Strategic options and modern financial theory

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Introduction

According to the mainstream of strategic management literature allocating resources is one of the major strategic activities to provide conditions for successful business performance. The final output of the business strategy is translated into a budget. The budget includes all the strategic and operational funds demanded for implementing the business strategy.

These strategic funds contain investments, increases in net working capital and developmental expenses. Whether these strategic funds follow strategy, as stressed by the prescriptive scholars on strategy, or whether strategy follows the process of formation of strategic funds, as enhanced by writers on financial theory, is still a matter of debate.

A somewhat broader perspective on financial strategy takes into consideration the main activities, being providing the firm with the appropriate financial structure and funds to achieve the overall objectives, the measuring of outcomes of strategic options and the selection of the best financial course of action. A particular interesting function of financial strategy is, according to Clarke (1988) to give competitive advantage trough a lower cost of funds and a flexible ability to raise capital.

Taking into account this broader set of functions of financial strategy, it is still open how financial theory can contribute to the core decision in the process of strategy formation: the selection of strategic options.

From the traditional point of view, financial theorists claim the use of pay-back period, internal rate of return, sensitivity analysis or capital project controls as key features for capital budgeting (Mills; 1988). In modern financial theory, however, the concept of net present value is the central theme. While writers on strategy formation and selection advocate completely different aspects to be included, as craft, creativity, experience and dedication (Mintzberg and Quinn; 1992).

So, the question is, how to select strategic options? In this article we advocate the use of a stronger financial dimension into strategy-making. More specifically, we consider the issues involved in the selection of strategic options using option theory, as one of the contributions to systematize decision-making processes on selection of strategic options.

First we describe the characteristics of strategic options and the problems enhanced to the selection of options. Second we look into the modern financial theory on market value. Third, the contribution to decision-making on selecting strategic options is clari-

fied. Fourth, some evaluative conclusions are drawn on contributions of financial theory to strategic management theory.

Strategic Options

Strategic options cover the alternatives the firm can exploit to maximize the market value of the firm. It is assumed that firms can exercise real options open to the organization. What options are meant? Strategic options can be classified according to the directions and methods of firm development. Porter introduced three generic strategic options based on two dimensions: scope and competitive advantage (Porter, 1985).

The three generic strategies are as follows:

- a cost leadership strategy assumes getting competitive advantage trough cost based advantage from all sources
- a differentiation strategy assumes getting competitive advantage trough unique dimensions widely valued by buyers
- a focus strategy assumes the choice of a narrow competitive scope within a industry by selecting a segment or group of segments in the industry; in cost focus a firm seeks a cost advantage in its segments, while in differentiation focus a firm seeks differentiation in its segments.

Although these generic strategies are debatable as far as their nature concern (Johnson and Scholes; 1992), they illustrate the importance of core competence of the firm in the industry and the value chain. The directions in which the organization may choose to develop within its generic strategy are developed by Ansoff (1965) and others. Using the two dimensions market development and product development, four strategic options are defined:

Assuming an expected lower return on investment, firms may decide to withdraw from a market. Remaining the product-market combination, consolidation provides opportunities to reduce costs and keep up market share or step up product quality, offering means for competitive advantage. Market penetration chances mostly depend on the nature of the market and the position of competitors.

Table 1. Generic Strategies

	competitive advantage	
Competitive scope	lower cost	differentiation
broad target	cost leadership	differentiation
narrow target	cost focus	differentiation focus

Table 2. Strategic Options

	Product	
Market	present	new
present	withdrawal market penetration	product development
new	market development	diversification

In growing markets market penetration for new entrants is relatively easy, while in declining markets market penetration is possible depending on the firms that exit from the market.

The product development strategy may give competitive advantage in markets with short product life cycles. Market development assumes the firm maintains the range of products, while venturing into new market segments.

Diversification may be related, assuming new product-market combinations that follow the competence of the firm, or non-related when these competence do not relate to the new product-market combinations.

As far as the way the firm can achieve the overall objectives and generic strategies, different methods of sustaining competitive advantage are open to the firm. Within the value chain or across value chains the firm can drive down costs, create bases of differentiation and add value. Apart from vertical integration of the firm with another firm backwards or forwards in the value chain, numerous alternatives are open to the firm, enabling the strengthening of the relation between the firm and another firm as shown in *Figure 1*.

