

International Capital Budgeting, Real Operating Options and FDI

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The financial analysis of international investment decisions is complex. The basic methodology which homes in on incremental cash flows needs to be refined in order to focus upon cash flows which are remittable to the parent company, for it is only these that would logically add shareholder value. Build in the complications of two lots of tax and changing exchange rates and the equation looks anything but simple. But there is another complexity too which renders the traditional discounting methodology less than wholly appropriate. And this applies not just to international investment but to any situation where capital is committed with an option to expand or curtail embedded in it. This is not to say that the typical model cannot be adapted to meet the situation. It can and it is not too difficult.

International Investment and Real Operating Options

In the usual discounted cash flow (DCF) calculations which are familiar to virtually all company executives, the project's anticipated cash flows are viewed as one of the early ports of call in terms of developing a capital investment appraisal's data set. To be sure, sensitivity analysis is available to sophisticate the appraisal - this might involve looking at out-turns with lower sales projections or higher cost levels or different timing of sales penetration and so on. Notwithstanding this approach, the angle that is so often taken in investment appraisal is a static one - static in the sense that operating decisions are viewed as being fixed in advance and, as such, giving rise to the base case set of incremental cash flows. It is this feature that is at the heart of why the pure discounted cash flow techniques, as used by so many companies, may be less than perfect in simulating the business world. This is the source of tension between finance and strategy referred to by Barwise, Marsh and Wensley (1989).

In reality, good managers are frequently good because they pursue policies that maintain flexibility on as many fronts as possible and they maintain options that promise upside potential. In respect of investment decision-making, this means keeping open the opportunity to make decisions contingent upon information to become available in the future. For example, dependent upon actual levels of demand, or of competition or of cost, the rate of output of a new product may be accelerated, existing facilities may be expended or, should out-turns be less attractive than expected, they may be closed temporarily or even abandoned altogether.

Research and development is an obvious case in point. Testing out a new market via a pilot plant is clearly another. Oil exploration obviously falls into this category, levels of exploration and investment being highly contingent upon oil prices prevailing. And mining and quarrying are similar kinds of investment too - extraction or temporary closure or even abandonment being obvious choices of action which will be a function of actual prices of and/or demand for the product concerned. All these examples have a big thing in common - the firm has flexibility in terms of its course of action depending upon

outcomes and factors unknown at the time of the project's inception. And, of course, international investment is another example. Invariably it begins with a small commitment which may be scaled upwards should the environment prove profitable, or it may be curtailed should the host country appear to offer less attractive cash flows than anticipated. Qualitatively, the idea is fairly straightforward.

The ability to change tactical direction in response to new information can contribute significant increments to value. And such financial flexibility should be given due weight at the gestation phase of a project's life - that is, at the quantitative appraisal stage. Investments which possess this flexibility have the characteristics of options. Research and development gives the firm the right but not the obligation to scale up from the pilot plant to the full commercial scale. Oil exploration rights or possession of mining reserves give the firm the opportunity to extract (which may or may not be a right because of planning consents and so on) but not the obligation to do so. Expansion into a foreign territory gives the firm the possibility (again it may not be a right) of scaling up should things turn out attractively, but to abandon should out-turns be less positive.

These kinds of investments readily equate to options in stock market terms or even currency options - and should therefore be valued accordingly. Remember that security and foreign exchange options give the holder the right to acquire or sell something at a particular price (the strike price) within a specified timeframe but there is not an obligation to do so. In the case of certain kinds of investment project, the firm acquires an opportunity (not necessarily a right) to do something but is not committed. The similarity is obvious.

A call option in the stock market gives the holder the right to buy shares at a fixed price over a period of time but not the obligation to do so. Similarly an investment in research and development gives the firm the potential to acquire the benefits thereof for the cost of commercialisation. The owner of a mine or oil well has the possibility of acquiring the proceeds from the mine's or oil well's output but does not have an obligation to do so and, like the stock market call option buyer, he or she may defer selling the proceeds of the asset's output. Pre-emptive (and not necessarily heavy) investment in new, including international, markets may give the firm the edge when it comes to opportunities for scaling up to a full sized production and distribution network whilst retaining the option to withdraw from that market if out-turns are unfavourable. The similarity between stock market or currency options and certain kinds of investment decisions is summarised in Table 1. With respect to research and development, minerals extraction projects and exploratory investments in new markets, including international ones, classic DCF techniques, unless accompanied by serious modification, fail to take into account the tactical flexibility and value-creating upside potential of subsequent add-on aspects and consequently understate true investment potential.

