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Swiss Statistics

# Limitations and impact of hedonic adjustment for the Swiss rent index

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2. Hedonic adjustment
3. Impact of adjustment
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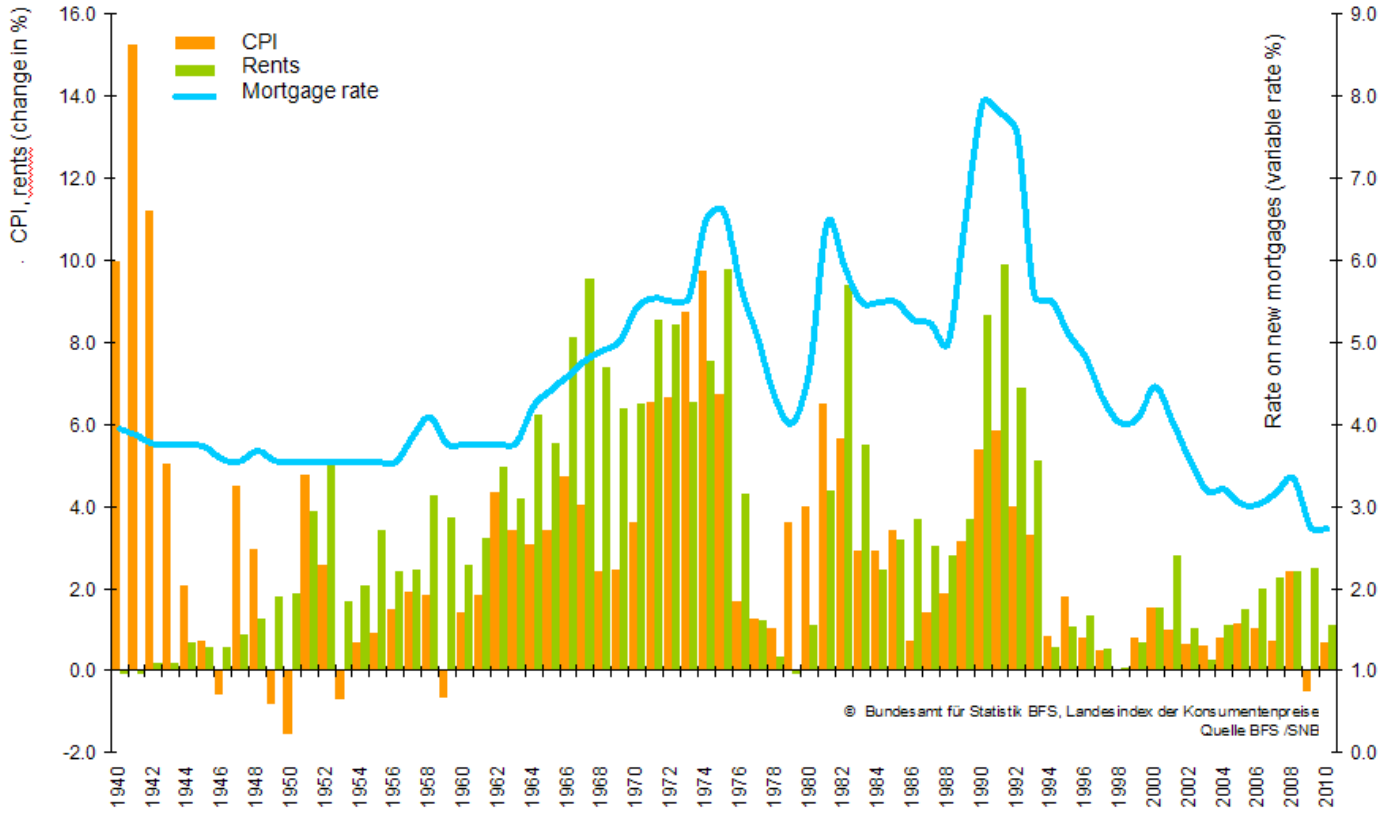
# Introduction

Rents for housing :

a major part of the CPI basket
a higher increase as the overall CPI
a special market
a major issue : quality adjustment

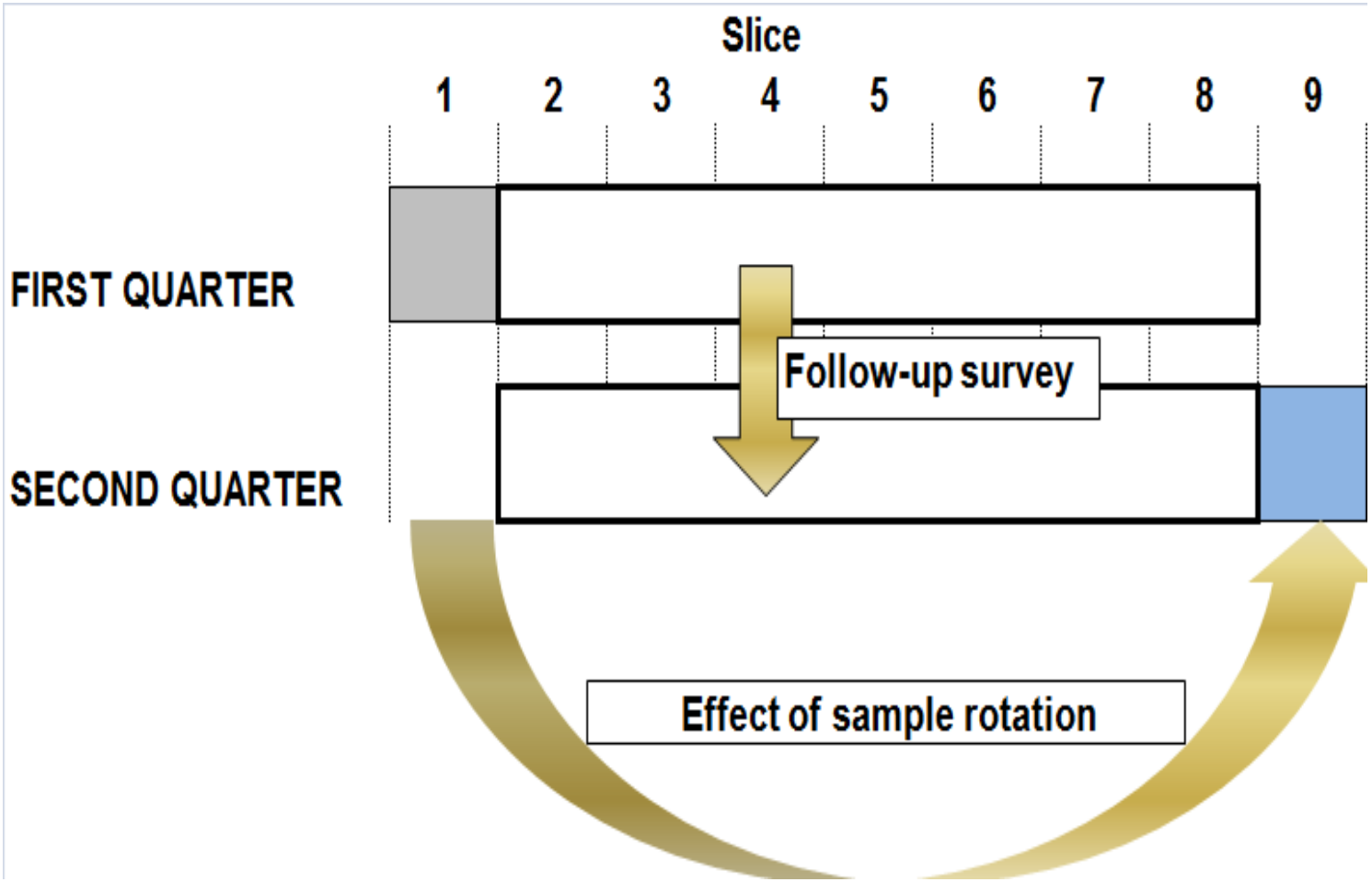
# Annual change in rents, CPI and mortgage rate