Horizontal strategies exploit interrelationships across distinct but related business units or firms. If the firm can not cope with environmental demands from internal resources alone, arrangements for joint activities and alliances might occur. A wide variety of options exist, like joint-ventures, consortia, licensing, sub-contracting and functional co-operations (see *Figure 2*).

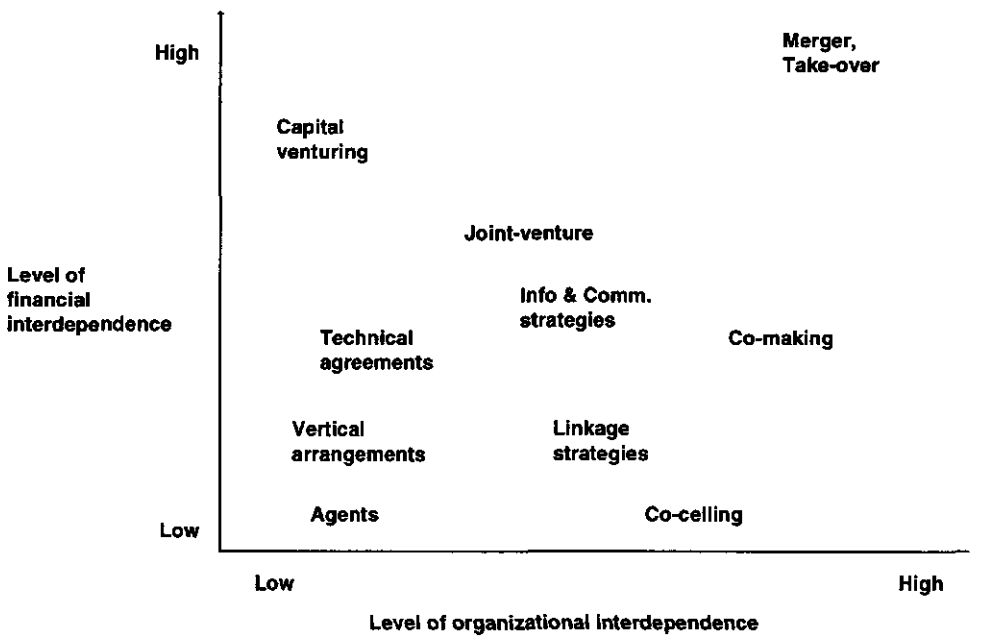

Figure 1. Vertical linkages between firms or business units

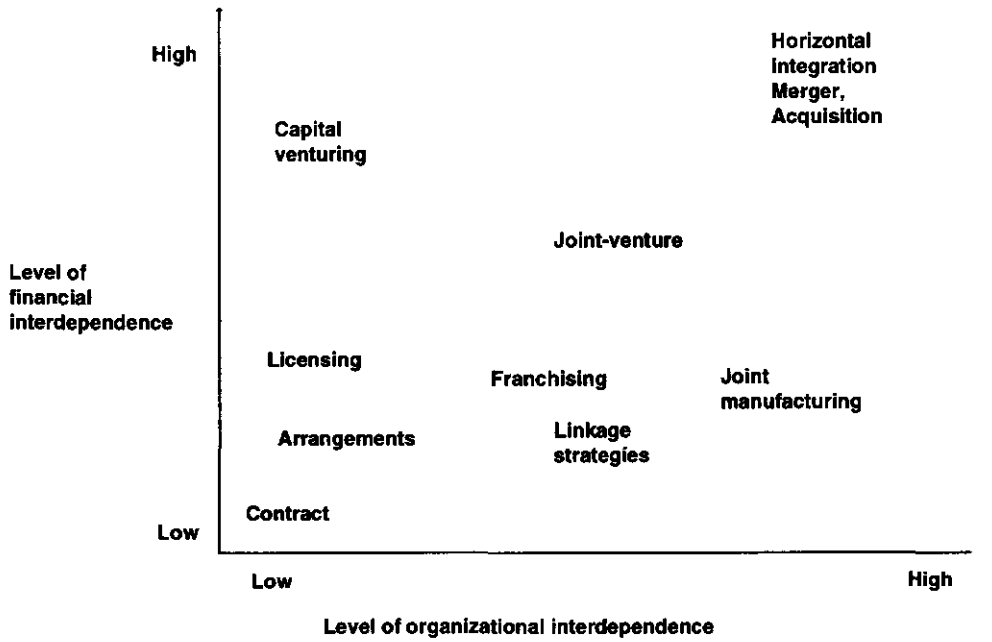

Figure 2. Horizontal linkages between firms or business units

Considering the financial and organizational dimensions of relatedness between firms or business units, some of the horizontal strategies are shown.