Various articles have appeared in the literature of capital budgeting stressing the need to extend the analysis of certain kinds of investment decisions to embrace these option-type characteristics. Reference to the put option aspect of capital budgeting - the value of the potential to abandon the project - has a long history. Robichek and van Horne (1967) were among the first to recognise this feature: examples of more recent contributions are associated with MacDonald and Siegel (1985) and Aggarwal and Soenen (1989). The option to expand further - the call option - has been the focus of a number of more recent

TABLE 1
PROJECTS AS OPTIONS

Investment	Value-creating flexibility	
	Upside	Downside
<ul style="list-style-type: none"> ▪ Stock market option 	Acquire shares at exercise price or sell on shares for intrinsic plus time value	Option lapses - or is sold for time value
<ul style="list-style-type: none"> ▪ Foreign exchange option 	Acquire currency at exercise price or sell on option for intrinsic plus time value	Option lapses - or is sold time value
<ul style="list-style-type: none"> ▪ Research and development 	Opportunity to take project commercial	Abandon - or perhaps sell R & D rights (rather like selling for time value?)
<ul style="list-style-type: none"> ▪ Mines and oil exploration 	Opportunity to extract ore/oil	Abandon. Or mine later. Or sell reserves
<ul style="list-style-type: none"> ▪ Exploratory or pre-emptive investment in new and international markets 	Opportunity to scale-up locally	Abandon. Or soldier on. Or sell out (again rather like selling for time value)

papers. Kester (1984 and 1986) and Mason and Merton (1985) pioneered the way. Trigeorgis (1986) presented his doctoral thesis in this area. Brennan and Schwartz (1985) and Siegel, Smith and Paddock (1987) apply the option pricing model to mining and oil exploration projects respectively as do Dentskevich and Salkin (1991) and Copeland, Killer and Murrin (1990) note its relevance to minerals industries and pharmaceutical research and development, the latter being part of the focus of work by Kasanen (1986).

Only Shapiro (1992) and Kester and Morley (1992), so far, have applied the notion, in a mainly qualitative way, to international investment although Kulatilaka and Marcus (1992) refer to it *en passant* - their main focus is upon embedded options in operational flexibility, a topic looked at earlier in Burstein and Talbi (1985), Kulatilaka (1985), Gaimon (1986), Kulatilaka and Marcus (1988), Kulatilaka and Marks (1988), dos Santos (1991), Lint (1992) Busby (1992) and Aggarwal (1991 and 1993). Both Myers (1984) and Barwise, Marsh and Wensley (1989) - as mentioned earlier - refer to the failure of traditional project evaluation to take cognisance of the value of growth options as a source of tension between finance and strategic management. The message is that the old-style capital appraisal techniques are more than adequate in terms of dealing with cash investments but leave something to be desired where there is operational flexibility or contingent opportunities for growth. In these circumstances, DCF methods consistently undervalue projects due to their failure to allow for strategic flexibility; this fact has been noted, in addition to the aforementioned, by Spence (1981), Baldwin (1982) and Hayes and Garvin (1982).

At the current time it is fair to say that far too few standard textbooks on financial management give this topic sufficient coverage - notable exceptions include Shapiro (1990), Copeland and Weston (1988) and Weston and Copeland (1992). When it is incorporated, it is frequently referred to by the letters PVGO - present value of growth opportunities. It is interesting to note that Myers (1977) has concluded that, *ceteris paribus*, the level of debt that maximizes the value of the firm is inversely related to the ratio of PVGO to the value of the firm itself. Further speculation and analysis on this front are offered in a complex modelling exercise developed by Merville and Mishra (1991).

