



The Stock Option Experience Study: Valuation and Program Design Implications

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Who are we?

- We represent the Society of Actuaries' Stock Option Valuation Task Force and related parties
 - The Society of Actuaries is the research and education organization of the U.S. actuarial profession.



Why are we here?

- The Stock Option Task Force wants to analyze option exercise experience in stock option plans for purposes of FAS123 valuation
- Experience analysis requires data
 - For a large number of participants over a large number of plans to create statistical significance
- Goal: Credible analysis that actuaries and others performing stock option valuations can use in valuing stock option plans



What is an experience study?

- An experience study is not a model: it's input to a model
- An experience study analyzes data to derive input (assumptions) to feed into models
- Example: life insurance & mortality rates
 - SOA gathers mortality data from insurers, other sources
 - Analyzes that data and produces mortality tables (experience of mortality)
 - Insurers use mortality tables to determine level of reserves needed to pay out claims



What is an experience study?

- Experience studies are important input to actuarial and other valuation models
 - To value a contingent liability (life insurance) I have to understand experience (mortality, lapse rates) to value that liability accurately
- Regulators, accountants, CEOs, rely on actuaries and others to use experience studies to accurately model liabilities
- Credible experience studies are the difference between accurate modeling and “garbage in, garbage out”



Why is this important?

- FAS 123(R) accounting statement requires sponsors of stock option plans to accrue expense for stock options when granted
- With **credible** experience studies and well developed models, actuaries and others can accurately value stock option plans which leads to better plans and better financial markets



Tangible Benefits

- In the future, companies without any data may be able to use aggregated exercise behavior as opposed to the “Simplified Approach” as outlined by SEC Staff Accounting Bulletin #107
- As plan designs change (vesting, terms, etc.), companies can anticipate the effect on exercise behavior
- Improved auditability with standardized data



Reasons to Participate

- Valuation: Using only single company's history has limitations
 - Underwater options
 - Stock price path
- Plan design: Opportunity to benchmark



Proposed Plan for Analysis

- We are interested in being able to predict when someone will exercise
- Believe this will vary based on
 - Plan/grant specific factors (plan type, stock price, exercise price, vesting date)
 - Demographic factors (age, gender, pay, length of service, officer indicator)
 - Company factors (industry)



