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# Investing in Movies

Presentation to the  
Institute for Quantitative Research in Finance

Procinea Management, LLC

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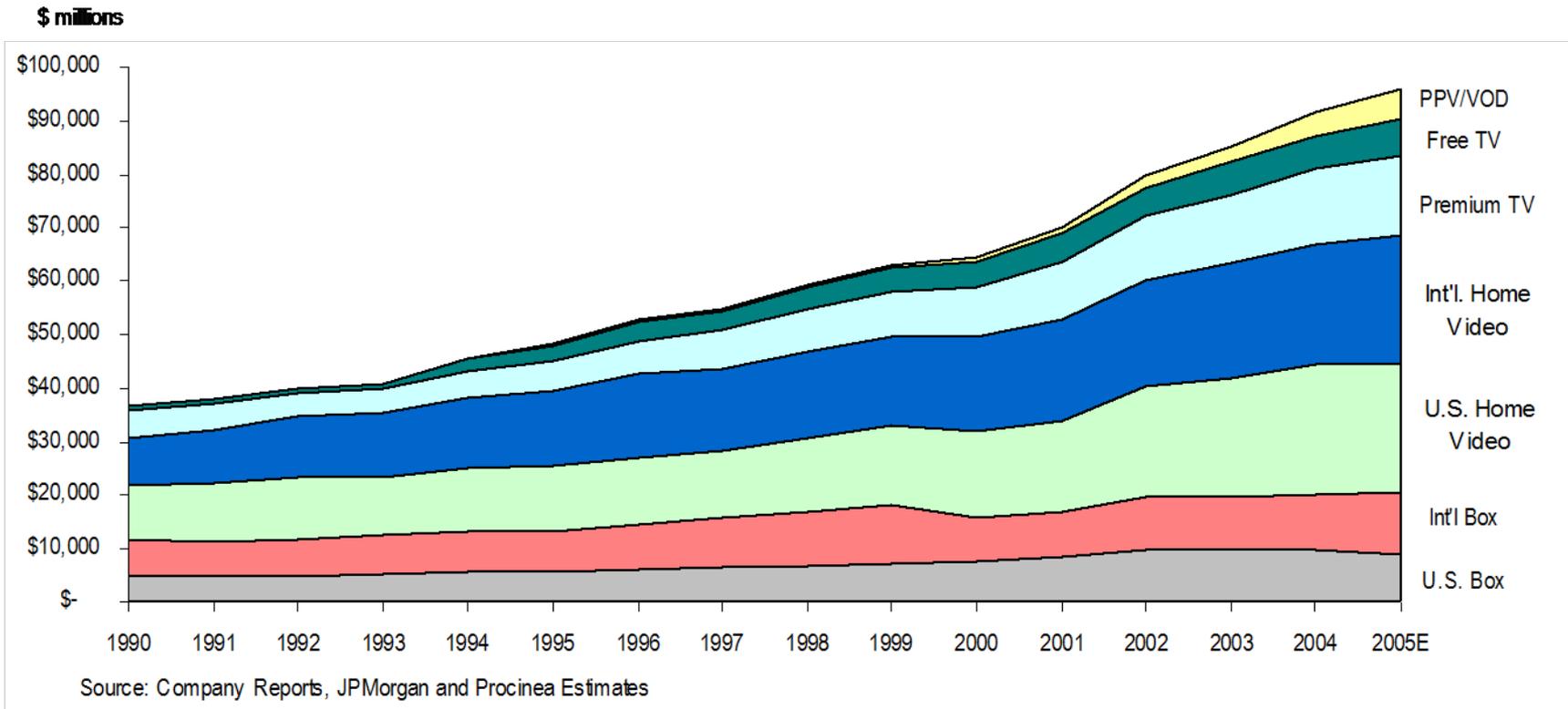
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- Movies are an Alternative Asset Class
  - Beneficiary of significant co-financing over the years, mostly tax-driven
  - Total return to the asset class not particularly exciting
- Research project to construct an active quantitative strategy to deliver attractive returns to investors
- Part of a broader initiative to analyze investment potential of Artistic and Intellectual Property

- Two major issues
  - Define appropriate contract to align interests between investors and studios
  - Identify investment strategy
- Interestingly, it appears relatively difficult to align interests
  - Investors wary because of unsuccessful attempts by previous investors
  - Participation accounting strongly favors the studio
  - Investors have historically borne studio error, bad judgment and profligate spending
  - Motion picture performance is wholly unpredictable
  - Studios saddle investors with “losers”
- Key steps in strategy research
  - Define Universe
  - Rank assets according to “valuation” model
  - Construct portfolio
  - Observe performance

1. Movie Industry
2. Prior Academic Research
3. Procinea Model Estimation
4. Strategy Results
5. Extensions

- Focus on movies distributed by the major studios and their subsidiaries
  - Ensure the movies are contracted for world-wide distribution
  - Very different from the “Indies”
- Lab for behaviorists
  - Creative vs. business skills
  - Better to fail spectacularly than succeed modestly?
  - An isolated success becomes conventional wisdom
  - “It is a miracle that any movie is ever made...”
- It is not just the box office

