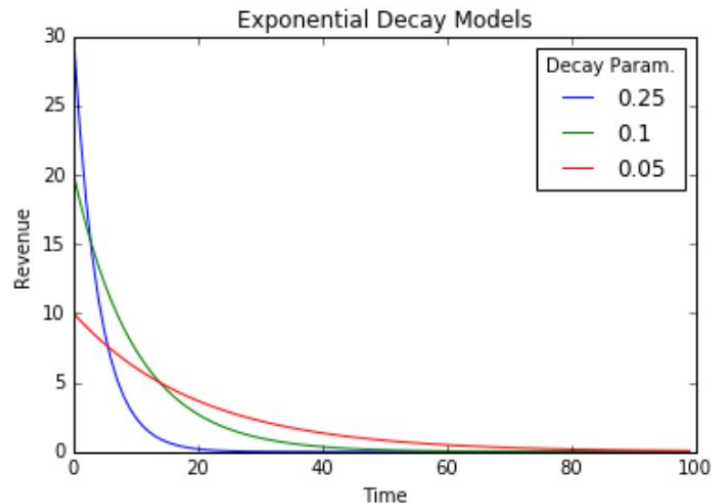# Modeling Weekly Box Office Revenue

RJ Singh

Why Do We Want Weekly Revenue Estimates?

Weekly estimates of box office figures enable:

- Predictions of in-theater longevity, creating better distribution schedules

- Performance benchmarking and goal setting

- Optimized timing for marketing spend based on expected weekly revenue

<u>Hypothesis:</u> Weekly box office gross decays exponentially.

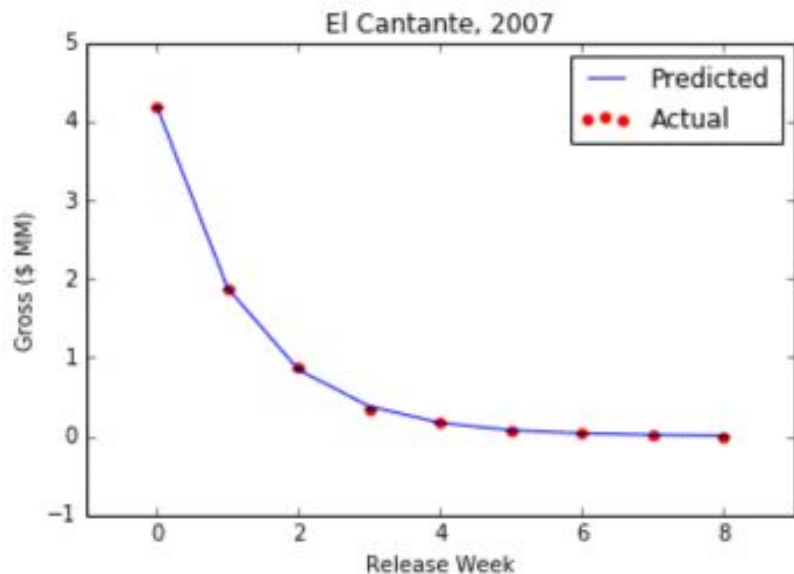To model revenue:
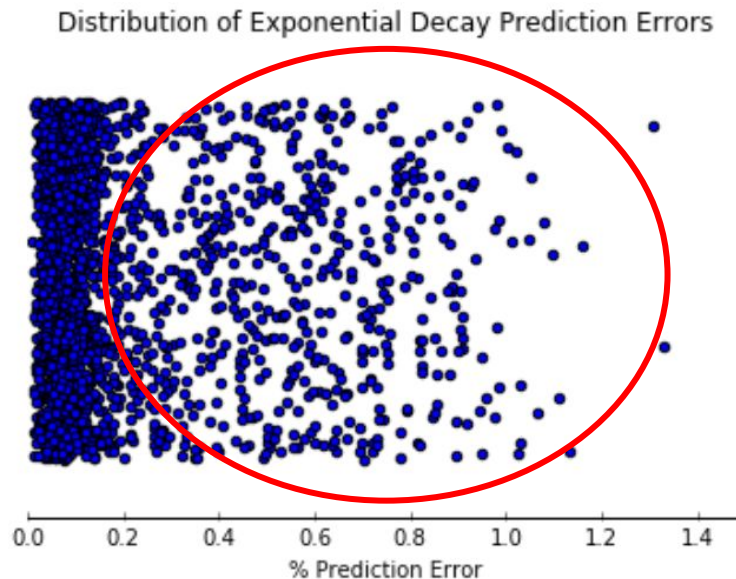
1 Confirm the movie's revenue decays exponentially