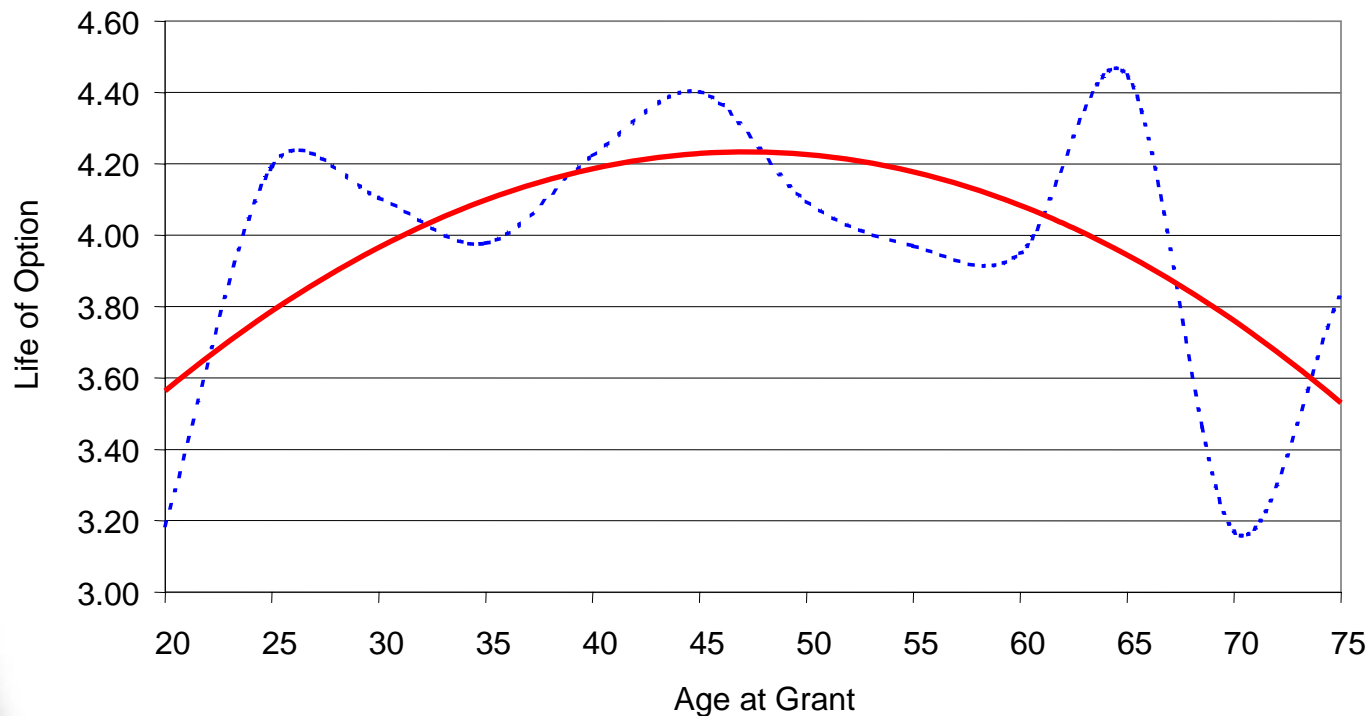
Getting the Data

- Data is recorded for every option exercise
- Third-party administrators (TPAs) keep records for many U.S. option exercises
- Through TPAs, companies provide plan participant exercise behavior data to the Society of Actuaries



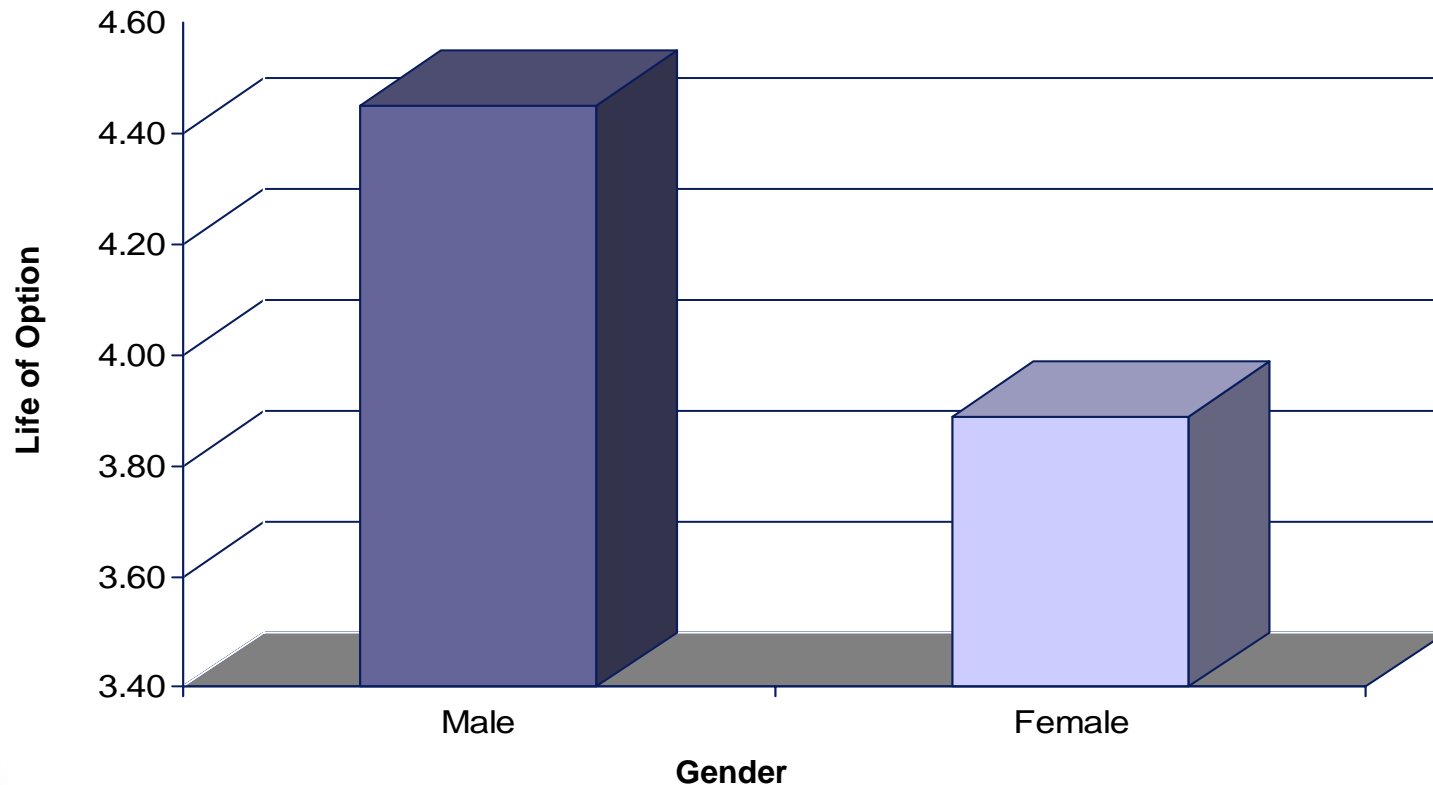
Early Exercise Behavior: Some Early Thoughts

