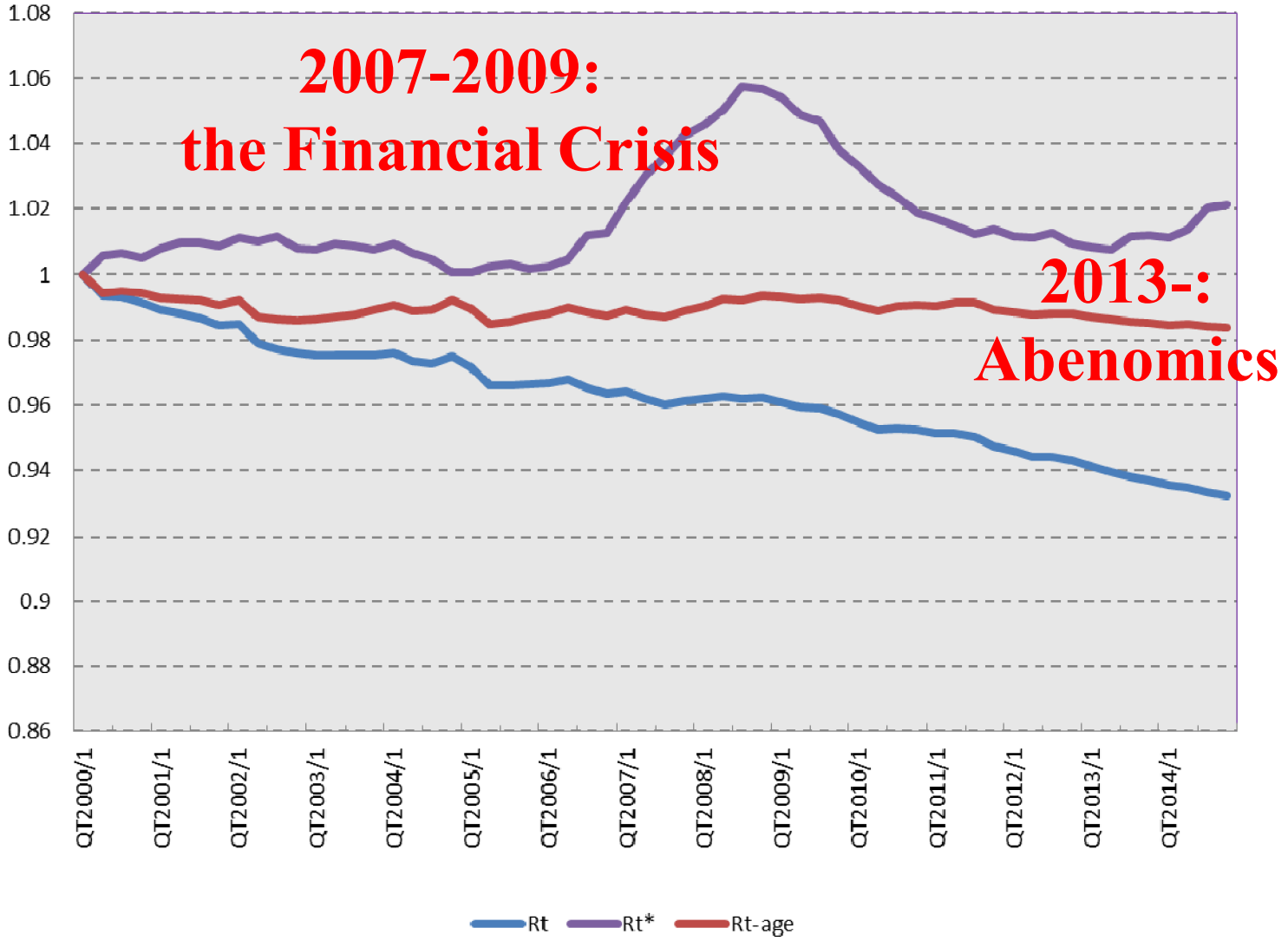

Figure 7: Hedonic estimate Rt*, R-age and Actual CPI

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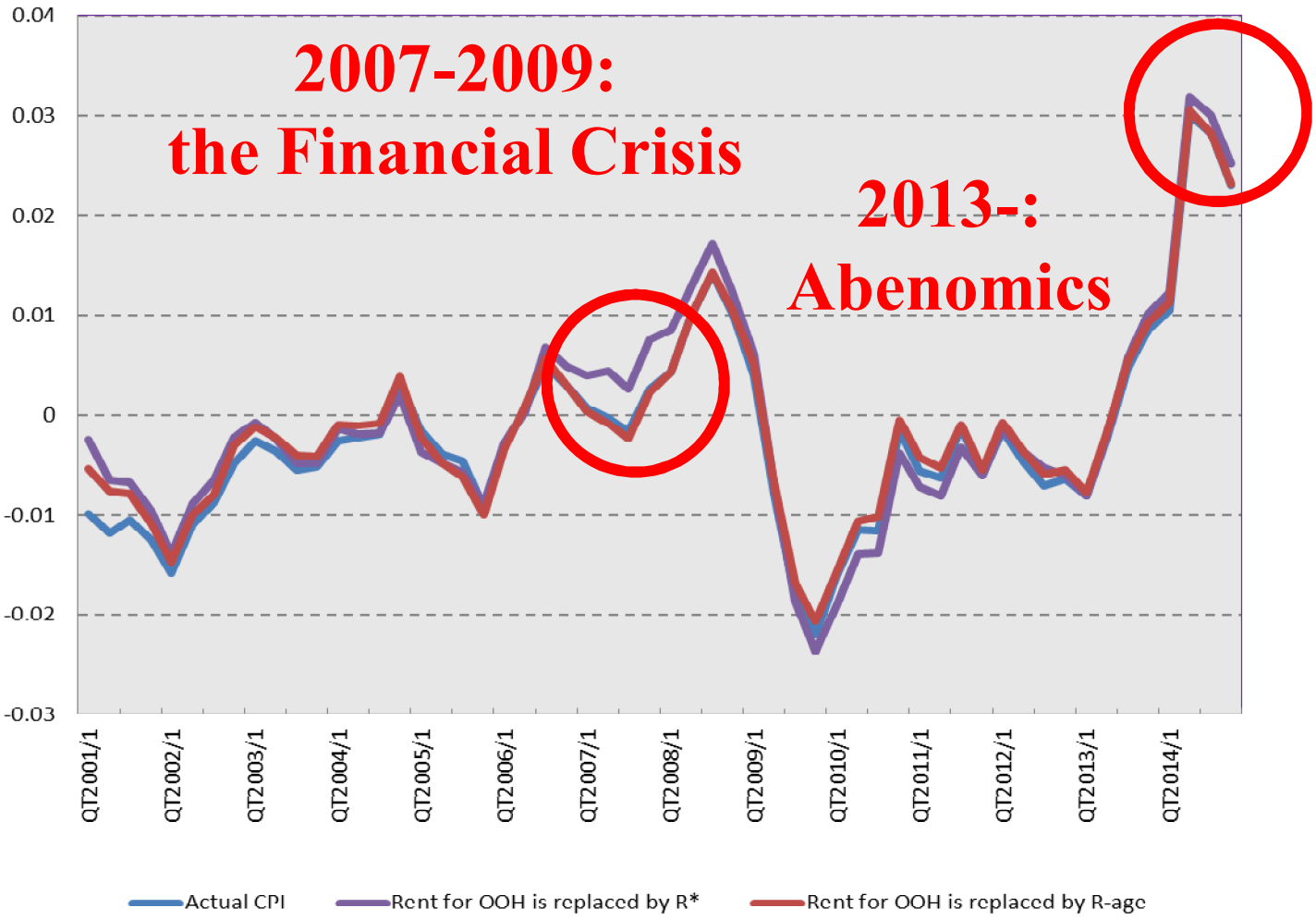
Figure 8: Reestimates of CPI inflation under Rent for OOH replaced by Rt* and R-age



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5. 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.
- In particular, there was no major change in goods and services prices even during the significant rise in asset prices that was one of the factors leading to the global financial crisis and subsequent decline in such prices. This lack of correlation means that business cycle management via financial policy is difficult.
- Focusing on rents, which are an important connecting point between asset market and goods and services market, we attempted to measure housing rent for Japan.

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5. Conclusions:

- **Depreciation Bias:**
- The Japanese rent index has a downward bias due to the neglect of depreciation. In other words, the actual CPI holds a strong downward bias due to the neglect of this ñaging depreciationò: approximately 1.1 percent per year.
- **Strong rigidity of price changes bias:**
- While rents based on new contracts change in an elastic manner, actual paid rents change only gradually, even when market shocks occur.
- 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.

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5. Conclusions:

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

- RPPI will be new important indicators for policy makers.

- Going forward, it will likely be necessary to clarify the relationship between asset price fluctuations and rent (or good and services) fluctuations.

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Population decline and Vacant rate bias

	2013	2008	2003	1998
Total	**14.1%**	13.9%	13.0%	12.6%
Owner Occupied Housing	**9.8%**	9.1%	7.8%	6.0%
(on Sale)	0.9%	1.0%	1.0%	-
(others)	8.9%	8.0%	6.8%	6.0%
Rental Housing	**18.8%**	18.8%	17.6%	17.0%

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