➡

2 Predict decay parameter

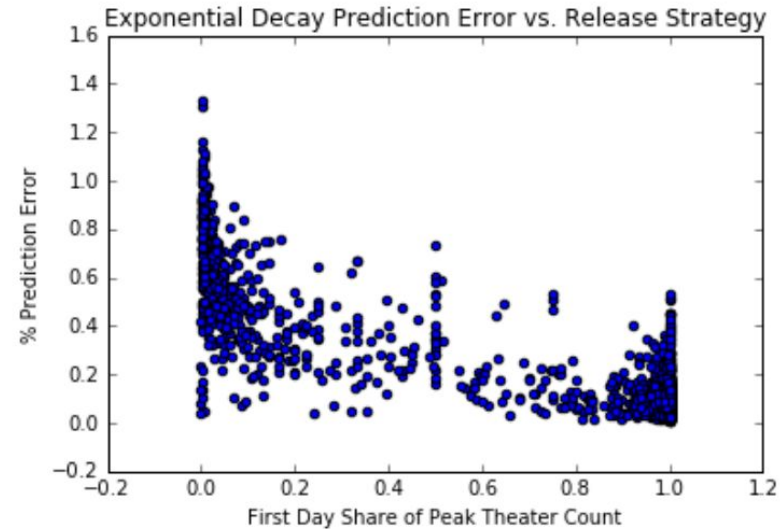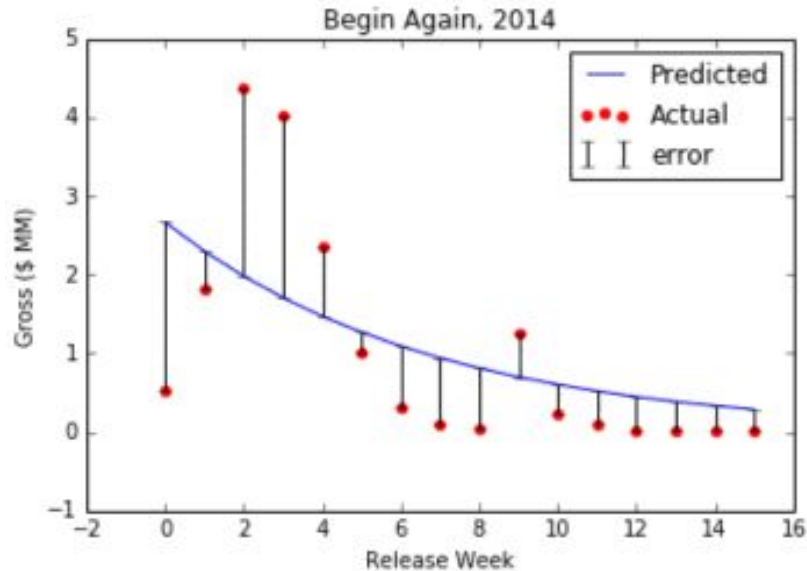# For the Most Part, Movie Revenue Exhibits an Exponential Decay

El Cantante, 2007

For most movies, ED models closely fit weekly revenue data

Distribution of Exponential Decay Prediction Errors

How do we assure our movie follows an ED pattern?

Release Strategy Plays a Significant Role In Distinguishing Movie Revenue Patterns

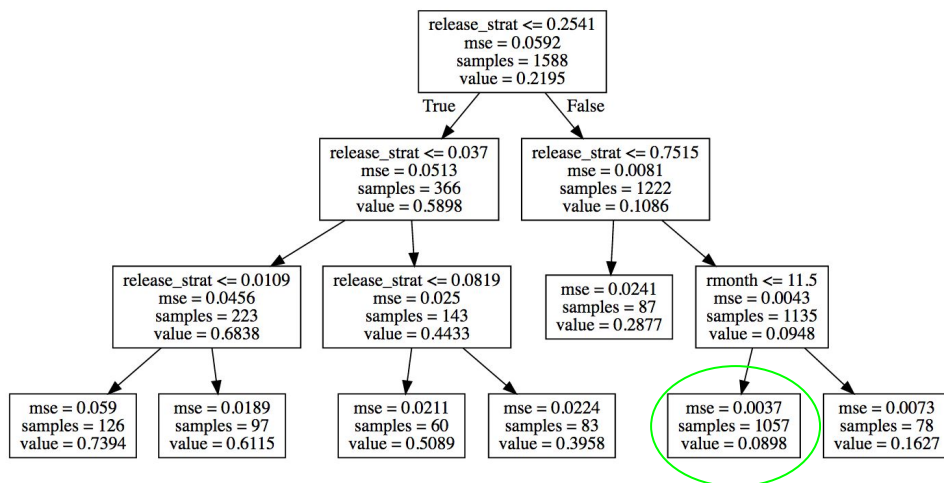Initial limited release strategies may explain cases of poor ED fit

We Can Check Whether a Movie's Revenue Will Follow ED by Predicting Fit Error

Fit Error: % error in total revenue prediction from exponential decay model ("value" below)

Tree Model Score: 0.81

Takeaways

- Starting with a limited vs. wide release mostly determines whether an ED model will work

- Even for delayed wide release movies, ED models can be applied - just consider data starting with widest release

For Movies with Reasonable Fit Error, We Can Move on to Modeling the Decay Parameter