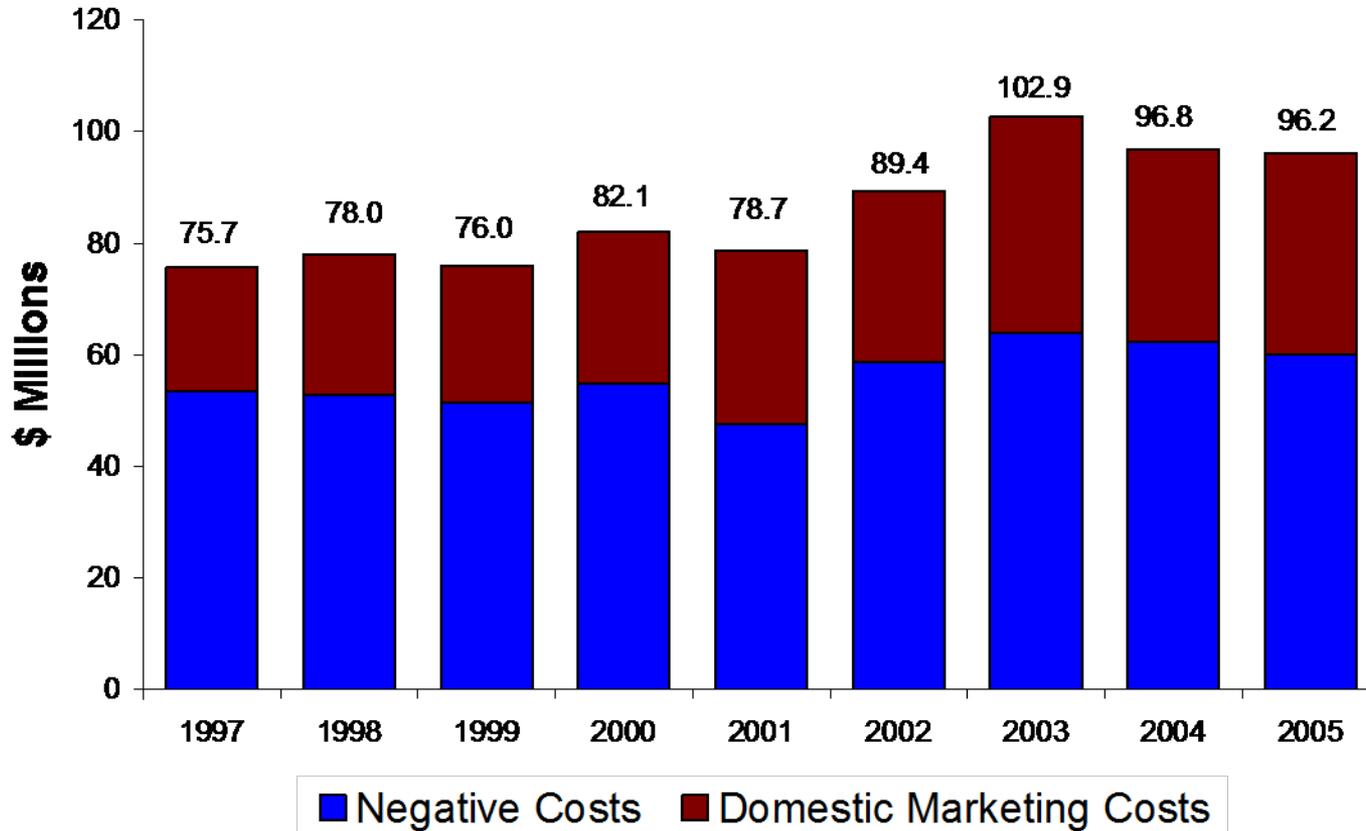


\* At retail level for all windows except FreeTV; Free TV includes network, leased cable and domestic and international syndication

- Major studios (Fox, Disney, Paramount, Sony, Universal and Warner Brothers, and their subsidiary brands) finance 100-125 titles per year
- Average production and distribution cost of each title exceeds \$100 million, creating annual funding needs of \$10 - \$12 billion
- The studios are voracious users of capital. There is a long history of studios using co-financing partners
- Procinea estimates a funding gap of \$5 billion or more per year—and this gap is liable to increase as the number of films and costs per film rise

# Average Cost of Major Studio Feature Films

Movie Industry

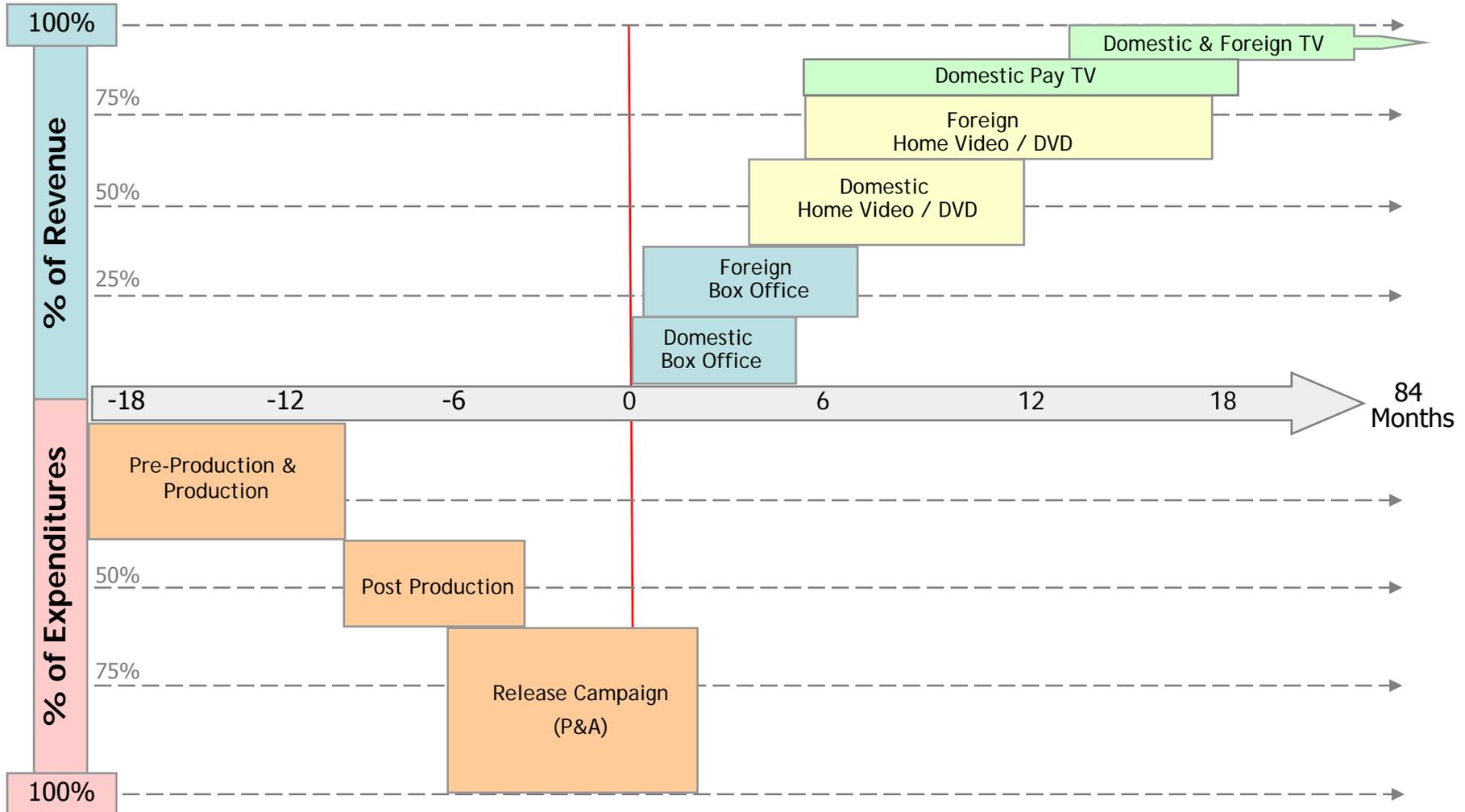


Source: Motion Picture Association of America

- Average production cost of \$60-70m
- Production cost incurred over 12-18 months
- Prints and Advertising (“P&A”) can be as much or more than production cost
- Revenue earned relatively quickly after release, but with a long tail
  - 60% of revenue in first year of release
  - Almost 90% by end of second year
- We focus on “first cycle” revenues, ignoring library value