In short, the firm seeking for a future course of action, may choose out of a wide range of potential strategic options. Identifying options is a prerequisite for the assessment of its potentiality and suitability.

So, how to evaluate the value of options ? Therefore, we look into the selection criteria.

Screening and selecting strategic options

From strategic management theory many criteria have been introduced to screen and select strategic options. Johnson and Scholes (1992) distinguish suitability, based on the fit between the results of the strategic analysis and the option favored, feasibility, based on the notion of chances for successful implementation and acceptability, related to stakeholders expectations. Within the limited space of this article we elaborate on the acceptability criterium. Acceptability is the likely return from a particular strategic option and refers to the goal of the firm.

Modern financial theory assumes value maximization as the overall goal of the firm. An empirical study by Lanzillotti (1958) concludes that the two primary concerns of management are long-run profitability and stability. These goals appear to be inconsistent, but the dilemma can be solved by assuming maximization of the market value of the sharehol-

ders' wealth as corporate goal. This goal is equivalent to maximization of the market value of the existing stock as shown by for instance Levy and Sarnat (1986).

The maximization of market value as corporate goal is supported by the participation theory (see Simon et al; 1950, and Rhenman and Stymne; 1965). In this both sociological as economic approach the organization is viewed as a coalition of participants who all contribute to the organization with rewards as incentives, although this view is criticized by Agency theorists. They claim that internal stakeholders incline to optimize their own agents rewards instead of the firms value. Survival of the organization is guaranteed as long as all participants are prepared to contribute. This is, of course, depending on the rewards. It is the task of the management to distribute the rewards in a way that is acceptable to the participants and it is also its task to maximize the total rewards in order to achieve the maximal probability of survival, the goal with the highest priority of all goals, with an absolute priority (see Ijiri; 1965) above all other goals. An illustration of the participant theory is given below. So, screening and selecting strategic options may be evaluated by the acceptability criterium, measured by the maximization of the market value: the higher the option contribution to market value, the more acceptable the option is.

Market value: the Firm in Real and Financial Markets

Maximization of market value is not the only standard against which strategic options may be assessed. Another factor is risk the organization faces. The firm invests in real as-

