Competitive Bidding Strategy

Predicting Markups and Key Metrics in Construction Estimating

Speaker Introduction

- Aaron D. Sauer
- Assistant Professor – University of Central Missouri
  - 2007 - Present
  - Current Courses – Statics, Applied Strengths of Materials Advanced Estimating and Cost Analysis
- ABD Indiana State University (May 2013 Graduation)
  - Dissertation – Investigating Code Officials' Perceptions of the International Green Construction Code (IGCC)
- 8 years Commercial Construction Estimating Experience
- Fun Facts – I still shoot Super 8 films and brew homemade Root Beer

Presentation Outline

- Key Estimating Metrics
  - Calculating Estimating Efficiency
  - Competition Analysis
    - Average Number of Bidders
    - Bid Spread Analysis
- Predicting Project Markups
  - Databid System
  - Multiple Linear Regression
  - Friedman's Model
- Questions & Discussion

Benefits of a Bidding Strategy (Park, p.7)

- Determine the chances of getting a job by bidding with any given markup.
- Identify the markup that will result in the greatest possible profit on a specific job in view of the prevailing competitive situation surrounding that job.
- Select from a number of different projects, the jobs offering the greatest profit potential.
- Decide whether a particular job offers sufficient profit potential to justify submitting a bid at all.

What if…

- You could increase your profit margin by 1% on all jobs for an entire year?
- You could reduce the number of bids that you generate in a year by 10% and still make your volume and margin goals

Keeping Score

- What is Bidding Efficiency?
  - It is a ratio of the profit actually won to the amount of money that could have been made had all competitors bids been known prior to the bid letting.
  - Note: The focus is on estimated profits, not actual post job results.
- Calculating Bidding Efficiency

  = Actual Profit (estimated) ÷ Maximum Profit Potential
- Where the Maximum Profit Potential is the difference between your estimated cost and the lowest competitor's bid.
- Example: Handout 1

Using Bidding Efficiency

- Used as a cumulative metric for all estimates.
  - What is your current efficiency rate.
  - How does your rate change over time
- Used to compare different types of work:
  - Type of Job
  - Number of Competitors
  - Project Size
  - Self Performance vs. Brokering
- The Key is moving towards metrics that are based in data, not intuition or experience alone.