# Film Life Cycle

## Movie Industry

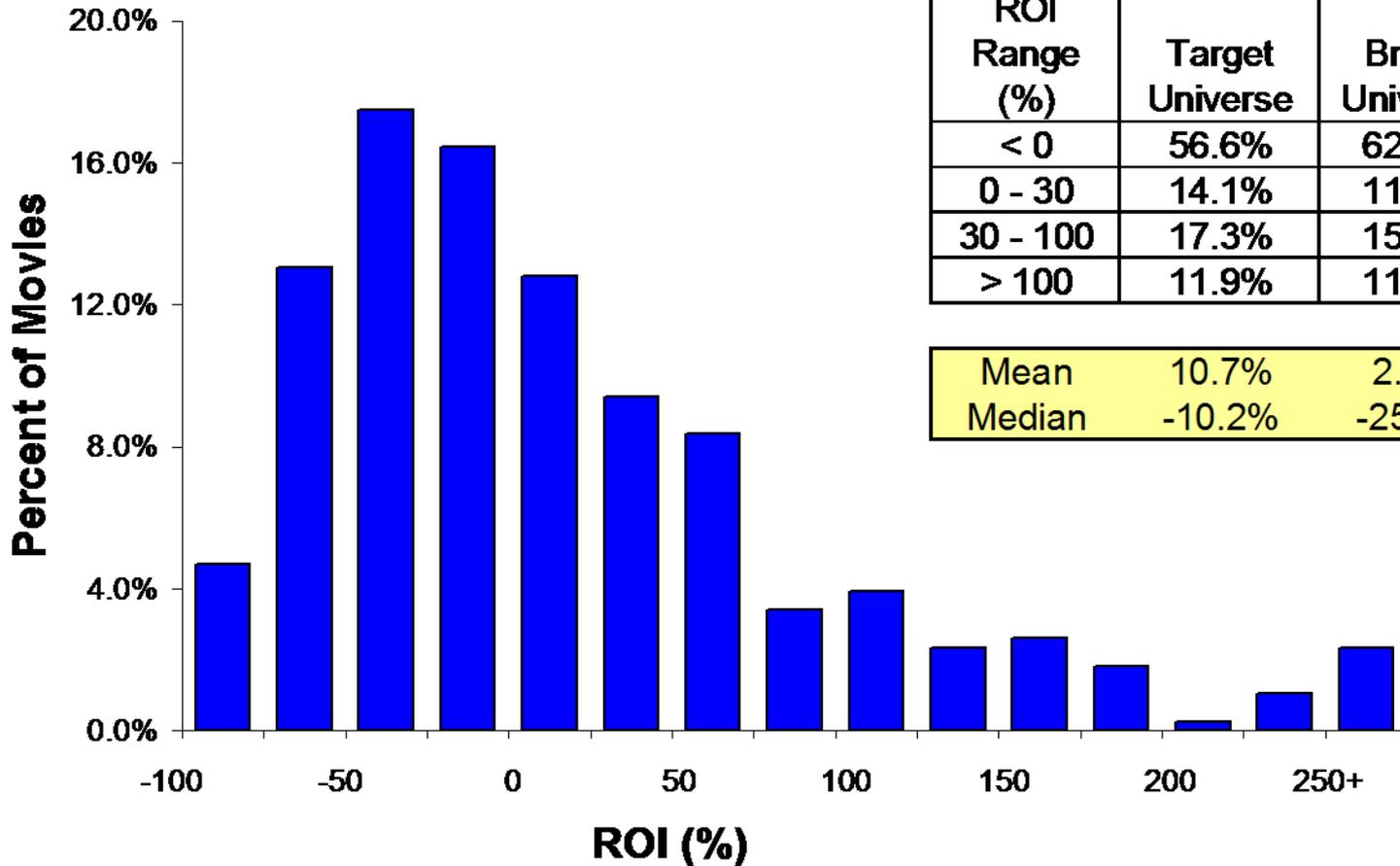


- Studios demand increasing financing to fill distribution windows so require outside investors
- Investors could wait until the movie is finished before investing, but this subjects them to adverse selection
- Assumes that studios have superior information
- The stories of *Starman* and *Titanic*
- Alternatively, investors could partner with the studio at “greenlight” and bear risk pari passu with the studios

- 1627 movies**
  - Broad universe
    - Movies released theatrically in U.S. or Canada
    - Minimum production cost \$2m
    - Exclude unrated and foreign productions
  
- 836 movies**
  - Estimation universe
    - Minimum production cost \$15m, maximum \$125m
    - Exclude sequels, animation, documentary, and NC-17
  
- 588 movies**
  - Target universe
    - Financed (or co-financed) and distributed by a major studio

# Distribution of Target Universe ROI

Movie Industry



ROI Range (%)	Target Universe	Broad Universe
< 0	56.6%	62.3%
0 - 30	14.1%	11.1%
30 - 100	17.3%	15.1%
> 100	11.9%	11.5%

Mean	10.7%	2.6%
Median	-10.2%	-25.0%

ROI = (Total Revenue / Total Cost) - 1  
 Movies released from 1997 to 2004

- Why so many losers?
  - Approximately 60% of movies fail to cover costs
- Suggests that studios cannot predict the outcome of a movie
  - Danger of adverse selection possibly not as great as previously thought
- Also suggests an active investment strategy
  - Forecast (net) revenues for each movie
  - Only invest in those movies where forecast revenues are “large enough”

- Limited universe of movies
- Revenue is clearly a non-linear function of movie attributes
- Interactions between the attributes likely to be very important
- Many interesting movie attributes are not publicly available (e.g., actor compensation)
- Not an optimistic sign that the studios cannot predict success
- Academic literature generally negative

- Substantial academic literature
- Recent works that analyze financial characteristics
  - Ravid (1999), Postrel (2000), Vogel (2001), De Vany (2004)
- Findings include
  - Highly skewed distribution of returns
  - Large budgets, movie stars no guarantee of success
  - Little evidence that movie attributes affect performance
  - Attributes studied include
    - Budget, stars, sequels, genre, ratings, screens, box office life, year of release
- Connection to literature on project finance (Berk et al.)