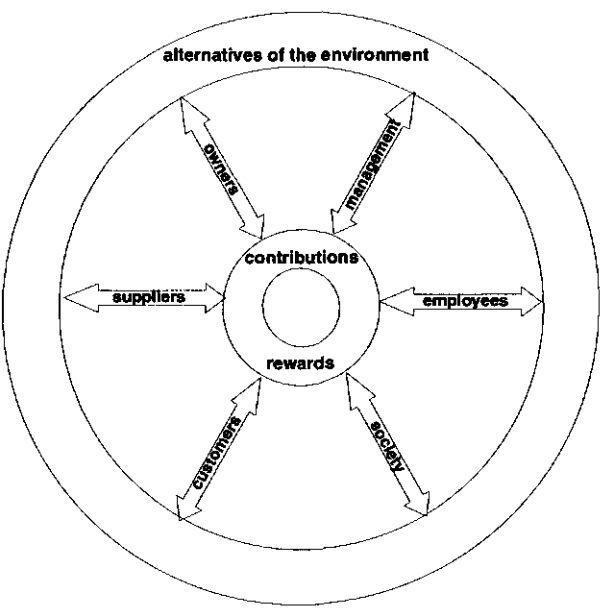

Figure 3. Contributions and rewards

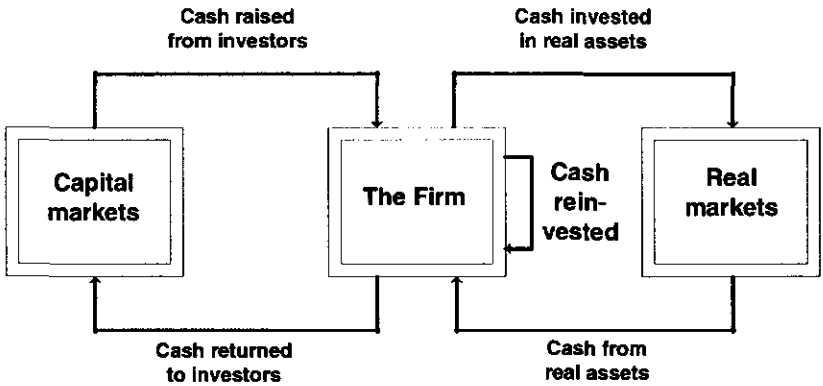

Figure 4. Cash flows in real and financial markets

sets with money from the capital market and is dependent on both real and capital markets.

The firm is an intermediary between the capital markets and the real markets on which the firm is operating. On real markets the firm has to make investment decisions and on capital markets it has to make financing decisions. The basic similarity between those decisions is evident in the light of the value maximalization goal.

"The decision to purchase a machine tool or to sell a bond each involve valuation of a risky asset. The fact that one asset is real and the other financial doesn't matter. In both cases we end up computing net present value." (Brealey and Myers, 1988).

The financial markets are highly competitive, in fact they are efficient. The first study on this subject was made by Kendall (1953) and the classic study was made by Jensen (1964). There are three levels of market efficiency defined:

1. Weak: Prices reflect all information contained in the record of past prices.
2. Semistrong: Prices reflect not only all information contained in the record of past prices but also all published information.
3. Hard: Prices reflect not only all information contained in the record of past prices and all published information but all the information that can be acquired by fundamental analysis of the company and the economy.

It is evident that the capital markets are efficient in at least the semistrong way and that the hard form of efficiency can be applied to at least the relative prices of stocks (Brealey and Myers, 1988). This implies that the expected value of capital market decisions is zero because all securities are fairly priced as they contain all relevant information. In other words, it is difficult to find financing schemes with net present values significantly different from zero. In fact, this is the fundamental concept of efficient capital markets; if capital markets are efficient, then purchase or sale of any security at the prevailing price is never a transaction with a positive net present value.

When a firm looks at capital investment decisions on real markets it does not assume that it is facing efficient markets. It may have just a few competitors or own some unique tangible or intangible asset. That is where positive net present values come from.

There has been a tremendous lot of research done about capital markets. Some thirty years ago the Capital Asset Pricing Model (CAPM) was developed to explain market values of stocks. It was a development of the pioneering work by Markowitz (1958), who presented a model of portfolio selection based on covariances between all existing securities. Assuming equal borrowing and lending rates it can be shown that all investors should choose the market portfolio in combination with borrowing or lending. This is known as the separation theorem and the original development of this theorem is due to Tobin (1958).

In the following figure AB is the efficient frontier of all combinations of securities, P^* is the market portfolio, r_B the borrowing rate, and r_L the lending rate. The line from the rates to P^* is known as the capital market line, and shows the required rate of return at different levels of risk.

The first article in which the CAPM was presented was written by Sharp (1964). Other founders of this approach are Lintner (1965), Mossin (1966) and Fama (1968). This theory states that the required rate of return is equal to the risk free rate plus a risk premium based on non-diversible or systematic risk. Diversible or unsystematic risk can totally be reduced by diversification as shown in *Figure 6.*

The non-diversible risk is measured by beta defined as

$$\beta_i = \frac{covariance(m,i)}{variance(m)}$$

where m is the market portfolio and i the individual stock i.
The required return of any risky asset (r_i) follows the security market line:

$$r_i = r_f + \beta(r_m - r_f)$$

where r_f the risk-free rate is and r_m the required rate of market as a whole measured by a market index. In *Figure 7* the security market line is pictured.

