

Real Options - A Case Study

Straight from Hollywood!

- In April 1992, David A. Davis, a movie industry analyst at Paul Kagan Associates, Inc. in LA was asked to evaluate a business idea.
- The idea was to purchase sequel rights to films produced by some major movie studios.
- As owner of these rights, the client would judge the success of a movie, and then decide whether or not to produce a sequel film.
- The sequel rights would be purchased *before* the first film was even made.
- The client would not select the rights for particular movies based on predictions of possible sequel's success – rather, they would purchase *all* of the sequel rights for a studio's entire production during a specified period (1-2 years), and/or a specified number of films.
- The client would pay cash in advance for the rights, which would help finance production of the initial films.

What were these sequel rights worth? How much should the client pay to purchase the portfolio of these sequel rights?

The Sequel Project

- The client would purchase sequel rights to a studio's entire production over a number of years.
- If a particular film was a hit, the client could exercise its right by producing the sequel itself or hiring professionals to do so.
- Alternatively, it could sell the rights to the highest bidder.
- Most first films would not justify sequels, so this option would expire unexercised.
- The rights must have a specific expiration date (say 3 years from the first film's release), by which time they would have to decide or forfeit the rights (*usually, for most films, it is clear after the first few weeks whether a sequel would be profitable or not*).
- It is critically important for the client to transact the deal *before* the studio knew which films it would produce.

Why this Project?

- The client doesn't have a comparative advantage in movie production, so it cannot make sequels cheaper than others.
- Are they just wealthy individuals with a whim to be in the movie business?

The more probable explanations are:

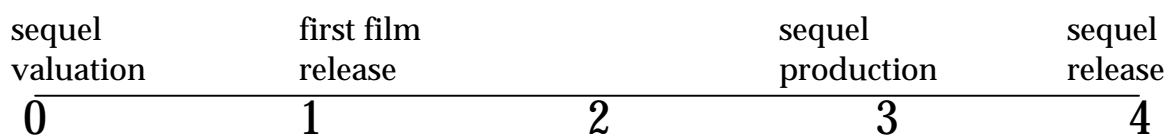
- If the studios systematically undervalue sequel rights before films go into production, the client may profit.
- The client is better at raising money than the studios, so the studios are paying for the source of financing.
- Indeed, in 1992, money was tight in the movie industry, so studios were willing to sell sequel rights just to raise money to make the film.
- The studios also did not have a clear understanding of how to value these rights – it was felt that an offer of \$2m per film would never be turned down.

Why transact before films go into production?

- Once production starts, the studio will know more about the film than the client, creating an adverse selection problem.
- The studio will take advantage of its private information by charging more for sequel rights of films it predicts will be hits.
- They may withhold giving sequel rights at all to potential hits, giving the client more than its (random) share of flops.
- It is crucial for the client to transact before and avoid this problem.
- And its no use transacting after the film has been released, because then there is little uncertainty left – the studio would be much less likely to misprice the rights, and would not have problems getting financing for sequels to hits!
- Hence the proposed timing is the only sensible way to implement this project idea.

The standard DCF valuation

- Lets see what happens if we value sequel rights as if they were operating assets.
- Normally, a movie is a one-year investment.
- Also, sequels usually go into production an average of two years after the release of the first film.
- So the time line for valuation is:



- For hypothetical sequels to all movies made in 1989, average net inflows were estimated at \$21.6m, average production costs were estimated at \$22.6m.
- Based on time value and risk premium, the discount rate on movie revenues was 12%.
- Hence the NPV at time $t=0$ is $-\$2.36m$, which suggests that the studios should pay the client to take the sequel rights!
- This is certainly not correct, since the client does not actually have to make all the sequels – *it will make only the hits, and it will know which they are by the time it has to decide.*
- Being able to wait and see what happens before making an investment decision is an option.
- The DCF methodology ignores the resolution of uncertainty at $t=1$, and the client's ability to delay the investment decision until after $t=1$.

Modified DCF valuation

- Most sequels are never made, so the valuation problem can be approached in a better way.
- Only those sequels would be made for which the estimated NPV was positive.
- Out of the 99 movies made by major movie studios in 1989, 26 had profitable hypothetical sequels.
- For this group of 26 movies, the estimated average net inflows were \$57.2m (at $t=4$), with an average cost of \$24.5m (at $t=3$), giving an NPV of \$18.9m per sequel.
- However, this is not what the price of sequel rights should be, per movie – these 26 winners must cover for the lost premiums on the 73 other movies for which the rights were expected to expire unexercised (the winners must pay for themselves as well as for the losers).
- Hence, the cost of each sequel right should be \$5m, as per this analysis.

Assumptions in modified DCF valuation

- A major assumption is that the films on which the client will buy sequel rights will be drawn from the same distribution that characterizes the 1989 group.
- The data has been treated as though there are no systematic differences between studios – i.e., buying rights from Disney is no different than buying them from Paramount (i.e., they are draws from the same distribution).
- It assumes that the model for estimating cash flows from hypothetical sequels is a reasonable one.
- It assumes that none of the films from the 1989 sample are “non-sequelizable”, hence none of the films could be excluded from the analysis outright.

What are the problems with this analysis?

