

# Hedonic price methods and real estate price index for Belo Horizonte, Brazil, 2004-2015

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## Abstract

### ✓ INTRODUCTION

Brazil has not yet an official real estate price index. A 2011 presidential decree stipulated for IBGE the assignment to create and spread a real estate price index for Brazil. As a result, attention has turned to study both methods and database affordable for a future Brazilian official real estate price index.

### ✓ DEVELOPMENT

Using fiscal data from Belo Horizonte, an important Brazilian city, we tested several hedonic price methods for its apartments market, based on European countries experiences. The methods used were:

- 1) Repricing (RP)
- 2) Average characteristics (AC)
- 3) Imputation method (IM)
- 4) Rolling window time-dummy (RTD)
- 5) Stratified median (MIX-UP)

### ✓ CONCLUSION:

The hedonic indices estimated exhibited a good performance in volatility terms, in contrast with the stratified median index. The Tornqvist's IM, an annual base's update RP, AC and an adjacent period RTD showed a good performance. By contrast, Paasche and Laspeyres' s IM and fifth years base's update RP showed evidences of bias.

## Methodology and database

✓ The hedonic models were estimated by an OLS regression with location's fixed effect by UP (Belo Horizonte's neighborhood variable). There are 82 UP's in Belo Horizonte.

✓ The RTD indices were estimated with location and time's fixed effect.

✓ The data base was the Real Estate Transfer Tax (RETT). All housing transactions in Brazil are subject to the RETT.

✓ The RETT data contains information about:

- 1) type of building
- 2) area
- 3) age of building
- 4) quality of building finishing material
- 5) zoning
- 6) district

✓ There were 266.596 apartments transactions in Belo Horizonte between 2004 and 2015.

