

# SENSITIVITY ANALYSIS REPORT

## Optimal Control Model

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### DATASET INFORMATION:

- Number of samples: 500
- Number of parameters: 5
- Parameters: tcre, cost\_mitig\_unit, cost\_remov\_unit, econ\_dam\_pct, disc\_rate
- Target variable: Y
- Target range: 1470.6 to 51363.2
- Target std deviation: 10192.2

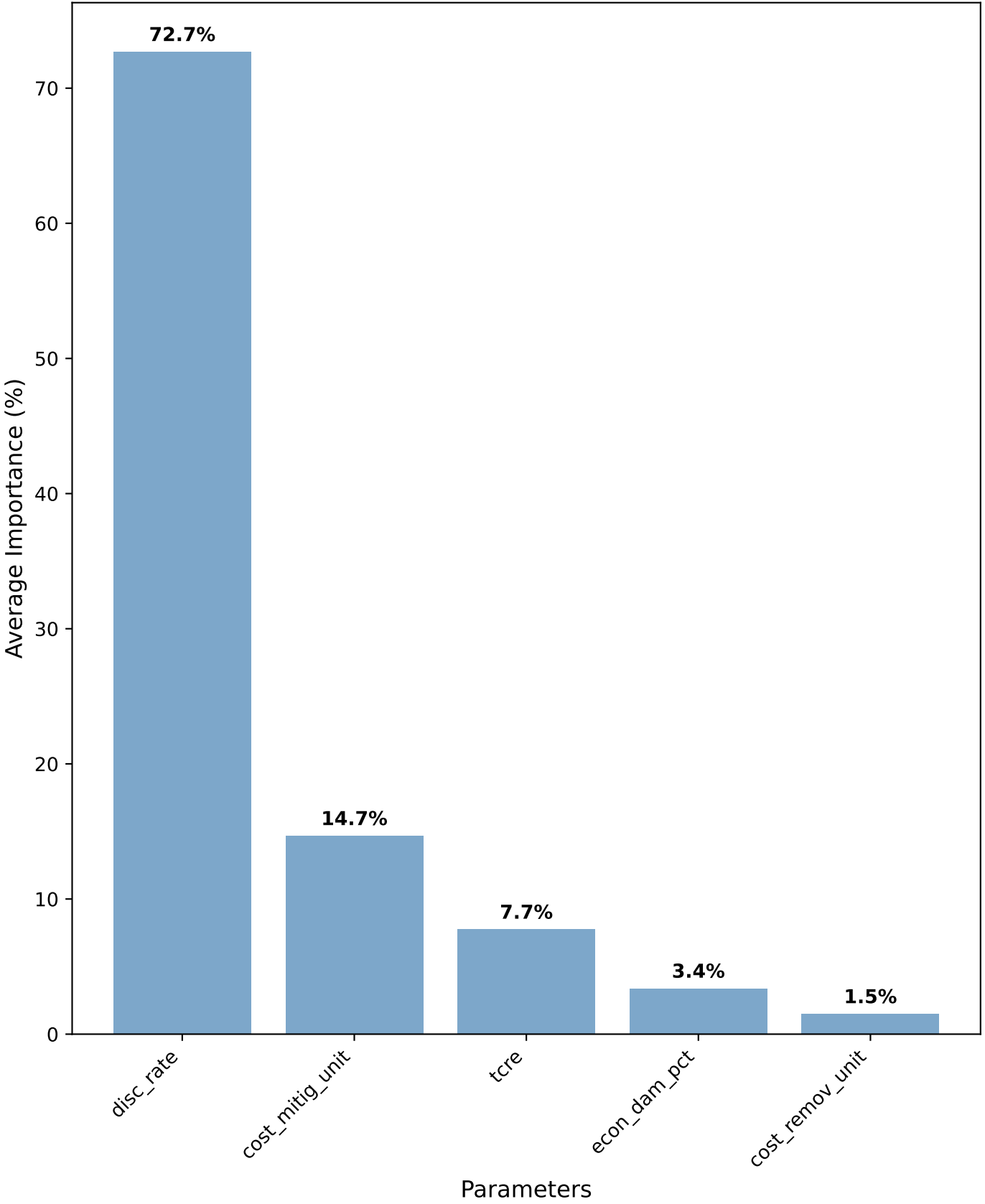
### KEY FINDINGS:

- Most influential parameter: disc\_rate
- Average importance: 72.7%
- Model performance (Random Forest  $R^2$ ): 0.995
- Model performance (Linear Regression  $R^2$ ): 0.849

### PARAMETER RANKING:

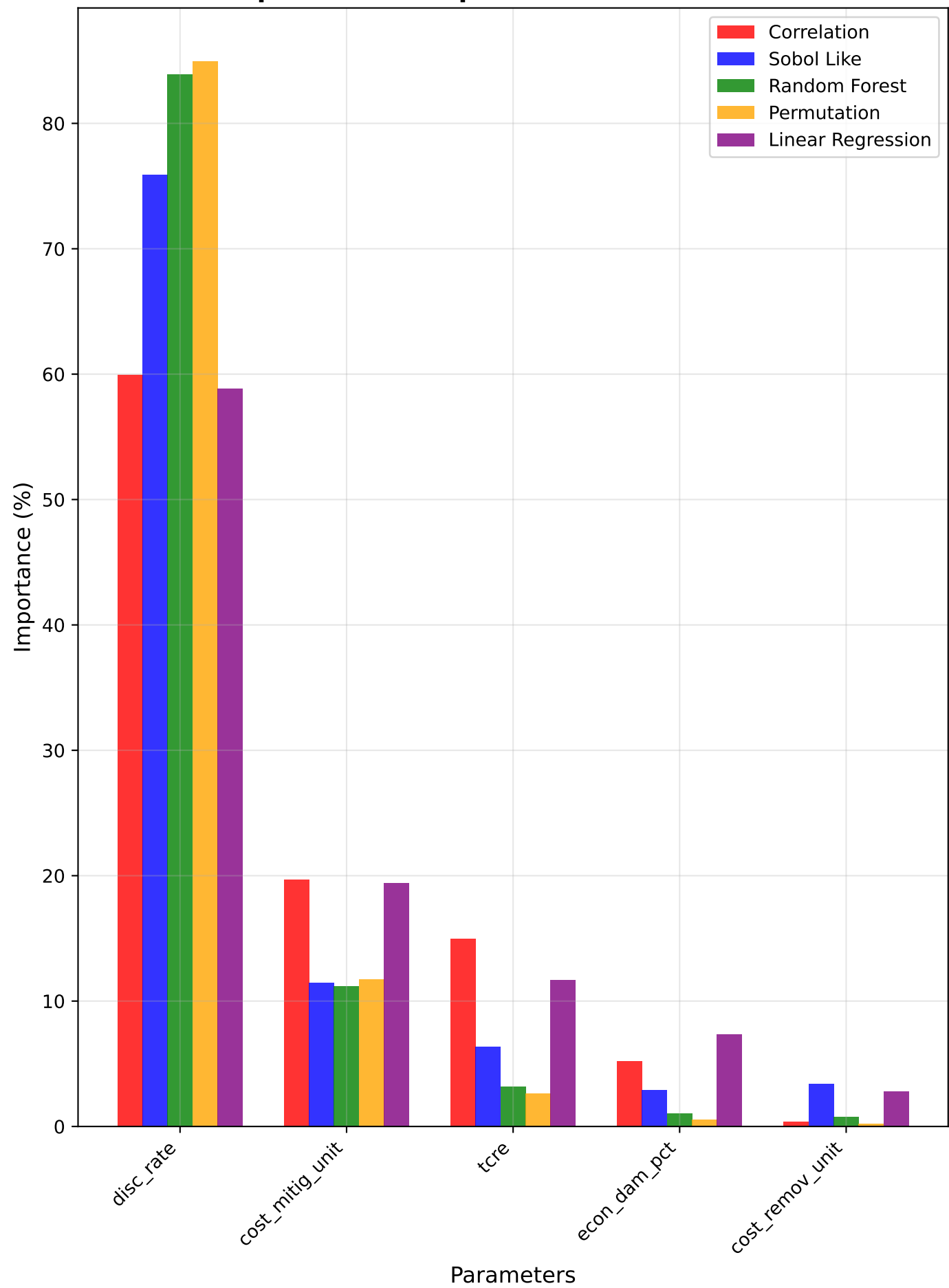
1. disc\_rate: 72.7%  $\pm$  12.7%
2. cost\_mitig\_unit: 14.7%  $\pm$  4.4%
3. tcre: 7.7%  $\pm$  5.4%
4. econ\_dam\_pct: 3.4%  $\pm$  2.9%
5. cost\_remov\_unit: 1.5%  $\pm$  1.5%