# Quality adjustment methods for rents

Statified ex post according to number of rooms and dwelling age.

-1993-2005 : further QA in accordance with renovations



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# The rent matrix

| Age/nb rooms | 1 room | 2 rooms | 3 rooms | 4 rooms | 5 rooms | 6 rooms |
|---|---|---|---|---|---|---|
| 0-5 years | | | | | | 2‘800.- |
| 6-10 years | | 950.- | | | | |
| 11-20 years | | | | | | |
| More than 20 years | | | 850.- | 1‘450.- | | |

3 rooms
1970
850.-

6 rooms
2011
2’800.-

2 rooms
2005
950.-

4 rooms
1990
1’450.-

# The rent matrix with adjustment according to renovations

| Age/nb rooms | 1 room | 2 rooms | 3 rooms | 4 rooms | 5 rooms | 6 rooms |
|---|---|---|---|---|---|---|
| 0-5 years | | | | | | |
| 6-10 years | | | | | | |
| 11-20 years | | | 1'200.- | | | |
| More than 20 years | | | 850.- | | | |

3 rooms, 1995, 1'200.-

Partially renovated, calculated age

# Quality adjustment methods for rents

Stratified ex post according to number of rooms and dwelling age.

-2006-2010: -------

-2011-now : hedonic model

# Hedonic adjustment

Hedonic adjustment (2011-now) : main features

- hedonic repricing / hedonic QA
- rent structure survey 2003
- multiplicative model
- issue of location

# Hedonic model

## Hedonic repricing : principles

$$I_t^{adj} = I_t^{unadj} \cdot \frac{1}{I_t^{\text{quality}}}$$

With Jevons-index:

$$I_t^{unadj} = \frac{\prod_{i=1}^{nt}\left(P_{i,t}\right)^{\frac{1}{nt}}}{\prod_{i=1}^{n0}\left(P_{i,0}\right)^{\frac{1}{n0}}}$$

*Adjustment factor*

$$I_t^{\text{quality}} = \frac{\prod_{i=1}^{nt}\left(\widehat{P_{i,t}}\right)^{\frac{1}{nt}}}{\prod_{i=1}^{n0}\left(\widehat{P_{i,0}}\right)^{\frac{1}{n0}}}$$

# Hedonic model

Why hedonic repricing ?

- Hedonic regression not constrained to current/base period: **2003**
- Database for regression <> Database for index calculation : **MSE (90‘000 dwellings)**

  **+ external suppliers (location)**
- Close to standard QA approaches

# Hedonic model

Multiplicative model (1)

1) Estimated model :

$$\ln(\widehat{P_i}) = \widehat{\alpha} + \widehat{\beta_1} X_{1,i} + \widehat{\beta_2} \ln(X_{2,i})$$

=> Multiplicative relation :

$$\widehat{P_i} = e^{\widehat{\alpha}} \cdot e^{\widehat{\beta_1} X_{1,i}} \cdot X_{2,i}^{\widehat{\beta_2}} = cst \cdot (1 + fact1_i\%) \cdot (1 + fact2_i\%)$$

# Hedonic model

Multiplicative model (2)

2) Adjustment factor:

$$I_t^{quality} = \underbrace{\frac{\prod_{i=1}^{nt}\left(1+factor1_{i,t}\%\right)^{\frac{1}{nt}}}{\prod_{i=1}^{n0}\left(1+factor1_{i,0}\%\right)^{\frac{1}{n0}}}}_{\text{Adjust.factor 1}} \cdot \underbrace{\frac{\prod_{i=1}^{nt}\left(1+factor2_{i,t}\%\right)^{\frac{1}{nt}}}{\prod_{i=1}^{n0}\left(1+factor2_{i,0}\%\right)^{\frac{1}{n0}}}}_{\text{Adjust.factor 2}}$$

# Hedonic model

## Variables

$$\ln(\hat{y}_i) = \hat{\alpha} + \underbrace{\sum_{j=1}^{12} \hat{\beta}_j X_{j,i}^{structure}}_{Structural\ component} + \underbrace{\sum_{k=1}^{47} \hat{\gamma}_k D_{k,i}^{location}}_{Locational\ component}$$

$$= \hat{\alpha} + \underbrace{\sum_{j=1}^{12} \hat{\beta}_j X_{j,i}^{structure}}_{Structural\ component} + \widehat{Hectare_value}_i$$

| Type (3) | Variables (58 / 47D) |
|---|---|
| Structural (12 / 8D) | Age, surface, room, storey, garage, penthouse, duplex |
| Micro-location (13 / 10D) | Distance from the lake, lake view, mountain view, gradient, exposure, noise |
| Macro-location (33 / 30D) | Potential accessibility, fiscal capacity, tax rate, canton, major city |

