Modern Property Assessment Systems: Mass Appraisal Models and Geospatial Analysis – Part 2

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Workshop Overview – Part 2

- More Detail on Modeling Issues
  - Time trends
  - Age factors
  - Use of additional Data

Addressing Time Trends

- In many parts of the world prices have not changed in a uniform way, either up or down
- There are both ups and downs over a given period of time
- How can we address this issue?
- Several choices
  - Linear splines
  - Fourier Expansions
  - Time Weighted Regression
- We first look at linear splines

Define the Reverse Month of Sale

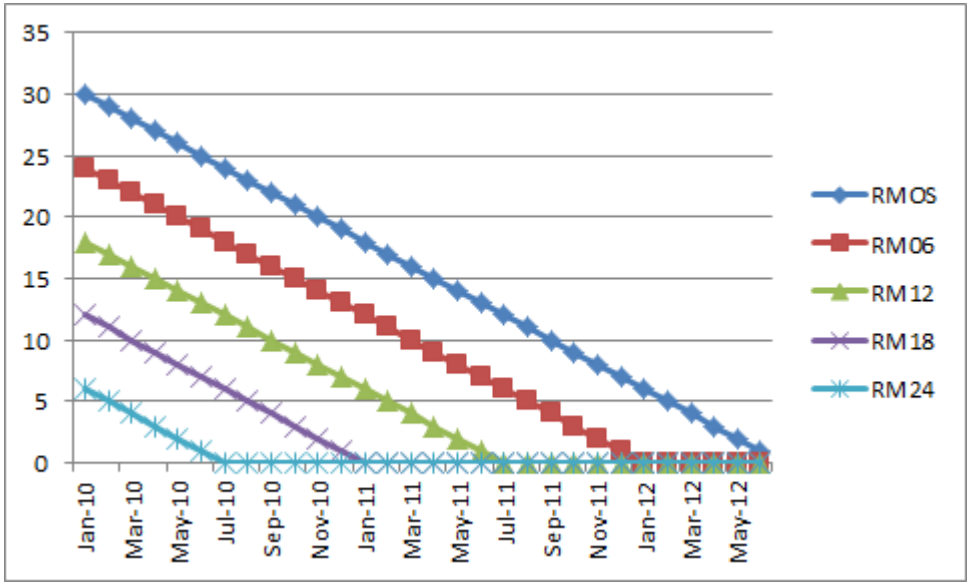
- From the date of sale form a variable Reverse Month of Sale (RMOS) from a given valuation date
- For example if we have 30 months of sales with the last month being June 2012
- June 2012 sales have RMOS=1
- May 2012 sales have RMOS=2
- April 2012 sales have RMOS=3
- .
- .
- January 2010 sales have RMOS=30

Spline Terms

- Typically quarterly or semi-annual splines are computed
- For semi-annual splines the computations are as follows
  - First semi-annual spline term is called RM06 if RMOS>6, RM06=RMOS-6, else 0.
  - Second semi-annual term called RM12 if RMOS>12, RM12=RMOS-12
  - Third semi-annual term called RM18 if RMOS>18, RMOS18=RMOS-18
  - Fourth semi-annual term called RM24 if RMOS>24, RM24=RMOS-24

Continuing Spline Definition

Month	RMOS	RM06	RM12	RM18	RM24
Jun-12	1	0	0	0	0
May-12	2	0	0	0	0
Apr-12	3	0	0	0	0
Mar-12	4	0	0	0	0
Feb-12	5	0	0	0	0
Jan-12	6	0	0	0	0
Dec-11	7	1	0	0	0
Nov-11	8	2	0	0	0
Oct-11	9	3	0	0	0
Sep-11	10	4	0	0	0
Aug-11	11	5	0	0	0
Jul-11	12	6	0	0	0
Jun-11	13	7	1	0	0
May-11	14	8	2	0	0
Apr-11	15	9	3	0	0
Mar-11	16	10	4	0	0
Feb-11	17	11	5	0	0
Jan-11	18	12	6	0	0
Dec-10	19	13	7	1	0
Nov-10	20	14	8	2	0
Oct-10	21	15	9	3	0
Sep-10	22	16	10	4	0
Aug-10	23	17	11	5	0
Jul-10	24	18	12	6	0
Jun-10	25	19	13	7	1
May-10	26	20	14	8	2
Apr-10	27	21	15	9	3
Mar-10	28	22	16	10	4
Feb-10	29	23	17	11	5
Jan-10	30	24	18	12	6



We will now add these terms to the example used for the linear model, for example

To do this the spline terms are multiplied by living area (ABSF) to obtain a coefficient scaled to size.

