

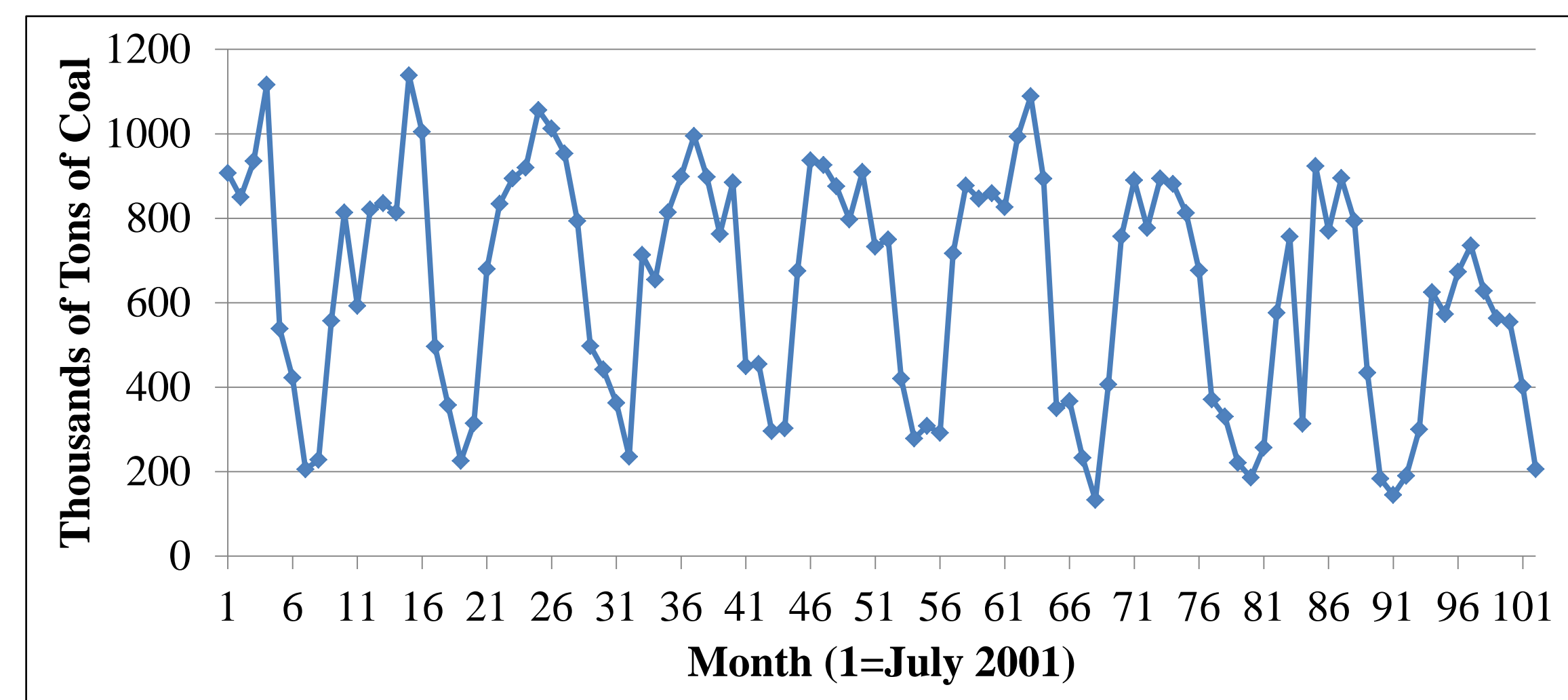
Forecasting Coal Movements Through Mississippi River Lock No. 27