Other contributions to the literature exploring real options in valuing new investment proposals include Ang and Doukas (1991), Agmon (1991), Baldwin (1982), Carisson (1989), Kensinger (1987), Kester (1993), MacDonald and Siegel (1986), Majd and Pindyck (1987), Sick (1989), Stultz (1982), Trigeorgis and Mason (1987), Trigeorgis and Kasanen (1991) and Kasanen and Trigeorgis (1993) amongst others. But perhaps Dixit and Pindyck (1994), in their development of option-based models for investment timing, entry, scale, cocooning and exit, to name but a few of the topics that fall within their careful analysis, will have the greatest impact upon the evolution of this area of capital budgeting. As they point out 'the ability to delay an irreversible investment expenditure can profoundly affect the decision to invest. It also undermines the simple net present value rule, and hence the theoretical foundation of standard neoclassical investment models'. They go on to point out that 'where a firm makes an irreversible investment expenditure, it exercises, or "kills", its option to invest. It gives up the possibility of waiting for new information to arrive that might affect the desirability or timing of the expenditure. As a result the NPV rule "invest when the value of a unit of capital is at least as large as its purchase and installation cost" must be modified. The value of the unit must exceed the

purchase and installation cost, by an amount equal to the value of keeping the investment option alive'.

The Black and Scholes Model

It is evidently the contention of this article that a means of appraisal which incorporates base case DCF plus an option valuation routine makes it ideal for analysing extractive industry projects, research and development investments and cross-frontier expansion of a pre-emptive nature. The basic framework can be sophisticated without too much difficulty to give it the full range of Black and Scholes (1973) features for those projects where future commodity prices form the main variable in the investment decision - and most importantly, the market moves in a random fashion. In other words while prices change, the chances of a rise are the same as the chances of a fall, and the likelihood of large movements relative to small movements is normally distributed. Plotting daily market movements over time should therefore result in the bell-shaped curve, the normal distribution.

With mining projects and oil exploration, it is usually the case that the price of the commodity (and hence returns) is likely to follow a random walk, making application of the Black and Scholes methodology appropriate. This is rarely the case with R & D projects and frequently it is not so for international investment either (except mining, oil and the like). Potential returns may be vastly skewed - for example pharmaceutical research might promise a small probability of a vast pay-off versus a large probability of nothing at all. And pre-emptive investment in a concrete roof tile plant in Eastern Europe may also promise non-normal distribution potential with, perhaps, high probabilities at the low out-turn end. In such circumstances it may be entirely inappropriate to use a Black and Scholes based method since one of its key assumptions is that prices follow a random walk with constant variance over the life of the option.

In cases where the distribution of returns is non-normal, valuation of growth options might involve a decision tree route. Copeland and Weston (1988) and Weston and Copeland (1992) are good references in terms of explaining the necessary routine. Calculation of the base case (that is without the inclusion of growth options) net present value normally comes first. If this is itself positive, the project clearly gets a green light. Even if it is negative, it can give management an idea of the necessary magnitude of PVGO in order to give the project the go-ahead. This value might then be estimated by decision tree techniques or the project may merely be sanctioned somewhat intuitively. For example, should a \$20 mn project for Ford promise an NPV of minus \$0.25 mn in respect of investment in vehicles in China with no PVGO built in, the management may conclude that achieving a further \$1/4 mn net present value from future follow-on investment may prove a relatively small problem and proceed with the investment.

Applied to the total corporate business, the logic of valuing growth options is evident. The value of the firm is given by the present value of future cash flows projected for existing operations based upon conventional discounting algebra (plus the present value of the tax shield on debt if an adjusted present value - APV - approach is being used) plus the value of options embedded in its operations - including R and D, international investments and similar activities - and the value of put and call options which may have

accrued as a result of financing the business. (Of course when debt with put or call features, warrants and so on is initially issued, the no free lunch theory would suggest that the company would not have any put or call gains or losses; these may accrue through the passage of time given changes to interest rates, exchange rates, share prices and so forth.) Written formally in terms of an APV equation:

$$\begin{aligned} \text{APV of business} = & \text{APV of existing operations currently in place} \\ & + \text{PV of tax shield on debt} \\ & \pm \text{PV of financing options which may have accrued} \\ & + \text{PV of options on R and D, international operations, mining} \\ & \text{activities, operational flexibility etc. (PVGGO)} \end{aligned}$$

It is probably the case that for companies with cross-border activities the greatest source of PVGO derives from this area of operations. Given this surmise, it is remarkable that the literature currently makes such small reference to such a potentially big source of value.

Clearly the importance of the perspective described in this section to strategic management and to financial management - and to their convergence in financial strategy - cannot be overstated. It is not the contention of this article that traditional DCF analysis should be rejected. The argument advanced here is that it needs to be refined in appropriate cases by the application of decision tree/options analysis. Together, and correctly used, the two are a potent force.

We now turn to the second main theme in this article. It concerns the application of the idea of real operating options in terms of explaining some aspects of foreign direct investment.