2 Predict decay parameter
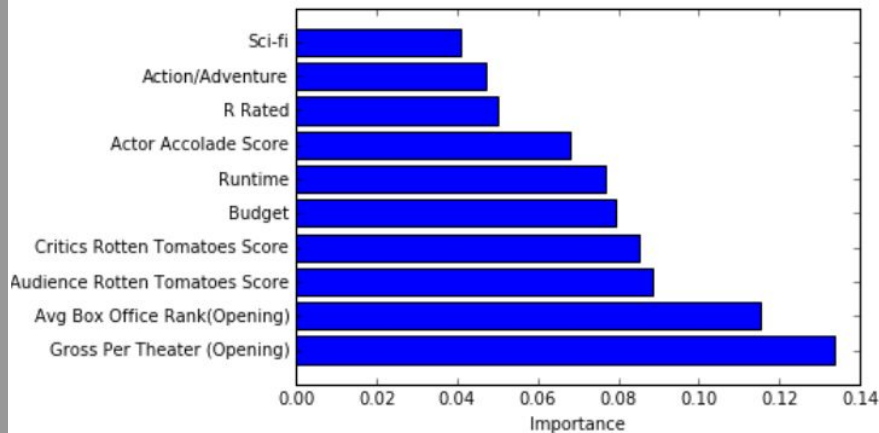
Assumptions/Constraints

- Modeling takes place after first weekend
  - We need an initial revenue figure for future predictions
  - Valuable ratings information is available after initial release
  - Model is still useful for planning remainder of movie's run

Potentially Informative Variables

- Opening rank
- Budget
- Genre
- Release Season
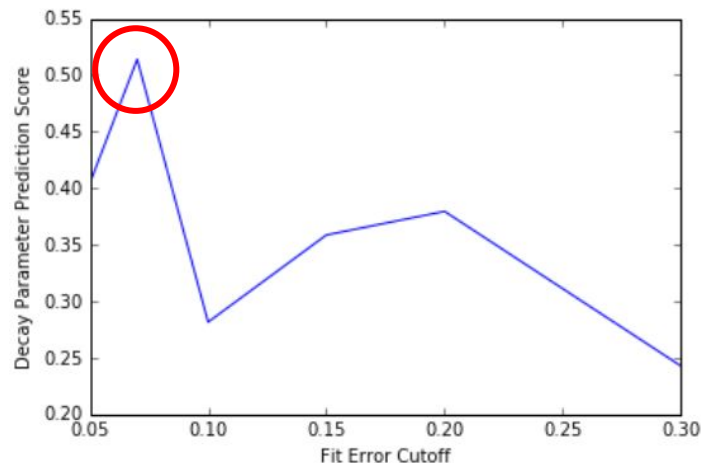- Cast Accolades
- Franchise Membership

The Decay Parameter is Heavily Influenced by Opening Metrics and the Fit Error Cutoff
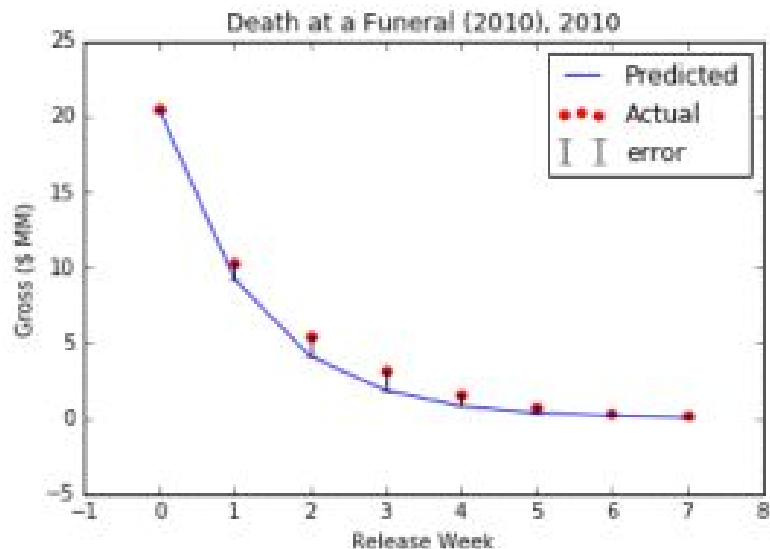
Top Model Variables

Decay Parameter Prediction Score vs. Fit Error

The top determinants of decay can be measured during opening days

Models of the decay parameter perform best for movies that follow ED

7

Weekly Revenue Predictions from the Model Reflect Observed Values

Death at a Funeral (2010), 2010

Prediction Process Recap

Estimate the movie's ED "fit error"

⬇

Assess whether fit error suggests the movie follows ED (ideally <.1)

⬇

Use opening metrics and other movie attributes to predict decay parameter

⬇

Use ED formula with decay parameter, opening gross, and week number

Exponential Decay Models Can Track Movie Revenues Over Time

- Most movies' weekly revenue follows an exponential decay curve

- Assuming we have certain data from opening weekend (average rank, per theater gross, ratings, and total opening gross), we can estimate revenue for each following week of release

Future Considerations

- Refine model for predicting fit error to improve classification of ED vs. non-ED movies
- Compile more data to improve prediction stability
- Isolate confounding effects of distributors/theaters phasing out movies from other factors causing decay