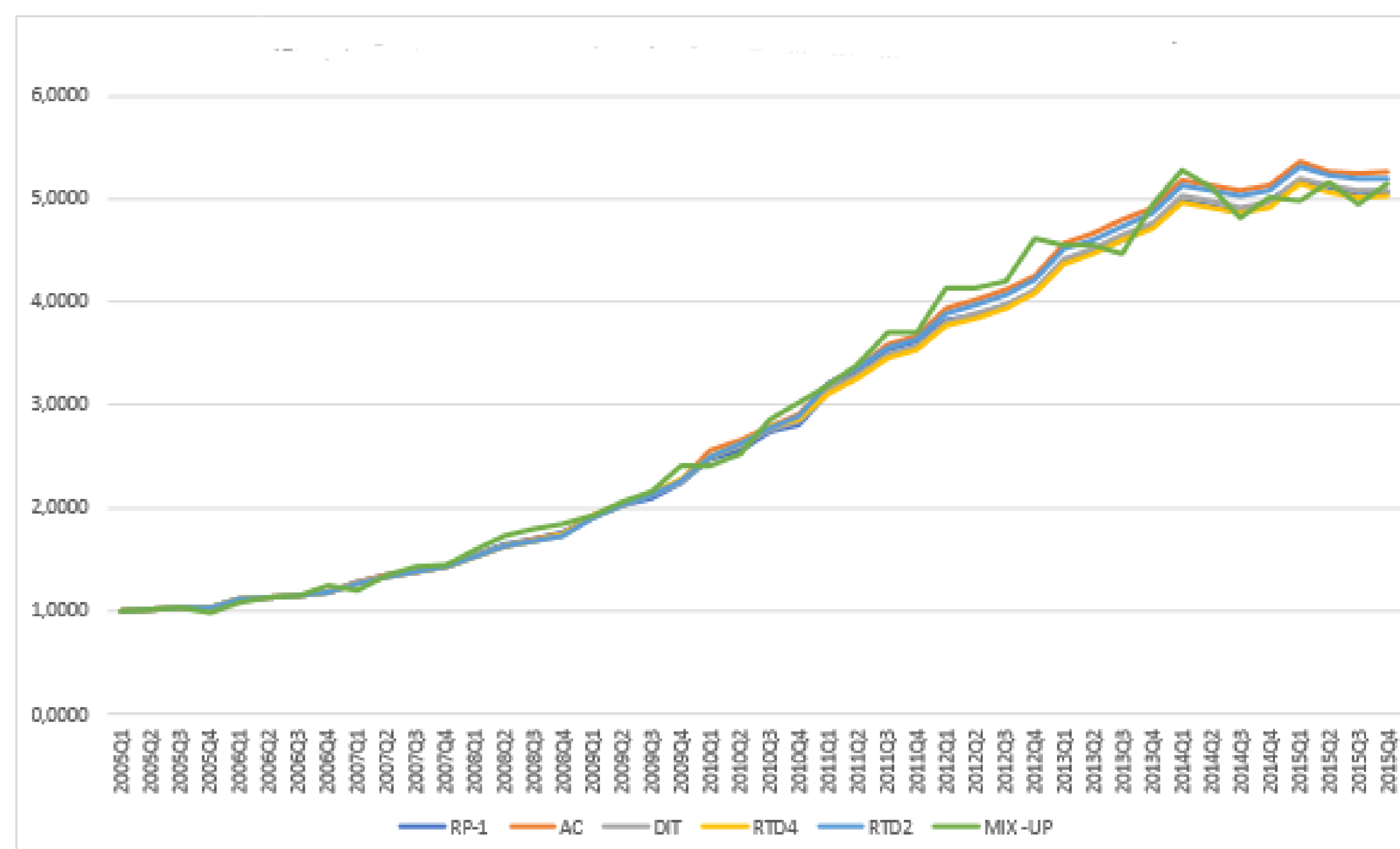
## Descriptive statistics

Variable	Mean	Median
Price (R\$)	218.149	140.000
Area (m <sup>2</sup> )	119,70	101,40
Age (years)	12,80	8,00