FDI and Real Options

Foreign direct investment (FDI) is a term used to denote the acquisition abroad of physical assets, such as plant and equipment, with operational control ultimately residing with the parent company in the home country. It may take a number of different forms including:

- * the establishment of a new enterprise in an overseas country - either as a branch or as a subsidiary
- * the expansion of an existing overseas branch or subsidiary
- * the acquisition of an overseas business enterprise or its assets

It contrasts with foreign portfolio investment where a stake is taken in an overseas business without operational control, but with the view to acquiring an investment income stream through dividends, capital gains or, maybe, through enhanced business links. Without making foreign direct investment commitments, firms may engage in international busi-

ness via exporting and importing, licensing, sale of technology, foreign management contracts, selling turnkey projects or undertaking portfolio investment.

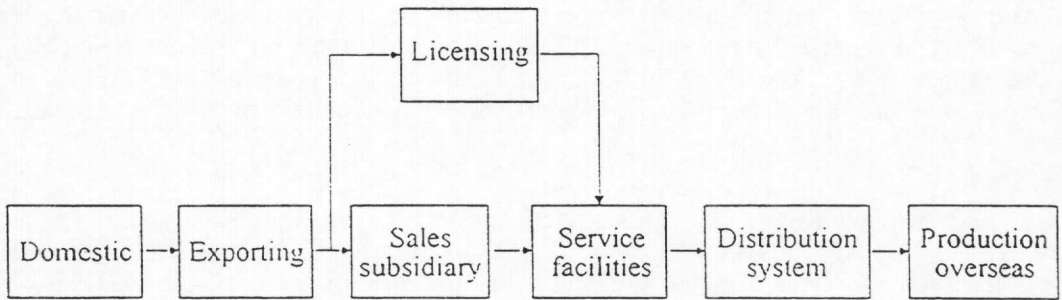
The great puzzle about FDI is simple. Why do it at all? As opposed to going to the trouble, risk and expense of setting up and managing manufacturing operations in a foreign country, why not export? Should transport costs be prohibitive, why not license? Or sell technology and/or brands to an overseas firm which knows the territory well, and can manage and adapt to local conditions? This is what Pilkington did with its float-glass technology around the world. This is what General Foods did with its Birds Eye frozen-food brand. Both simply sat back and took their international profits in the form of royalty streams.

The development of international corporate strategy usually involves a sequential process. It normally moves through exporting to the setting up of a foreign sales subsidiary, to licensing agreements and similar contracts before actual investment in foreign production facilities takes place. This evolutionary approach may act as a risk-minimizing process given the relative uncertainty associated with operating in a foreign environment. By internationalizing in stages, the firm gradually moves from a relatively low risk export-oriented policy to a higher risk strategy involving production in other countries; at the same time, profit payoff should multiply. The typical sequence of overseas expansion is depicted in Figure 1.

The firm with international ambitions typically makes its initial moves in this direction by exporting to a foreign market. Exporting has significant advantages over more fully-fledged involvement. Capital requirements are minimal, risk is low, and profits are immediate. Exporting provides a steep learning curve effect about the ways and business culture of the foreign country concerned. This is especially so in the areas of supply and demand conditions, competition, channels of distribution, payment conventions, and the methods of foreign financial institutions. Building on export success, the firm may expand its marketing organization abroad. It may switch from using export agents and similar intermediaries to dealing direct with foreign agents and distributors. As knowledge is built through increased communication with customers, the firm may establish its own sales subsidiary and service facilities. The culmination of this marketing expansion is often control of its own foreign distribution system.

As Figure 1 indicates, another route towards foreign expansion involves licensing as opposed to the overseas sales subsidiary. Licensing involves a local firm in manufacture of another company's products in return for royalties and/or other forms of payment. For the home-based company, the main advantage of licensing is the minimal investment required. But the corresponding cash flow may be relatively low as well. There are sometimes problems in maintaining quality standards and it may be difficult to control exports by a foreign licensee. Take a Japanese licensee, for example. Japan is likely to refuse to sanction any restrictive clauses on sales to foreign markets. Thus, a licensing agreement may create a competitor in some markets, with a resultant loss of future revenues to the licensing firm. Despite the risks, it appears very frequently that licensing, on its own, is the preferred method of penetrating foreign markets.

