



CREATING VALUATION MODELS

MODELING FOR THE 2019-2020 MILWAUKEE REVALUATION



OVERVIEW

- Understanding Milwaukee's CAMA software and residential model
- Creating tools that enhance efficiency based on your assessment knowledge
- Implementing statistical methods to create regression-based models

WHAT IS A MODEL?

Intuitive answers might include:

- Requires data
- Uses statistics
- Can be complicated to create/understand
- Computers generate values
- Needs specialized experience to complete

However, models are simply:

- A defined relationship between explanatory variables (property characteristics) and a response variable (property value)
 - Can be as simple as land value in a certain area is equal to \$2 per square foot of land
- Can be quantitatively rigorous (e.g. regression modeling) or based on assessor's experience

WI ASSESSMENT—WPAM'S STATEWIDE VALUATION MODEL

- Whether you realize it or not, Wisconsin already has a statewide valuation model
- Wisconsin Property Assessment Manual provides assessors with a cost approach for calculating property values

WI ASSESSMENT – HOW MILWAUKEE USES THE WPAM MODEL

- Milwaukee made a few changes to convert the WPAM model structure from a cost approach to a sales approach
 - Use sales to adjust parameters for depreciation, quality, condition, building style
 - Neighborhoods – Boundaries based on sales patterns; Factors based on relative sales levels

Cost Calc Ladder

Base Value:	\$00	Bld Type:	01 - Ranch	Neighborhood Modifier:	1.0000
Base Rate:	117.92	Building Cat:		NBC Influence:	1.1250
Size Adjustment:	1.00550	Finished Area:	982	LUC Factor:	1.0000
Construction Adjustment:	1.00000			Building Multiplier:	1.0000
Adjusted Price:	\$118.57			Adjusted Total (RCN):	\$194,900
Grade Factor:	1.01500	Grade Code:	C - C	Depreciation Percent:	49.93
Other Features Total:	\$15,723			Actl Year:	1961
Baths:	\$5,075			Eff Year:	
Other Fixtures:	\$00			Depreciation:	\$97,314
Kitchens:	\$10,150			Depreciated Total:	\$97,586
AC:	\$498			Jurisdictional Factor:	1.0000
Heat:	\$00			Special Features:	\$700
Central Vacuum:	\$00			Lump Sum Amount:	
Fireplaces:	\$00			Final Total:	\$98,300
Wood Stove Flues:	\$00			Override Value:	
Sprinkler:	\$00			Assessment Factor:	1.0000
Solar:	\$00			Assessed Value:	\$98,300
Other:	\$00			Total \$/SF:	\$100.10
				Undepr \$/SQ:	120.34855



PREPARING ASSESSMENT DATA FOR A MARKET ADJUSTED COST MODEL

- Review neighborhood changes
- Update primary wall factors
- Setting size adjustments for building styles
- Update value added from kitchens and bathrooms using market research

CALIBRATING THE MAC MODEL WITHOUT TOOLS

- Prior to the introduction of external tools, calibrating this model was tedious
 - Manually adjust parameters for grade, style, condition, etc.
 - Re-calculated the values for all residential properties in the CAMA system
 - Produce ratio reports to see whether the new model matched sales
 - Repeat

Summary: A-

Max Ratio: 1.021	Mean: 0.982	Count: 5	COV: 4.990	60% between 95 and 105
Min Ratio: 0.914	Weighted Mean: 0.977	COD: 3.488		100% between 90 and 110
Median: 1.012	Standard Dev: 0.049	PRD: 1.005		100% between 80 and 120

