

Hedonic Pricing Model to Value Water Resources in the Arbuckle-Simpson Aquifer

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Data Collection

- MLS Agricultural/Undeveloped lands in Coal, Garvin, Hughes, Johnston, Murray, Pontotoc, and Seminole

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Property Sub Type	Address	County	Acres	Zoning	Fence
Over 5 Acres	000 NE 10th Road	Pontotoc	10	NOT CITY	Barbed, Full
Building	Distance to Lake/River	Mineral Rights	Pasture	Road Frontage	Road Surface
			None	County Rd	Paved
Public Remarks			Current Price	Closed	
10 acres on corner of NE 10th & Sliger at Byng. Great building sites!			\$25,000	2/20/2017	

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- The hedonic method assumes that these two approaches will be convex and concave respectively and will tangentially meet when a sale is completed.
- Because of these assumptions it can be shown in a perfect market the price function should be linear.

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$p \rightarrow 0$ is a limiting case.

Limiting Case

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$$\lim_{p \rightarrow 0} \frac{a^p - 1}{p} = \ln a$$

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The limit is best calculated by applying L'Hôpital's rule and using the derivative of a^x , ($a^x \ln a$). Indeed

$$\lim_{p \rightarrow 0} \frac{a^p - 1}{p} = \lim_{p \rightarrow 0} \frac{a^p \ln a}{1} = \ln a$$



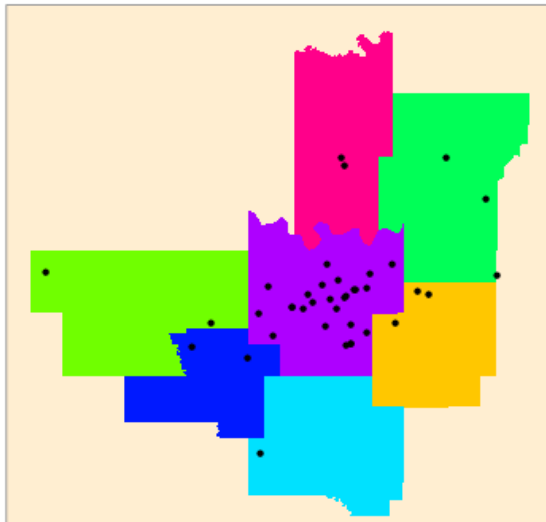
Data for Regressions

- Zoning** 1 for “Residential”. 0 for “Agricultural”. We also used zero if they listed a zoning code we were not familiar with or did not translate into something useful.
- Timber** Many of the descriptions contained this phrase or a derivative such as “timbered”. A one was used if either was present and a zero otherwise.
- Hunting** Several descriptions mentioned hunting. A one was used if the word was present and a zero otherwise.
- Fence** 4 for Full, 1 for partial and 0 for none
- Building** If the description contained any mention to buildings, shops, or structures
- Spring** A property description mentioned a spring

Data for Regressions Cont.

- Distance less than 5 miles to Lake/River** Only a few entries contained this data in its own column
- Pond(s)** We have included a count for the ponds
- Rivers** One property mentioned having access to a river
- Pasture** Many of the property descriptions included the phrase pasture or some derivative
- Road Surface** The road surface was its own column in the MLS listing. For ease of interpretation, it has been divided into three new columns.
 - Dirt** Either a one or a zero depending on the appearance of “Dirt”
 - Gravel** Either a one or a zero depending on the appearance of “Gravel”
 - Paved** Either a one or a zero depending on the appearance of “Paved”

Figure: Approximate Position of Data Points



Test for Normality: Shapiro-Wilks Test

Column	p -Value
Acres	3.61598×10^{-11}
Zoning	8.1216×10^{-10}
Timber	5.9838×10^{-12}
Hunting	4.2566×10^{-11}
Fence	7.88598×10^{-8}
Building	1.43169×10^{-9}
Spring	1.03184×10^{-13}
Water Well	4.2566×10^{-11}
Distance less than 5 miles to Lake/River	1.89454×10^{-12}
Pond(s)	3.51959×10^{-7}
Rivers	1.03184×10^{-13}
Pasture	1.89454×10^{-12}
Dirt	1.14418×10^{-8}
Gravel	5.9838×10^{-12}
Paved	3.67796×10^{-9}
Sale Price	1.138910×10^{-7}
Natural Log of Sale Price	0.0803349
Quadratic Box-Cox of Sale Price	1.233×10^{-11}