Using Ordinary Least Squares Regression

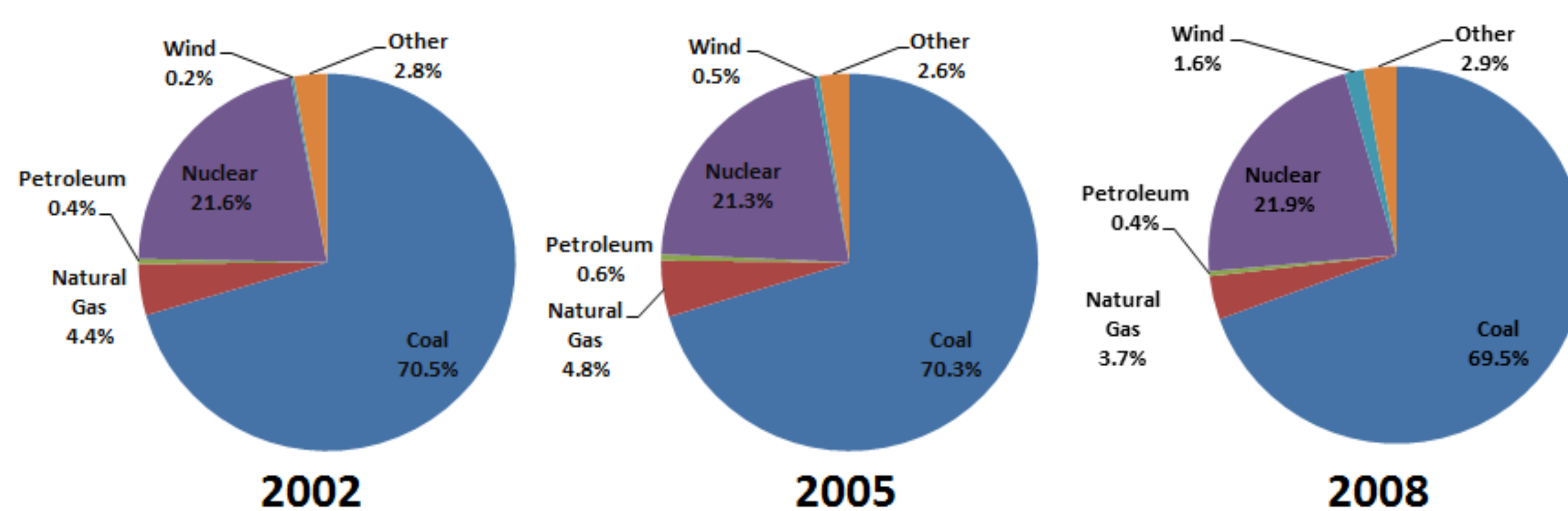
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INTRODUCTION & MOTIVATION

- Barge transportation more fuel efficient and less polluting than highway and rail transportation, but also the least studied.
- 44% of electricity in the United States comes from burning coal, 10% of coal shipped by barge.
- What factors relating to barge transportation and energy production affect the movement of coal on the Mississippi River?
- Data
 - Previous months' coal tonnage through Lock 27
 - Total monthly delay hours at Lock 27
 - MW hours generated by fuel type
 - Monthly retail diesel prices



