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## Addressing Uncertainty in Property Depreciation Rate Estimation Using Fuzzy Logic Modelling

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## Outline

- Introduction.
- Property Depreciation Rate (DR).
- Addressing Subjectivity in DR estimation.
- Fuzzy logic and Fuzzy Numbers.
- DR estimation using Triangular Fuzzy. Numbers.
- Fuzzy and conventional DR estimations compared.
- Conclusions.

## Introduction

- Property valuation is the technique of estimating and determining the fair value of a property such as land, building, factory, and other structures.
- Purpose is to arriving at a fair price or value of a property.
- Valuation reports are for: Property Transfer, Mortgages, Compensation Rent assessment etc.
- Accuracy of property values is critical for equitable property transactions.

## Introduction continued.....

- During property valuation for different purposes, depreciation rate plays a key role at arriving to a correct value of the property.
- In the case of compensation, the client would wish that the value of the property is higher and to the contrary the one paying for compensation would wish to lower the value.

The valuer's opinion has to meet their expectations.

## Property Depreciation Rate(DR)

- Depreciation Rate estimation is imprecise due to subjective opinion of appraisal.
- This leads to disparity in property values in case the same property was appraised by more than one person.
- Therefore improving precision in estimation of depreciation rate is critical for reducing property valuation disparities.

## Subjectivity in DR Estimation

Valuation Reports need to be consistent and accurate enough if they are to be reliable.

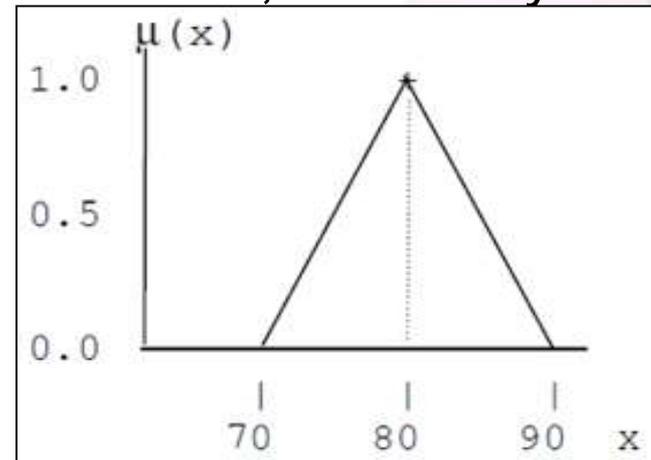
However, exact values such as those obtained from measurements are rare in real life. Most of the time we estimate values, and thus subjectivity, inconsistency prevails. **This study proposes an approach that can improve estimations of DR and hence decrease disparity during property valuation. The approach is based on Fuzzy Logic concept.**

## Fuzzy Logic and Fuzzy Numbers

- Fuzzy Logic (FL) allows us to deal with uncertain and imprecise data.
- Fuzzy Logic is less dependent on exact data and therefore resemble human reasoning.
- To deal with inexact information we use Fuzzy Numbers(FN).
- There are types of Fuzzy Numbers; Triangular Fuzzy Numbers, Trapezoidal Fuzzy Numbers, etc.  
This study uses Triangular Fuzzy Numbers (TFN).

## Knowledge gap

- TFN are intuitive, simple to understand, and easy to use
- A TFN has three parameters
  - Smallest value
  - Most probable value
  - Largest value



- Thus, instead of one value, the appraiser, provides three values for estimation of a single quantity
- The mean (average) is regarded as the best estimate or Crisp Value of the TFN

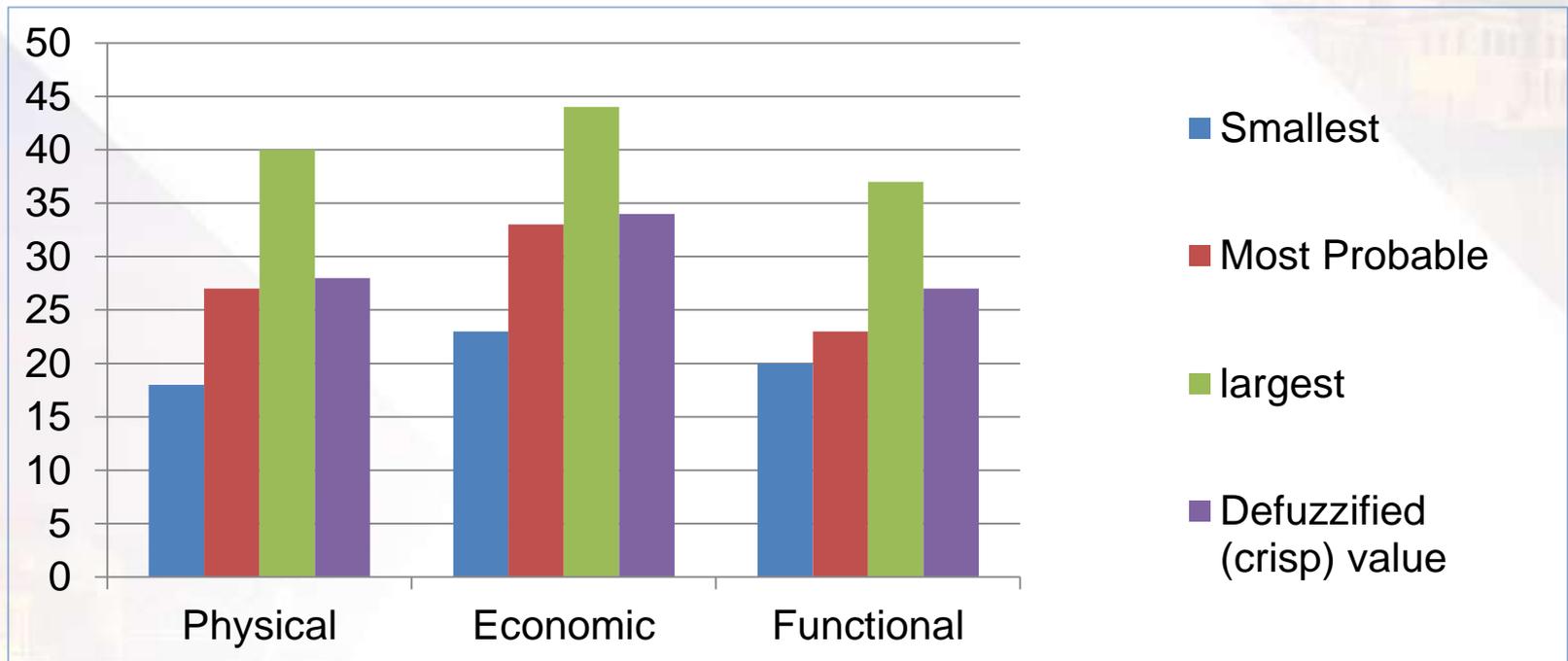
## Depreciation Rate Estimation Using TFN

