

# Price Prediction for Dubai's Residential Real-Estate Market



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## 1 Dubai Real Estate Market Overview

### Market Introduction

Market transactions worth

**\$9.8Bn**

within the first 5 months of 2021.

Transaction value growth of

**44%**

in the last year.

Average 2020 return of

**5.19%**

which is significantly higher than yields in NYC, London, Singapore, Hong Kong.

Foreign investors makeup

**75%**

of all property buyers, making Dubai the most active market for foreign investors.

### Key Challenges

#### 1 Demand & Supply Dynamics

- ❑ **70%** of home sales are off-plan investments, generating no income in early years
- ❑ **Inflated supply** as developers construct new buildings when demand isn't there
- ❑ **Opaque market prices** controlled by developers and brokers, difficult for investors to assess deals
- ❑ **High price volatility** in the early-life of properties

#### 2 Policy Changes

- ❑ **Transaction fees** and home sales tax curb demand growth
- ❑ **Tightened mortgage lending** standards reduce investments

#### 3 Alternative Assets

- ❑ Risks & return of **alternative assets** impact investor's decision making

## 2 Problem Statement

**Goal** Develop a price prediction model for the residential real-estate market that is data-rich, method-driven, and scalable.

### System Comparison

	Standard System	Analytics-driven System
<b>Inclusion of Factors</b>	Based on standard factors and <i>Underutilize</i> the existing and available data	Explores comprehensive, novel, dynamic and granular <i>engineered</i> features
<b>Data Coverage</b>	<i>1 week</i> worth of data input with monthly updates and discontinued due to efficiency	<i>13 years</i> of historical data, covering entire economic cycle with easy and fast to update approach
<b>Methodology</b>	<i>Discounted Cash Flow</i> with simple statistics and management inputs	<i>Big data analytics-driven</i> machine learning models for fair market price prediction
<b>Scalability</b>	<i>Low Scalability</i> and restricted to limited number of property candidates	<i>High Scalability</i> that enables scaling to select from all deals across Dubai

## 3 Overview of Analytical Approach

**Data Strategy** Sourced 38,000 historical records between 2009-21 across 4 price driver categories with 211 independent features

Building-Level	Area-Level
<ul style="list-style-type: none"> <li>▪ Number of bedrooms</li> <li>▪ Apartment size</li> <li>▪ Building age</li> <li>▪ Building amenities</li> <li>▪ .....</li> </ul>	<ul style="list-style-type: none"> <li>▪ Number of buildings nearby</li> <li>▪ Number of high-end buildings nearby</li> <li>▪ Total apartment units</li> <li>▪ .....</li> </ul>
Macro-Level	Macro-Level
<ul style="list-style-type: none"> <li>▪ S&amp;P500 Index</li> <li>▪ OPEC oil prices</li> <li>▪ Case Shiller index</li> <li>▪ .....</li> </ul>	<ul style="list-style-type: none"> <li>▪ Daily number of transactions</li> <li>▪ Real-estate policy change (2014)</li> </ul>

**Modeling** Final price prediction model is an ensemble of 3 decision-tree based regression algorithms

CART Regression Tree	Random Forest Regression	Gradient Boosting Regression
R <sup>2</sup> = <b>65.7%</b>	<b>72.0%</b>	<b>71.6%</b>
<b>45%</b> of the top 20 important drivers are <b>engineered features</b>		<b>72.4%</b> out-of-sample R <sup>2</sup> of the final <b>weighted voting regressor</b>

## 4 Management Impact

	Existing System	Proposed System
<b>Expand Coverage of Key Price Drivers</b>	3 Building-level features	44 Features across 4 levels
<b>Improve Data Reliability &amp; Scalability</b>	1 Week of data with monthly manual update	13 Years of data 95% Acquisition automation with weekly updates
<b>Quantify Price Prediction Accuracy</b>	<i>Unknown</i> accuracy	72.4% accuracy, compared to 12.4% in literature using similar ensemble of decision-trees
<b>Support Operations &amp; Sales Processes</b>	Based on <i>qualitative information</i>	Combine <i>quantitative &amp; qualitative</i>