Figure 1
TYPICAL FOREIGN EXPANSION SEQUENCE



Some firms follow a policy of selling technology for equity in foreign joint ventures plus royalty payments. This kind of route towards internationalization is really somewhere between licensing and developing overseas production facilities on one's own. It often results in a network of associate companies around the world. Other firms evolve to become fully-fledged multinationals with production facilities overseas without passing through the licensing (or quasi-licensing), phase - hence the mode of evolution summarised in Figure 1.

One of the disadvantages with both exporting and licensing is their inability to realize the full potential of a product in a foreign market. And licensing may create a significant competitor in some markets unless carefully controlled. Setting up a firm's own production facility overseas overcomes these drawbacks and enables the firm to keep up to date with local market developments and adapt its products and production and marketing methods to meet changing local tastes and conditions whilst also providing better after-sales service. At the same time, establishing local production facilities demonstrates a greater commitment to the local market and an increased assurance of supply stability. This is important for firms that produce intermediate goods for sale to other companies, rather than for the end-user. Tied in to the firm's decision to produce abroad is the question of whether to create its own subsidiaries and associates organically or to acquire going concerns. An advantage of the acquisitive route is the greater capacity to effect a speedy transfer overseas of parent skills, such as innovative production technology. And, the inorganically acquired local firm may provide ready-made marketing networks. This could be important if the parent is a late entrant to the market. Many firms use the acquisition route to gain knowledge about the local market or about a particular technology. The disincentive to use of this route is, of course, the cost of the acquisition.

The incremental model set out in Figure 1 proves a useful pedagogic approach to internationalization and is undergoing continuous empirical investigation. It has a number of shortcomings. The dynamics of progress from one stage to another are not necessarily fully understood. The model is unidirectional and, as such, cannot explain divestment or strategic re-orientation. Also, the sequential nature of the process denies the leapfrogging of stages, which has, in fact, been observed in Welch and Luostarinen (1988). The model has also been criticized for representing a process of great complexity in too simple a format - see Dichtl, Liebold, Koglmayr and Muller (1983). And the unidirectional orientation of the model assumes, or at least suggests, a cause and effect relationship which may be less than justified. The complexity of the process plus the possibility of feedback loops representing re-orientations aggravates the neat ordering of the variables. Clearly, empirical testing in the area is difficult. In short, the model is by no means proven. Export seems, certainly, to be the first step in the process of internationalization. Like many of our models in the social sciences, the sequential route to full FDI via the ports of call illustrated in Figure 1 is anything but an immutable picture of a complex process. Nonetheless it should not be given short shrift; it deserves healthy respect and also a certain amount of suspicion.

But there is a scenario about the rationale of FDI which has been overlooked heretofore. It is the real options-based theory of FDI which is advanced as a partial explanation of why firms might prefer FDI as opposed to exporting, licensing or selling technology and/or brands. It may explain the leapfrogging of the order suggested in the

model summarised in Figure 1. And it is not one-directional; it consequently allows for withdrawal and retrenchment. What is it all about?

As we saw earlier in this article, real operating options are concerned with having the possibility, but not the obligation, to pursue a profit generating opportunity. To be in a position to exploit a real option the firm must own the option and identify the opportunity to exploit it. Ownership of an asset confers the right to any option over it. The firm owning an asset can operate the asset, it can put it in cold storage, it can lease the asset to someone else, it can sell or re-deploy the asset for another purpose - if legally possible - and so on. Actually having the operation of the asset and the marketing of the produce of the asset directly in its own hands better enables the firm to identify opportunities to exploit the asset in different ways - in other words it better enables the firm to reap the rewards of future real options.

If the firm exports or licenses overseas sales or sells technology or sells foreign rights to brands, it is likely that it will be some third party - the importing agent, the licensee, the operator of the technology or the marketer of the brands - who will have such close proximity to the market as to identify further opportunities. These new opportunities might include extending the market in various ways including adapting the product to meet new needs and so on and so forth. In short, in pursuing an overseas strategy of exporting, licensing or selling technology or the right to brands, the multinational probably puts itself in a position where it is less well able to identify real operating options in the overseas market concerned compared with being fully and directly involved itself.

