

Methodology used in “Transparency in ERCOT: A No-cost Strategy to Reduce Electricity Prices in Texas”

The study uses data from https://pi.ercot.com/contentproxy/publicList?folder_id=10001829. The ERCOT data is a combination of monthly summaries and daily summaries by price quantity for each market participant, hour, and zone.

Decision-makers and the public will discover that there is no direct Web link to the bid data posted on ERCOT’s Web site. Different data sets are reported on different pages using different formats. Some years are present in great detail, but others are missing altogether. Although https://pi.ercot.com/contentproxy/publicList?folder_id=10001838 shows some data, the page has several problems:

1. Each daily file must be downloaded and processed. Since hundreds of files are available on this page, the process can be challenging and labor-intensive for anyone without experience.
2. The Web site states that it includes data back to April 2003, but only files since October 2006 are present.
3. The files that are present can be misnamed. For example, ERCOT sometimes gives daily files for different dates the same name.

More research reveals that while data for 2002 and 20003 can be found at <http://www.ercot.com/mktinfo/balbids/2002/> and <http://www.ercot.com/mktinfo/balbids/2003>, these files have different formats that are inconsistent with ERCOT’s protocols, both now and in the past. In these files, the names of the bidders have been replaced with a numbered code.

Timeline of Changes in ERCOT’s Balancing Energy Services Market Protocol

ERCOT's markets officially began on January 1, 2002, although they had started with a trial period from July 31, 2001. The market rules pertaining to BEM bid information release were set out in ERCOT Protocol Section 12.4.4.2.3.3. At first there were no posting delays required for BEM bids. On July 1, 2002, ERCOT released an updated protocol establishing a 180-day delay in the release of

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BEM bids.¹ Also on July 1, 2002, ERCOT initiated a new posting requirement for entities that make bids over \$300. This “Shame Cap” required bidders to make their identities known within the next business day.²

On March 1, 2007, the \$1,000 BEM bid cap was increased to \$1,500.³ On May 1, 2007, the Shame Cap was removed from the protocols.⁴ On March 1, 2008, the \$1,500 BEM bid cap was increased to \$2,250.⁵ On September 22, 2007, the reporting delay of BEM bids was reduced from 180 days to 60 days.⁶

Date	Protocol Change	Protocol Reference
July 31, 2001	ERCOT’s trial market opens.	http://www.ercot.com/about/profile/history/
June 1, 2001	BEM bid limit set to \$1,000.	ERCOT Protocols, Section 6.5.2 – June 1, 2001
January 1, 2002	ERCOT’s markets officially begin.	http://www.ercot.com/about/profile/history/
July 1, 2002	180-day delay in the release of BEM bids.	ERCOT Protocols, Section 12.4.4.2.3.3 – July 1, 2002
July 1, 2002	\$300 “Shame Cap” entered into protocols. Requires next day bidder identification for bids over \$300.	ERCOT Protocols, Section 1.3.3 – July 1, 2002
March 1, 2007	BEM bid limit increased to \$1,500.	ERCOT Protocols, Section 6.11.3 – July 1, 2007
May 1, 2007	\$300 “Shame Cap” removed from protocols.	ERCOT Protocols, Section 1.3.3 – May 1, 2007
March 1, 2008	BEM bid limit increased to \$2,250.	ERCOT Protocols, Section 6.11.3 – July 1, 2007
September 22, 2007	180-day delay reduced to 60 days for BEM bids.	Whitepaper related to posting changes for PUCT Projects 31972 and 33490, Matt Mereness and Carrie Tucker, November 12, 2007, page 2

We chose the form of the bidding rule variables in order to make interpretation of the results intuitive. Raising the Shame Cap by \$1.00, for example, increases the average bid by 9/10ths of one cent. The delay variable was entered at 180 days before September 22, 2007 and 60 days thereafter.

The direction of causality in the Texas Balancing Energy Market is summarized in this illustration:

¹ ERCOT Protocols, Section 12.4.4.2.3.3 – July 1, 2002.

² ERCOT Protocols, Section 1.3.3 – July 1, 2002.