3560406000	2006 E LAFAYETTE P	1	3060 RT2Milwaul	0.15	Mansion	5,049	8,383	1896	A+	EX	0.00	0.00	0.00	0.00	1	40	V	4/12/18	1,207,500	1,425,000	0.85
3612123000	1141 N OLD WORLD	5	5899 RECDMilwaul	0.00	High Rise > 1	0	2,720	2011	A+	AV	0.00	0.00	0.00	0.00	1	40	V	7/24/19	1,070,000	1,200,000	0.89
3930802000	825 N PROSPECT AV	5	5994 PD Milwaul	0.00	High Rise > 1	0	3,181	2007	A+	AV	0.00	0.00	0.00	0.00	1	40	V	1/24/18	1,796,900	2,000,000	0.90
2780605000	3465 N LAKE DR	1	3060 RS5Milwaul	0.29	Mansion	4,177	7,143	1925	A+	GD	0.00	0.00	0.00	0.00	1	40	V	2/15/18	875,000	955,000	0.92
2780265000	3245 N LAKE DR	1	3060 RS5Milwaul	0.42	Mansion	7,502	13,396	1912	A+	GD	0.00	0.00	0.00	0.00	1	40	V	3/1/18	1,379,900	1,440,000	0.96
3930826000	825 N PROSPECT AV	5	5994 PD Milwaul	0.00	High Rise > 1	0	2,068	2007	A+	AV	0.00	0.00	0.00	0.00	1	40	V	9/20/18	860,000	860,000	1.00
3930839100	825 N PROSPECT AV	5	5994 PD Milwaul	0.00	High Rise > 1	0	6,411	2007	A+	GD	0.00	0.00	0.00	0.00	1	40	V	4/24/19	3,000,000	3,000,000	1.00
3180061100	2611 N TERRACE AV	1	3060 RS5Milwaul	0.00	Triplex	0	12,882	1899	A+	FR	0.00	0.00	0.00	0.00	3	40	V	5/3/19	730,000	730,000	1.00
2781562000	3452 N LAKE DR 3452	5	5429 PD Milwaul	0.00	Condo Duplex	3,900	3,900	2006	A+	AV	0.00	0.00	0.00	0.00	1	40	V	2/16/18	1,471,500	1,470,000	1.00
2780105000	3223 N LAKE DR	1	3060 RS5Milwaul	0.23	Mansion	5,612	10,753	1922	A+	GD	0.00	0.00	0.00	0.00	1	40	V	8/3/18	1,017,100	1,000,000	1.02
3612128000	1141 N OLD WORLD	5	5899 RECDMilwaul	0.00	High Rise > 1	0	760	2011	A+	AV	0.00	0.00	0.00	0.00	1	40	V	4/3/18	299,800	290,000	1.03
3930842000	825 N PROSPECT AV	5	5994 PD Milwaul	0.00	High Rise > 1	0	3,964	2007	A+	VG	0.00	0.00	0.00	0.00	1	40	V	2/4/19	2,212,700	2,050,000	1.08
3930838000	825 N PROSPECT AV	5	5994 PD Milwaul	0.00	High Rise > 1	0	3,345	2007	A+	AV	0.00	0.00	0.00	0.00	1	40	V	1/3/18	1,820,400	1,650,000	1.10
3930841000	825 N PROSPECT AV	5	5994 PD Milwaul	0.00	High Rise > 1	0	2,447	2007	A+	AV	0.00	0.00	0.00	0.00	1	40	V	6/21/19	1,438,500	1,075,000	1.34

Summary: A+

Max Ratio: 1.338	Mean: 1.006	Count: 14	COV: 11.928	50% between 95 and 105
Min Ratio: 0.847	Weighted Mean: 1.002	COD: 7.577		64% between 90 and 110
Median: 1.000	Standard Dev: 0.120	PRD: 1.004		93% between 80 and 120

USING EXCEL AND
PROGRAMMING FOR
ACCURACY AND SPEED
DURING REVALUATIONS

CREATING EXTERNAL TOOLS TO IMPROVE MODELING EFFICIENCY

BEFORE YOU BEGIN – MAKE SURE YOU KNOW YOUR CAMA

- CAMA software is the most valuable tool in our offices – we want and need to use it
- Creating a “perfect model” on paper is less valuable than making sure that your model works with your CAMA
 - E.G. Milwaukee’s AP5 CAMA has a set structure for how properties are valued
- It’s also critical to lay out your CAMA model’s calculations from start to finish
 - Understand where “hidden calculations” are occurring
 - Refer to documentation or speak to your software vendor if you can’t explain something

