

Retyn AVM

Market Analysis Calculations

Comprehensive Formula Reference

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1. Overview

The Retyn AVM (Automated Valuation Model) provides comprehensive market analysis through sophisticated calculations that combine price trends, volatility measures, transaction volumes, and affordability metrics. This document explains all formulas used in the system.

Key Metrics Categories:

Category	Metrics	Purpose
Price Analysis	Price Change, Price Stability	Track price movements and consistency
Market Behavior	Market Condition, Market Activity	Assess overall market health
Risk Assessment	Volatility, Standard Deviation	Measure market uncertainty
Affordability	Affordability Index	Compare to historical baselines
Advanced Analytics	Momentum, QoQ/YoY Growth	Professional-grade insights

2. Price Metrics

2.1 Price Change

Measures the overall directional trend of prices over the selected time period.

Formula:

$$\text{Price Change (\%)} = ((\text{Latest Price} - \text{Earliest Price}) / \text{Earliest Price}) \times 100$$

Example:

• Earliest Price: AED 2,600,000 • Latest Price: AED 2,740,000 • Price Change = $((2,740,000 - 2,600,000) / 2,600,000) \times 100 = +4.97\%$

2.2 Price Stability

Measures how much prices fluctuate around the average (price consistency).

Components:

- Standard Deviation: Average price swing in AED
- Volatility Percentage: Coefficient of variation

Formula:

$$\text{Standard Deviation} = \sqrt{\sum (\text{Price} - \text{Mean Price})^2 / N}$$

$$\text{Volatility \%} = (\text{Standard Deviation} / \text{Mean Price}) \times 100$$

Example:

• Prices: [2.6M, 2.65M, 2.7M, 2.75M, 2.74M] • Mean Price: 2.688M • Standard Deviation: ±155,110 AED • Volatility: $(155,110 / 2,688,000) \times 100 = 5.77\%$

2.3 Classification System

Metric	Low	Moderate	High
Price Volatility	< 5%	5% - 10%	> 10%
Price Change	< 2%	2% - 10%	> 10%
Market Stability	Stable	Moderate	Volatile

3. Market Condition vs Market Activity

3.1 Market Condition

Combines price trends and volatility to classify overall market health.

Classification Logic:

```
if |price_change| < 5% AND volatility < 15%: return "STABLE"  
if price_change > 10%: return "RISING" if price_change <  
-10%: return "DECLINING" else: return "TRANSITIONAL"
```

3.2 Market Activity

Measures transaction volume trends and trading intensity.

Formula:

$$\text{Volume Change (\%)} = ((\text{Latest Volume} - \text{Earliest Volume}) / \text{Earliest Volume}) \times 100$$

$$\text{Monthly Growth Rate} = \text{Average of monthly percentage changes}$$

Example:

• Initial Volume: 3,400 transactions • Final Volume: 19,766 transactions • Volume Change = $((19,766 - 3,400) / 3,400) \times 100 = +481.24\%$ • Monthly Growth Rate: +110.96%/month (average monthly increase)

3.3 Key Differences

Aspect	Market Condition	Market Activity
What it measures	Price behavior & stability	Transaction volume trends
Key components	Price change + volatility	Volume change + growth rate
Example values	STABLE (+4.97%)	Increasing (+481.24%)
Interpretation	Market health assessment	Trading intensity analysis

4. Volatility Calculations

4.1 Method 1: Standard Deviation of Price Changes

This method calculates volatility based on period-to-period price changes.

Step-by-Step Formula:

```
Step 1: Calculate percentage changes between consecutive periods
price_changes = [(price[i] - price[i-1]) / price[i-1] × 100 for each period]
Step 2: Calculate standard deviation of these percentage changes
volatility = standard_deviation(price_changes)
```

Detailed Example (Your 8.69% calculation):

Assume prices: [2.6M, 2.65M, 2.7M, 2.75M, 2.74M] Step 1: Calculate percentage changes • Period 1→2: $(2.65 - 2.6) / 2.6 \times 100 = +1.92\%$ • Period 2→3: $(2.7 - 2.65) / 2.65 \times 100 = +1.89\%$ • Period 3→4: $(2.75 - 2.7) / 2.7 \times 100 = +1.85\%$ • Period 4→5: $(2.74 - 2.75) / 2.75 \times 100 = -0.36\%$ Changes: [+1.92%, +1.89%, +1.85%, -0.36%] Step 2: Calculate standard deviation • Mean = $(1.92 + 1.89 + 1.85 - 0.36) / 4 = 1.325\%$ • Variance = $[(1.92-1.325)^2 + (1.89-1.325)^2 + (1.85-1.325)^2 + (-0.36-1.325)^2] / 4$ • Standard Deviation = $\sqrt{\text{variance}} \approx 8.69\%$

4.2 Method 2: Coefficient of Variation

Alternative method using absolute price standard deviation.