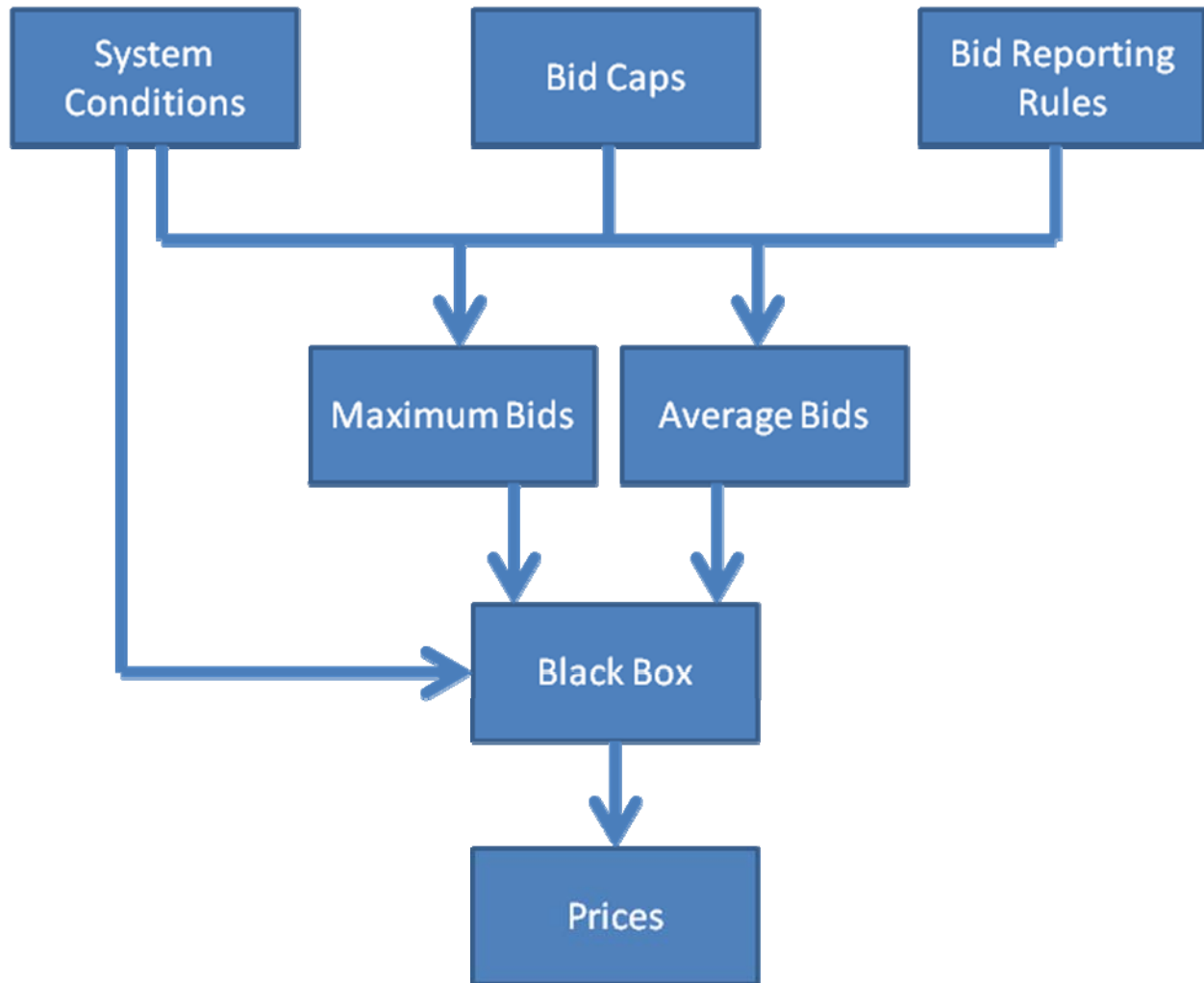
³ ERCOT Protocols, Section 6.11.3 – July 1, 2007.

⁴ ERCOT Protocols, Section 1.3.3 – May 1, 2007.

⁵ ERCOT Protocols, Section 6.11.3 – July 1, 2007.

⁶ Whitepaper related to posting changes for PUCT Projects 31972 and 33490, Matt Mereness and Carrie Tucker, November 12, 2007, page 2.

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Source: McCullough Research

Our first step processed the bid data into two metrics -- the simple average of the prices weighted by quantity and the maximum bid in each hour. Load data was taken from ERCOT at http://www.ercot.com/gridinfo/load/load_hist. Natural gas prices were taken from http://tonto.eia.doe.gov/dnav/ng/ng_pri_sum_dcu_nus_m.htm. Three variables were used to reflect market rules – the price of the “Shame Cap”, the number of days until bids were released, and the value bid cap. All prices were converted to real 2008 dollars using the Consumer Price Index. The basic model is a traditional linear regression using the two metrics as the dependent variables. Time series data, and especially time series data reflecting electric markets, is characterized

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by a high degree of serial correlation of the error terms. While this problem does not bias the coefficient estimates, it does make interpretation of the statistical results difficult.