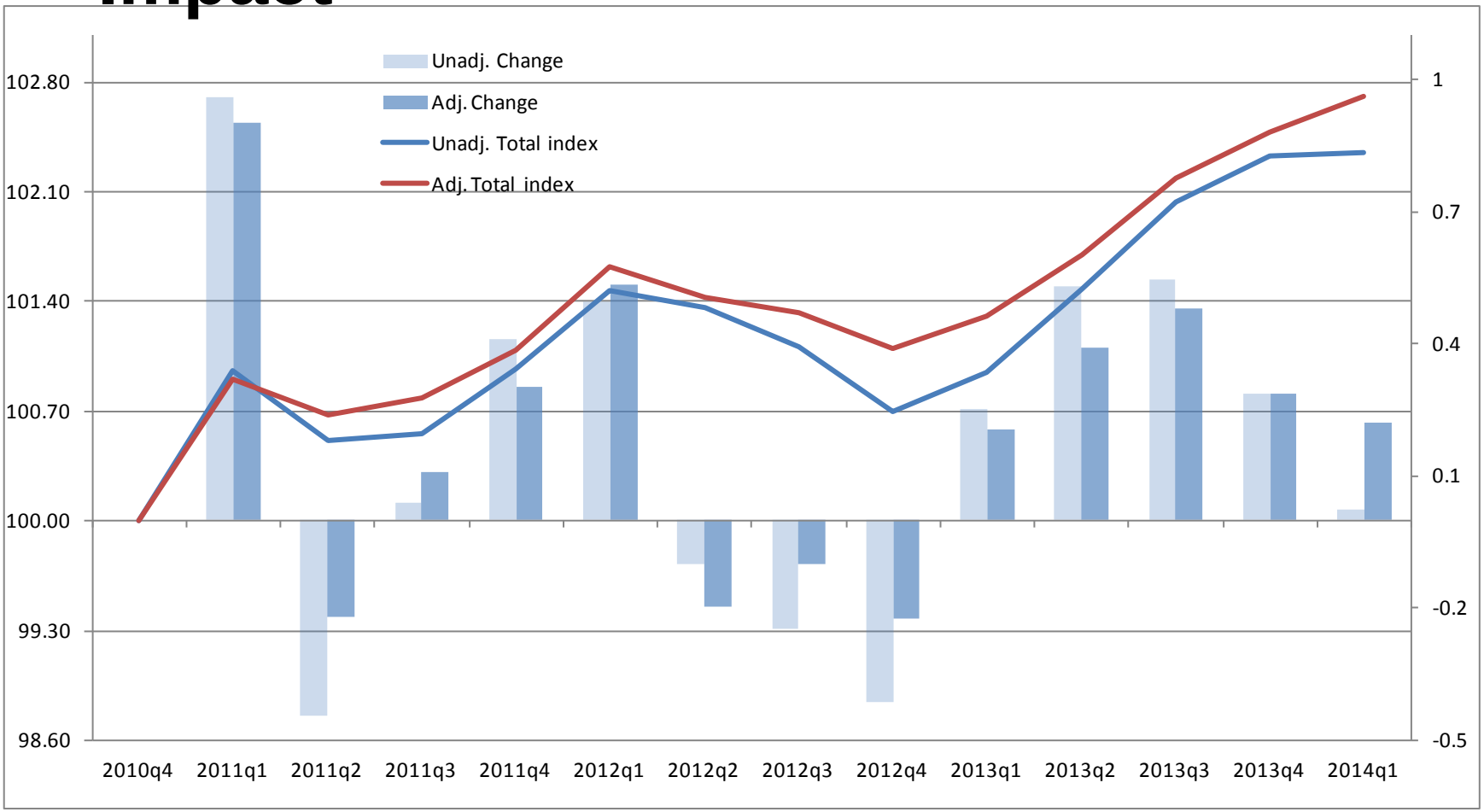
Hectare values

# Impact

## Impact on the index

| | Index AC | Total index |
|---|---|---|
| Unadj. change | + 0.81% | + 0.18% |
| Adj. change | + 1.03% | + 0.21% |
| Deviation | + 0.21% | + 0.03% |