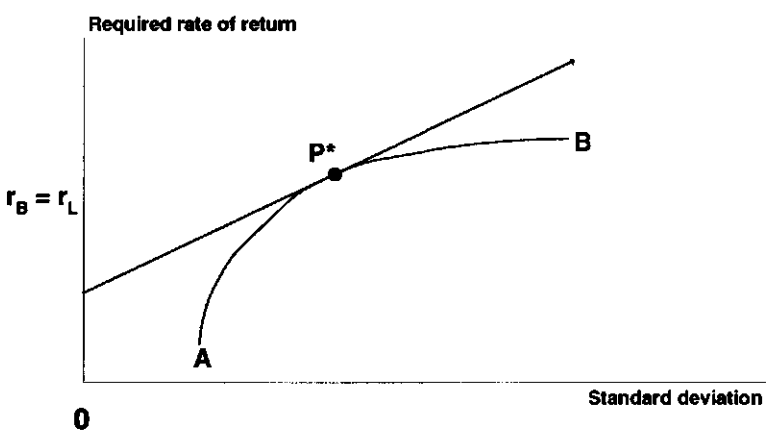

Figure 5. The capital market line

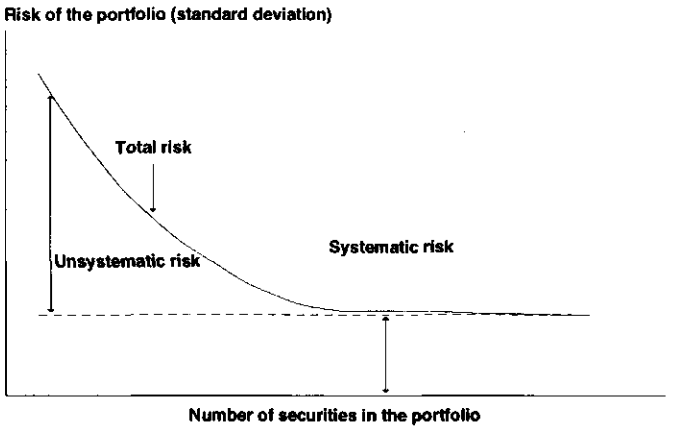

Figure 6. Systematic and unsystematic risk

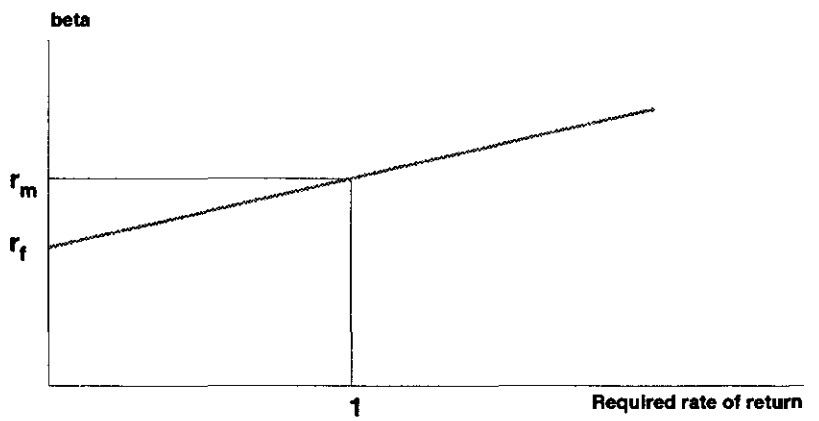

Figure 7. The security market line

However, the risk of a stock is a combination of business risk and risk due to financial leverage. For our purpose the risk of debt financing should be excluded. Assuming risk free debt the equation:

$$\beta_{Business} = \beta_{Equity} * \frac{Equity}{Equity + Debt} + \beta_{Debt} * \frac{Debt}{Debt + Equity}$$

reduces to:

$$\beta_{Business} = \beta_{Equity} * \frac{Equity}{Equity + Debt}$$

In this way a benchmark can be found for valuation of a strategic option. All cash flows associated with an alternative can be reduced to a present value by using a beta of a firm with a risk equivalent to the alternative. As pointed out before, there hardly is an efficient market in real investment projects we need this link with the capital market.

