



Making A More Desirable Film: How Budget Allocation Affects Return on Investment?

By Stuart Bovich, Advised by Dr. Drew Pasteur & Dr. Huiting Tian

Research Question

How does increased budget allocation towards below-the-line costs affect return on investment for a film?

Background

The film industry operates under extreme uncertainty. While prior research examines how total budget size relates to profitability, almost no work examines how a budget is allocated. This study addresses that gap.

Below-the-line (BTL) costs cover the technical and craft inputs that shape a viewer's experience: cinematography, sound design, editing, VFX, costumes, locations, and post-production.

Data

- IMDB + TMDb combined dataset
- 5,423 U.S. films, 2000–2025, budget > \$1M
- Dependent variable: $ROI = (Revenue - Budget) \div Budget$
- Controls: genre, content rating, runtime, release year, number of production companies

BTL Proxy

Direct BTL spending data is proprietary. This study uses award nominations in technical categories as a proxy BAFTAs, Oscars, Golden Globes, Cinema Audio Society, Costume Designers Guild, American Cinema Editors, Stunt Awards, Location Managers Guild, and World Soundtrack Awards.

Films investing more in technical quality are more likely to receive recognition in these categories. The proxy is noisy, findings are predictive, not causal.

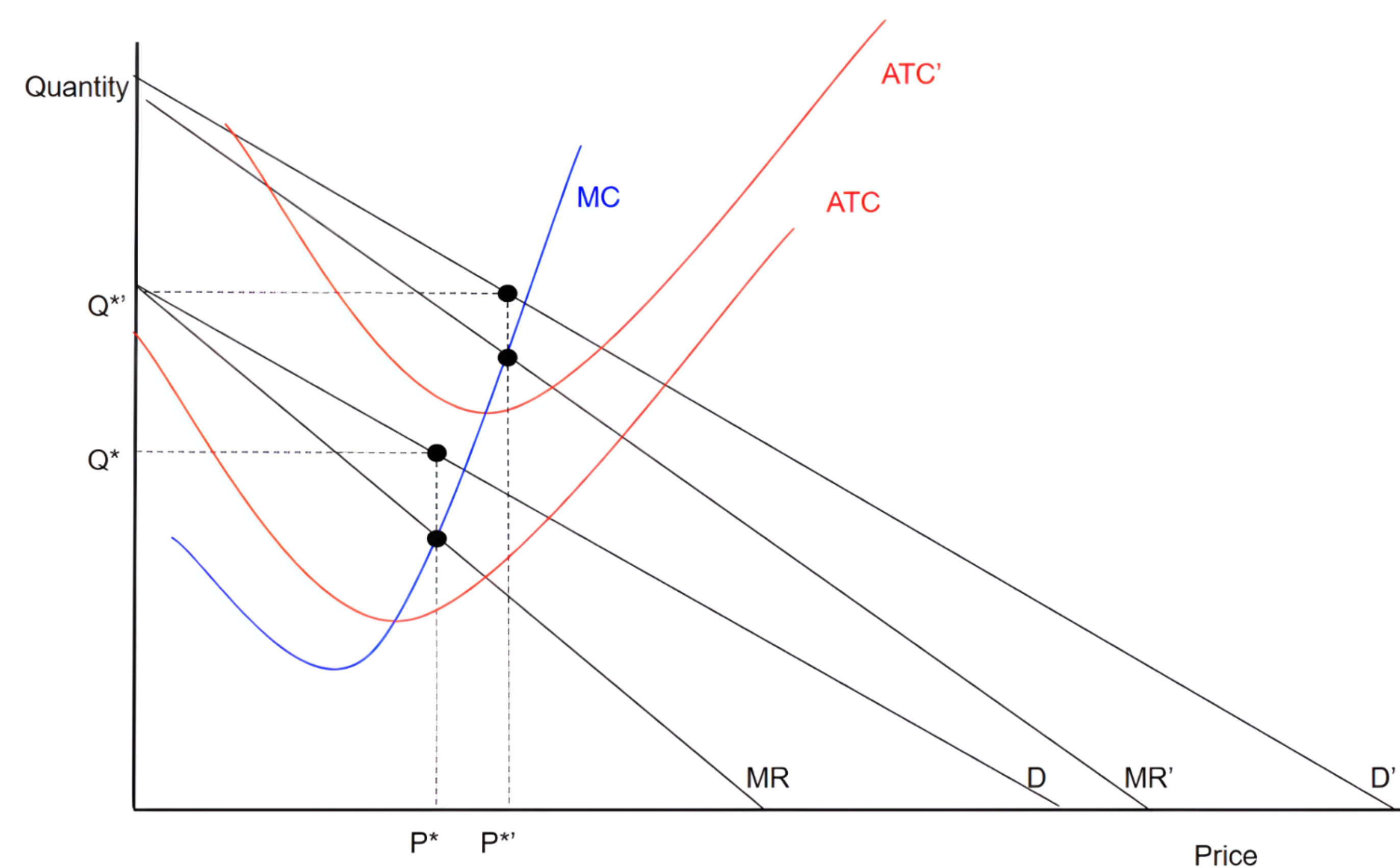
Theoretical Framework

Films are modeled as experience goods using a Cobb-Douglas utility function. BTL spending raises perceived quality q , which increases the consumer's preference weight α for films, raising willingness to pay and shifting market demand outward.

Each film studio acts as a monopolist over its own film. Higher BTL spending raises fixed costs but also shifts demand to the right. The demand response exceeds the cost increase until diminishing returns set in.