- Twenty-six companies have provided data on more than one billion historical option exercises that have been analyzed relative to age at grant date
- Establishment of a “frown” curve



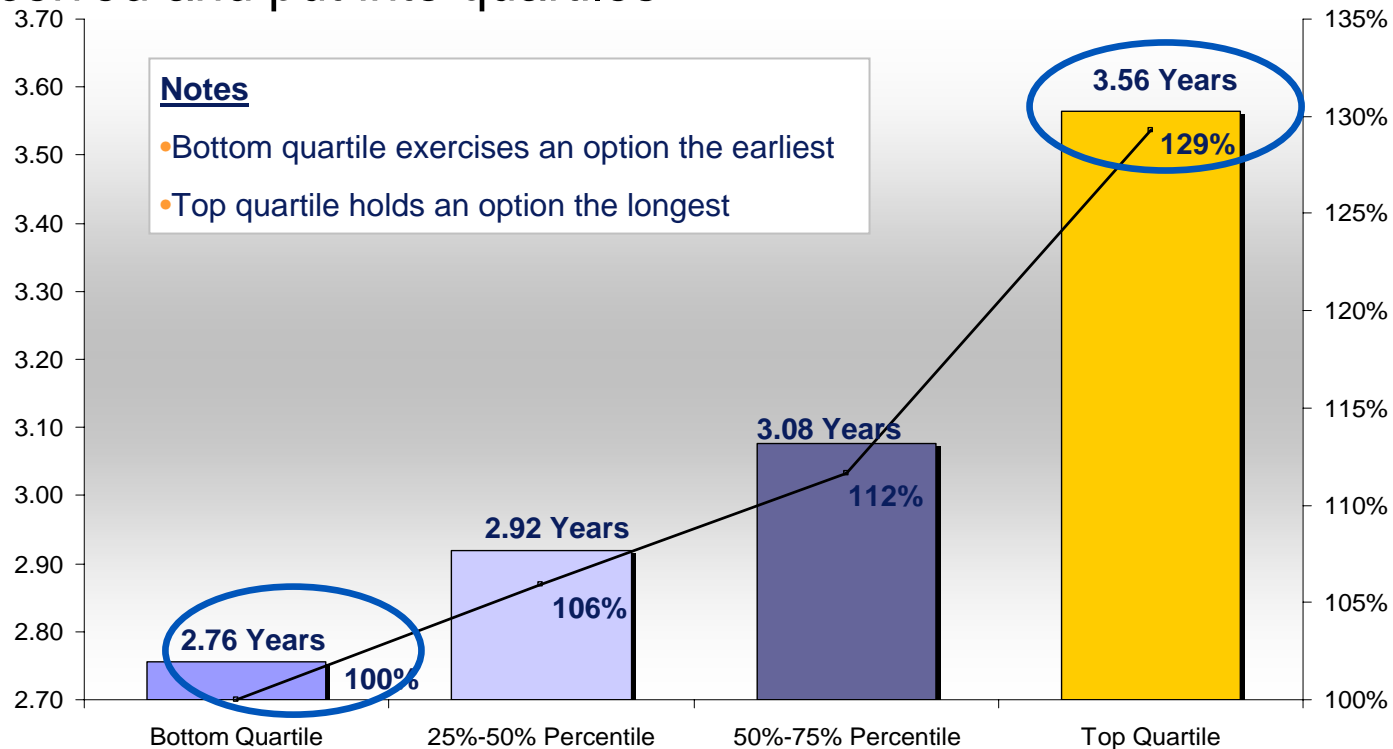
Early Exercise Behavior: Some Early Thoughts

- Eleven companies have provided data on 400 million-plus historical option exercises have been analyzed relative to gender