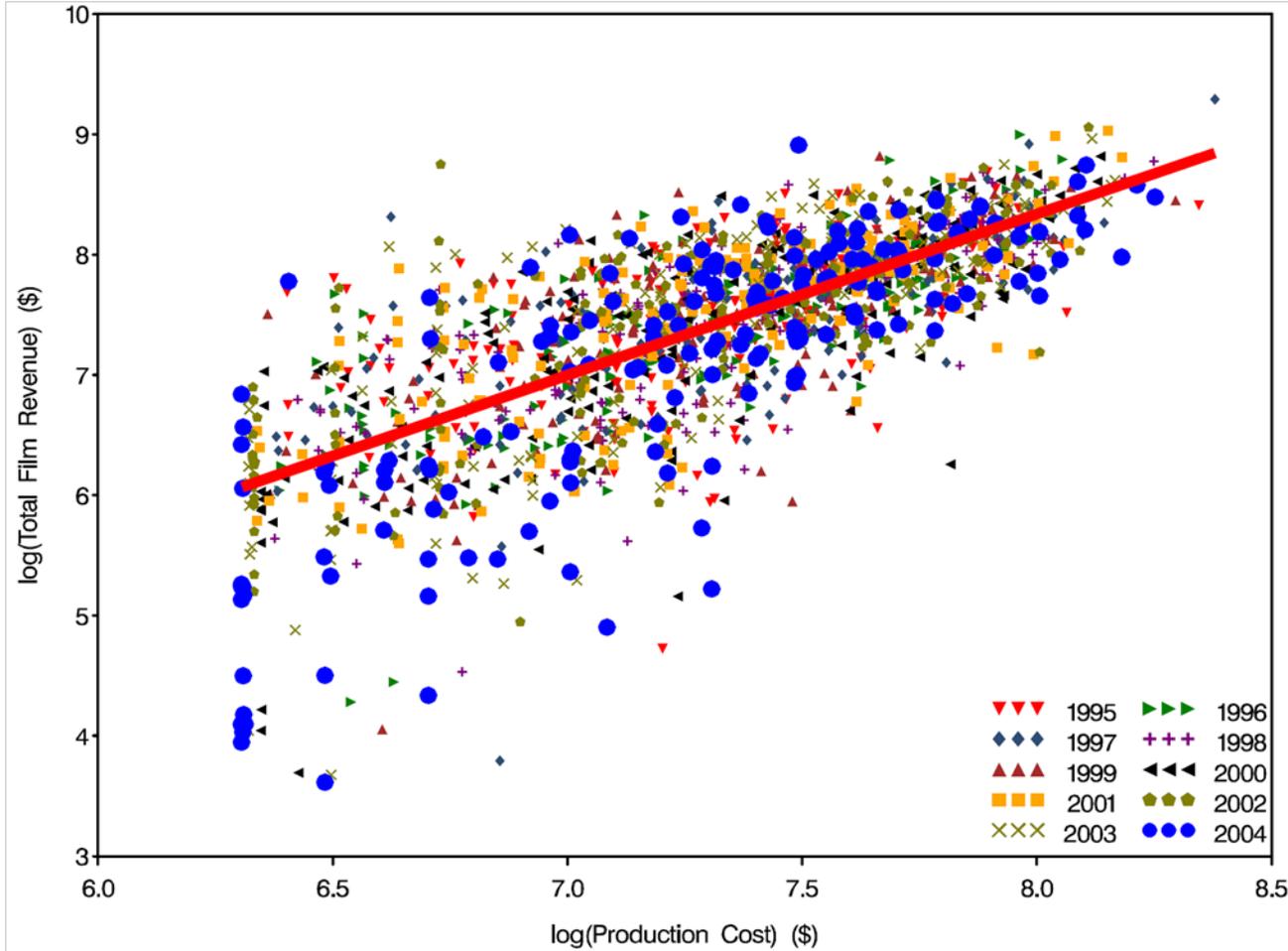
- "...most major-distributed films do no better than financially break-even," Vogel (2001), p.97
- "Most movies are unprofitable. Large budgets and movie stars do not guarantee success. Even a sequel to a successful movie may flop," De Vany (2004), p.82
- "...forecasting revenue is futile...," De Vany (2004), p.90
- "The financial performance of a movie is unpredictable because each one is unique..." Vogel (2001), p.97
- "There are no formulas for success in Hollywood," De Vany (2004), p.98
- "Most stars do not really make a difference," Postrel (2000)
- "Nobody knows anything," Goldman (1983)

- Total revenue is driven by audience appeal
- Why not model return?
  - Fractional share of investment in each project is fixed
  - Advertising effect in denominator mitigates outliers
- Guiding principles for sparse data
  - Sensible
  - Simple
  - Stable

- Unfortunately no single data source is complete
- Collect data from standard industry data sources
- Augmented with extractions from on-line entertainment media, media research reports, etc.
- Define and collect movie attributes not provided by vendor and industry sources
  - E.g., cast billed order, story elements, etc
- Data cross-referenced and cross-validated to achieve a “Compustat-like” database
  - Includes more than 7,800 films, up to 70 data points/movie
- Many interesting items still confidential to the studios
  - E.g., star compensation

# Production Cost Is an Important Factor

## Model Estimation



Data: March 2005

- Power law with exponent greater than one
- In-sample explanatory power is a strong function of range of cost
- Lower-budget movies are riskier
- Prior to video release, recent movies appear to underperform

- Procinea's proprietary hit ratio  $D$  quantifies past financial performance of director
- Correlation of cost  $C$  and hit ratio is 0.34
  - Both factors and their interaction are significant predictors of revenue  $R_i$  of movie  $i$  according to OLS
- Naturally handle interaction and heteroskedasticity