Assume that a firm has the opportunity to cooperate with another firm in a joint venture for production in the agribusiness sector. Other firms operating solely in this sector have a beta of about 1.5 and are financed with debt and equity in equal proportions. The capital market risk-free rate is 7 percent. Using the equation for calculating business beta:

$$\beta_{Business} = 1.5 * \frac{.5}{.5 + .5} = .75$$

The appropriate risk-adjusted discount rate will be:

$$r = .07 + .75 * (.11 - .07) = .10$$

The project involves an investment of $ 1 million and will return an annual stream of equivalent cash flows the coming two years. The expected value is $ 570,000 a year. The present value of this project is:

$$NPV = -\$\,1{,}000{,}000 + \sum_{t+1}^{2} \frac{\$\,570{,}000}{(1 + .10)^t} = -\$\,10.744$$

As the net present value is negative, the project should be rejected.

This approach involves evaluating the total cash flows of the business units individually and the total cash flow of the firm in order to valuate the strategic option to its current owners.

Valuing Strategic Options

The concept of real options was introduced by Myers (1977). The assets of a firm are twofold:

1. Real assets with a market value independent of the firms' investment strategy
2. Real options or possibilities real assets to acquire on favorable terms

This is consistent with the Modigliani and Miller theory (1958) in which the market value of the firm consists of the present value of the current assets and the present value of growth opportunities.

Both Myers (1984) and Kester (1984) emphasize the existence of a gap between finance theory and strategic planning and suggest that besides correct use of finance theory an extension is needed by the use of the concept of real options. In Kemna (1988) the theoretical development of real options is treated.

In the context of strategic cooperation, a framework for an option pricing approach can be found in Stemne and Zuurbier (1992).

The valuation of European options (to be exercised on a particular day) is mostly based on the valuation formula of Black and Scholes (1973). The value of a European call option is:

$$C(0) = SN(a) - Ee^{-rT}N(a - \sigma\sqrt{T})$$

where: S = market value of the stock
E = exercise price
T = number of periods to exercise date
r = interest rate
σ = volatility

a is defined as:

$$a = \frac{\ln(\frac{S}{E}) + (r + 0.5\sigma^2)T}{\sigma\sqrt{T}}$$

N(a) is the cumulative normal distribution:

$$N(a) = \int_{-inf}^{a} \frac{1}{\sqrt{2\pi}} e^{-0.5x^2} dx$$

Using the put-call parity the value of a European put option is:

$$P(0) = Ee^{-rT}N(-a + \sigma\sqrt{T}) - SN(-a)$$

American options can be exercised during the whole period until expiration date. As an American call option never will be exercised before maturity the Black and Scholes formula will hold, but an American put option could be exercised sometimes with profit before maturity. For this kind of options a binomial model (see Cox, Ross, and Rubinstein, 1979) can be used.

To illustrate the application of an option theory approach we use the following example. The management of a firm has to decide if they should maintain capacity for hardly profitable products. The capacity can be sold on the second-hand market and, of course, the current capacity can be expended if the market goes up.

Using S(t) for the present value of future cash flows at time and ß for the cash flow that per year becomes realized, we get the following relationship:

$$S(t) = S(t-1) * (1 - \beta)$$

It is possible to sell the capacity involved at a fixed price (E). This is an American put-option with E as the exercise price.

The possibility of expansion (with the fraction f) is an American call-option with the investment outlay (I) as exercise price.

In this case the current capacity has a value of $ 10 million and this value will decrease by 10 percent per year. The value on the second-hands market is $ 6 million and the capa-

city can be expanded by 40 percent at a cost of $ 3 million. The value of the capacity can per year rise or go down by 50 percent. The risk-free interest rate (r) is 8 percent. The variables can be summarized as follows where the upward and downward swing are denoted by u and d, respectively:

S(0)	= $ 10	f	= .4
ß	= .12	u	= 1.5
E	= $ 6	d	= .5
I	= $ 3	r	= .08

The data seems hard to find in real life, but let us examine them more in detail. The value of the current capacity ($ 10 million) is the current market value which is easy to find for a firm on the stock exchange, in other cases this value has to be estimated. The annual decrease in market value (10 percent) should be estimated by management as the value on the second-hand market ($6 million) and the cost of expansion ($3 million).

The variability of the value of the capacity (up- or downswing by 50 percent) is based on subjective probability assessment of management. The risk-free interest rate can hardly be difficult to find.