Maintaining ownership and operation of foreign activities is a far better and more likely way of identifying profitable options available to the multinational. It may be true that the base present value of licensing exceeds the base case present value of FDI, that is:

$$NPV_{\text{licensing}} > NPV_{\text{FDI}}$$

where both cases exclude real operating option values. But further opportunities that may accrue to the multinational via FDI and which may be overlooked when licensing might mean that:

$$NPV_{\text{licensing}} + \text{Opt}_1 > NPV_{\text{FDI}} + \text{Opt}_2$$

where Opt_1 and Opt_2 represent the net present value of operating options under licensing and FDI respectively. Opt_2 exceeds Opt_1 because the multinational is better able to identify and exploit real growth options under FDI compared with licensing.

The same kind of argument may be invoked in terms of preferring FDI to exporting. The base case - excluding options - scenario might be such that:

$$NPV_{\text{export}} > NPV_{\text{FDI}}$$

but if the physical presence given by FDI translates into better ability to spot and turn profitable possibilities into probabilities, perhaps the situation might be re-written as:

$$NPV_{\text{export}} + \text{Opt}' < NPV_{\text{FDI}} + \text{Opt}''$$

where Opt' is the present value of possible opportunities which may be identified and exploited under the export strategy and Opt'' is the present value of probable opportunities with FDI. The same kind of present value conceptualization might be formulated for preferring FDI to selling technology or granting rights to export the brand overseas.

Internalizing options available in overseas markets is achieved through FDI whilst it may be lost with licensing, selling technology or rights to brands or using export agencies to operate overseas. Ownership of an asset, as opposed to leasing it, gives a better chance of pursuing opportunities in respect of that asset. Operating and marketing give the opportunity to identify options in a superior way compared to developing these functions.

Perhaps the same kind of idea applies in respect of pursuing opportunities via joint venture as opposed to selling on the rights associated with an asset. Thus, the base case scenario - excluding options - might be written as:

$$NPV_{\text{selling out}} > NPV_{\text{joint venture}}$$

but, if we take account of the fact that the joint venture may yield new opportunities over and above those already apparently available then:

$$NPV_{\text{selling out}} < NPV_{\text{joint venture}} + \text{Opt}$$

Clearly the model is more than seductive in terms of putting some logic on previously unaccounted for behaviour. But there are problems. Perhaps one partner to the joint venture may attempt to behave opportunistically - and unethically - and appropriate growth options promised by the venture for itself. Many joint ventures have gone this way. And many joint ventures have resulted in the evolution of a new competitor - numerous US companies who have ventured with a Japanese partner can testify to this - or perhaps a clever disarming of, for example, an American firm as it becomes ever more dependent upon its Japanese partner for access to Asian markets. A good example is NEC Corporation of Japan. Once a mere licensee of Honeywell, today it is a premier world competitor and it has joined forces with Bull of France in taking over Honeywell's worldwide computer business.

Japanese companies have been astute in their management of joint ventures. Why should this be so? Perhaps their tradition of selective absorption and adaptation of new ideas, their avoidance of the not-invented-here mentality about new technology may account for it. Perhaps they are simply more practised at managing ventures with others in order to shift advantages their way. After all, many Japanese corporations are part of large industrial groups, with many reciprocal trade and interlocking shareholding arrangements. Within such networks, Japanese executives may become practised at the art of managing long term relationships and shifting the hub of production or marketing or

finance to wherever within the group there is a comparative advantage in that activity. Also, it has been observed that Japanese companies have a strong orientation toward long-term growth of market share and are less concerned with short run cash flow and profit impacts of an investment decision. Whatever the underlying explanation, they do seem to be adept at spotting, seizing and exploiting shared growth options. They seem to emphasize and attempt to secure the growth option component of value more decisively than do their Western rivals.

The long and short is that companies that choose to pursue foreign direct investment via joint ventures would do well to recognize the hazards. Certainly incentives to behave opportunistically may be reduced by various practices, for example limiting dependence on any single partner by operating a network of joint ventures. Also, simply limiting the visibility and transferability of technology or trusting to joint venture only those investments with relatively little in the way of valuable growth options are techniques which may work. In truth, it is impossible to eliminate this kind of joint venture risk.

Acquisitions may also be analysed by the options approach. Developing a market organically may promise a greater net present value than acquiring it by takeover. But the option approach may have a part to play in explaining the choice of the apparently more expensive route. If one of the key purposes of the expansion is to allow the firm to exploit new opportunities opened up by the project, acquisition may allow this option to be exercised earlier. To use the approach referred to earlier, the base case scenario - without option values - might be written as:

$$NPV_{\text{organic expansion}} > NPV_{\text{acquisition}}$$

but, allowing for the value of real operating options, it may be the case that:

$$NPV_{\text{organic expansion}} + \text{Opt}_B < NPV_{\text{acquisition}} + \text{Opt}_A$$

where the growth option, option A, available as a corollary of the takeover, is clearly exercisable now, whereas option B, the same kind of growth option but associated with organic expansion will not be exercisable until some time in the future when such expansion is on stream.