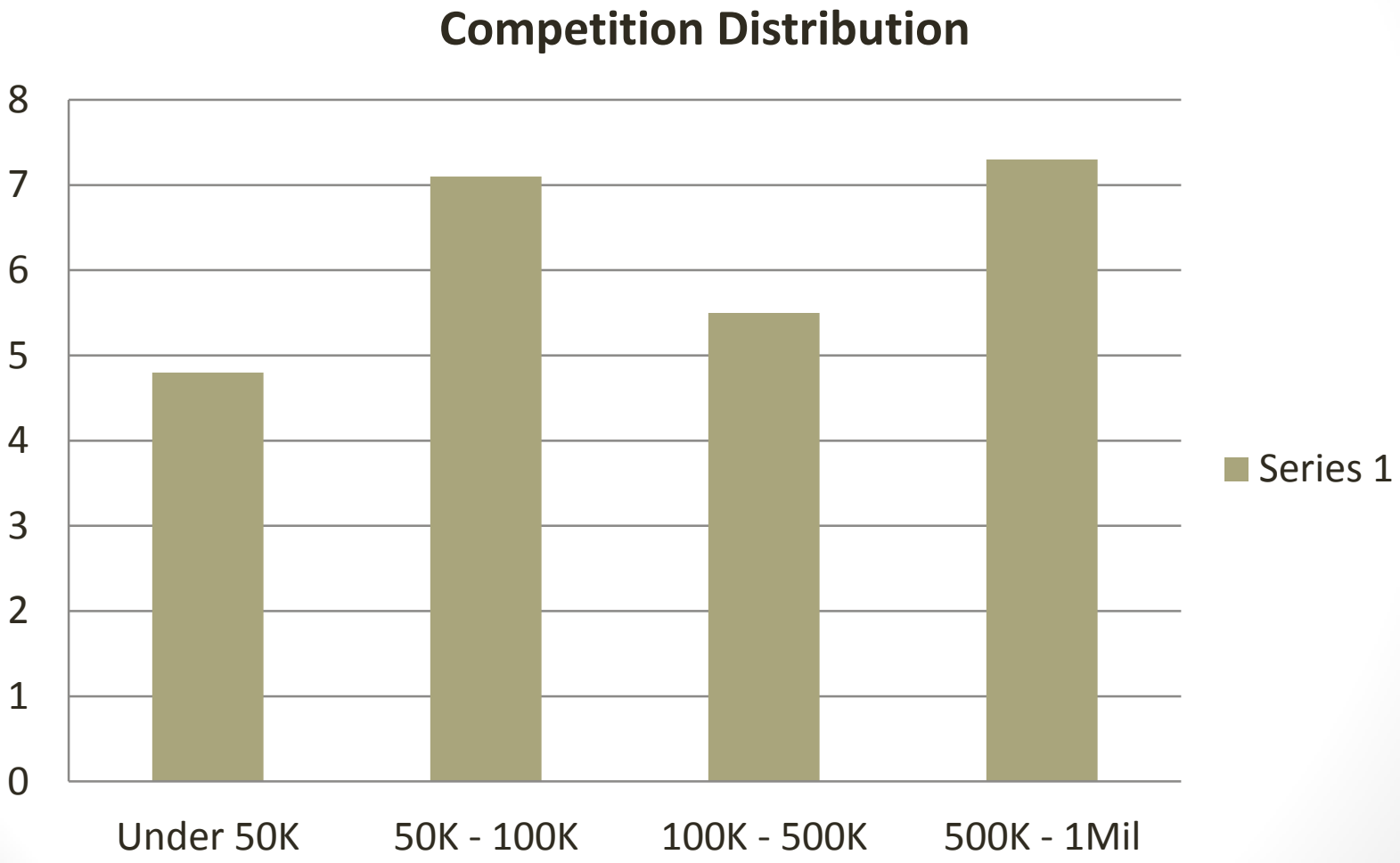
What are the Data?

- What type of information do we need to collect?
- General Info: bid date, estimator, owner, type of job, location, number of bidders, select bid list, unusual conditions, self perform
- Your estimated direct costs, jobsite overhead and profit
- Tabulations of competitors' bids
- What else??? Anything that might help us predict our performance versus the competition
- Don't get lazy! How long does it take to pull together a bid? Spend ten minutes go collect and document the data.

Analyzing the Competition

- Key Metrics in Bidding Strategy
  - Average number of bidders based on job size
  - Bid spread