MKE'S MARKET-ADJUSTED COST FORMULA

ASSESSED = LAND + SFYI + [(AREA*SIZEADJ)*CONSTRMOD]*BASERATE + AMENITIES]*NBHD*DEPR*QUAL

- LAND: Land value for property calculated by separate land study
- SFYI: Value of special features and yard items (e.g. garages) calculated outside of MAC calibration
- AREA: Finished area plus a fixed fraction of non-finished areas (e.g. attics, unfinished basements, rec rooms)
- CONSTRMOD: Construction modifier reflecting value change due to standard of construction
- BASERATE: Base price per square foot for the building style, before depreciation, location, and quality of building are accounted for
- AMENITIES: Value of amenities like bathrooms and kitchens
- NBHD: A locational modifier determined by neighborhood sales
- DEPR: Depreciation factor that accounts for the age and condition of the house
- QUAL: Factor that accounts for overall quality of materials, workmanship, and features in the house

THE VALUE OF EXTERNAL TOOLS

Depreciation Tables											
Year	Depreciation Table	Percent Per Year	Min Depr	Min Depr AV	Max Depr AV	Max Depr	Max Age	Create Table	AV Created	Short Description	Full Description
2020	x							Automatic			
>	2020 RES	6.50	0.00	0.00	80.00	80.00	150	Automatic	Square Root of Age	Residential Model	Residential Model
	2020 SFYI- R	2.00	0.00	0.00	80.00	80.00	80	Automatic	Linear	SFYI-Residential	SFYI-Residential
	2018 COMM	1.00	0.00	5.00	40.00	55.00	60	Automatic	Linear	COMMERCIAL	
	2020 CONDO	1.00	0.00	0.00	80.00	80.00	100	Automatic	Linear	Condo Model	Condo Residential
	2020 SFYI-RS	4.00	0.00	0.00	80.00	80.00	50	Automatic	Linear	SFYI-Residential Shed	Residential Shed
	2020 SFYI-RG	2.50	0.00	0.00	80.00	80.00	80	Automatic	Linear	SFYI-Residential Det Garage	Residential Detached Garages
	2020 M&S	2.50	0.00	0.00	80.00	80.00	80	Automatic	Manual	M&S	Marshall & Swift

Factors		Depreciation Details									
Physical Condition	Factor	Depr %	Condition								
		Age	EX	VG	GD	AV	FR	PR	VP	UN	
>	EX - Excellent	0.80	0	3.93	4.23	4.59	5.00	5.55	5.75	6.15	8.20
	VG - Very Good	0.84	1	14.80	17.84	19.46	135.30	27.02	34.90	58.91	138.48
	GD - Good	0.90	2	22.62	28.23	30.91	326.89	44.17	59.10	105.19	249.71
	AV - Average	1.00	3	29.96	38.13	41.79	471.06	60.63	82.49	150.42	317.83
	FR - Fair	1.13	4	37.02	47.72	52.39	578.10	76.72	105.45	195.09	344.31
	PR - Poor	1.30	5	43.91	57.16	62.79	656.43	92.57	128.14	239.40	359.74
	VP - Very Poor	1.70	6	51.49	67.30	73.97	633.82	109.37	151.80	268.70	376.10
	UN - Unsound	5.00	7	58.96	77.37	85.07	591.50	126.05	175.31	297.82	385.92
			8	66.37	87.35	96.07	535.48	142.61	198.69	326.77	395.33
			9	73.72	97.28	107.02	482.60	159.11	222.00	335.61	404.75
			10	81.02	107.14	117.91	422.55	175.52	245.22	344.34	414.17
			11	88.29	116.99	128.75	452.66	191.89	268.30	352.99	423.59
			12	95.51	126.77	139.56	471.82	208.21	284.12	361.56	433.01
			13	102.71	136.55	150.33	490.84	224.48	299.88	370.07	442.42
			14	109.87	146.26	161.07	509.32	240.70	315.60	378.50	451.84
			15	117.01	155.97	171.77	527.67	256.89	331.27	386.89	461.26
			16	124.13	165.65	182.45	554.90	273.06	346.97	395.24	470.67