This produces an inverted-U relationship between BTL spending and ROI: early investment yields large quality gains; beyond BTL*, additional spending erodes returns.

Film Market



Methods

- OLS Regression - baseline linear model; estimates direction and significance with genre, rating, and language fixed effects; robust standard errors
- LASSO Regression - L1-penalized selection across 50+ predictors; λ chosen by 5-fold cross-validation; budget eliminated, award noms retained
- Random Forest - 800 trees, tuned (mtry=2); captures nonlinear relationships; evaluated on out-of-bag samples

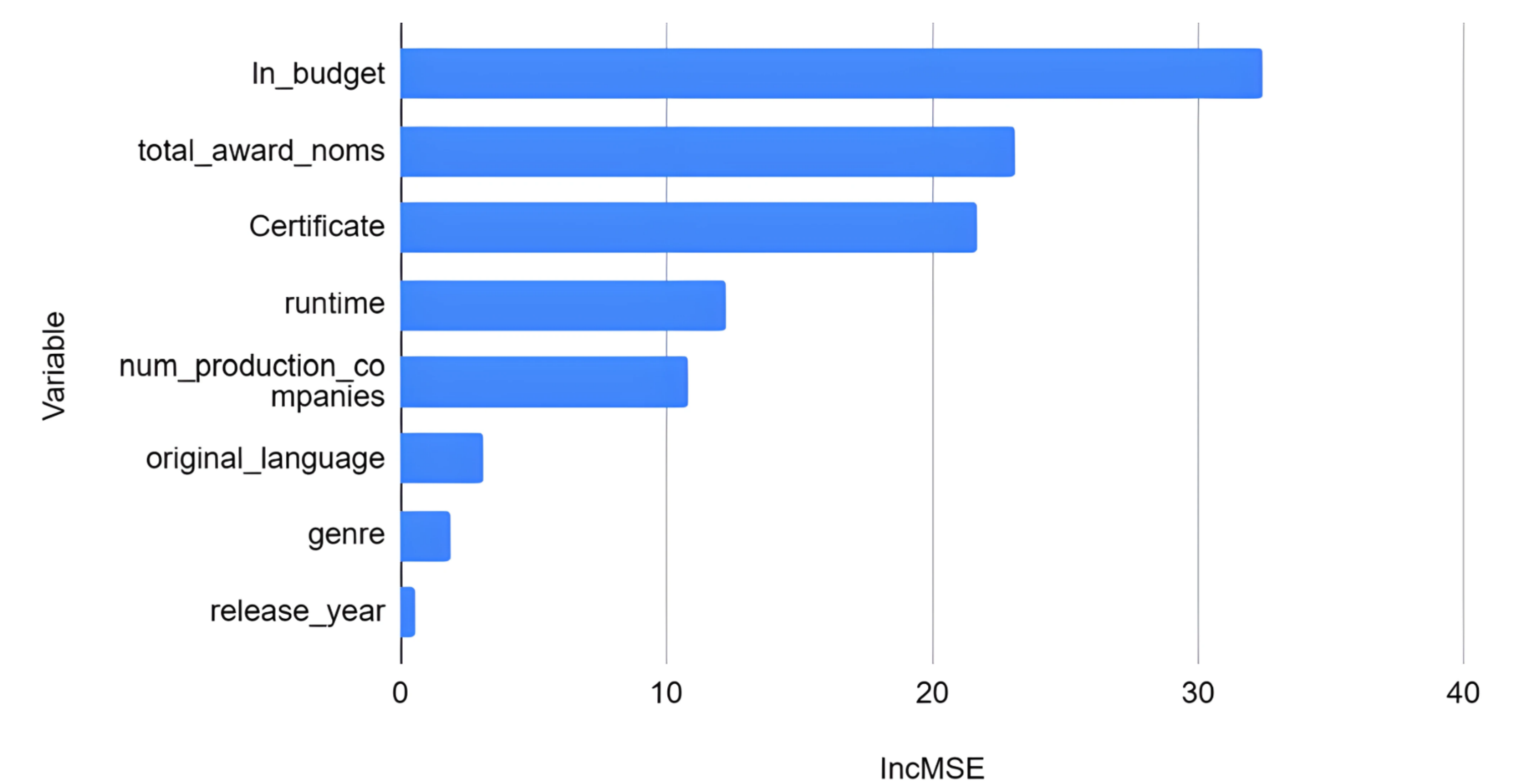
Model Comparison

Metric	OLS	LASSO	Restricted OLS	RF (Tuned)
Model Type	Linear	Penalized	Linear	Nonlinear
# Predictors	7	5	5	10
Budget Included	yes	no	no	yes
Awards Included	yes	yes	yes	yes
Rating Included	yes	yes	yes	yes
Language FE	yes	yes	yes	Low importance
Out-of-Sample Error	High	Lower	Lower	Lowest
Interpretability	High	Medium	High	Low
Primary Goal	Inference	Selection	Robust inference	Prediction

Key Findings

Award nominations, a proxy for BTL technical quality, are positively and significantly associated with ROI across all four models. Larger budgets are negatively associated with ROI. Allocation matters more than size.

Random Forest Variable Importance



Conclusion/Implications

- Budget allocation matters more than budget size for maximizing ROI
- Technical quality signals drive returns more efficiently than scaling overall spend
- Mature-audience ratings (R, Unrated) consistently predict lower ROI
- Reverse causality possible, observational data and proxy limitations apply
- Future work: direct budget data, streaming platforms, foreign markets