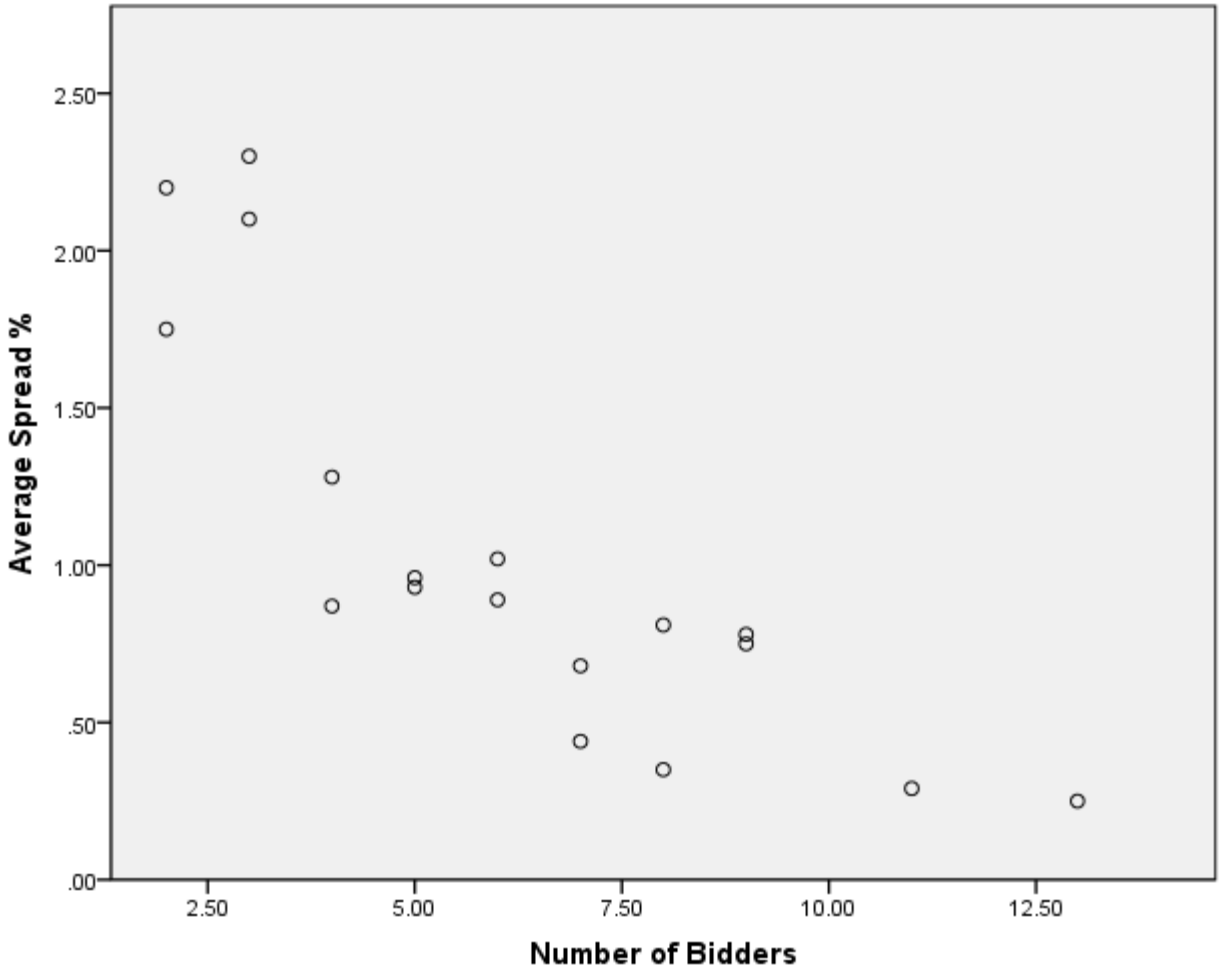
Average # of Bidders



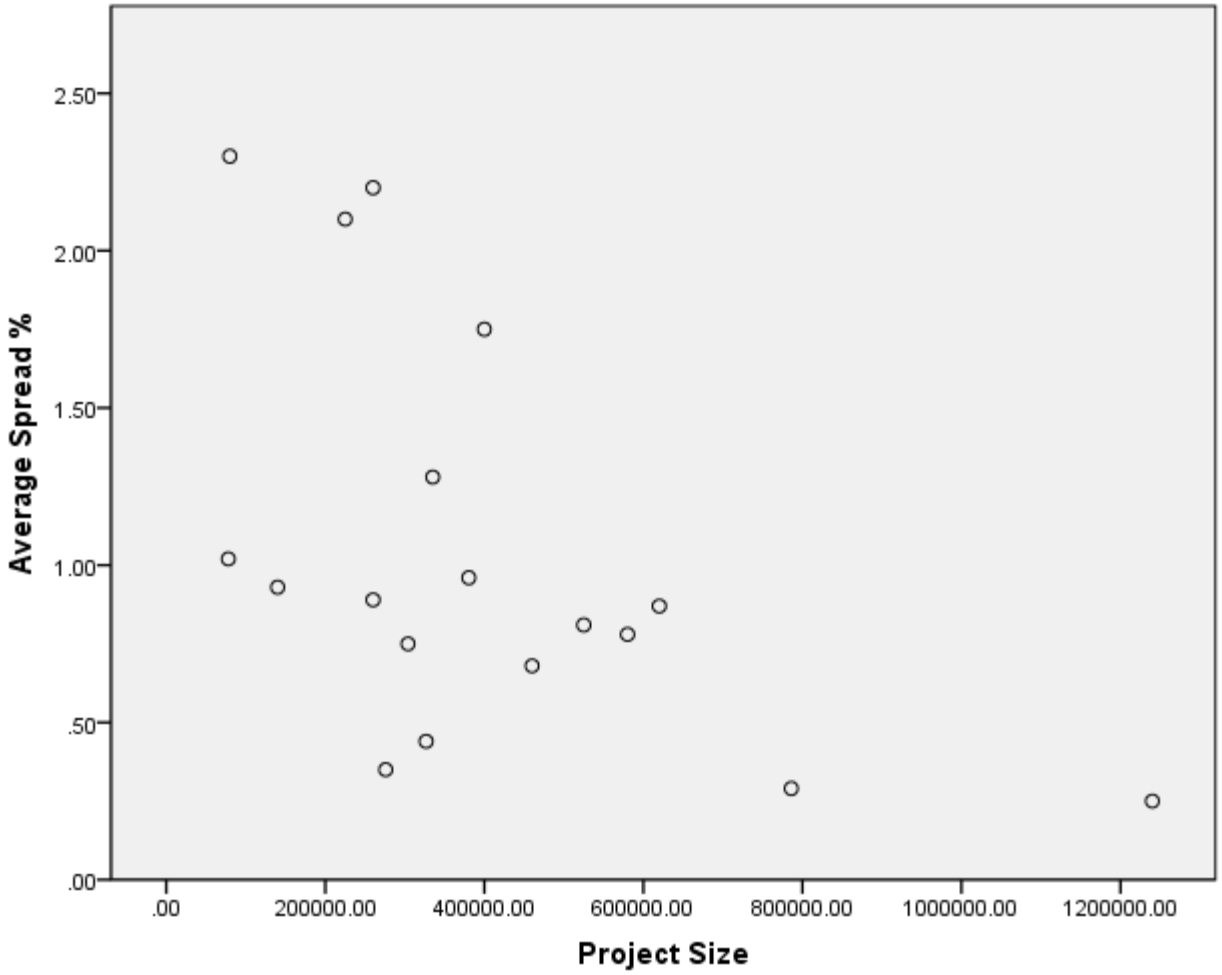
Bid Spread (p.201)

- The difference between the low bid and second low bid.
- Can be an indicator of intensity of competition (do tighter spreads indicate more competition?)
- Can be used to single out competitors who are usually low (how low?) when analyzing an individual project.
- Do bigger spreads indicate greater opportunity (is the spread due to a rogue bidder or the type of work?)

Scatterplot – Bid Spread with Number of Bidders



Scatterplot – Bid Spread by Project Size



Databid System

- A technique for establishing project markups based on historical cost and probability data
- Information needed:
  - Project Size
  - Number of Competitors
  - Lowest Competitors Markup (based on your estimated costs)
- See Handout 2 for Raw Data

Databid System

- Step 1 – Organize data based into reasonable groupings based on project size and number of competitors. It is recommended that each group should include a minimum of 5 data points. Handout 3
- Step 2 – For each group, build an Optimum Bid table that includes the range of markups, number of jobs won, and cumulative expected profit. Handout 3
- Step 3 – Complete a table with Optimum Bid values
- Step 4 – Update your data frequently!!!