THE VALUE OF EXTERNAL TOOLS

- <https://mkeassessor.shinyapps.io/ResModel/>
- Easier to view all parameters at once
- Instantly get feedback on how tweaks to parameters affect model performance
- Helps model creator understand their macro-level sales data more accurately

HOW WE DEVELOPED OUR MODELING TOOLS

- Identify the modeling steps to improve:
 - Specification
 - Data collection
 - Data exploration
 - Model development
 - Calibration/ratio analysis
 - Final value calculation
- Decide what software/tech is available
- Dedicate resources (i.e. staff time)
- Create a mock-up
 - Simple sketches are great
 - Notes for key functionalities
- Allow time for refinement
 - Best ideas come after the first prototype is built
- Understand the limitations of your tools

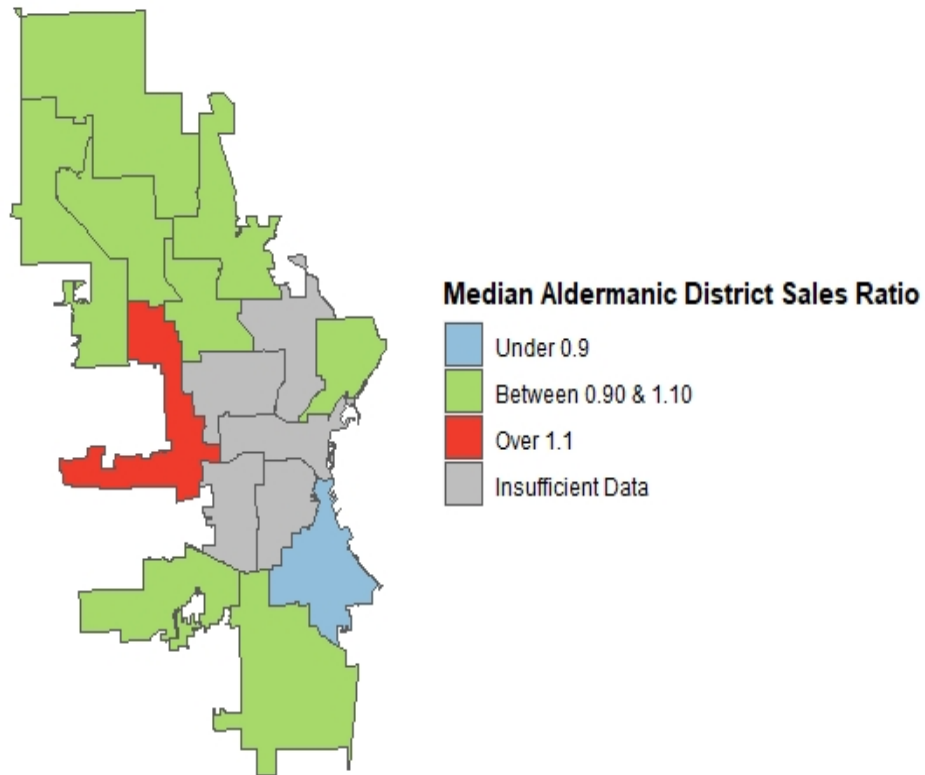


**ACCESSIBLE
ALTERNATIVES FOR
NON-CODERS**



**EXCEL
DEMONSTRATION**

INITIAL PERFORMANCE MEASURES FOR 2019-2020 REVALUATION



QUAL	N	MEDIAN	COD	COD_CI	COD_MET
A-	1	1.12	NA	NA	NA
B+	1	1.21	NA	NA	NA
B	3	1.00	0.7749475	0, 0.781	FALSE
B-	3	1.04	3.3881279	0, 3.591	FALSE
C+	11	0.88	6.4212965	2.342, 10.749	TRUE
C	256	0.97	12.0780849	10.456, 13.739	TRUE
C-	26	0.95	14.6197215	9.185, 19.764	TRUE
D+	22	0.86	19.6000382	13.069, 23.712	FALSE
D	8	0.84	9.6820675	2.519, 15.212	TRUE
D-	4	0.85	23.0330220	2.865, 29.596	FALSE