



## Background and Objectives

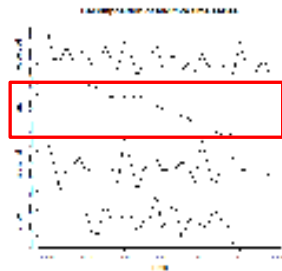


- The relationship between the secondary construction machinery market and the business cycle is currently unknown.
- Analyzing the trends within this market can help predict the future state of the economy.
- Our team used R to analyze sales and macro patterns in the U.S. economy.
- The dataset was sourced from *MachineryTrader.com*, a reputable auction website for heavy equipment.
  - It contains records of 944,737 machinery sales between January 2015 and December 2017, and more than 20 variables.
- Our goals were to:
  - Uncover any temporal patterns in the prices of construction machinery.
  - Determine if construction machinery prices can be used to predict macroeconomic trends in the U.S. economy.

# Prices are Falling

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- Prices of used construction machinery have been steadily decreasing from 2015 to 2017.
- Time series analyses reveal that seasonally-adjusted prices for the industry and for most individual equipment categories are falling. An additive time series decomposition for the secondary market average is on the left.



	Estimate	Std. Error	Pr(> t )
Quarter 1 2016	-\$26,821.19	32939.57	0.559843
Quarter 1 2017	-\$79,120.56	31103.63	0.066908
Quarter 2 2016	+\$5,204.97	26093.34	0.671804
Quarter 2 2017	-\$77,227.73	27880.64	0.01722
Quarter 3 2016	-\$12,377.88	30359.24	0.687636
Quarter 3 2017	-\$32,216.92	32130.81	0.360712
Quarter 4 2016	-\$11,942.70	23195.87	0.490971
Quarter 4 2017	-\$25,367.80	22717.96	0.355576

- Controlling for age, hours on machine, condition, and sale type, the results confirm the time series analyses. The table on the right shows price difference from 2015 for excavators.

# Construction Equipment as an Indicator

- To test whether construction equipment prices could be used to predict the state of the U.S. economy, our team ran OLS models using economic indicators as dependent variables and equipment categories, lagged by 1-12 months, as independent variables.
- Industrial Production Index:**
  - Significance of estimates increased between 1-5 months and decreased onward.
  - Equipment prices have small positive relationship with IPI.
- Standard & Poor's 500:**
  - Increases in any category are severely correlated with decreases in the S&P.
  - Inconsistent indicator due to limited time frame.
- Private Housing Permits**
  - Increases in price of equipment are negatively correlated with the number of housing permits issued.
- In general, lift, light tower, and loader backhoe prices are good economic indicators with 1 - 6 months lag, while asphalt equipment prices are a good indicator 12 months ahead of time.

	Estimate	Std. Error	tvalue	pvalue
<b>No lag</b>				
Loader Backhoes	0.83%	4.09E-05	2.026981	0.050563
Sweepers / Broom Equipment	-0.51%	2.63E-05	-1.93717	0.061068
<b>1 month</b>				
Motor Graders	0.32%	1.26E-05	2.560185	0.015225
Lifts	0.44%	2.14E-05	2.052434	0.048128
Loader Backhoes	0.81%	3.99E-05	2.02676	0.05083
<b>3 months</b>				
Forklifts	1.19%	3.48E-05	3.418388	0.001782
Loader Backhoes	1.18%	3.45E-05	3.416627	0.00179
Lifts	0.68%	2.05E-05	3.309371	0.002378
Generator Sets	0.25%	7.85E-06	3.128021	0.003813
Scrapers	0.04%	1.45E-06	2.782378	0.009104
Motor Graders	0.33%	1.21E-05	2.732666	0.010281
<b>6 months</b>				
Loader Backhoes	1.64%	3.83E-05	4.282384	0.000196
Excavators	0.46%	1.69E-05	2.722263	0.011029
Motor Graders	0.32%	1.49E-05	2.145048	0.040767
Scrapers	0.04%	1.74E-06	2.106218	0.044277
Compactors	0.38%	1.81E-05	2.088309	0.045984
<b>12 months</b>				
Dumpers	0.27%	1.08E-05	2.509947	0.019929
Lifts	0.96%	3.91E-05	2.466991	0.021886
Off-Highway Trucks	0.06%	2.51E-06	2.356394	0.027773
Forestry Equipment	0.52%	2.42E-05	2.165649	0.04145

## *IPI Lagged OLS Model Results*