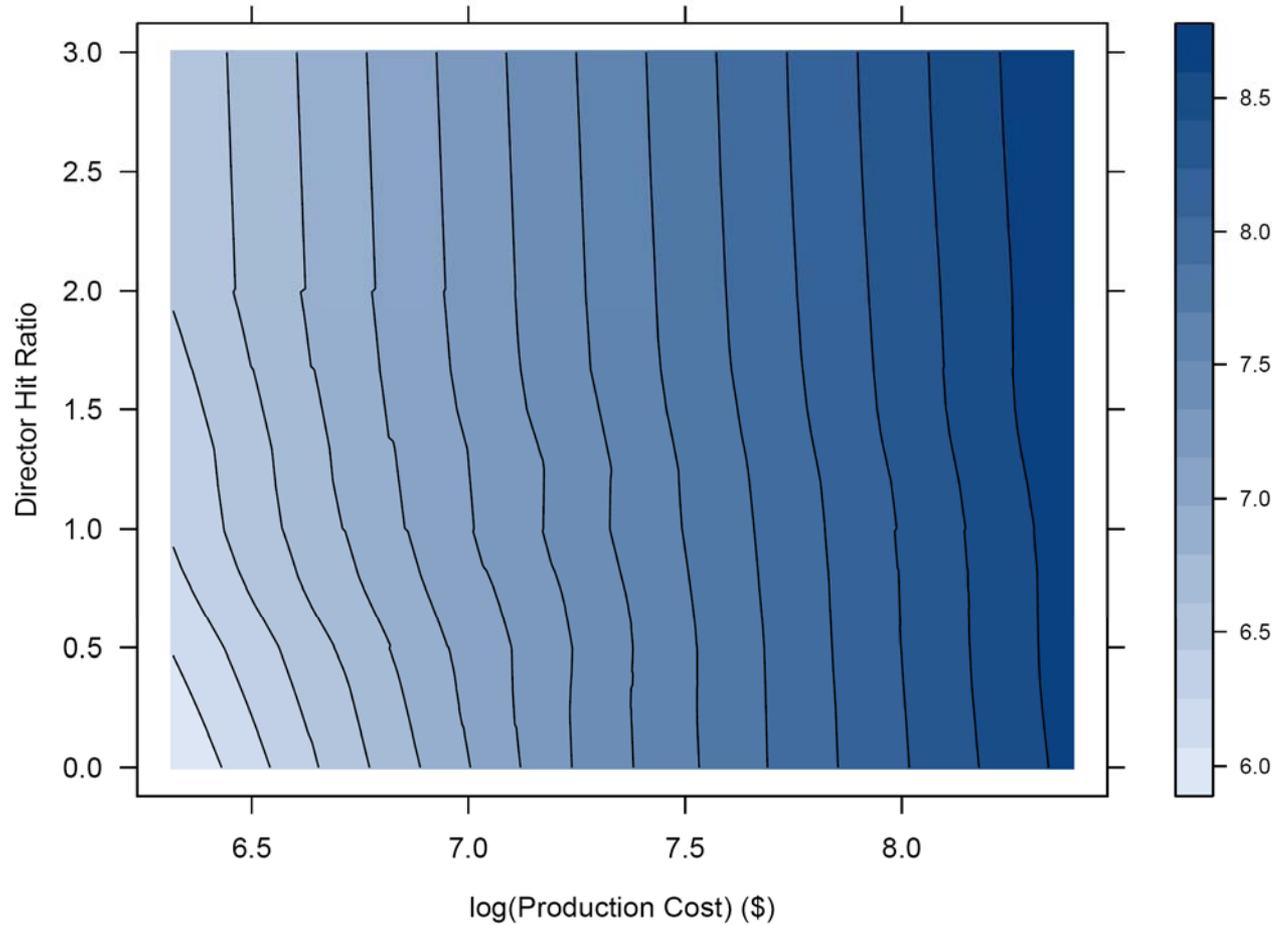
$$\log R_i = a_1(C, D) \log C_i + a_2(C, D) D_i + \eta_i$$

$$w_i = \left[ 1 - (d_i/d_N)^3 \right]^3 \quad \text{Tricubic weight}$$

$$d_i = \left[ (C_i - C)^2 + (D_i - D)^2 \right]^{1/2} \quad \text{Euclidean distance}$$

# Director's Track Record Matters

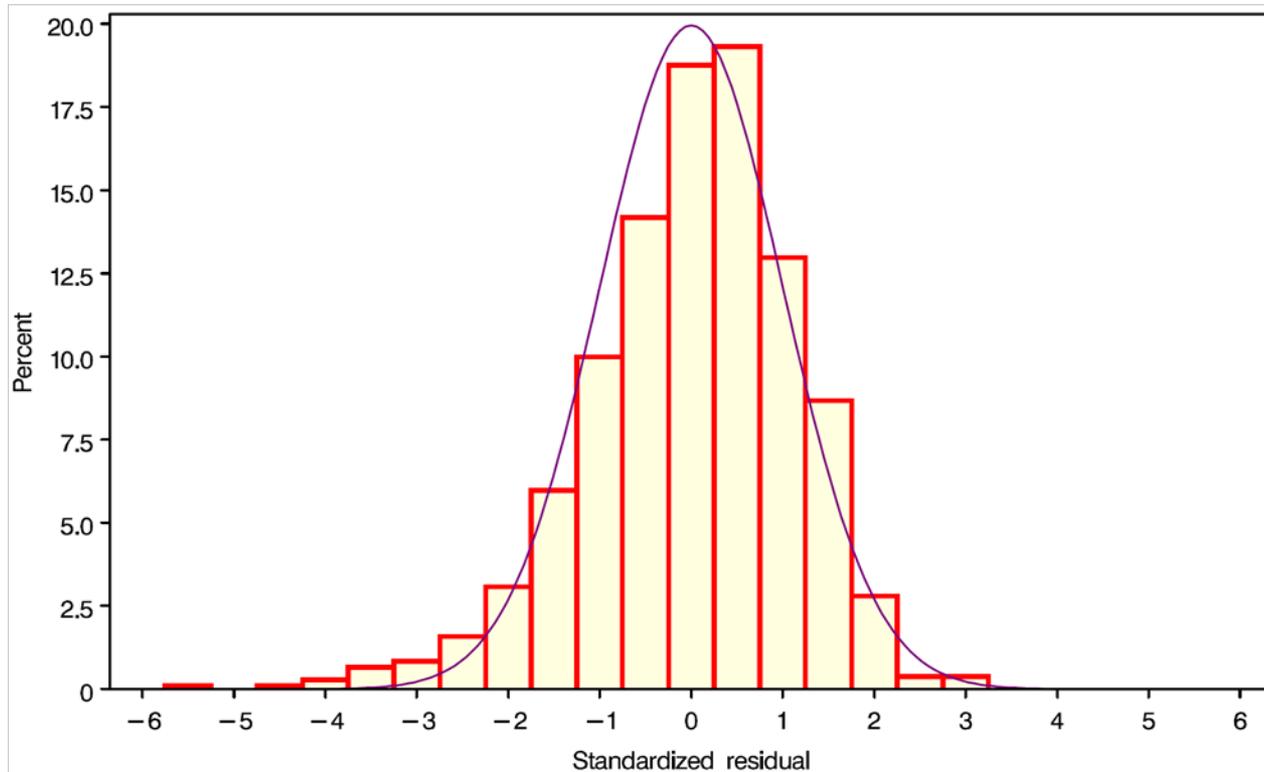
## Model Estimation



- Better director increases  $\log(\text{Revenue})$  for any budget
- A little skill really helps a small project
- A little cash really helps a struggling director
- Excellent directors cannot outperform if cash-constrained

