



Time is like money in the bank

Economist.com

FINANCE & ECONOMICS

### Economics focus

## Keeping all options open

Aug 12th 1999

From The Economist print edition

### **Economists are urging companies to evaluate investment projects just as they price financial options. Easier said than done**

"THOSE who can, do; those who cannot, teach." Many a manager has at times been tempted to borrow this aphorism to put woolly professors in their place. Company bosses find it especially hard to resist grumbling about academic otherworldliness whenever they are deciding where to invest their shareholders' money. To evaluate potential projects, they almost invariably have to resort to a theory of corporate finance called the "Capital Asset Pricing Model" (CAPM). Yet real-life managers tend not to like this model, for the simple reason that it ignores the value of real-life managers. So they might welcome some recent academic work. In the ivory tower, they are talking about ditching the CAPM for a rival, called "real-options theory", that places managers at its very core.

To see why bosses are likely to prefer this new approach, consider what is wrong with the traditional model. The CAPM involves forecasting all the cash flows of an investment project and discounting them to their net present value (NPV). Getting the cash-flow projections right (or even close) is staggeringly difficult. But it is even trickier to choose the correct discount rate. Conceptually, that rate is the opportunity cost of not investing in another project of similar systematic risk (ie, risk that, in a large portfolio, cannot be diversified away). So the higher a project's risk, the higher its discount rate and the lower its NPV. But in practice, setting discount rates at the right level is almost impossible. The CAPM often spits out negative NPVs for many of the most exciting strategic opportunities.

The main reason for this shortcoming is that the model can use only information that is already known. That is typically not much, and the resulting uncertainty tends to be reflected in an excessive discount rate. Combining an NPV calculation with decision trees (which assign numerical probabilities to various possible outcomes) may help, but not much. For each branch of the tree, the analyst still has to pick and apply an appropriate discount rate, and that of course was the problem in the first place. More fundamentally, the flaw in the CAPM is that it implicitly assumes that when firms buy new assets, they hold these passively for the life of the project. But they do not. Instead, they employ managers precisely in order to react to events as they unfold. Obviously, this managerial flexibility must be worth something.

## Getting real

To quantify exactly how much it is worth is the point of real-options analysis. It starts by recognising that most investment opportunities have embedded in them a series of managerial options. Take, for instance, an imaginary oil company. Its bosses believe that they have found an oil field, but they know neither how much oil it contains nor what the price of oil will be once they are ready to pump. So, as a first step, they could simply put enough money down to buy or lease the land and explore. If they do not find oil, they can cap their outlays at the costs already sunk. If they do strike oil, however, they might invest a bit more and put the drilling gear in place. But suppose the oil price then plummets. Management could put the project on hold and let its field lie fallow. Perhaps it could also switch to producing gas instead of oil. Or it could drop the project and sell the land. If, on the other hand, the oil price goes up, the firm is ready to pump. Since oil prices and other factors are uncertain, in other words, the mere option to produce has value.

The logic is similar in other industries. Pharmaceutical companies, for instance, are in the business of searching for new pills, but never know which ones will work. So they may start researching a number of drugs, in the hope of striking lucky with just a few. By contrast, if they stuck strictly to the CAPM in making their investment decisions, they would almost certainly turn down most of these projects, since the uncertainty surrounding them would require such high discount rates.

Poker provides a good analogy. If players had to place their final bets right as the first hand is dealt (as the CAPM requires them to), most would (reasonably) opt out quickly. Instead, they merely put down a small initial stake to stay in the game. Depending on the next card, they then pass, match or raise, and so on.

Options on "real" assets (and indeed poker bets) behave rather like options on financial assets (puts and calls on shares or currencies, say). The similarities are such that they can, at least in theory, be valued according to the same methodology. In the case of the oil company, for instance, the cost of land corresponds to the premium (or down-payment) on a call option, and the extra investment needed to start production to its strike price (at which the option is exercised). As with financial options, the longer the option lasts before it expires and the more volatile the price of the underlying asset—in this case, oil—the more the option is worth. This is in sharp contrast to the CAPM, which deals harshly with both long time horizons and uncertainty.

There is a snag, of course: sheer complexity. Pricing financial options is daunting, but valuing real options is harder still. Their term, unlike that of financial options, is usually open-ended or undefinable. The volatility of the underlying asset can be difficult to measure or guess, especially since it is not always clear what it is—if, for example, it is yet to be invented. How can one define the appropriate benchmark asset-class in the case of a new drug for a rare disease? And there may be additional variables to consider, such as the strategic benefit of pre-empting a rival.

So will real-options analysis replace the CAPM? Archie Pitts, a professor of finance at Warwick Business School, says that this would be likely only if all managers had doctorates in applied mathematics. He has conducted a survey of Britain's 100 largest companies and discovered that the finance directors of only four of them had even heard of the term. They might do well to start paying attention, if only to keep those academics in their place.