# Impact

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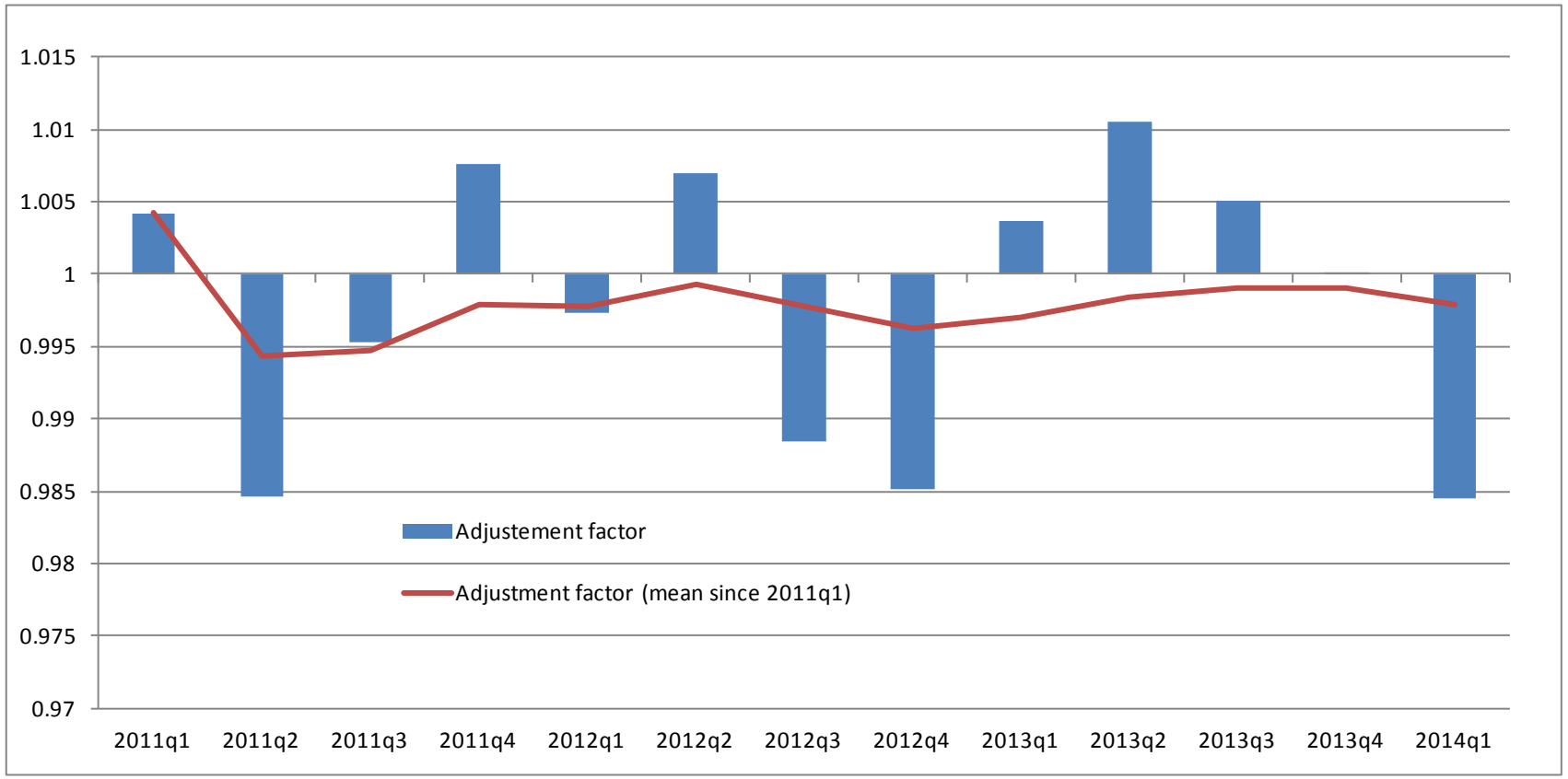
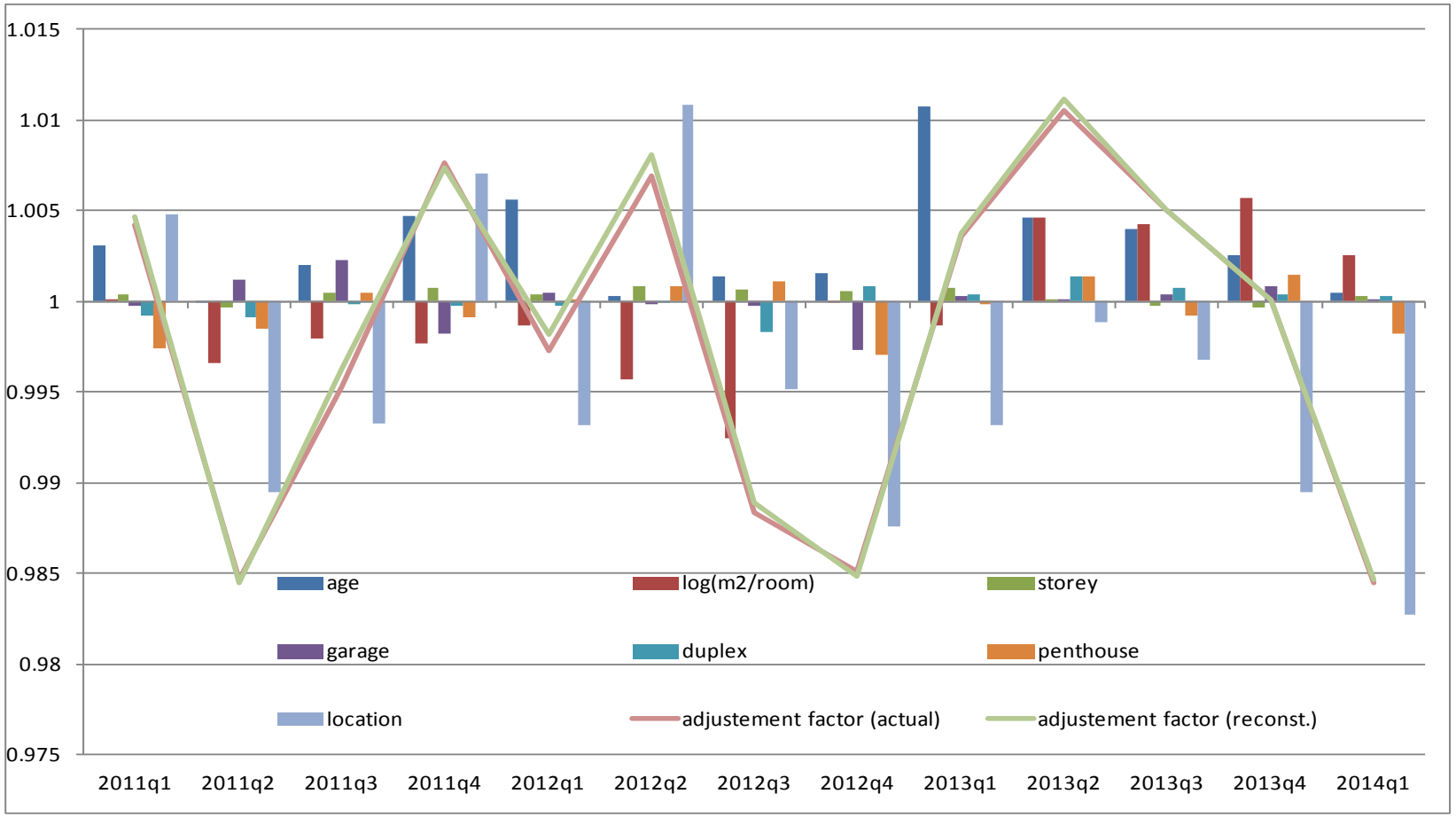
# Impact


1.015
1.01
1.005
1
0.995
0.99
0.985
0.98
0.975
0.97
Adjustement factor
Adjustment factor (mean since 2011q1)
2011q1
2011q2
2011q3
2011q4
2012q1
2012q2
2012q3
2012q4
2013q1
2013q2
2013q3
2013q4
2014q1