Early Exercise Behavior: Some Early Thoughts

- Grant and exercise practices for 20 companies were aggregated - involving more than 700 million option exercises
- Employees were categorized by the percent of the annual grant received and put into quartiles



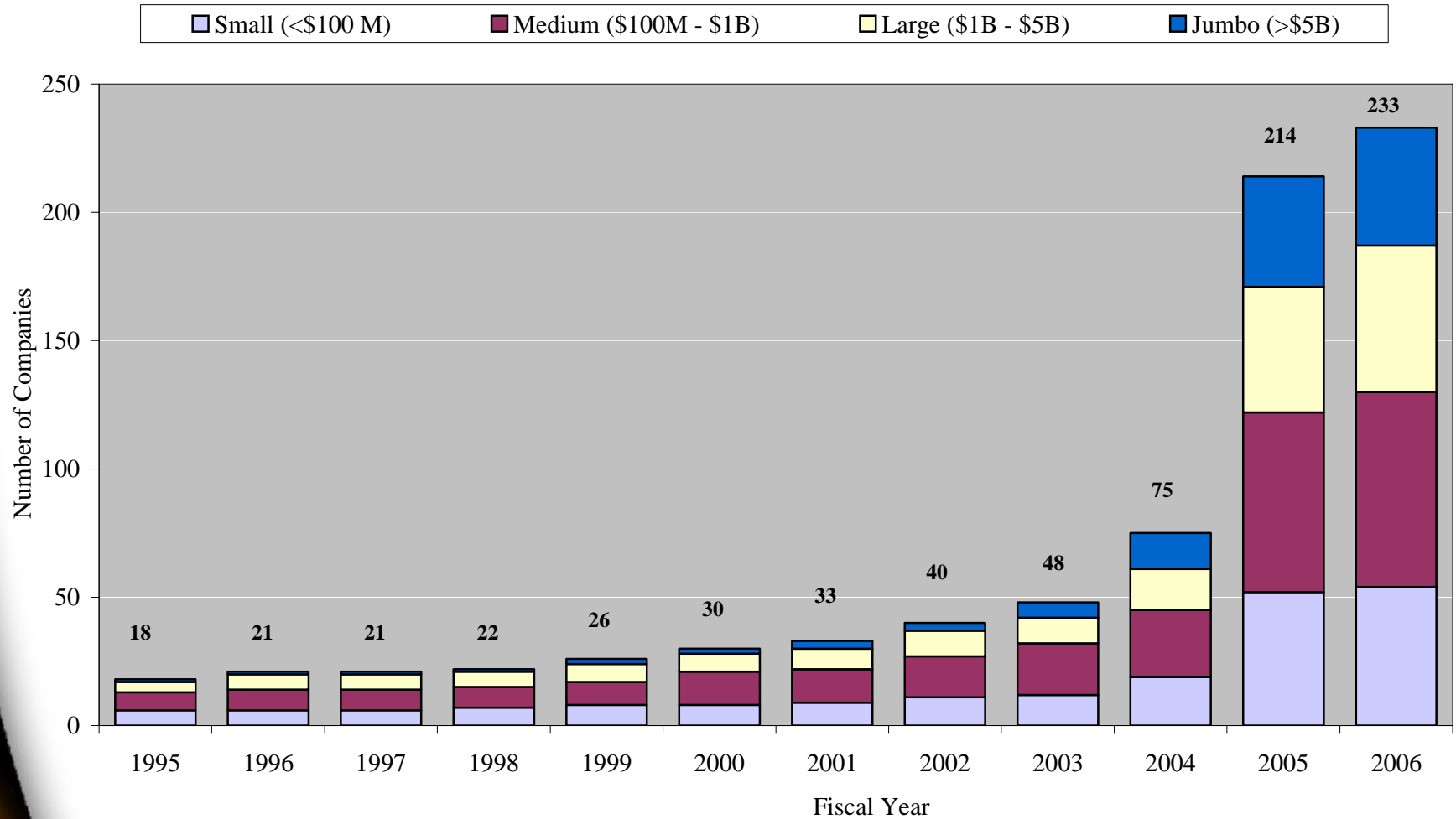
Trends in U.S. GAAP Option Valuation

- Current valuation guidance in FAS 123(R) allows use of various valuation techniques or models (Black-Scholes/lattice or binomial/Monte Carlo simulation)
 - As a footnote, companies ignored inaccuracy and possible overstatement of the Black-Scholes model
 - As of March 31, 2006, 233 companies have publicly disclosed the use of a binomial/lattice model for purposes of FAS 123(R) stock option valuations