- The model is very “optimistic” – assuming 26 sequels from films in a single year is unrealistically high, as indicated by past years.
- This model regards a sequel as an echo of the first film, with slightly higher costs, and slightly lower revenues, everything else being the same – *this model would never predict a sequel doing better than its predecessor, as with Terminator 2 (1991)*.
- It makes no distinction between various types of films, like comedies versus thrillers, etc.
- Another problem is the sample itself – there are some films for which it is known ex ante that a sequel is impossible.
- Examples include films in which one or more of the main characters die, e.g., in previous group of 26, one could exclude *War of the Roses*, *Driving Miss Daisy*, etc. (but *The Godfather* violates this rule!).
- One could also exclude biographical films like *Born on the Fourth of July*.
- One could reduce the number of probable sequel films using a number of criteria, but they will all have shortcomings.
- Reducing the number of estimated sequels would reduce the estimated value of these sequel rights (e.g., assuming only 10 sequels reduces the value of the rights to \$3.1m per film).

- Another way to use the 1989 is sample is to see which films actually had sequels, and how much money the sequels made (these are *Batman*, *Look Who's Talking*, *Honey I Shrunk the Kids*, *Uncle Buck*, *Major League*, and *The Little Mermaid*).
- These six sequels had a combined NPV of \$244.5m, hence the value of each of the 99 sequel rights would be \$2.5m.
- But one has to use and interpret this information cautiously.
- First, some of the sequels were a disaster (*Look Who's Talking Too*), though they were not expected to be – had the client owned the sequel rights, they probably would have fetched a good price at auction.
- Second, the studios themselves may have erred in not making more or different sequels.
- So while 26 sequels may be too many, 6 may be too few, from the perspective of optimality.
- Hence the process of estimating sequel rights in this way is fraught with adhoc assumptions.

Using Option Pricing to value sequel rights

- Essentially, the client wants to purchase a portfolio of out-of-the-money call options.
- The client exercises the option by paying the cost of making the movie, which, on average, is \$22.6m, hence the strike price here is \$22.6m.
- The underlying asset is the sequel's net cash flows, which is \$21.6m on average.
- The appropriate risk free rate as of April'92 was 6%.
- The standard deviation of sequel cash flows is 1.21 per year, computed from the projected sequel cash flows for all the 99 films of 1989.
- The time to expiration of this option will be 1 year, *and not 3 years* – Once a movie is released, the uncertainty about the viability of a sequel is resolved within a few weeks, once and for all (this happens at $t=1$).
- If a movie flops at $t=1$, it does not get another chance to do well at $t=2$, and $t=3$.
- The fact that a sequel does not go into production till $t=3$ only affects the discounting of the sequel's future cash flows.
- Using these numbers, the Black-Scholes value of the option comes out to be \$4m.

Limitations of Option Valuation of Sequel Rights

- Some of the limitations outlined for the modified DCF analysis still apply.
- Plus, the cross-sectional distribution of returns on hypothetical sequels is not likely to be compatible with the lognormality assumption in Black-Scholes.
- There are other technical conditions of Black-Scholes that are not met.
- However, option valuation makes the analysis easier and less arbitrary.
- It allows us to get an estimate of the option value using only the parameters of the probability distribution instead of the film-by-film information and assumptions required earlier.
- Sensitivity analysis is much easier now – if we believe the true standard deviation to be 0.9, we can easily check the effect of this change without trying to revise the forecasts for all 99 films.
- Similarly, if different studios are thought to have different probability distributions for sequel returns, the range of possible effects on option values is easily checked.

What are some potential problems in these rights?

- Once a contract is signed, the two parties' interests diverge – Warner Bros is bound to feel cheated if the client ends up with the sequel rights to *Batman*; likewise, the client will feel cheated if somehow Warner Bros managed to save *Batman* for itself.
- The studios will propose that certain films or types of films be excluded from the contract.
- This is dangerous for the client unless it can re-price the remaining contracts based on the exclusion rule.
- Either ways, the studio has an incentive to hold films like *Batman* back if the contract expiration date is nearing.
- There is no easy way around this problem – somehow, the control of films subject to the agreement must be taken out of the hands of the studio, which is cumbersome.
- There is the problem of moral hazard – once the studio sells these contracts, it has incentives to make different movies, less risky movies, change the plots, etc.
- Aligning the studio's interests with the client's is nearly impossible, as they are on the opposite sides of the same deal.
- The client also has to worry about what happens if the studio gets into financial distress – studios likely to be in distress will be more eager to sell such contracts, but they are the ones who would be least likely to be able to

perform – if there is a significant reduction in the output of films, the client suffers.

- Distress can cause a studio to make different kinds of films – when MGM encountered financial difficulties, it turned out many low-budget, low-quality films, hoping for a hit somewhere.
- In effect, they were drawing from a different population than the one that would have been used by the client to value the sequel rights.

That's probably why this deal has never happened till now in the movie industry!

The Lessons

- Insights from option pricing can improve estimates of project value for many projects and industries, and have the potential to enhance project management.
- Almost all long-range investment programs are sequences of options.
- Creating these options, cultivating them, and getting the exercise decisions right are important jobs for the top management.