Data: September 2005

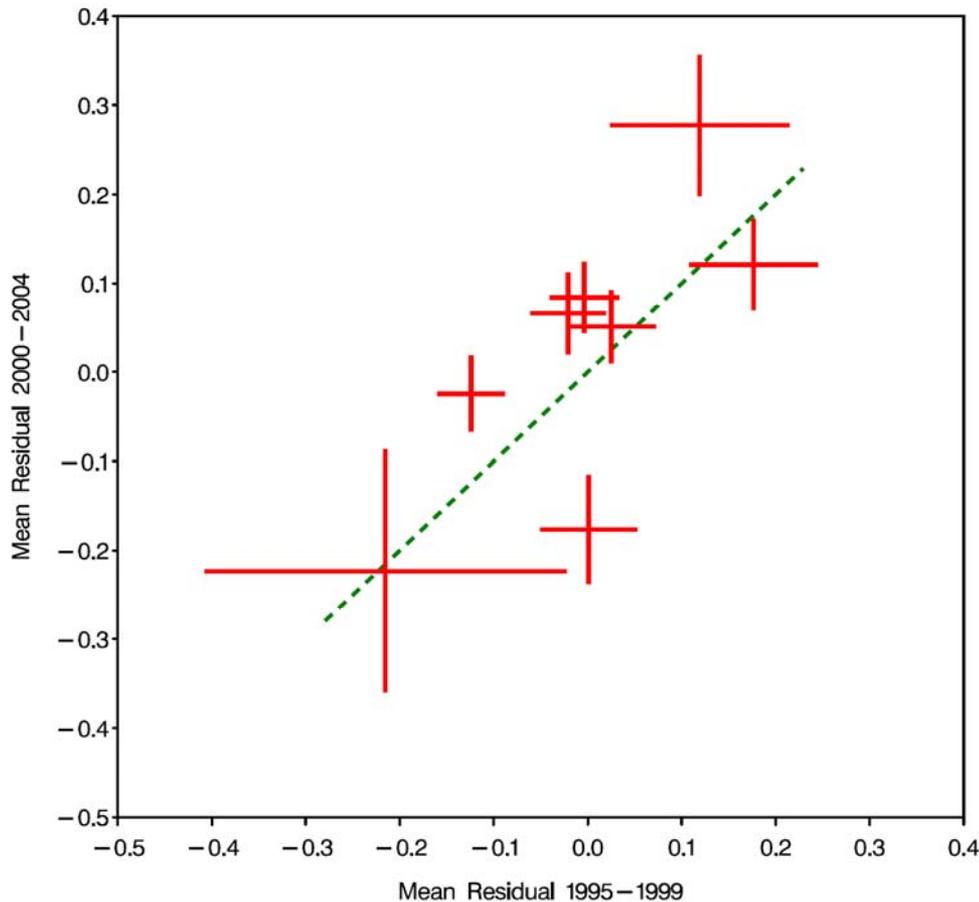
- Fit cost-dependent risk  $\sigma(C)$  to squared residuals after accounting for production cost and director
- Distribution of standardized residual  $\eta_i/\sigma(C)$



	Summer	Holiday	Off Season	Full Year
1995-1999				
G, PG, PG-13	0.21 13%	0.01 10%	-0.03 26%	0.04 49%
R	0.05 9%	0.00 10%	-0.08 33%	-0.04 51%
2000-2004				
G, PG, PG-13	0.17 15%	0.06 13%	0.01 34%	0.06 63%
R	0.02 5%	-0.07 7%	-0.13 25%	-0.10 37%

- Mean residual  $\eta_i$  and fraction of movies in each cell
- Typical standard error of mean residual = 0.05
- Season and rating effects are significant at the 95% level
- Interaction of season and rating is not significant

## Model Estimation



- Primary genre from Nielsen
- Genres combined until none contains fewer than 30 movies
- Mean residual in each genre computed for two sub-periods
- Analysis of variance shows significant explanatory power in each sub-period
- Correlation shows significant persistence

	Intercept	$M_{raw}$	$M_{neut}$	Adjusted $R^2$
Mean		49.5	0.0	
Std Dev		17.0	16.4	
Raw Metascore	-0.275 (-5.98)	0.00665 (7.57)		6.9%
Genre Neutral	0.054 (3.70)		0.00843 (9.40)	10.3%

- Metascore® between 0 and 100 from metacritic.com
- 763 movies from estimation universe, 1995-2004
- Perfect foresight test, not model component
- Like a valuation ratio, performs better when genre neutral
  - Action, Comedy, Drama, Horror, Romance, Sci-Fi, Thriller, and Other
- Two standard deviations is an 89% increase in revenue

	Young Protag	Male Protag	Happy Ending	Adjusted $R^2$
Mean	0.179	0.771	0.791	
De-Meaned	0.145 (2.76)	-0.086 (-1.82)	0.067 (1.37)	3.0%
Genre Neutral	0.165 (3.08)	-0.087 (-1.75)	0.065 (1.26)	3.4%

- Manually collected story surveys
- 397 movies from estimation universe, 1995-2004
- All variables are de-meaned before regression
- Story elements influence revenue independently of their correlation with genre

- Sensible
  - Production cost
  - Talent (director, actor, writer, producer, ...)
  - Studio
  - Rating
  - Season
  - Genre, story elements, demographics
  - Run time
  - Interactions (teams repeat, stars specialize by genre, ...)
- Excluded to prevent look-ahead
  - Advertising expense
  - Opening screens
  - Prediction markets ([hsx.com](http://hsx.com))

## 1. “No one knows anything”

- Average revenue of past movies in estimation universe
- EWMA with 5 year half life