Parameter Importance Ranking  
(Average Across All Methods)

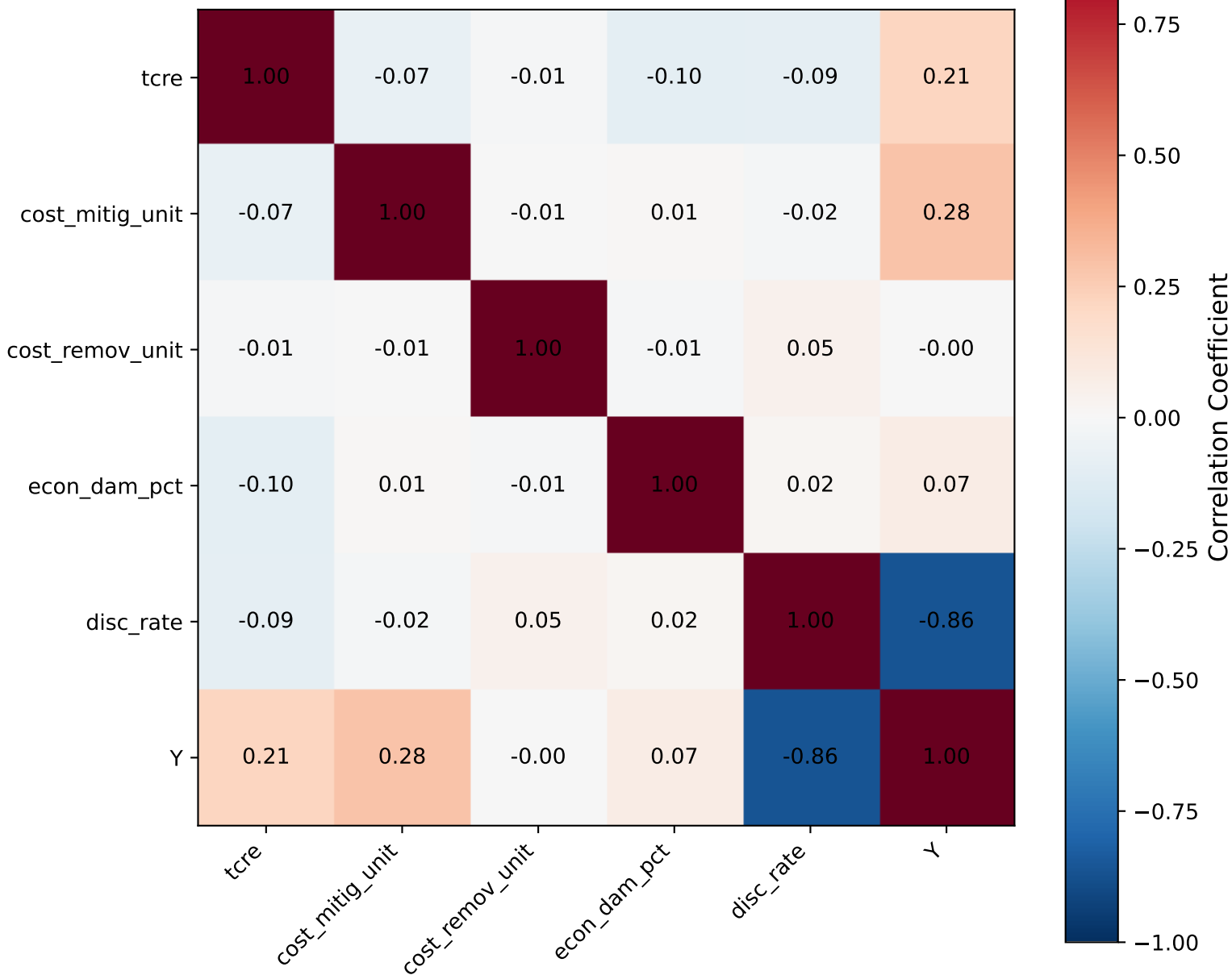


Parameter	Avg Importance	Std Dev
disc_rate	72.7%	12.7%
cost_mitig_unit	14.7%	4.4%
tcre	7.7%	5.4%
econ_dam_pct	3.4%	2.9%
cost_remov_unit	1.5%	1.5%