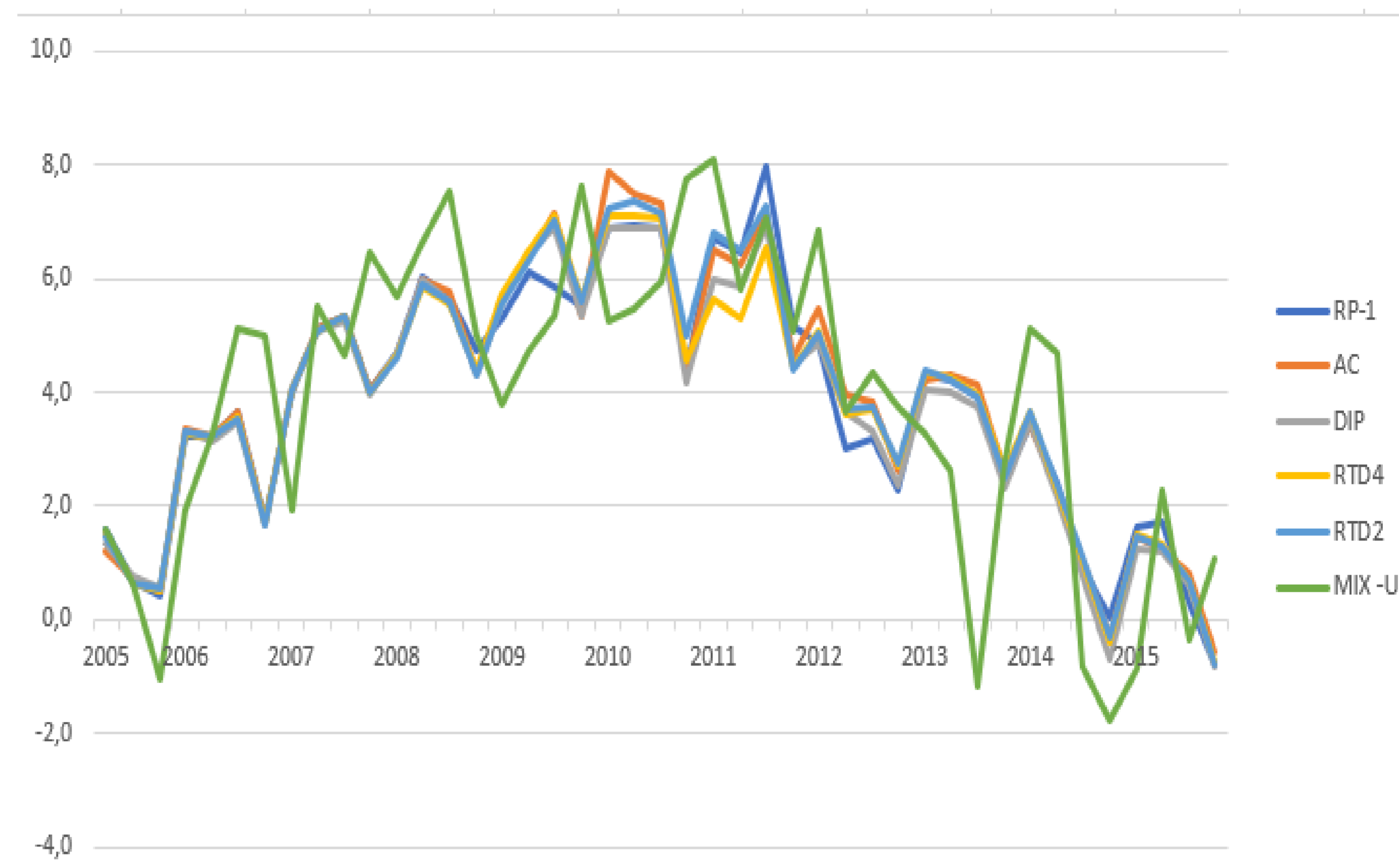
Quality of building finishing materials	Proportion (%)
Popular	2
Low	21
Normal	59
High	16
Luxury	2

Regional	Proportion (%)
Centro-Sul	21
Leste	9
Nordeste	9
Noroeste	11
Oeste	20
Pampulha	15
Venda Nova	5
Barreiro	4
Norte	3

## Estimated Price Indices for Apartments (2005Q1=100)



## Apartments anual valuation rate (%)



## Apartments indices prices behaviour

✓ There was a great appreciation in apartments price in Belo Horizonte. Using DIT, a superlative index, as benchmark, the index estimated was 5,09 or 409,0%.

✓ From the first quarter of 2007 to the first quarter of 2014 there was an intense apartment's price appreciation in Belo Horizonte. This situation agrees with Brazilian real estate outlook.

✓ This appreciation was contemporary with the expansion rate of housing credit in Brazil. Some institutional improvements like fiduciary alienation law's refinement in 2004 agreed with income growth and the decline interest rates helped the housing credit's growth. Also the government politics and the restructuring (more market concentration) of real estate development's firm role in the real estate market expansion.

## Conclusion

✓ The hedonic quality adjusted price and the RETT data seem to be a good alternative to estimated housing price indices in Brazil. The most popular methods used in European countries (RP and RTD) and the less popular robust methods (AC and DIT) exhibited a good performance in Belo Horizonte's apartment market database.

✓ All estimated indices exhibited a good performance in volatility terms.

✓ As expected the stratified median was more volatile then the hedonic price indices. A drift was detected on Double imputation Laspeyres (DIL) and Paasche (DIP). While some European countries use stratified median as an official housing price index, none of them use DIL or DIP.

✓ Further analysis could extend the hedonic price models to estimate price indices for the Brazilian smaller city context and its less frequent housing sales reality. The smaller number of observations imposes new challenges to estimated housing prices hedonic quality adjusted indices. In addition, future analysis could extend the types of real estate units, including houses and different types of commercial real estates.