Raw Data Table

Job Number	Job Size	Competitors	Lowest Markup	Job Number	Job Size	Competitors	Lowest Markup
1	26300	2	29	38	36300	5	9
2	2800	1	10	39	7000	3	7
3	6100	1	31	40	34400	5	4
4	3000	5	20	41	2200	1	5
5	1200	1	40	42	9400	3	33
6	23500	1	26	43	7500	1	41
7	2000	1	7	44	2900	1	27
8	11400	1	14	45	44800	2	7
9	13600	1	21	46	192900	5	15
10	124500	2	15	47	9800	2	12
11	1400	2	7	48	24000	4	8
12	80900	5	28	49	18700	1	28
13	743400	3	2	50	3700	1	37
14	64300	10	10	51	12800	5	16
15	3300	1	24	52	3500	3	9
16	69300	2	12	53	20400	3	3
17	5900	1	9	54	7400	2	4
18	229900	6	5	55	3700	3	34
19	4900	3	16	56	97700	7	1
20	3200	6	9	57	12500	2	7
21	22300	2	3	58	6100	2	16
22	25100	3	6	59	464200	4	2
23	2400	2	21	60	86500	7	12
24	43200	6	1	61	2200	1	39
25	2100	1	29	62	4200	1	44
26	1800	2	50	63	3500	1	22
27	29900	2	3	64	19900	2	42
28	16200	1	37	65	4400	2	28
29	8200	2	15	66	357500	5	2
30	2100	2	42	67	3000	1	53
31	16500	4	7	68	5100	2	57
32	2400	1	32	69	2900	5	9
33	8600	3	32	70	23600	3	3
34	96200	1	33	71	20900	1	35
35	2100	2	8	72	5400	1	39
36	8300	2	24	73	13800	1	12
37	16100	1	9	74	3300	1	51

Example Grouping

Job Size		Competitors		
	1	2	3 to 5	6 or More
0-5K				
5K-20K				
20k-100K				
Over 100K				

Jobs Under 5K, 1 Competitor

Job Number	Job Size	Competitors	Markup
2	2800	1	10
5	1200	1	40
7	2000	1	7
15	3300	1	24
25	2100	1	29
32	2400	1	32
41	2200	1	5
44	2900	1	27
50	3700	1	37
61	2200	1	39
62	4200	1	44
63	3500	1	22
67	3000	1	53
74	3300	1	51

Optimum Bid Table

Markup	Jobs Won	Exp. Profit		Markup	Jobs Won	Exp. Profit
1	14	14		27	8	216
2	14	28		28	8	224
3	14	42		29	7	203
4	14	56		30	7	210
5	13	65		31	7	217
6	13	78		32	6	192
7	12	84		33	6	198
8	12	96		34	6	204
9	12	108		35	6	210
10	11	110		36	6	216
11	11	121		37	5	185
12	11	132		38	5	190
13	11	143		39	4	156
14	11	154		40	3	120
15	11	165		41	3	123
16	11	176		42	3	126
17	11	187		43	3	129
18	11	198		44	2	88
19	11	209		45	2	90
20	11	220		46	2	92
21	11	231		47	2	94
22	10	220		48	2	96
23	10	230		49	2	98
24	9	216		50	2	100
25	9	225		51	1	51
26	9	234		51	1	51
				53	0	0

Final Table (example values only)

Job Size		Competitors		
	1	2	3 to 5	6 or More
0-5K	26	41	45	
5K-20K	27	23	31	
20k-100K	25	28	27	9
Over 100K			14	

Additional Thoughts

- Strive for as much data as possible (many projects for each group)
- However…Keep in mind the influence of time (inflation & market trends) and radical market changes. (2 year time horizon for project data at the most)
- Always remember the Databid System uses historical data and does not forecast future events.
- Even if you don't use the Databid System, there is much value that can be gained through a retrospective "what if" analysis.