# Breakdown



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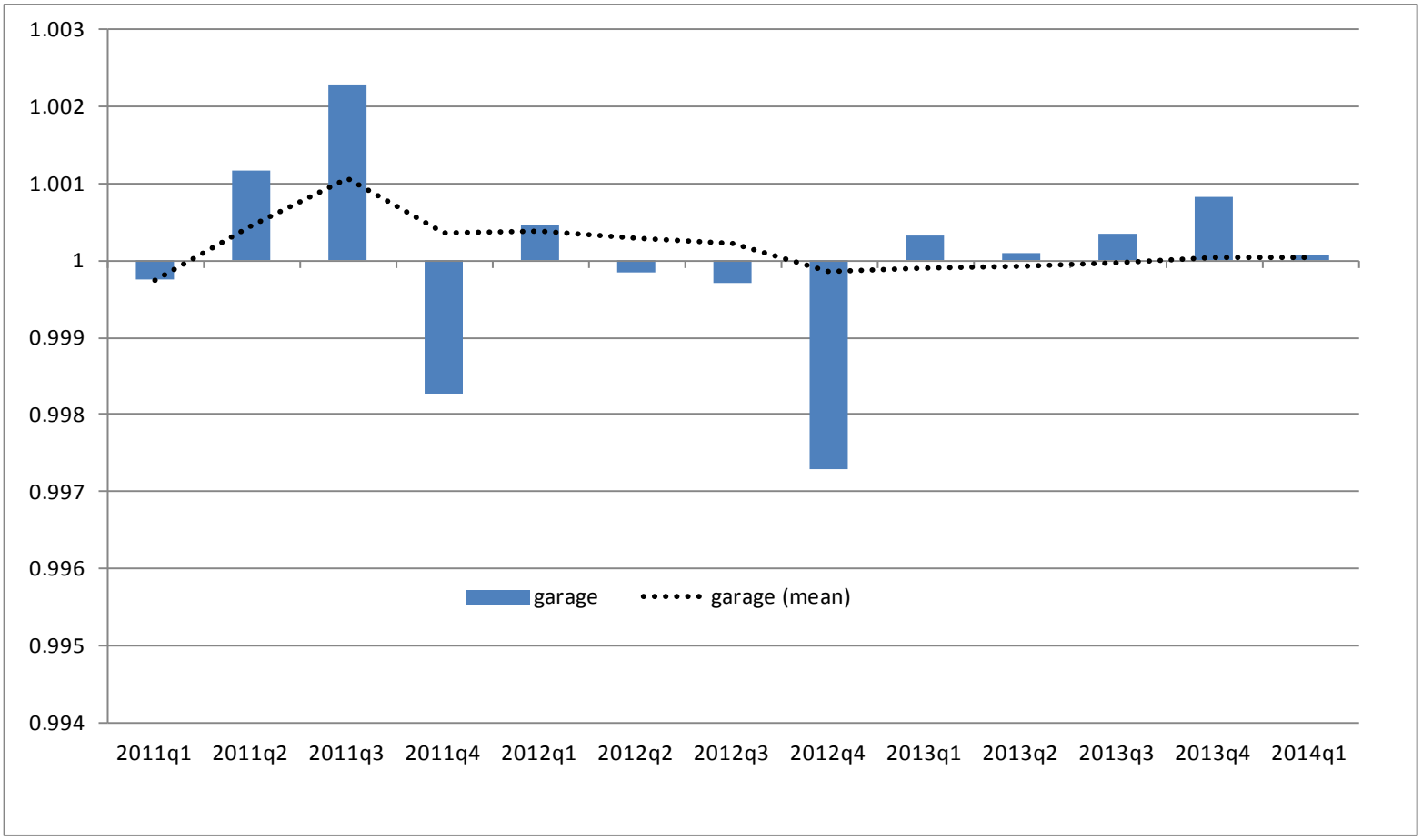
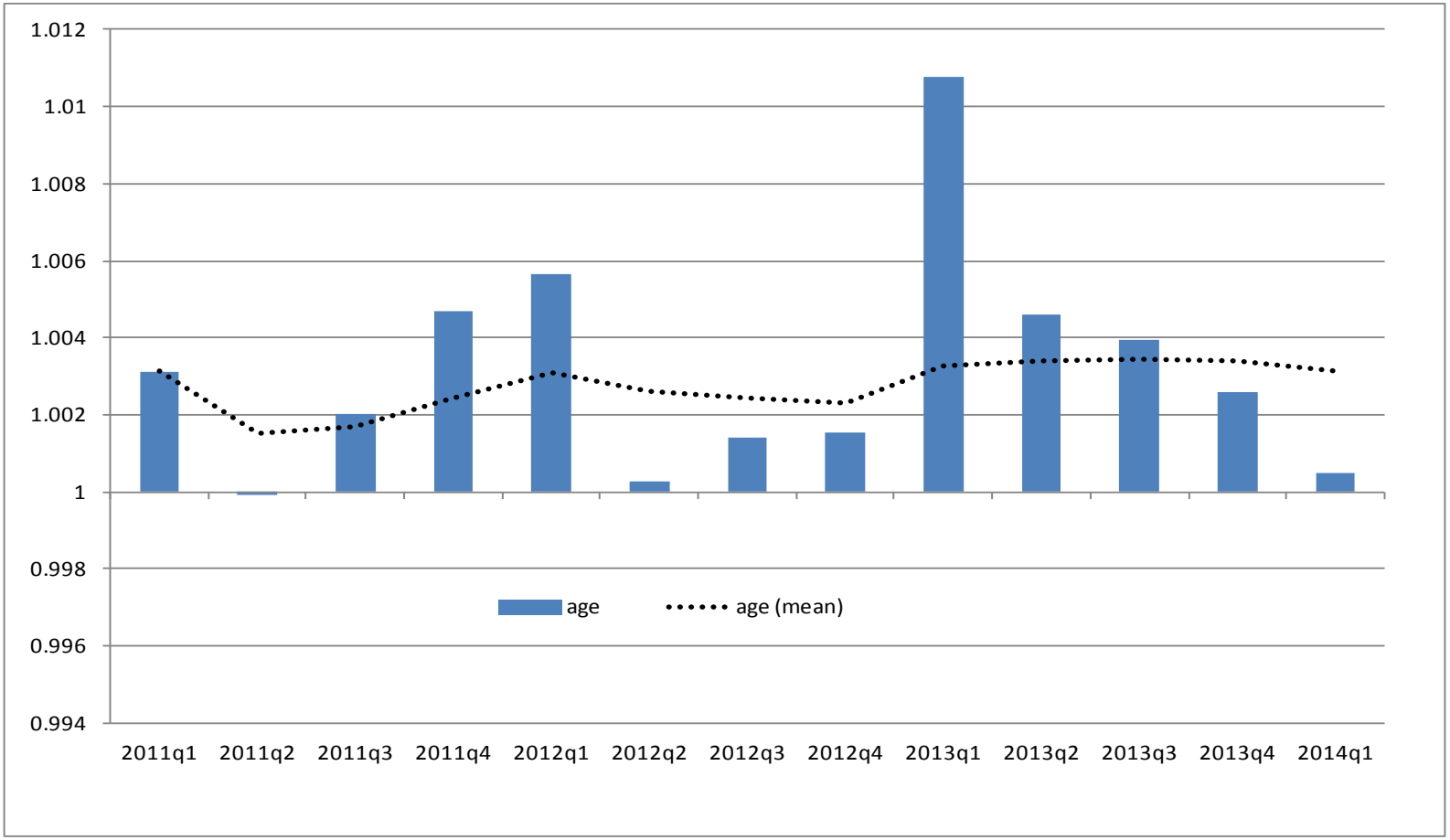
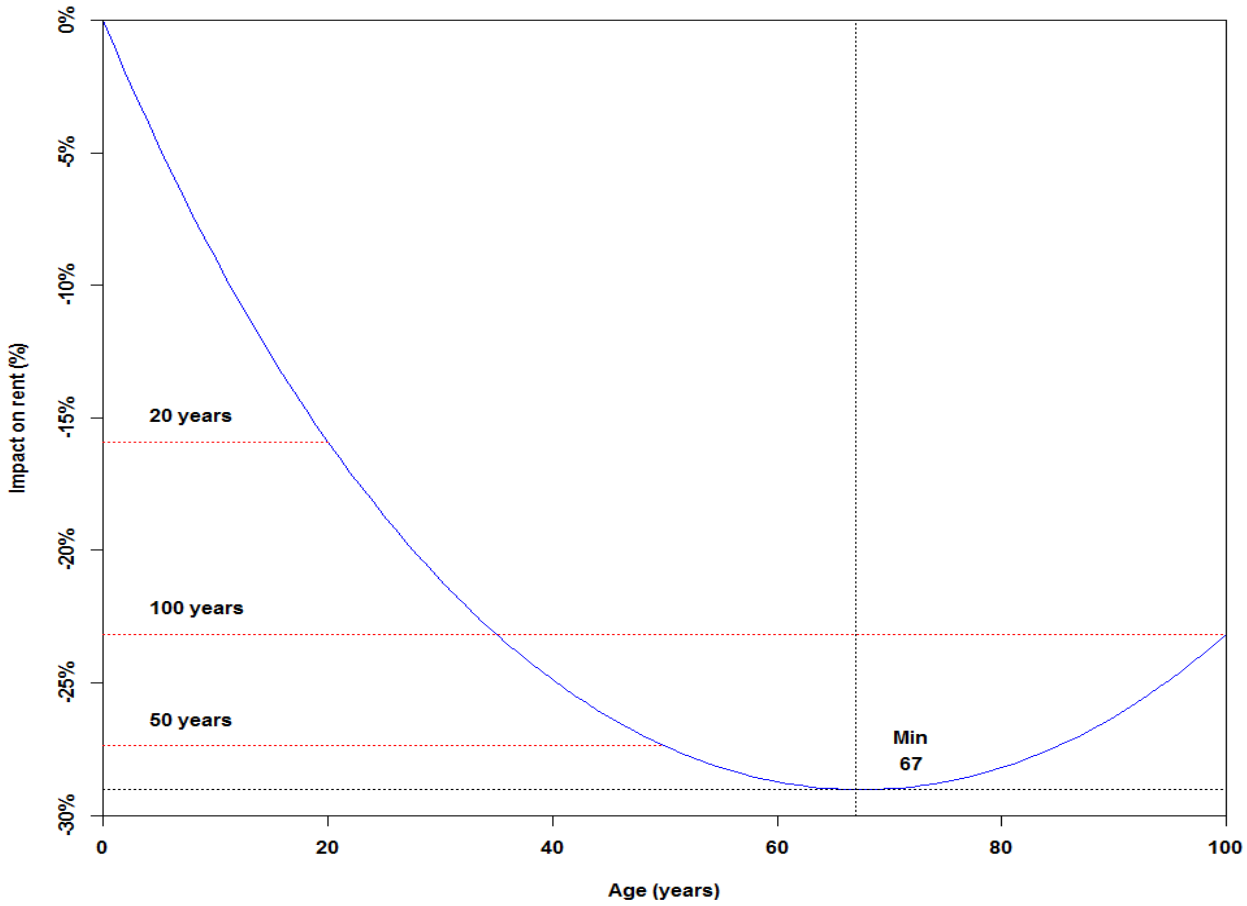
# Breakdown