Lock No. 27 Monthly Coal Movements



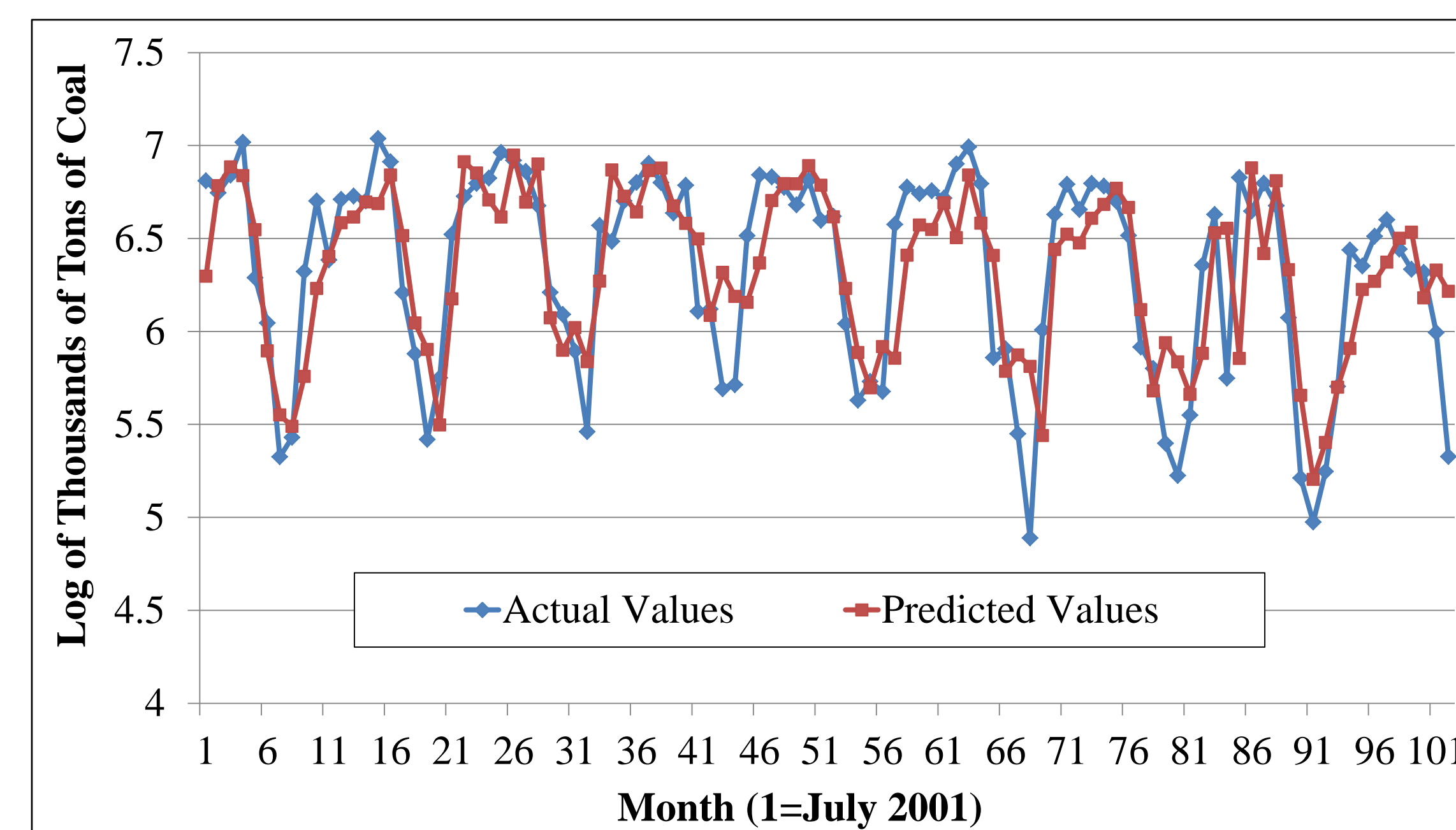
Midwest Electricity Generation by Fuel Type

METHODOLOGY & RESULTS

- Linear regression with Ordinary Least Squares Estimation used to resolve parameter estimates.
- Log-log model used in order to directly ascertain diesel fuel price and energy source elasticities.
- Non-stationary data required a check for autocorrelation.