Multiple Linear Regression

- A statistical technique to predict a dependent variable based on one or more independent predictor variables.
- Example: Predicting vehicle sales based on vehicle characteristics (fuel efficiency, purchase price, color, horsepower).
- Application to construction estimating – using multiple variables (project size, number of competitors) to predict project markups.
- Requires statistics software (SPSS, SAS, etc.)
- Limitations: Relies on a linear relationship between variables

Regression Results

- Predicting markup from full dataset
- Using project size and number of competitors as predictors

Correlations

Correlations

		Lowest Markup	Job Size	Number of Competitors
Pearson Correlation	Lowest Markup	1.000	-.305	-.444
	Job Size	-.305	1.000	.284
	Number of Competitors	-.444	.284	1.000
Sig. (1-tailed)	Lowest Markup	.	.004	.000
	Job Size	.004	.	.007
	Number of Competitors	.000	.007	.
N	Lowest Markup	74	74	74
	Job Size	74	74	74
	Number of Competitors	74	74	74

ANOVA Table

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3782.431	2	1891.216	10.732	.000[a]
	Residual	12512.163	71	176.228		
	Total	16294.595	73			

a. Predictors: (Constant), Number of Competitors, Job Size
b. Dependent Variable: Lowest Markup

Model Summary

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.482[a]	.232	.210	13.275	1.868

a. Predictors: (Constant), Number of Competitors, Job Size
b. Dependent Variable: Lowest Markup

Model Coefficients & Equation

- Constant = 28.866
- Job Size = -.00002609
- Competitors = -3.089
- Equation:

Markup = 28.866 – .00002609(Job size) – 3.089(# of Competitors)

Model Application

- Predicted markup for a project with one competitor and a project size of $4,200.00
- Predicted Markup = 28.866 – .00002609(4200) – 3.089(1)
- Predicted Markup = 25.67%

Non-Linear Regression

- Possible applications

Friedman's Model

- Based on calculating the probability of success against a known number of competitors.