1.003
1.002
1.001
1
0.999
0.998
0.997
0.996
0.995
0.994
2011q1
2011q2
2011q3
2011q4
2012q1
2012q2
2012q3
2012q4
2013q1
2013q2
2013q3
2013q4
2014q1
garage
garage (mean)

# Breakdown

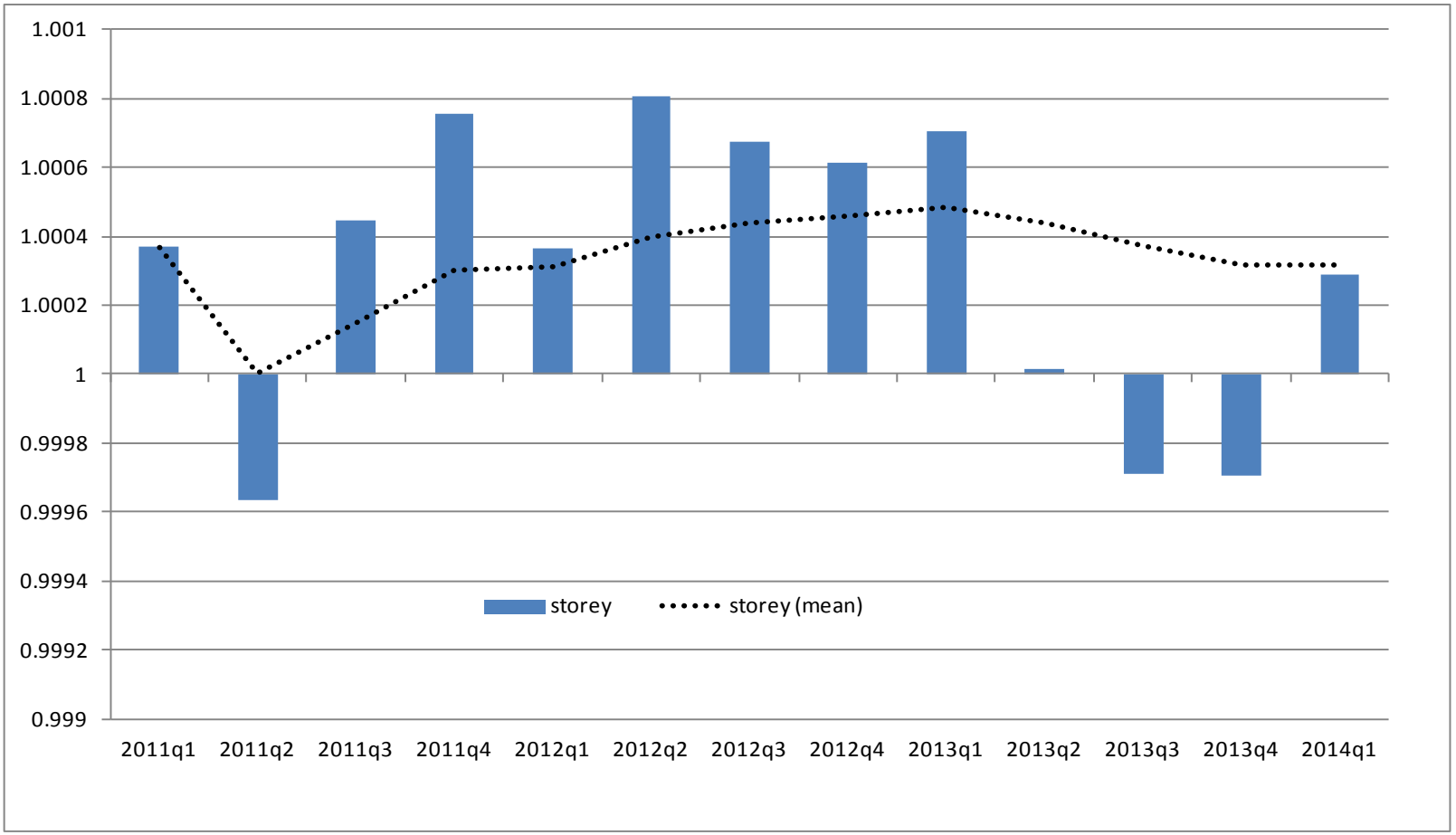

1.012
1.01
1.008
1.006
1.004
1.002
1
0.998
0.996
0.994
2011q1
2011q2
2011q3
2011q4
2012q1
2012q2
2012q3
2012q4
2013q1
2013q2
2013q3
2013q4
2014q1
age
age (mean)