Linear Model with Multiplicative Terms

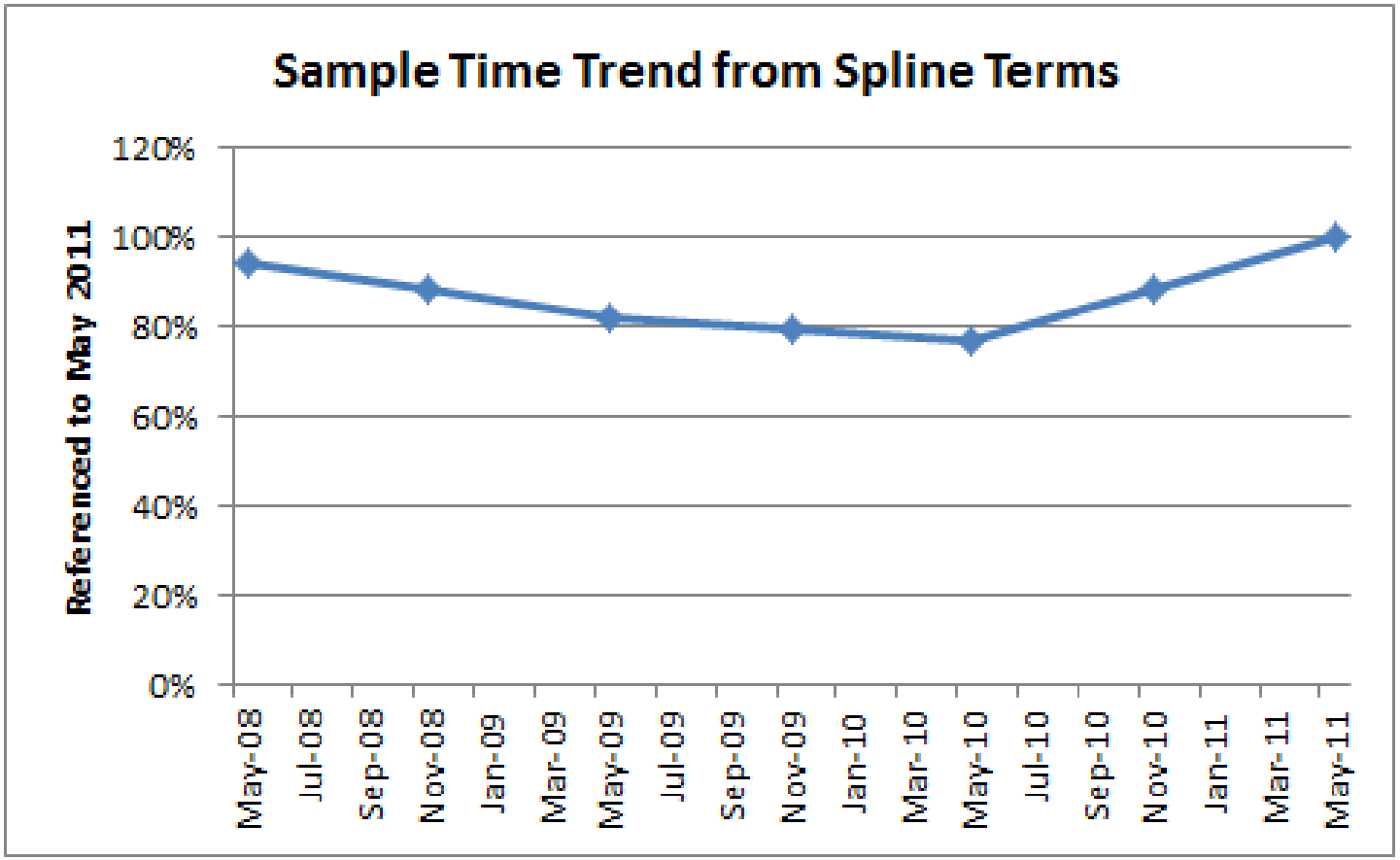
Dependent	SALEPRICE
Std Error for Estimate	28,904.9170
Constant:	71,379.9768