Friedman's Model

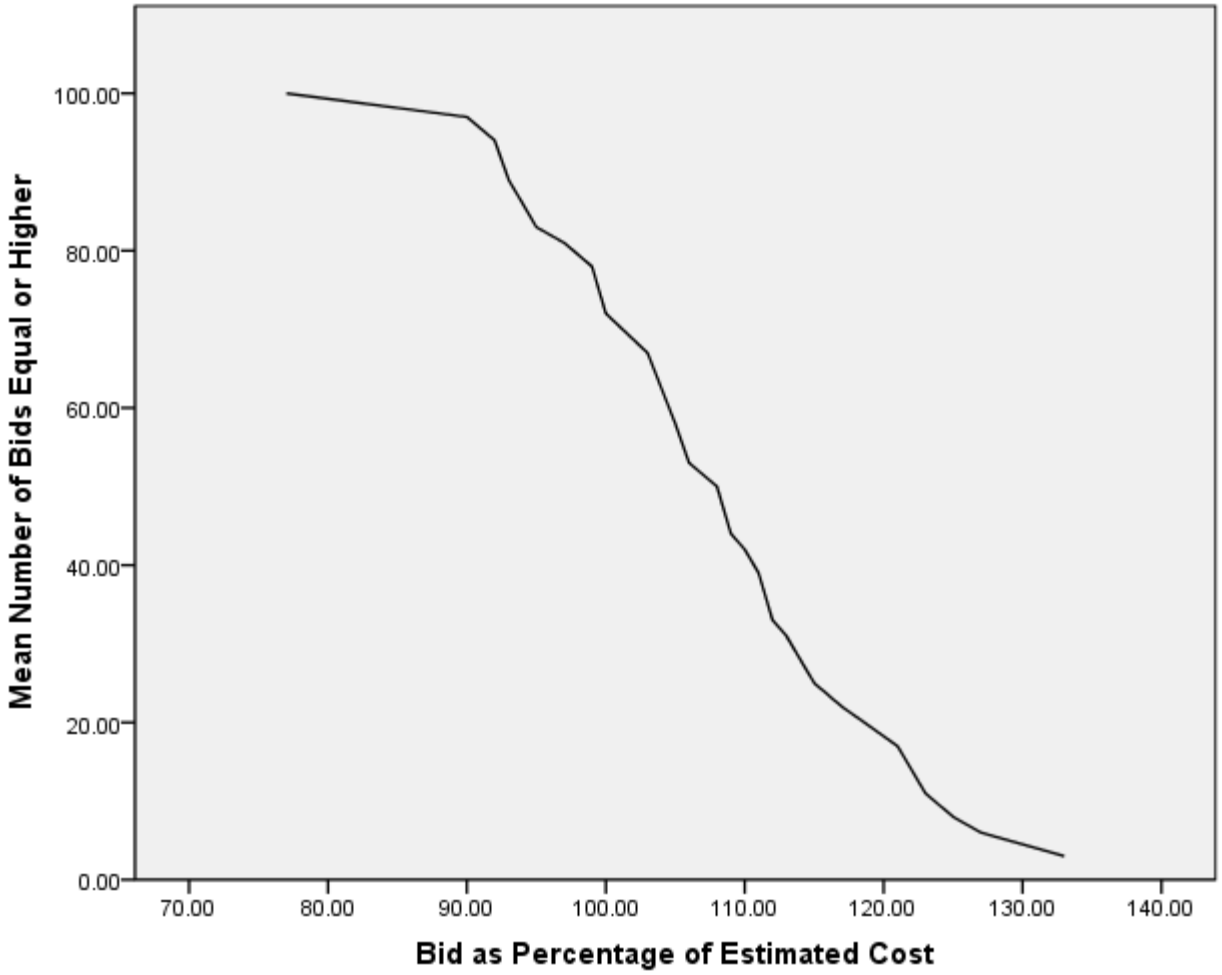
- Step 1 – Use historical data to calculate the probability of being low against typical competitors. Use all data to calculate probability against general competition.
- Step 2 – Identify the competitors for a given project.
- For each potential markup, multiply the probability rates associated with the anticipated competition.
- Multiply the probability of success by the associated project markup to build a table of expected profit.
- Select the Optimum bid value for maximum long-run profits.

Probability vs. ACME

Partial Chart based on 36 projects

Bid as Percentage of Estimated Cost	Total Number of Bids	Number of Bids Equal or Higher	Percentage of Bids Equal or Higher
95	1	30	83.3%
97	1	29	80.6%
99	2	28	77.8%
100	2	26	72.2%
103	3	24	66.7%
105	2	21	58.3%
106	1	19	52.8%
108	2	18	50.0%
109	1	16	44.4%
110	1	15	41.7%

Probability Plot ACME Const.



Optimum Bid Table

Markup	ACME	2 Unknown	All Three	Expected Profit
0	72	47.6	34.272	0
1	70.5	43.6	30.738	30.738
2	69	41	28.29	56.58
3	67	38.4	25.728	77.184
4	62	36	22.32	89.28
5	58	32.5	18.85	94.25
6	53	30.3	16.059	96.354
7	51.5	28.1	14.4715	101.3005
8	50	25	12.5	100
9	44	23	10.12	91.08
10	42	21.2	8.904	89.04

Threats

- Undisciplined competition
- Rapidly changing market conditions
- Focus on historical performance

Summary

- Use appropriate metrics to track bidding efficiency and competitor performance
- What other measures would be of value?
- Databid System for predicting markups
- Multiple Linear Regression for predicting markups
- Friedman's Model for predicting markups

Reference

- Estimating Metrics, Databid System and Friedman's Model
  - Park, W.R. (1979). Construction Bidding for Profit. New York: John Wiley & Sons.
- Multiple Linear Regression
  - Field, A. (2009). Discovering Statistics Using SPSS (and sex and drugs and rock 'n' roll) (3rd ed.). Thousand Oaks, CA: Sage Publications Inc.

Questions & Discussion