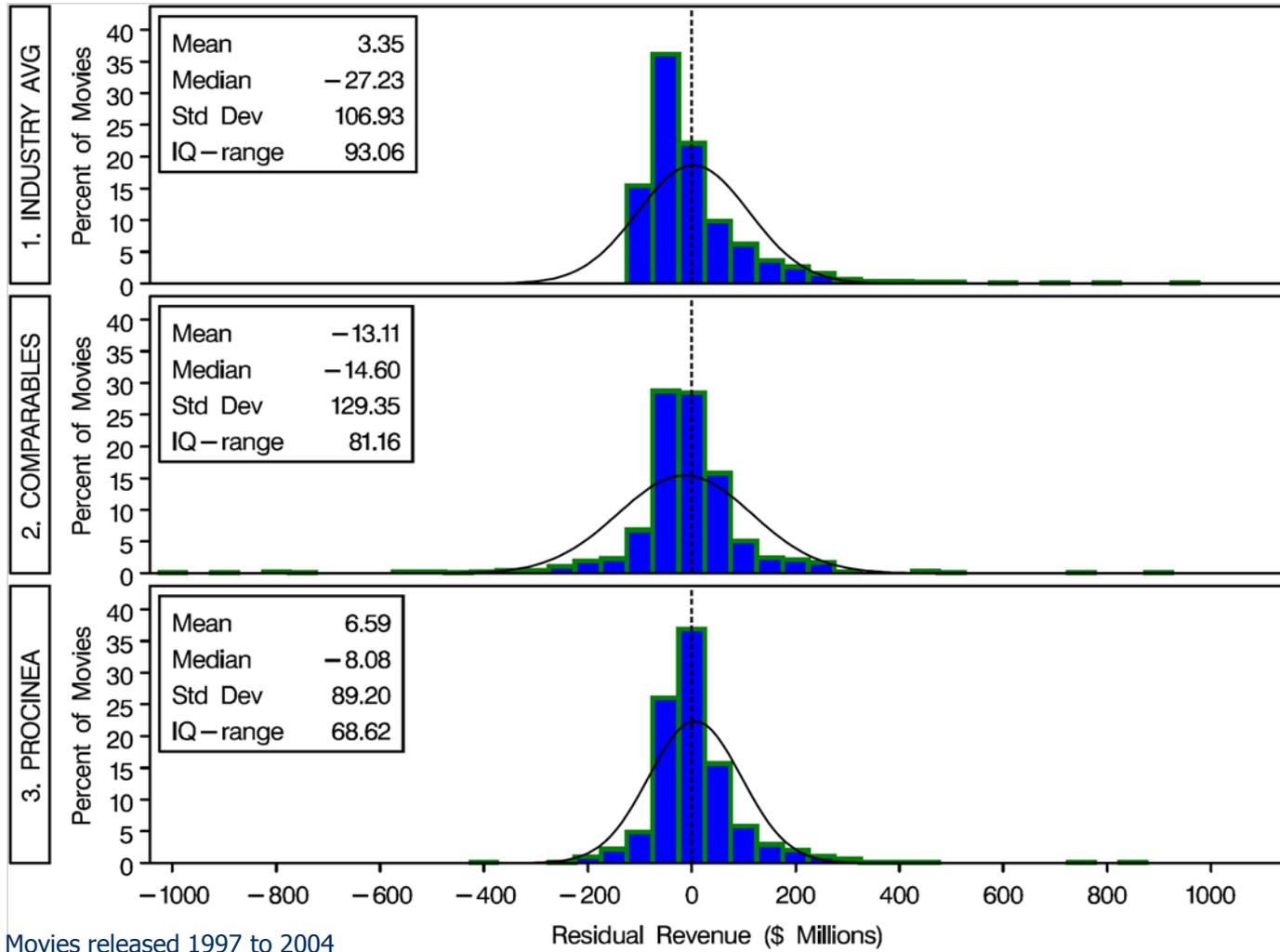
## 2. Average over comparables in one of roughly 60 clusters

- Production cost
- Talent
- Rating
- Season
- Genre

## 3. Procinea revenue model

- All models updated monthly using realistic lags
- Out of sample test in estimation universe