- A case study was to estimate DR of a building using both conventional and Triangular Fuzzy Number.
- Expert opinions were consolidated after estimating a set of three possible values (TFN) for the three categories of depreciation. Namely; Physical, Economical and Functional depreciation.
- The experts were not allowed to communicate their respective opinions to avoid one person influencing estimation of another.

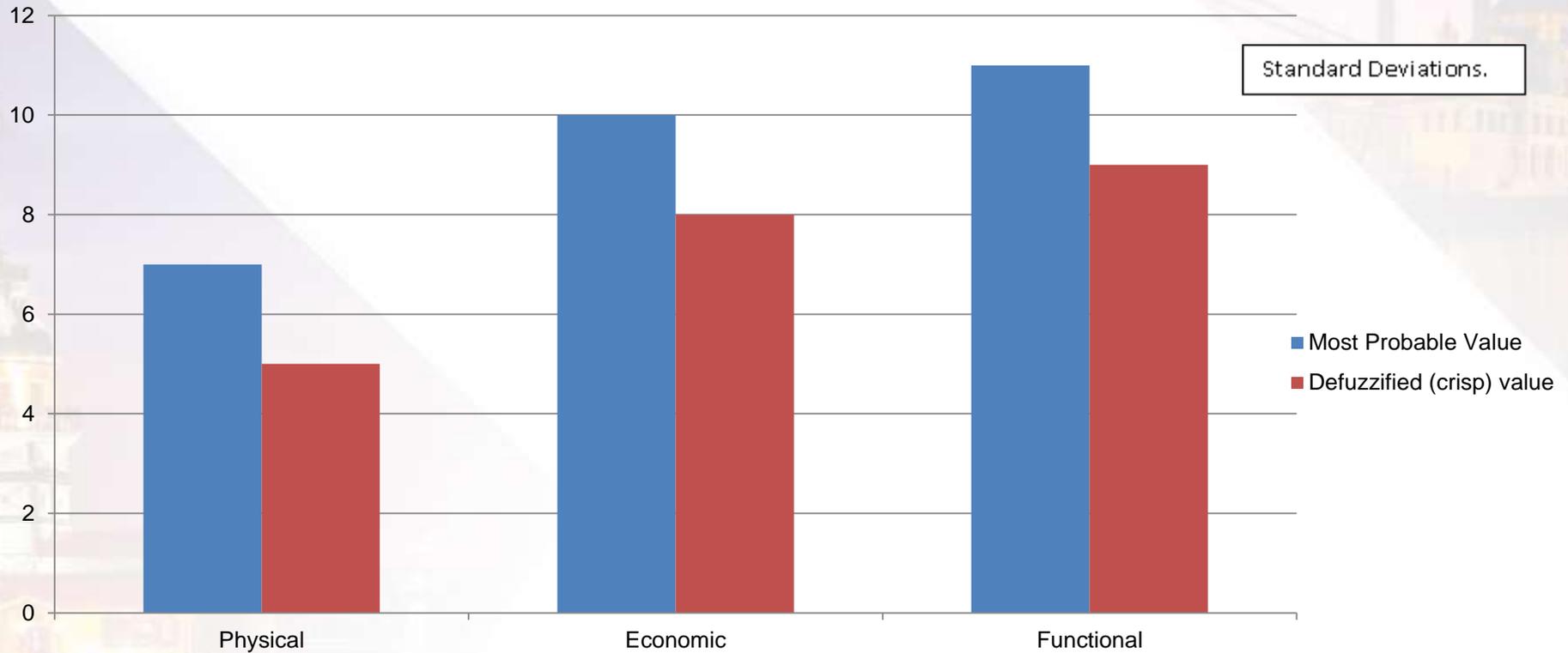
## Comparison of Results

The standard deviation of fuzzy estimates and that of crisp estimations were compared graphically

Results indicate less disparity when Fuzzy logic approach is used compared with conventional method



Standard deviation showing disparities between ordinary and fuzzy estimations.



## Conclusion

The study demonstrated that fuzzy logic modelling is applicable to address imprecise and uncertain estimation of depreciation rate and improve precision in property valuation.

The integrity of the standard Depreciated Replacement Cost(DRC) model is maintained.

Fuzzy Logic is only used to provide the best possible values for depreciation rate and ensure more reliable property value

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*I hope that you will enjoy reading the full paper.*

**Thank You**

**Teşekkür ederiz**

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