Introduction

- Significant volatility in the price of asphalt cement leads to considerable uncertainty about transportation project costs.

Issues:
- Hidden Price Contingencies (Eckert & Eger 2005)
- Very Short-term Price Guarantees (Ashuri & Lu 2010)
- Not Enough Bidders (Skolnik 2011)

Current Strategy:
- Price Adjustment Clause (PAC)
  - Eliminating the risk premiums of bids and reducing project costs by sharing the risk between owner and contractors.
  - PAC has been offering for asphalt cement in Georgia since September 2005.

Research Background:
- Asphalt cement price is a significant factor for transportation projects cost (Wang & Liu 2012).
- A survey and interview with five border states of Georgia indicates that four of them (FL, NC, TN & SC) are satisfied with PAC for asphalt cement (Eckert & Eger 2005).
- A quantitative analysis in Oklahoma state indicates that PAC is successful to reduce the difference between winner bids and engineering estimates (Kosmopoulou & Zhou 2011).
- A quantitative analysis of different states with and without PAC indicates that the effectiveness of PAC is not similar in different states (Skolnik 2011).

Research Motivation

- What is the impact of offering PAC for asphalt cement on bid prices in Georgia?

Research Objective

- Assess the impact of offering PAC for asphalt cement on submitted bid prices by highway contractors.

Data Set

- Detailed information of 3326 transportation projects in the state of Georgia from January 1995 to May 2012.
- Four major line items:

Research Methodology

- Multivariate Regression Analysis
  - Detecting unusual observations
  - Finding the best subset
  - Evaluation of the model
  - Residual Analysis
  - Multicollinearity Diagnosis

Regression Models

- Response Variable: Bid Prices
- Potential Explanatory Variables:
  1. Number of Bidders
  2. Duration
  3. Quantity
  4. Total Contract Price
  5. Relative value of all asphaltic items
  6. Relative value of the item

Analysis and Results

- Detecting unusual observations
  - Large Standardized Residuals Criterion
- Finding the best subset
  - Backward Elimination Process
  - Variables with zero coefficient are not significant to explain the variation of the response variable

Table 2: Results of finding best subset for each line item

| Table 2: Results of finding best subset for each line item |
|---|---|---|---|---|---|---|
| Item Code | Item Description | 402-1812 | 402-3190 | 402-3130 | 402-3121 |
| 402-1812 | Recycled Asphalt Concrete Leveling, Include Bitumen | 0.00 | 0.00 | 0.00 | 0.00 |
| 402-3190 | Recycled Asphalt Concrete 19 mm, GP 1 or 2, Include Bitumen | 0.00 | 0.00 | 0.00 | 0.00 |
| 402-3130 | Recycled Asphalt Concrete 12.5 mm Superpave, GP 1 or 2 | 0.00 | 0.00 | 0.00 | 0.00 |
| 402-3121 | Recycled Asphalt Concrete 25 mm Superpave, GP 1 or 2 | 0.00 | 0.00 | 0.00 | 0.00 |

Conclusions

- Evaluation of the model
  - Analysis of Variance (ANOVA) test OK!
- Residual Analysis
  - Patternless
  - Constant Variance
  - Normally Distributed
- Multicollinearity Diagnosis
  - Variance inflation Factor (VIF) test
  - VIF for all variables are less than 10 OK!