Assume that the options can be exercised at once or at the end of each of the next two years. Using the binomial method, the value of the production capacity in millions of dollars one year ahead [S(1)] has two possibilities:

$$S(1) = S(0) * u * (1 - ß) = \$\ 10 * 1.5 * .88 = \$\ 13.2$$
$$S(1) = S(0) * d * (1 - ß) = \$\ 10 * 0.5 * .88 = \$\ 4.4$$

The value of the production capacity after two years from now can take the following values:

$$S(2) = S(0)*u^2*(1-ß)^2 = \$\ 10 * 2.25 * .77 = \$\ 17.4$$
$$S(2) = S(0)*u*d*(1-ß)^2 = \$\ 10 * 1.5 * .5 * .77 = \$\ 5.8$$
$$S(2) = S(0)*d^2*(1-ß)^2 = \$\ 10 * .25 * .77 = \$\ 1.9$$

The binomial tree for the coming two years becomes:

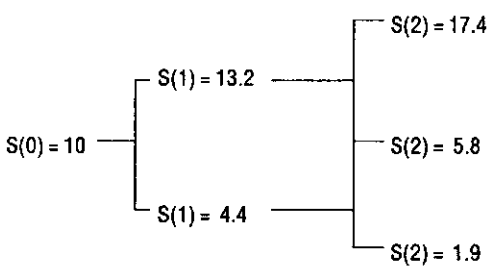

Figure 8. Value of Production Capacity

The option to stop (P) is valuable only if S(t) is below the exercise price of $ 50 million and the option for expansion has a value of:

$$C(2) = S(2) * f - 1 = S(2) * .5 - \$ 3$$

If this value is positive. The tree can be completed by the option values where T(t) is the value of the combination of the call- and the put-option at time t:

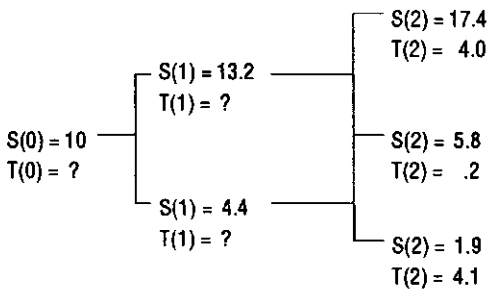

Figure 9. Option Values after Two Years

From the following relationship the probability of an upward change be determined:

$$p = \frac{\frac{r}{h} - (1 - d)}{(u - 1) - (1 - d)}$$

$$p = \frac{.08 - (-.5)}{.5 - (-.5)} = .6$$

The possible values of the options one year from now [T(1)] are:

T(1) = {(.6 * $ 17.4 + (1 - .6) * $ 5.8}/1.08 = $ 2.2
T(1) = {(.6 * $ 5.8 + (1 - .6) * $ 4.1}/1.08 = $ 1.7

But at time 1, when the option value is $ 2.2 exercising the call option is worth more: 13.2 * .4 - 3 = 2.3
and at time 0 the value [T(0)] is:
T(0) = {(.6 * $ 2.3 + (1 - .6) * $ 1.7}/1.08 = $ 1.9

The complete binomial tree becomes:

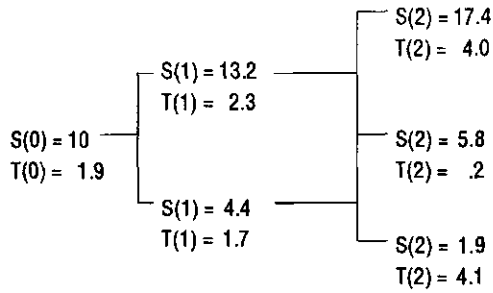

Figure 10. The Complete Binomial Tree

The total value of the project becomes:

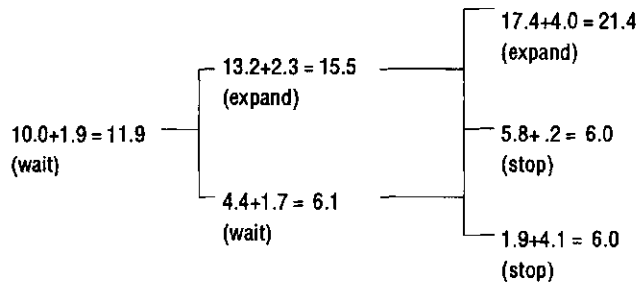

Figure 11. Total Value of the Project

By the two options (to stop and to expand) the project is worth $ 1.9 million more than without these options. The best strategy is to wait, and thus keeping both options. This example shows the usefulness of option theory for screening and selecting options.