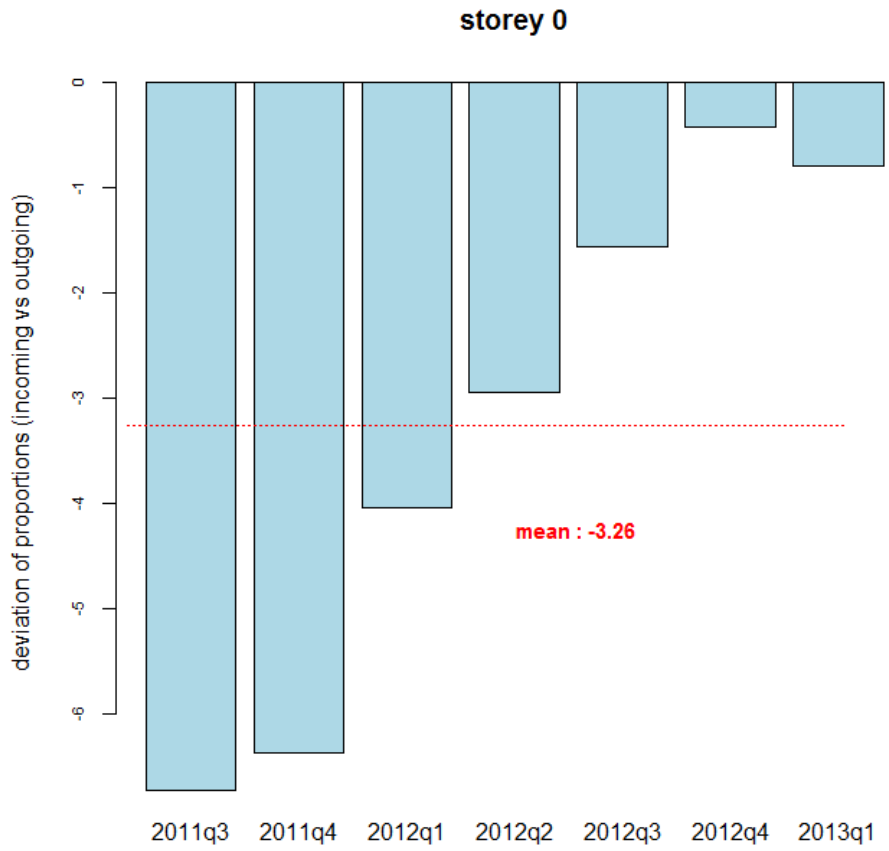

Swiss Statistics

# Breakdown

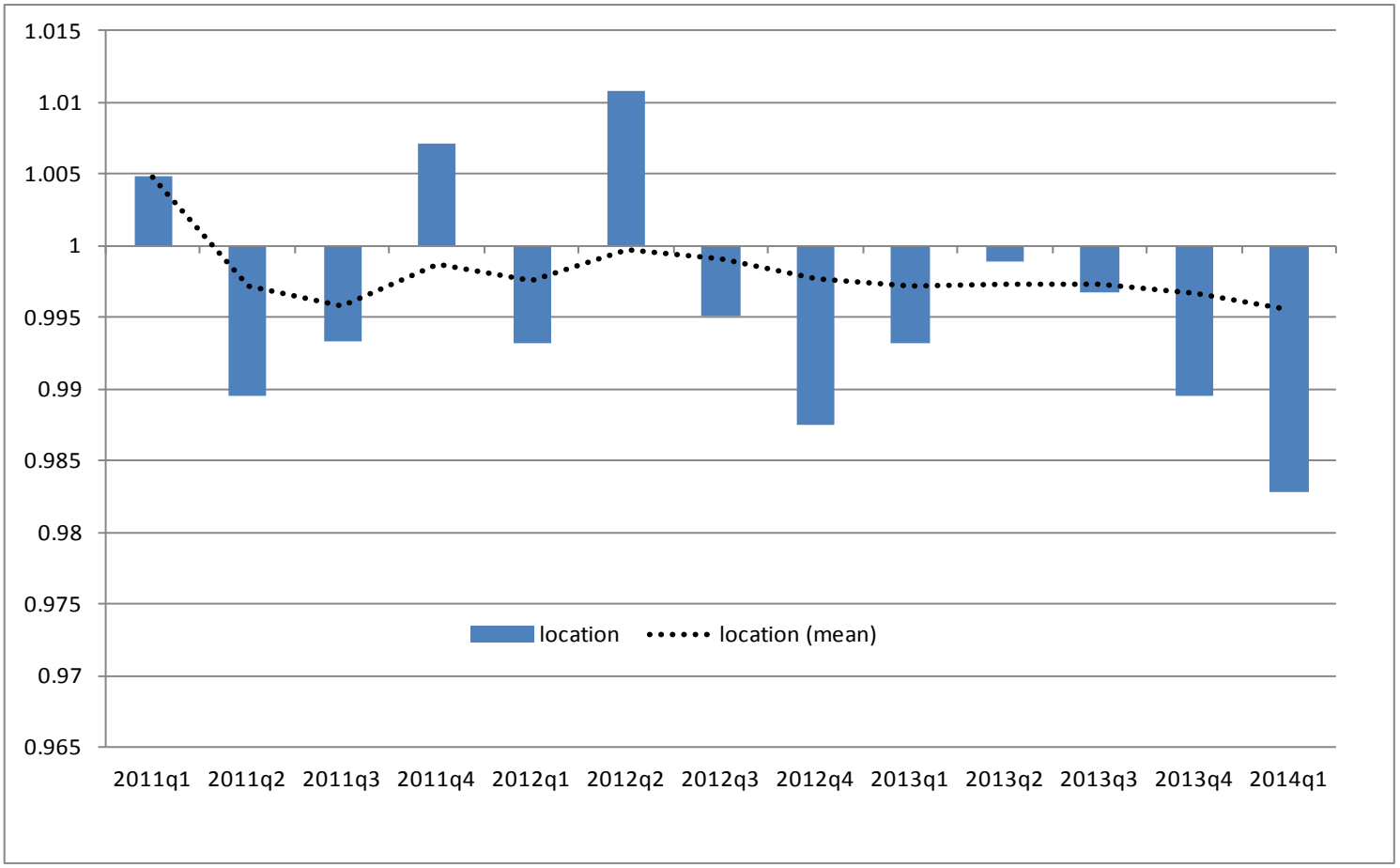





Swiss Statistics

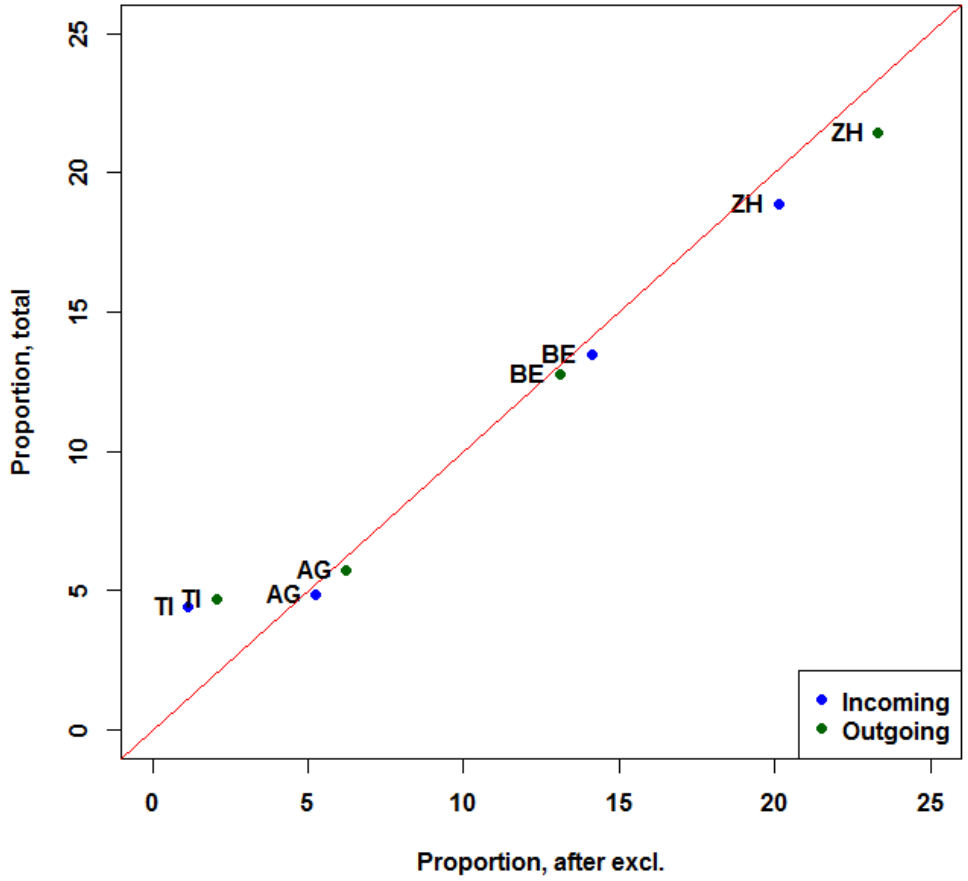

storey 0
deviation of proportions (incoming vs outgoing)
0
-1
-2
-3
-4
-5
-6
mean : -3.26
2011q3
2011q4
2012q1
2012q2
2012q3
2012q4
2013q1

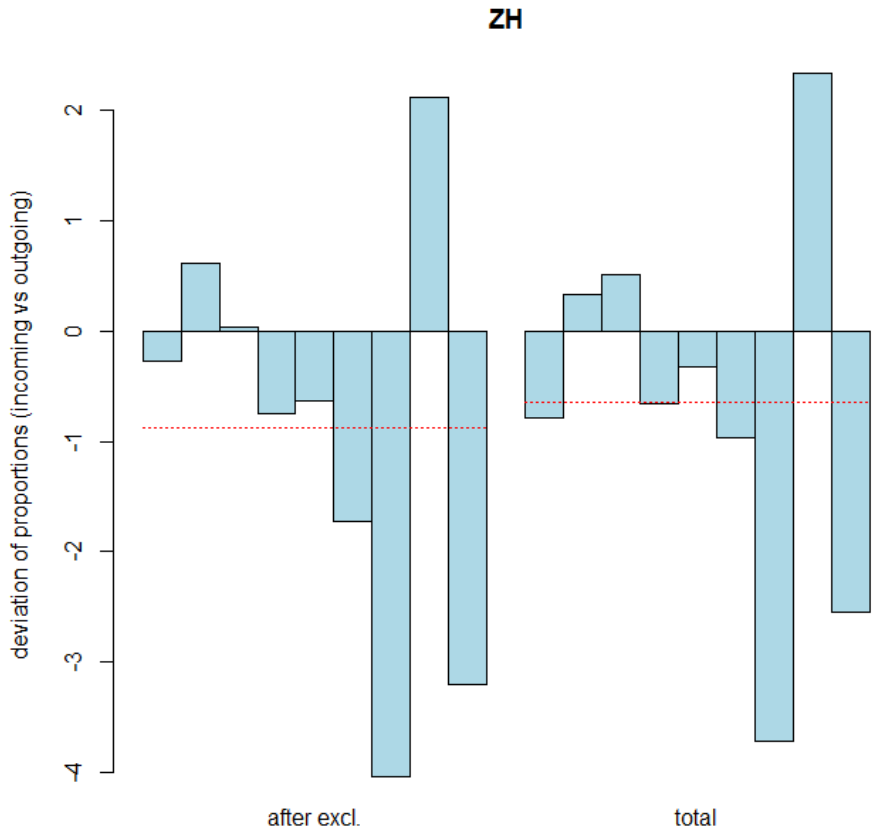
# Breakdown






Swiss Statistics


Proportion, total
Proportion, after excl.
0
5
10
15
20
25
ZH
ZH
BE
BE
AG
AG
TI
TI
Incoming
Outgoing


ZH
deviation of proportions (incoming vs outgoing)
2
1
0
-1
-2
-3
-4
after excl.
total

# Conclusions

Impact depends on the entire construction of the index

Limited impact on the short term

No impact in the long run