Increased Adoption of Binomial Models

(as of 3/31/2006)



Multiple-Point Black-Scholes

- Fundamental inaccuracy of traditional Black-Scholes is use of single-point expected life
 - Collapses all expected exercise activity to one date
- A multiple-point approach overcomes this problem
 - Utilizes actual historical exercise option data by individual
 - Can incorporate historical unexercised option data
- A distribution of exercise activity is created
 - Each option is valued as a European option at its actual or assumed exercise date
 - Creates weighting of results based on number of shares
 - Results are summed and averaged



Examples: Multiple-Point Black-Scholes

Company	Fixed Point Black-Scholes	Multiple-Point Black-Scholes	Error Term	Expected Life	Contractual Term	Volatility	Dividend Yield	Standard Deviation	Kurtosis
Company A	13.28%	12.26%	-7.65%	4.29	10.00	16.11%	3.36%	2.3590	(0.3778)
Company B	36.33%	35.14%	-3.28%	5.84	10.00	35.04%	1.00%	2.3883	(0.9050)
Company C	44.89%	43.29%	-3.57%	4.89	10.00	46.46%	0.00%	2.2066	(1.0080)
Company D	20.30%	19.19%	-5.50%	4.77	10.00	25.11%	3.23%	2.4140	(1.0919)
Company E	55.82%	54.28%	-2.76%	5.05	10.00	61.06%	0.00%	1.8318	0.0940
Company F	31.02%	30.30%	-2.33%	6.19	10.00	22.98%	0.59%	1.8428	(0.5975)
Company G	42.39%	40.53%	-4.38%	4.07	10.00	47.19%	0.00%	2.1376	(0.6557)
Company H	59.50%	56.28%	-5.40%	5.26	10.00	64.71%	0.00%	2.4881	2.0704
Company I	55.99%	53.77%	-3.95%	4.74	10.00	63.45%	0.00%	2.0822	2.4096
Company J	37.19%	36.80%	-1.04%	3.61	5.00	43.00%	0.00%	1.0037	7.2713
Company K	49.44%	48.02%	-2.87%	3.91	7.00	60.78%	0.00%	1.5042	3.0813
Company L	62.34%	59.27%	-4.92%	5.11	10.00	70.77%	0.00%	2.1348	2.7479
Company M	56.73%	54.31%	-4.26%	5.81	10.00	56.44%	0.00%	1.9833	2.3470
Company N	48.78%	44.90%	-7.96%	3.81	10.00	59.95%	0.00%	2.4418	1.5674
Company O	29.83%	29.38%	-1.50%	4.93	6.00	29.38%	1.20%	0.8175	5.7420
Company P	54.23%	52.06%	-4.00%	5.30	10.00	57.30%	0.00%	2.2993	2.2516
Company Q	43.17%	42.31%	-1.99%	5.69	10.00	38.55%	0.00%	1.9894	2.6006
Company R	67.55%	64.43%	-4.61%	5.17	10.00	79.74%	0.00%	2.1908	2.6212
Company S	17.02%	16.37%	-3.87%	4.23	10.00	21.34%	3.20%	1.8860	2.5333
Company T	28.65%	27.88%	-2.67%	5.31	10.00	28.56%	1.65%	1.9172	2.3716
Average	42.72%	41.04%	-3.93%	4.90	9.40	46.40%	0.71%	1.9959	1.7537



Results: Multiple-Point Black-Scholes

- Of the 20 companies, the fixed point Black-Scholes had an approximate 4% error term
- We have observed that a fixed point Black-Scholes model creates the greatest error for companies that have the following characteristics:
 - High dividend yields
 - Short historical average lives
 - Large standard deviations of exercise behavior
 - Small or negative kurtoses



Valuation from an Audit Perspective

- Current audit practices in the area of fair value estimation for equity compensation involve review of company-specific information to validate the reasonableness of valuation and of early-exercise models.
- There is currently a wide variety of practices among different companies and their consultants in terms of such modeling, from extremely simplistic to highly complex.
- Auditing these models can be cumbersome and expensive, resulting in higher audit costs.
- Greater transparency through emerging “best practices” in modeling and greater comparability – via multi-company studies like the one proposed here – therefore stand to provide potential benefits for all.



Exercise Behavior and Plan Design

- Employee “perceived” value vs. accounting expense
- Apply to organization’s compensation goals
- Share utilization



Questions?

Thank you for your participation