Option theory: some critical notions

Based on our arguments, selecting the preferred option is, among other criteria, based on acceptability by internal and external stakeholders.

Real options are measured by market value, considering risk and the worth of real options. More specifically, one can hypothesize that option A is more preferred than option B, if and when

1. A contributes more to the overall objectives of the firm, expressed by maximization of market value, than B;
2. B contributes less to risk than B and
3. A shows a higher value than B.

If these conditions prevail, internal and external stakeholders will perceive option A more acceptable than B.

So far, these elaborations have shown their potential contribution to improving the quality of strategic decision making in general and selection of strategic option more specifically. However, some critical notions have to be considered.

First, the option pricing theory developed for financial markets should be treated very carefully when used for valuing real options. Compared to financial markets, real markets are obviously less efficient. The option valuation is based on put-call parity. Investors can create two alternative strategies which yield the same income, regardless of the future stock price at expiration. The alternative to buy a call option is then equivalent to the alternative to buy a stock and put option in combination with borrowing. As pointed out by Levy and Sarnat (1986) this is true only in perfect markets. However in real, non-perfect and even far from efficient markets the put-call parity should be used with great caution.

Second, option theory is focussed on the maximization of market value as perceived by internal and external stakeholders. However, internal and external stakeholders do not necessarily share the same ideas on the how and what of the maximization of market value. In fact, under opportunism conditions shirking behavior is likely to occur among agents, such as the board of directors allocating an increase in income to themselves, vis-a-vis the interests of external stakeholders such as investors and stockholders. More in general, organizations, as defined by Fama and Jensen (1983), as nexus of contracts between principals and agents, are assumed to show differences of interests between them. Consequently, maximization of market value is a perceptual phenomenon, a social construct, expressed by internal and external stakeholders, poses a theoretical problem. The nexus of contracts view of the firm reduces to conceiving the firm as an efficient bundle of skills, competencies and shared ideas on maximization of market value.

Third, option theory poses a methodological problem. Considering market value, potential cash flows and risks as the major concepts in the paradigm, the question of measuring these concepts has to be clarified. If firms are registered on the stock market, the market value of the firm over time can be approximated. However, what, if the firm is not operating on the stock market. How can the market value be measured, then? Moreover, how to estimate the potential cash flow and risks, if information in that respect is scarce or even unreliable?

Fourth, option theory offers a set of criteria to evaluate the potentiality of a real option. However, as we discussed earlier, what about the other criteria that are deployed, such as suitability of the option, consonance with the firms' policy or consistency over time ? The process of selection of options may well be regarded as a multi-criteria evaluation. If that is the case, how shall the relative weight of the option theory contribution be compared with other criteria?

In short, option theory promises to improving the quality of strategic decision making, but between promises and real contributing some barriers have to be taken first.

Conclusion

In this article we discussed option theory within the context of the process of selecting strategic options. We referred to Brealey and Myers (1990) who challenged strategy theorists and scholars in modern financial theory to bridge the gap between them. We ela-

borated on the potential use of option theory, considering the major concepts: market value, potential cash flow and risk.

Based on our argument, we conclude that option theory may contribute to the understanding of strategy making processes in general and the process of selecting strategic option specifically.

However, some problems have to be solved. Problems that deal with the basic assumptions of option theory, as the maximization of market value in view of internal and external stakeholders, the intransparency of real markets, the measurement of the basic concepts and their relative weight compared with other selection criteria.

The importance of the option theory with respect to strategy making is that is gives a source of information that may raise the quality of decision- making. In that respect, the contribution is comparable with other technical-financial instruments, such as funds-flow analysis, break-even analysis, sensitivity analysis and cost-benefit analysis. These instruments may clarify the attractiveness of strategic options and, by that, create a consensus between internal and external stakeholders.

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