Returning to foreign investment, the possibilities of successful FDI leading on to additional opportunities may be so high - especially where there is a significant specific advantage or market imperfection associated with the investment - that the value of the real operating option is very significant. If this is so, the contribution of the theory of real options in explaining FDI in preference to exporting, licensing or selling technology or the right to brands in overseas markets may be substantial indeed.

Can we weave these observations into a theory of internationalization? The following section is an attempt to do just this.

The Real Options Theory of FDI

There is no *a priori* reason for the sequential approach. Certainly it has appeal in terms of its incremental position in relation to risk and from the standpoint of internationalization as a learning process. It would, perhaps, have business logic if it were founded upon the maximisation of net present value. And it is by way of this route - incorporating real operating options - that a theory is advanced here. In other words, the decision making organization should choose the mode of entry and develop an internationalization strategy which maximizes the firm's net present value inclusive of real operating options. Note that we specifically incorporate the option aspect. It is important since so much of international investment seeks to achieve toe-holds with a view to exercising flexibility in terms of scaling up if successful or abandoning if results fail significantly to achieve respectability.

To exercise, optimally, the flexibility which is the key to option value the firm needs information which is as bias-free as possible. One could argue that such information is likely to be of the highest quality where the firm has a physical presence - for example in the case of FDI.

Not only does information enter the equation, so also does moral hazard. We would argue that this is greatest in the case of using an export agent, a licensee or a joint venture. With an export agency or licensee, the danger is that if the agent does too well, the multinational firm may not renew the agency agreement and go it alone, perhaps via FDI or an overseas sales subsidiary. So the agent is not necessarily motivated to pursue maximum sales. In the joint venture case the moral hazard lies in the possibility of the partner appropriating value. So moral hazard is distinctly present in these cases. And so, of course, are significant agency monitoring costs.

In Table 2 an attempt is made to focus upon control, resource commitment, risk of losing a specific advantage, moral hazard and ability to identify and exploit growth options by various internationalization routes. These qualities are rated on a relative scale. Control of operations is highest with export (other than by way of agency) and FDI involvement and lowest where licensees are used. Relative resource commitment is greatest with FDI, followed by joint venturing and lowest in the case of export and licensing. Risk of losing a specific advantage is greatest where a partner is involved, as in joint venturing, followed by licensing. And the ordering is approximately similar in respect of agency costs and moral hazard. Of course, in the case of exporting the moral hazard question varies between an export agent and exporting directly. Finally, on the question of depth of information and ability to spot and exploit growth options, it is hypothesised that both of these interlinked qualities tend to increase as the extent of direct foreign involvement increases. It is thus greatest in the case of FDI and least in exporting.

Earlier we referred to the work of Dixit and Pindyck (1994). They refer to the value of information in observing that 'the ability to delay an irreversible investment expenditure can profoundly affect the decision to invest. In particular, it invalidates the simple net present value rule as it is commonly taught to students in business schools: "invest in a project when the present value of its expected cash flows is at least as large as its cost".'

TABLE 2
INTERNATIONALIZATION ROUTES - CONTROL, COMMITMENT, RISK,
MORAL HAZARD AND GROWTH OPTIONS

	FEATURE				
	Control of operations	Resource commitment	Risk of losing a specific advantage	Moral hazard and agency cost of monitoring	Information depth and ability to spot and exploit growth option
Export	High	Low/Medium	Low	Low/Medium*	Low
Licensing	Low	Low	Medium/High	Medium	Low
Joint venture	Medium	Medium	High	High	Medium
FDI	High	High	Low	Low	High

* Varies dependent upon the use of an export agent as opposed to going it on one's own.

This rule is incorrect because it ignores the opportunity cost of making a commitment now, and thereby giving up the option of waiting for new information.' Both the value of and the rationality of waiting are a function of what competitors may do. With no barriers to entry, this value should be reduced to zero. In studying the trade-off between early investment in an oligopolistic situation and the value of flexibility under uncertainty, Kulatilaka and Perotti (1992) suggest that in a quantity-setting duopoly the first mover gains the larger market share, and its profit is a more convex function of demand shock variables than its competitor. Thus, an increase in uncertainty increases the relative value of early investment.