Attribute	**Coeff**
BATHS	14,001.2536
LANDVAL	0.7104
FBLA	28.3270
AGE40ABSF	-0.0103
RM00ABSF	-4.0696
RM12ABSF	5.0181
RM24ABSF	-2.0693
RM30ABSF	3.2232
ADJGRFABSF	228.5506
ABSF	80.8336

Model Statistics	
Total Valued	408
R squared	0.8730
Adjusted R squared	0.8698
COD	8.8401
COV Median	11.5219
COV Mean	11.3887
Median	1.0021
Mean	1.0116
Weighted Mean Ratio	1.0000

The splines are weighted by living area (ABSF) Only those that were significant are shown

Graphical Results



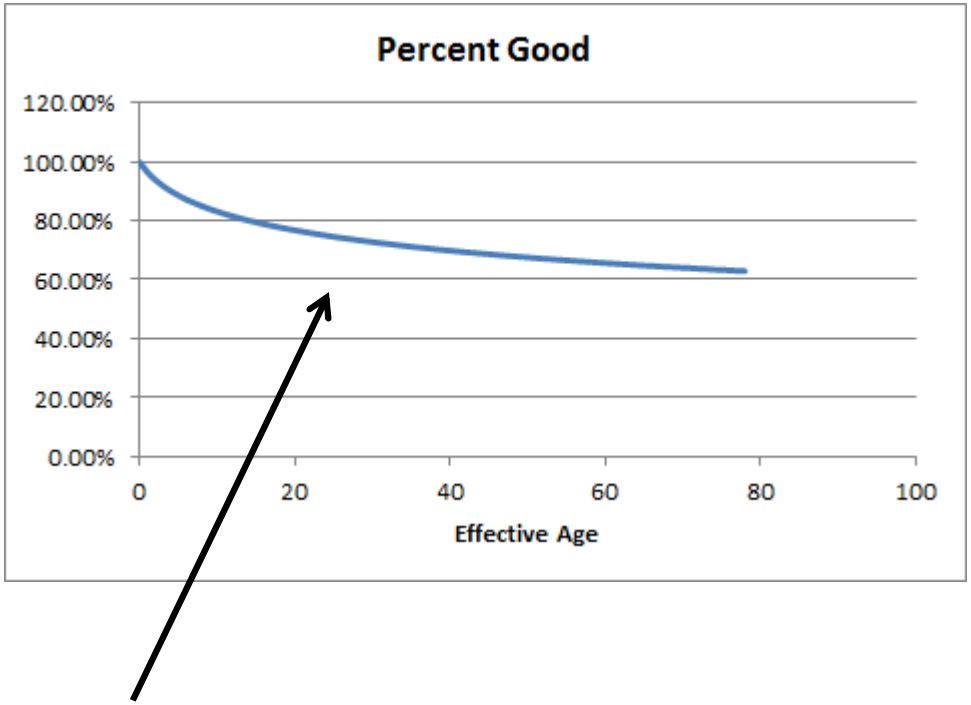
Age of Property

- Splines can be used to model the effects of age (depreciation) in the same way as was done for Date of Sale
- There is another approach that is shown here to round out the types of techniques that might be used.
- One term ln(EffAge) natural log of effective age is used to illustrate the point.

Percent Good (Depreciation) Using Natural Log of Effective Age

Dependent	SALEPRICE
Std Error for Estimate	26,988.0189
Constant:	69,493.4392

Attribute	Coeff
BATHS	13,842.2850
LANDVAL	0.7986
FBLA	27.4065
RM00ABSF	-3.5366
RM12ABSF	4.6010
RM24ABSF	-2.5526
RM30ABSF	3.7193
ADJGRFABSF	179.0012
ABSF	143.1826
LNEFFAGEABSF	-20.1485



($237,344-16.1611*ln(EffAge+e)*1,289)/$237,344

Note that Effective Age was offset by the constant “e” to allow for an Effective Age of 0