Linear Regression

Adjusted R^2	Coefficients	P-value	Lower 95%	Upper 95%
0.8728				
Acres	906.3853042	9.20457E-11	734.4750717	1078.295537
Zoning	18972.84481	0.364086822	-23352.33719	61298.02681
Timber	-4132.428582	0.878846333	-59491.45157	51226.5944
Hunting	-15200.35535	0.571574843	-69893.47495	39492.76426
Fence	3465.74768	0.5531597	-8426.496496	15357.99186
Building	-18290.79641	0.355827228	-58386.54929	21804.95646
Spring	-124619.317	0.041691741	-244150.8564	-5087.777574
Water Well	69668.07293	0.034356395	5578.86822	133757.2776
Less than 5 miles to Lake/River	29700.53518	0.501669881	-60159.64733	119560.7177
Pond(s)	20122.12535	0.133878628	-6646.158631	46890.40934
Rivers	-50169.44113	0.486466425	-196656.8233	96317.941
Pasture	-26781.05577	0.450040217	-98761.5886	45199.47706
Dirt	36774.2736	0.086355431	-5666.607904	79215.1551
Gravel	44728.55818	0.219807062	-28541.25725	117998.3736
Paved	22100.93263	0.401166673	-31267.34125	75469.2065

Log-Linear

Adjusted 0.9558	R^2	Coefficients	P-value	Lower 95%	Upper 95%
Acres		0.005100705	7.70076E-05	0.002887741	0.007313669
Zoning		0.24127001	0.369836521	-0.303573024	0.786113043
Timber		0.300516491	0.392729635	-0.412108395	1.013141378
Hunting		-0.435215628	0.214231243	-1.139268482	0.268837226
Fence		0.094229013	0.216124145	-0.058857308	0.247315334
Building		-0.279951587	0.274031752	-0.796095655	0.236192481
Spring		-1.791629654	0.024341213	-3.330333647	-0.252925661
Water Well		0.84447817	0.045226622	0.019471518	1.669484822
Less than 5 miles to Lake/River		0.601975568	0.293477632	-0.55477538	1.758726516
Pond(s)		0.382254943	0.031141468	0.037672537	0.726837349
Rivers		-0.544796968	0.556571051	-2.43049777	1.340903833
Pasture		-0.418048098	0.361040737	-1.344638133	0.508541936
Dirt		10.55647747	1.89138E-23	10.01014507	11.10280988
Gravel		10.43856688	8.60824E-18	9.495380183	11.38175357
Paved		10.2497712	8.35333E-21	9.562772803	10.9367696

Quadratic

Adjusted 0.9291	R^2	Coefficients	P-value	Lower 95%	Upper 95%
Acres		265348907.4	2.006E-19	244969777.9	285728036.9
Zoning		3799285509	0.131187253	-1218160819	8816731836
Timber		-7420326935	0.028316707	-13982872291	-857781579.5
Hunting		2062074862	0.51780419	-4421530857	8545680582
Fence		-506219081.9	0.465820512	-1915987311	903549147
Building		952039118.7	0.682990764	-3801119131	5705197369
Spring		-4172641110	0.549054196	-18342528991	9997246771
Water Well		3575241477	0.341117979	-4022224844	11172707799
Less than 5 miles to Lake/River		430564369.8	0.934208725	-10221927159	11083055898
Pond(s)		-588317585.6	0.70535106	-3761568634	2584933463
Rivers		-2093215014	0.805646421	-19458588126	15272158098
Pasture		1348399904	0.747143016	-7184545332	9881345140
Dirt		-2899285533	0.245934673	-7930447479	2131876412
Gravel		-56424082.15	0.989413613	-8742207556	8629359391
Paved		-2534231773	0.416530035	-8860783416	3792319871

- Linear

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- Quadratic

$$price = \sqrt{\sum_{i=1}^n a_i x_i}$$

- Longer Date Range

Future Work

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- Wider Area

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- Principle Component Analysis

Thanks

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