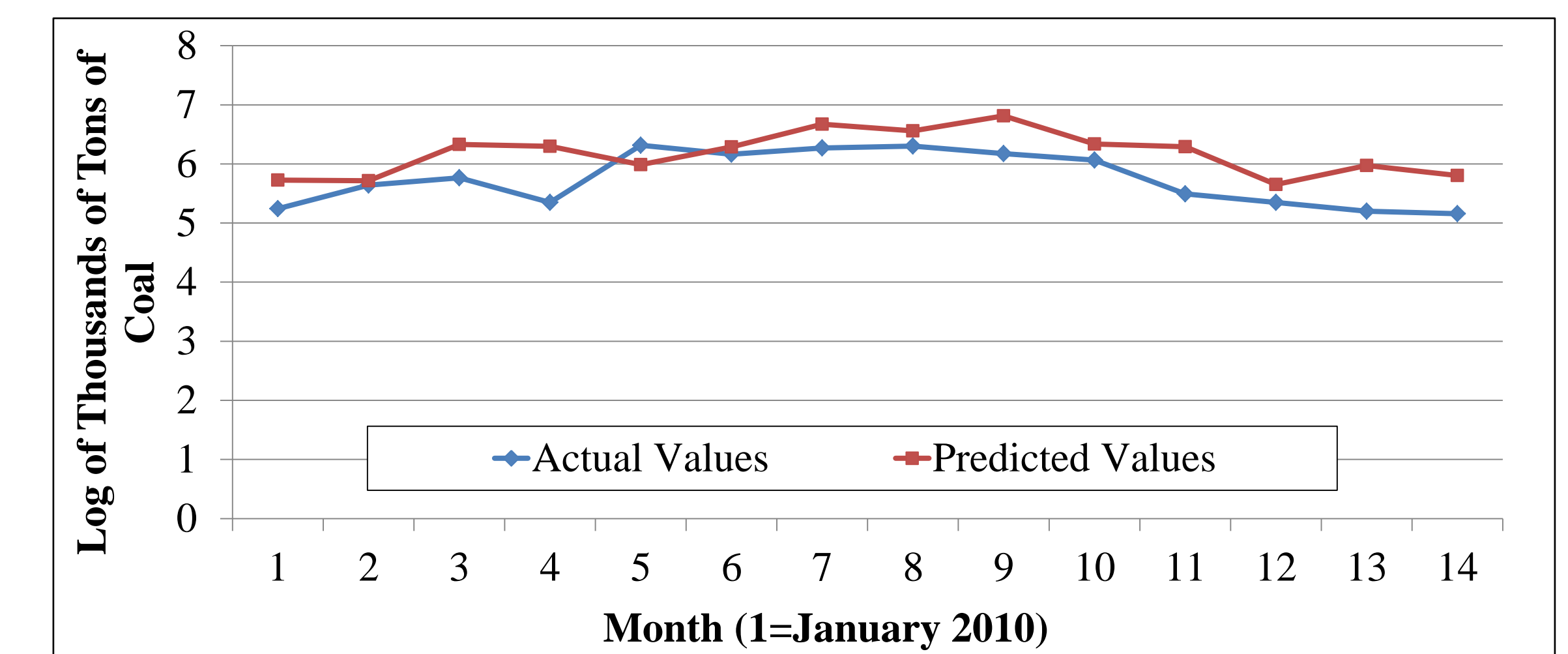
Variable Description	Estimated Parameter (elasticity)	t-Statistic
Constant	-6.526	-3.487***
1-month lag of tons of coal moved	0.630	9.124***
1-month lag of retail diesel fuel prices	-0.280	-2.020**
2-month lag of petroleum MW hours	0.570	4.675***
4-month lag of wind MW hours	0.149	2.522**
1-month lag of total lock stall hours	-0.106	-2.837***
Number of observations	102	
Durbin-Watson Statistic	1.843	
Autocorrelation Coefficient	0.078	
R-Squared	0.623	
Corrected R-Squared	0.603	

*, **, *** = Indicates significance at 10%, 5%, 1% level



DISCUSSION & CONCLUSION

- No significant autocorrelation present.
- MW hours generated by wind and petroleum have a positive effect on coal tonnage shipped by barge.
 - Reflection of complementary fuel sources
 - Nuclear and natural gas had no effect
- Coal tonnage inelastic with respect to fuel prices, lock delay, and energy source type.
- RMSE for model predictions significantly better than a 3-period moving average of coal tonnage.
- Model Validation & Transferability
 - Predict future Lock 27 coal movements
 - Also applied successfully to Lock 25



Lock No. 27 Future Monthly Coal Movements

- Data can be used by U.S. Army Corps of Engineers to determine best lock maintenance/closure times.
- Planning agencies can see the effects of altering energy generation sources.
- Future research may explore further interactions with other transportation and energy systems.

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