# Importance Comparison Across Methods

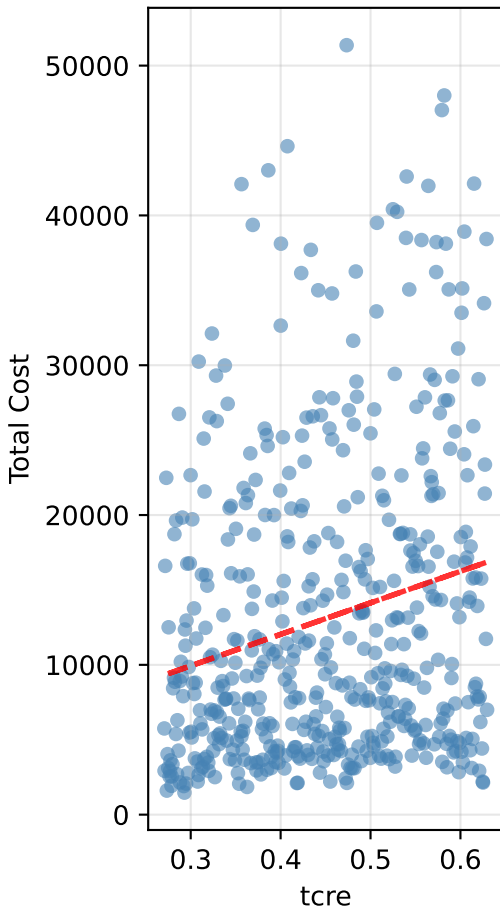


**Parameter Correlation Matrix**

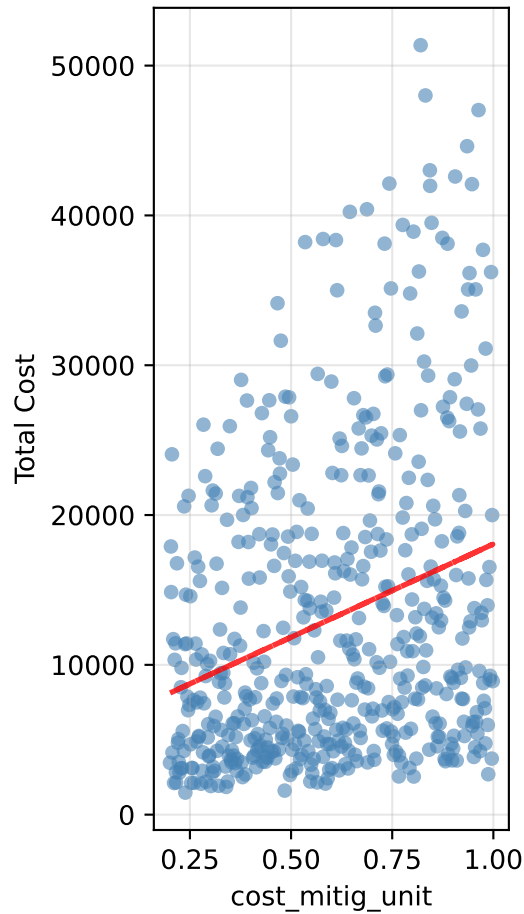