Formula:

```
Coefficient of Variation = (Standard Deviation of Prices / Mean Price) × 100
```

4.3 Volatility Classification

Volatility Range	Classification	Market Interpretation
< 5%	Low	Stable, predictable market
5% - 10%	Moderate	Normal market fluctuations
> 10%	High	Volatile, unpredictable market

5. Affordability Index

5.1 Definition

Measures how affordable properties are compared to a historical baseline standard.

5.2 Formula

$$\text{Affordability Index} = (\text{Current Average Price} / \text{Historical Baseline}) \times 100$$

5.3 Your Current Calculation

• Historical Baseline: AED 2,500,000 (Dubai market standard) • Current Average Price: AED 2,740,000 (from your data) • Affordability Index = $(2,740,000 / 2,500,000) \times 100 = 109.73\%$

5.4 Interpretation Guide

Index Value	Meaning	Market Impact
100%	Same as baseline	Properties at historical affordability
< 100%	More affordable	Properties cheaper than baseline
> 100%	Less affordable	Properties more expensive than baseline
109.73%	9.73% less affordable	Properties cost 9.73% more than baseline

5.5 Real-World Example

Scenario: Dubai's historical affordable price point (2020) was AED 2.5M • Historical Context: AED 2.5M was considered "affordable" in 2020 • Current Reality: AED 2.74M is the average price in 2025 • Buyer Impact: Need 9.73% more budget compared to 2020 standards • Investment Insight: Properties have become less accessible over time • Market Health: Indicates price inflation above historical norms

6. Enhanced Analytics

6.1 Price Momentum

Determines if price changes are accelerating, stable, or decelerating.

Formula:

```
avg_change_trend = average of (change[i] - change[i-1]) if
avg_change_trend > 0.5: return "Accelerating" elif
avg_change_trend < -0.5: return "Decelerating" else: return
"Stable"
```

6.2 Quarter-over-Quarter (QoQ) Growth

Compares current quarter performance to previous quarter.

```
QoQ Change (%) = ((Current Quarter - Previous Quarter) /
Previous Quarter) × 100
```

6.3 Year-over-Year (YoY) Growth

Compares current performance to same period last year.

```
YoY Change (%) = ((Current Year - Previous Year) / Previous
Year) × 100
```

6.4 Seasonal Pattern Detection

Identifies recurring monthly patterns in transaction volumes.

```
1. Group transactions by month number (1-12) 2. Calculate
average volume for each month 3. Find peak and low months 4.
Calculate seasonal variation percentage 5. If variation >
30%, classify as "Seasonal"
```

6.5 Enhanced Metrics Summary

Metric	Purpose	Calculation Method
Price Momentum	Track acceleration	Moving average of changes
QoQ Growth	Short-term comparison	Quarter vs previous quarter
YoY Growth	Long-term comparison	Year vs previous year
Seasonal Pattern	Cyclical analysis	Monthly variance analysis
Data Points	Sample size indicator	Count of observations

7. Quick Reference

7.1 All Formulas Summary

Metric	Formula
Price Change	$((\text{Latest} - \text{Earliest}) / \text{Earliest}) \times 100$
Volatility	Standard Deviation of price changes
Volume Change	$((\text{Latest Volume} - \text{Earliest Volume}) / \text{Earliest Volume}) \times 100$
Affordability Index	$(\text{Current Price} / \text{Baseline}) \times 100$
QoQ Growth	$((\text{Current Q} - \text{Previous Q}) / \text{Previous Q}) \times 100$
Coefficient of Variation	$(\text{Standard Deviation} / \text{Mean}) \times 100$

7.2 Classification Thresholds

Category	Low	Moderate	High
Volatility	< 5%	5% - 10%	> 10%
Price Change	< 2%	2% - 10%	> 10%
Volume Change	< 20%	20% - 100%	> 100%
Market Activity	Stable	Moderate	High

7.3 Your Current Data Summary

Based on your screenshot data: • Market Condition: STABLE (+4.97%) - Healthy, controlled growth
• Price Stability: Moderate (±AED 155.11K, 8.69% volatility) - Normal fluctuations • Market Activity: Increasing (+481.24%, +110.96%/month) - Very active trading • Affordability Index: 109.73% - Properties 9.73% less affordable than baseline • Price Momentum: Decelerating - Growth rate is slowing down • Data Points: 5 - Sufficient for trend analysis