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THIS MONTH'S CHALLENGE:

Valuation of early stage companies using real options

THE CHALLENGE:

Valuation of early stage high tech and life science companies is always a difficult task and presents a number of challenges. Up-and-coming companies in sectors such as communications, semiconductors, electronics, software, biotechnology and medical devices often have negative earnings with little or no revenues. In addition, most are likely to require multiple financing rounds. Private equity or venture capital investors dealing with such companies require realistic valuations to make profitable investment decisions. From an investor's perspective, an investment in early stage ventures may incorporate future follow-up investments that will be carried out if the company proceeds successfully. In that sense, there is an inherent value in having the flexibility to delay investment decisions. Options theory offers high potential for useful insights regarding the valuation of irreversible investments made under uncertainty and requiring flexibility.

Consider a company such as MicroTech (fictitious name) that is planning to develop pattern analysis software for fingerprint matching that will be used in access control applications. The company requires \$3 million to develop the technology and launch the company. This phase is supposed to last one year. At that point, MicroTech will require an additional \$8 million financing round followed by another \$15 million financing round one year later. The company projects that it will reach full operations and positive earnings by the end of the fourth year.

Alpha Ventures, a local VC, is considering investing in each of the financing rounds, but only if prospects for the business are promising. Thus, after the initial \$3 million seed round, Alpha Ventures will face the decision to wait, commit additional capital or simply abandon its investment at two future dates: the end of the first and second year. Alpha expects to exit the investment at the end of the fourth year through an M&A transaction.

The question is: How do we determine the current value of MicroTech in a manner that reflects all investment rounds while also taking into consideration the flexibility of the investment decision?

ENRIQUE BRITO'S ANSWER:

The solution lies in recognising that the investment in MicroTech can be considered as a purchase of two sequential, compounded European call options – one for each future financing round. This, of course, requires expressing the problem in option theory terminology while defining several input parameters: current value of the underlying asset, its associated volatility, exercise price for each option, time to maturity, risk-free rate and risk-neutral probabilities (if using a binomial tree approach).

Consequently, Microtech's value can be determined using either the Black/Scholes equation or a binomial tree approach. This result fully captures the value of the flexibility in the investment decisions, which in turn depend on the company's continued success as it grows.

A brief description of the required input parameters for calculating the options' value follows:

- **Current value of underlying asset:** this represents the discounted value (today) of MicroTech's value four years hence. It is calculated using a standard multi-stage DCF model.
- **Volatility of underlying asset:** this value can be estimated by incorporating Monte Carlo simulation in the DCF model, assigning probability distributions to the sources of uncertainty (such as revenue growth rates and operating margins) and defining the simulation output to represent the rate of return. The standard deviation of this output parameter denotes the asset's volatility.
- **Exercise price:** amount of each investment round.
- **Time to maturity:** investment's holding period.
- **Risk-free rate:** equals the yield to maturity of a Treasury Note with a tenor equal to the option's time to maturity.

The real options approach to valuing early-stage companies represents an added improvement over traditional valuation methods such as DCF or multiples. At their core, business strategies are collections of options: the option to wait, abandon or expand. And, from an investor's perspective, the fact that not all decisions need to be made in advance has tangible value and definite investment return implications. Real options analysis adopts the point of view of the investor and allows capturing the value of this flexibility. ■