# Individual Parameter Effects on Total Cost

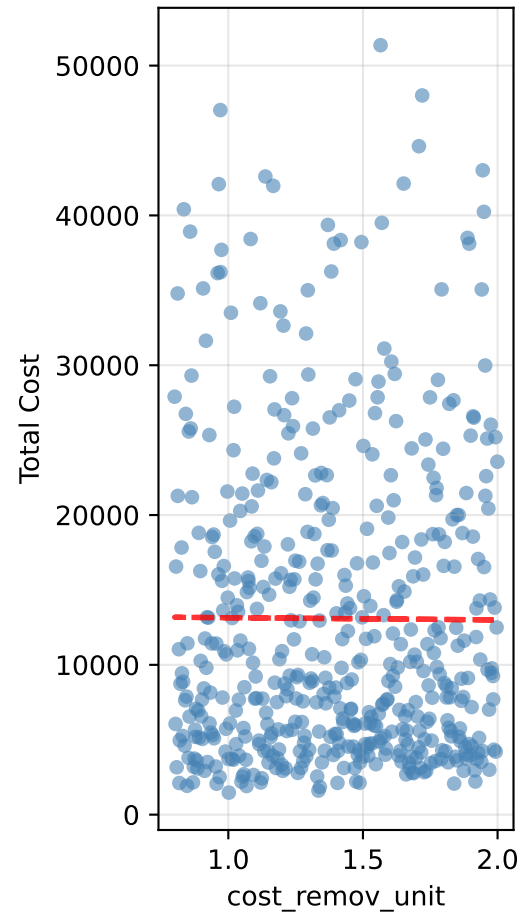
tcre  
( $r = 0.215$ )



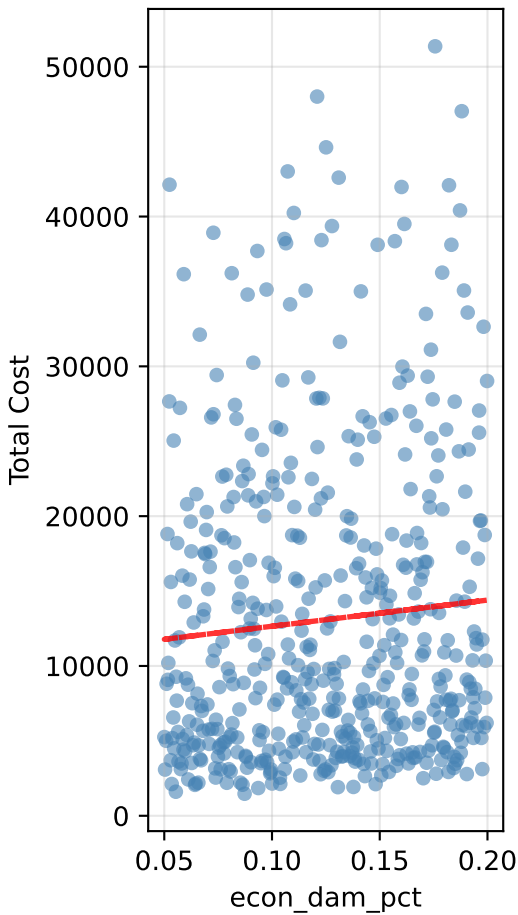
cost\_mitig\_unit  
( $r = 0.282$ )