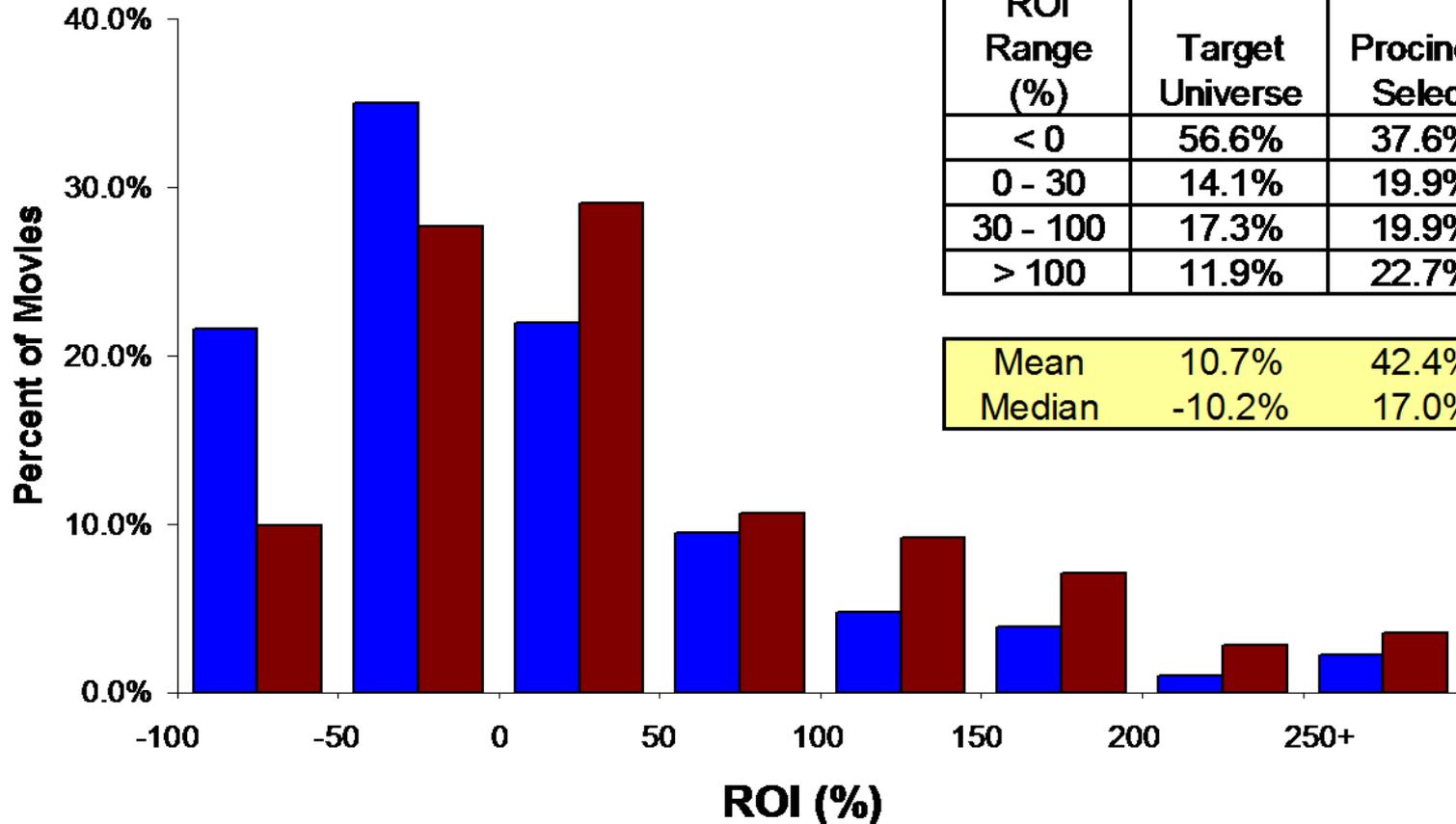
## Model Estimation



- Decision rule for each movie
  - Given attributes at greenlight, model predicts total revenue
  - Total revenue is divided among channels according to historical fractions
  - Channel revenue is scheduled according to historical time envelopes
  - Value is estimated as the present value of these cash flows at a fixed required rate
  - Project is accepted if value exceeds fully loaded production cost, including a cost-dependent estimate of P&A
- 141 movies selected from 1997 to 2004
  - 24% of target universe

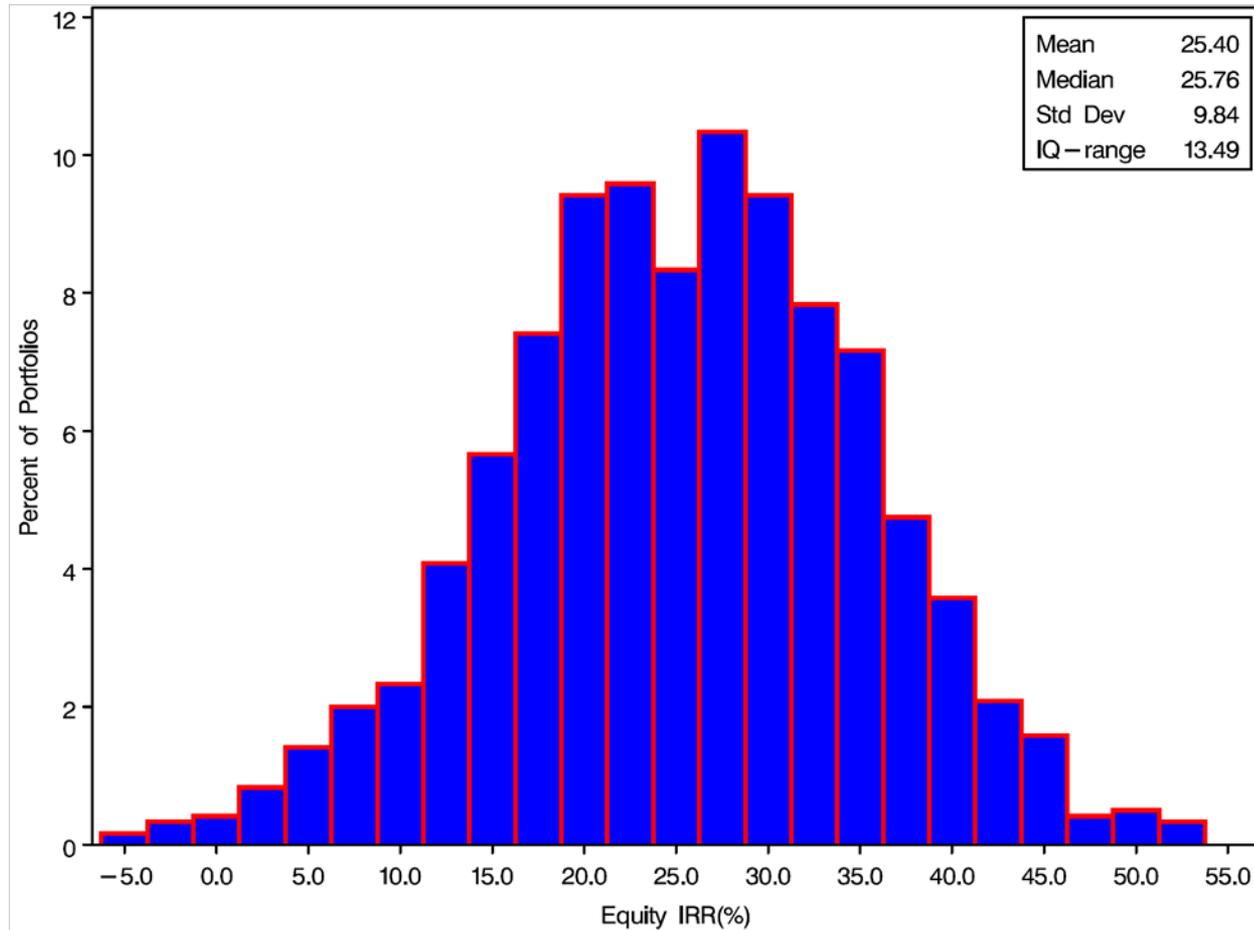
# Movies Selected by Model Have Superior ROI

## Strategy Results



■ Target Universe ■ Procinea Select

- Model can inform a strategy
  - Valuation and risk assessment are used to negotiate with studio
- We simulate performance of hypothetical investor
  - Starting November 1998, each month at most one movie is chosen from those selected by the model, if any
  - Time from initial investment to release is stochastic 14-18 months
  - Continue until \$1b total investment in \$2b of production and P&A
  - Funded with \$400m equity, remainder debt
  - Diversified, multi-studio portfolio of 15-20 films created in 2 years
  - Timing of cash flows assumed consistent with historical experience
  - Simulation pays studio distribution fee and participations
  - Repeat for subsequent inception dates
- Fundamental independence of movie projects simplifies portfolio construction



- 1% of simulations give negative IRR

- Artistic and Intellectual Property
  - “The sheer volume of intellectual property worldwide is staggering,” Borod (2005), p.65
  - Patents
    - Intellectual Ventures, Ocean Tomo, RIM vs. NTP, LabCorp vs. Metabolite
  - Other areas
    - Pharmaceuticals, video games
- Non-linear models and interactions
  - Not a significant area of research in mainstream finance
  - Techniques suggest that useful progress could be made beyond standard linear factor technology

## Summary

- Forecasting revenue is not futile
- Movie attributes can be used as a basis for an active investment strategy
  - Story elements do help
- There is lots we don't know
  - Models of compensation and advertising budget
  - Really understanding the role of stars
  - The impact of managing the contracting process
  - Sequels, animations, foreign movies, Bollywood,...
- Thoughts for the future
  - Structure of the industry
    - organization, production process, who should benefit from movies, technology, etc
  - Art or science?