Source	SS	df	MS			
Model	124321305	5	24864260.9	Number of obs = 20492		
Residual	2.2513e+09	20486	109895.972	F(5, 20486) = 226.25		
Total	2.3757e+09	20491	115936.274	Prob > F = 0.0000		
				R-squared = 0.0523		
				Adj R-squared = 0.0521		
				Root MSE = 331.51		

maxbid	Coef.	Std. Err.	t	P> t	[99.9% Conf. Interval]
load	.0048459	.0002879	16.83	0.000	.0038985 .0057932
henryhub	17.22926	1.700769	10.13	0.000	11.63203 22.82649
shamecap	.1693791	.0080754	20.97	0.000	.1428029 .1959553
reportingd-y	.9166942	.0659072	13.91	0.000	.6997935 1.133595
priccap	-.1763426	.0136518	-12.92	0.000	-.2212707 -.1314146
_cons	120.9765	21.56811	5.61	0.000	49.99588 191.9572

We adopted the standard solution of adjusting the variables to eliminate the serial correlation. We used the SSE Search algorithm within the Prais regression package in STATA to make the correction. The adjustment changed the Durbin Watson statistic from .38 for the original regression to 2.15. As expected, the elimination of serial correlation did not change the coefficient estimates to any degree, but did provide better estimates of the standard errors.

Prais-Winsten AR(1) regression -- iterated estimates

Source	SS	df	MS			
Model	9141033.34	5	1828206.67	Number of obs = 20492		
Residual	778816926	20486	38017.0324	F(5, 20486) = 48.09		
Total	787957959	20491	38453.8558	Prob > F = 0.0000		
				R-squared = 0.0116		
				Adj R-squared = 0.0114		
				Root MSE = 194.98		

maxbid	Coef.	Std. Err.	t	P> t	[99.9% Conf. Interval]
load	.0074121	.0005919	12.52	0.000	.0054643 .0093599
henryhub	15.12926	5.13418	2.95	0.003	-1.767341 32.02585
shamecap	.1459922	.0242303	6.03	0.000	.0662503 .2257341
reportingd-y	.6898717	.1987562	3.47	0.001	.0357646 1.343979
priccap	-.1584324	.041298	-3.84	0.000	-.2943443 -.0225205
_cons	75.03706	64.11128	1.17	0.242	-135.9533 286.0274

rho	.8095921
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Durbin-Watson statistic (original) 0.382910
Durbin-Watson statistic (transformed) 2.154621

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Each of the independent variables was significant at 99.9% except for the Henry Hub fuel cost. This is expected since the maximum bids in RTO balancing energy markets reflect a variety of non-economic concerns. Hockey stick bids, for example, would not be expected to reflect fuel costs in any fashion. We did expect that natural gas prices would be significant in average bids since many market participants would base their bids on their marginal costs. As expected, the Henry Hub prices were significant in both the normal regression and the results after correction for serial correlation.

Source	SS	df	MS			
Model	5425959.45	5	1085191.89	Number of obs =	20492	
Residual	2485876.91	20486	121.345158	F(5, 20486) =	8943.02	
Total	7911836.36	20491	386.11275	Prob > F =	0.0000	
				R-squared =	0.6858	
				Adj R-squared =	0.6857	
				Root MSE =	11.016	

averagebid	Coef.	Std. Err.	t	P> t	[99.9% Conf. Interval]	
load	.0006664	9.57e-06	69.67	0.000	.0006349	.0006978
henryhub	7.226178	.0565152	127.86	0.000	7.040186	7.412169
shamecap	.0085944	.0002683	32.03	0.000	.0077113	.0094775
reportingd-y	.0544747	.00219	24.87	0.000	.0472672	.0616821
pricecap	-.0016133	.0004536	-3.56	0.000	-.0031063	-.0001204
_cons	-5.427448	.7166916	-7.57	0.000	-7.786081	-3.068814

As with the results for the maximum bids, the coefficients were not substantially changed due to the correction for serial correlation. All of the bid rule variables were significant at the 99.9% level except for the price cap.

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Prais-Winsten AR(1) regression -- iterated estimates

Source	SS	df	MS	Number of obs =	20492
Model	203773.056	5	40754.6113	F(5, 20486) =	986.59
Residual	846250.891	20486	41.3087421	Prob > F =	0.0000
Total	1050023.95	20491	51.2431774	R-squared =	0.1941
				Adj R-squared =	0.1939
				Root MSE =	6.4272

averagebid	Coef.	Std. Err.	t	P> t	[99.9% Conf. Interval]
load	.0005885	.0000196	29.96	0.000	.0005239 .0006532
henryhub	7.036808	.172262	40.85	0.000	6.469893 7.603722
shamecap	.008661	.0008129	10.65	0.000	.0059856 .0113364
reportingd-y	.0532967	.0066699	7.99	0.000	.0313459 .0752475
pricecap	-.0013324	.0013857	-0.96	0.336	-.0058929 .0032281
_cons	-1.535886	2.150898	-0.71	0.475	-8.614493 5.542722
rho	.8130901				

Durbin-Watson statistic (original) **0.376062**
Durbin-Watson statistic (transformed) **2.154370**