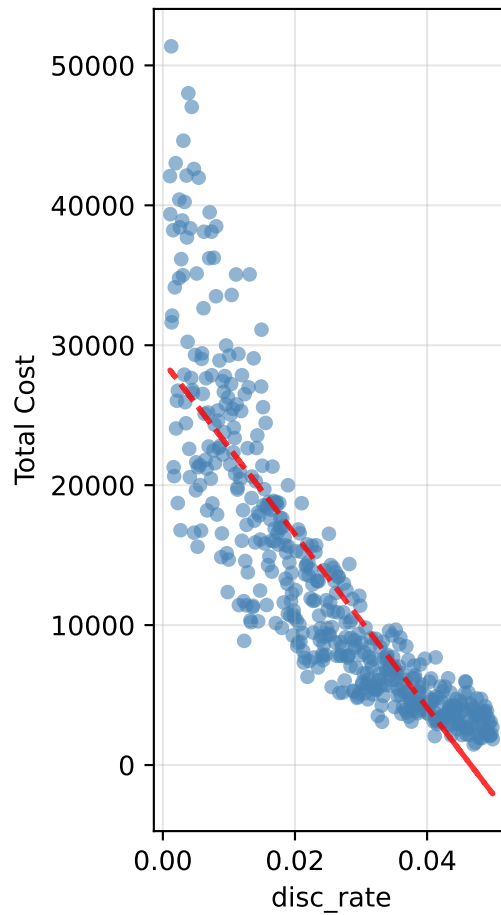
cost\_remov\_unit  
( $r = -0.005$ )

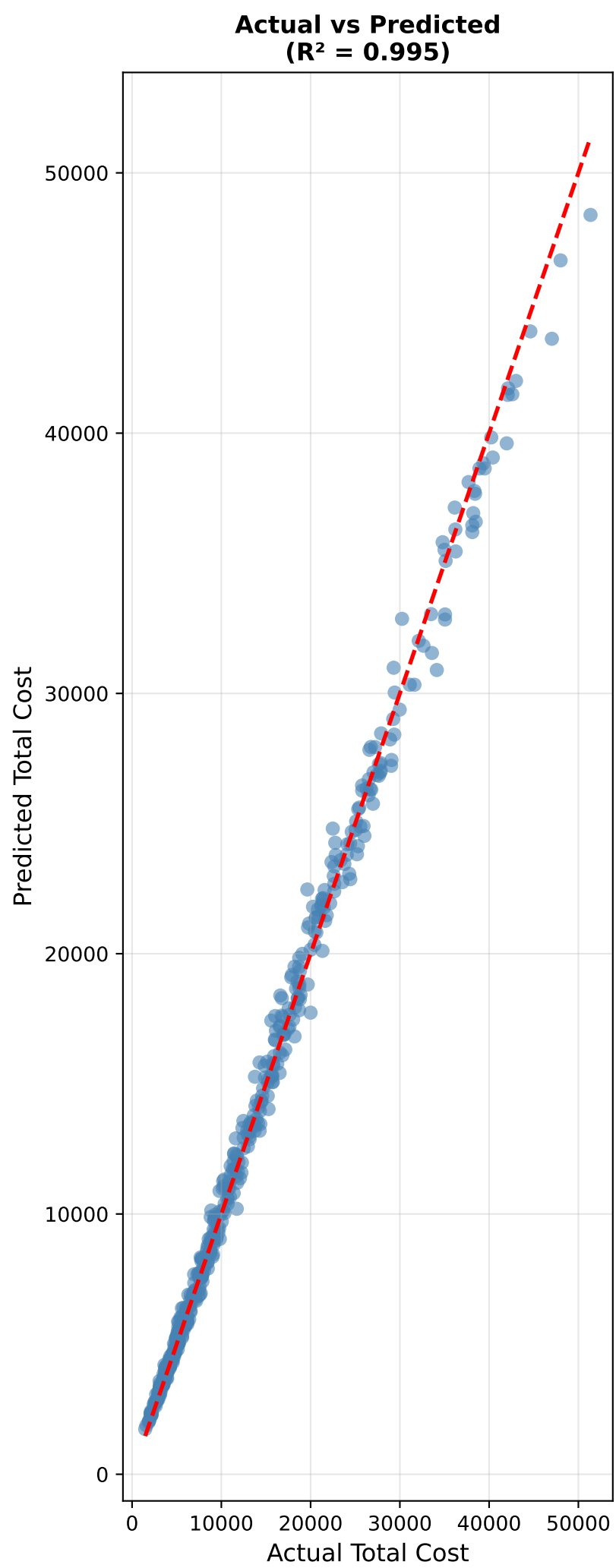
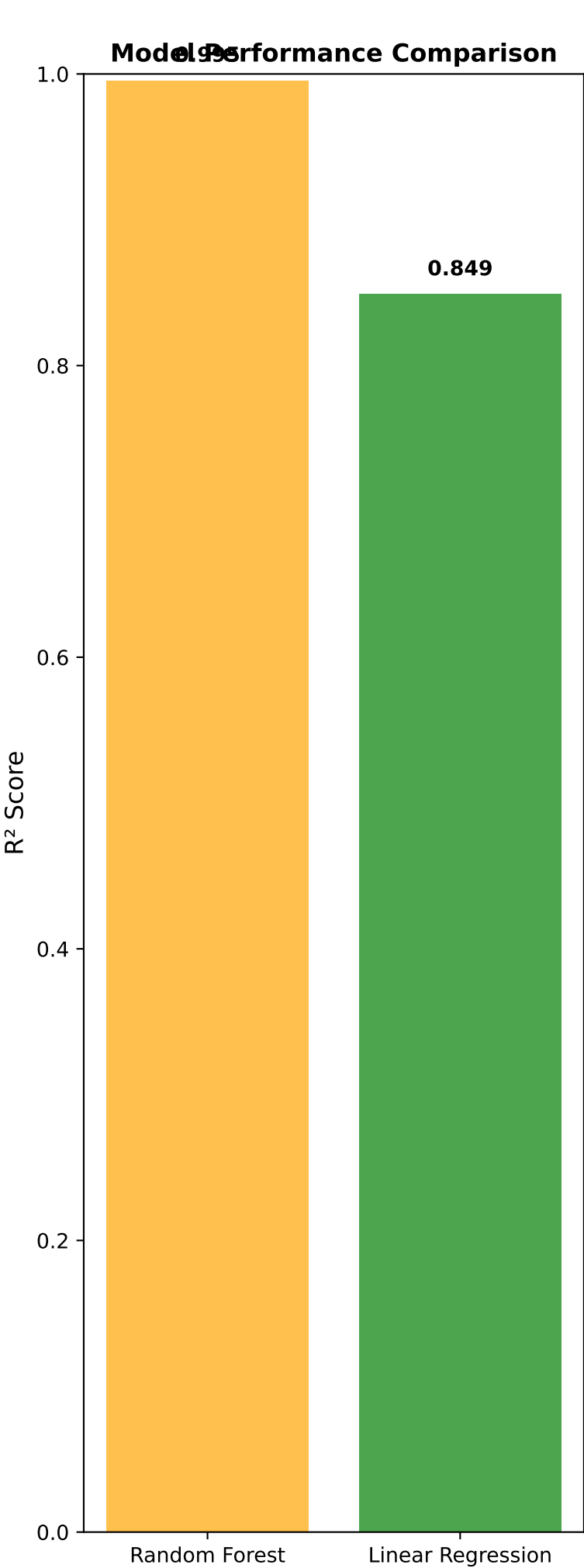


econ\_dam\_pct  
( $r = 0.074$ )



disc\_rate  
( $r = -0.861$ )





# DETAILED RESULTS TABLES

SUMMARY TABLE (All Methods):

	Parameter	Correlation	Sobol_Like	Random_Forest	Permutation	Linear_Regression	Average_Importance	Std_Importance
4	disc_rate	59.91	75.89	83.88	84.96	58.82	72.69	12.67
1	cost_mitig_unit	19.65	11.45	11.15	11.72	19.42	14.68	4.44
0	tcre	14.93	6.35	3.18	2.61	11.68	7.75	5.39
3	econ_dam_pct	5.17	2.91	1.01	0.51	7.32	3.38	2.86
2	cost_remov_unit	0.34	3.40	0.77	0.21	2.76	1.50	1.48

MODEL PERFORMANCE DETAILS:

Random Forest:

- R<sup>2</sup> Score: 0.9954
- Number of trees: 100
- Feature importance method: Gini impurity

Linear Regression:

- R<sup>2</sup> Score: 0.8489
- Features: Standardized
- Method: Ordinary Least Squares

Permutation Importance:

- Baseline R<sup>2</sup>: 0.9954
- Method: Feature permutation with Random Forest