Kester (1984) offers interesting speculation in this area. Option pricing theory tells us that there are four critical variables in valuing any option - these are time value, volatility, interest rates and intrinsic value.

To put these variables into the context of investment projects as options, it should be clear that they liken, respectively, to the following:

- * the period of time during which the scale-up decision may be realistically deferred
- * the volatility of the price and demand for the key product of the project. This is substantially all to do with the risk associated with the project
- * the level of interest rates
- * the proprietary nature of the option

Let us look in more detail at each of the above key points. Taking the deferability of scale-up first, the ability to put off an investment gives the firm additional time to examine the course of future events and to reduce the chance of costly errors should unfavourable developments occur. The longer the time interval to scale-up, the greater the odds that a positive turn of events will occur thus increasing the project's profitability. It could, of course, even transform a negative NVP project into a positive one.

We now turn to the riskiness of the project itself. Surprisingly enough, the greater the risk associated with the investment, the more valuable an option on it. This arises because of the asymmetry of gains and losses. A big upside outturn confers a highly positive NPV. But large downside operating outturns do not necessarily flow through to the bottom limit NPV because of the option not to scale up. This means that the riskier the project the greater the odds of a large gain without a corresponding increase in the size of the potential loss. It needs to be born in mind, of course, that whilst an increase in the risk of the project may increase the value of the option, in the context of capital budgeting it may increase the asset beta and thus reduce the net present value of the base case scenario. So, whether increased volatility actually increases the value of the overall project cannot be immutably asserted. Sometimes the increased value of the option exceeds the reduction in the net present value of the base case scenario; sometimes the increased value of the option falls short of the reduction in the net present value of the base case scenario.

The same kind of logic applies in respect of the level of interest rates. A higher discount rate, all other things being equal, lowers the present value of a project's future cash flows. At the same time, it reduces the present value of the cash outlay needed to exercise an option. Generally, but not always, the net effect is that high interest rates raise the value of projects with expansion options.

Fourth, there is the proprietary nature of the option itself. What do we mean by this? Very simply that an exclusively owned option is worth more than one which is shared or competed for with others. Self-evidently, shared options are less valuable because competitors can replicate the firm's investments and, in so doing, drive down profitability.

Kester (1984) observes that companies frequently commit investment funds early rather than later, despite their ability to defer. Presumably the cost of deferring exceeds the value sacrificed in early exercise. He goes on to suggest that it pays a company to exercise its growth options earlier rather than later when:

- * options are not proprietary; that is, they are shared.
- * the project's NPV is high
- * the level of risk and interest rates are low
- * industry rivalry is intense

Kester provides a useful guideline through a two by two matrix in respect of timing of commitment of capital. Table 3 summarizes the essence of his suggested decision matrix. An interesting comment by Kester is that companies generally try 'to obtain a dominant competitive position in order to achieve and protect high returns on investment. But by giving a company the right to time the investment more selectively, the growth option provides an important, though often overlooked, motive for dominating the market'.

Although Kogut (1983 and 1991) focuses upon net present value with real operating options and FDI and Bowman and Hurry (1993) stress the strategic virtues of holding bundles of real operating options and favour market entry via small pre-emptive investments (the option premium) followed by larger linked scaling up (the exercise), neither melds these ideas into a fully-fledged theory of internationalization.

The whole point is that the net present value (allowing for real operating options) from internationalization may be greatest following any mode of entry. Certainly for firms with little international experience, the sequential route appeals on grounds of risk aversion. And from the viewpoint of learning, it is an alluring idea. But to the seasoned multinational intent upon net present value maximisation, the sequential route is far from logical. Within a model of bounded rationality, we would suspect that the international firm seeks net present value maximisation (inclusive of real operating option values) subject to a series of constraints, some of which are internal and some external. For example, constraints internal to the firm would embrace risk aversion, experience in the host country, psychic (or cultural) distance, information quality, confidence about the firm's ability to unlock PVGOs and so on. External constraints would include legal

TABLE 3

INVESTMENT TIMING MATRIX

C O M P E T I T I V E R I V A L R Y	Intense	Rapid exercise of option for defensive or possible pre-emptive reasons. Little chance of appropriating full value of option	No threat of pre-emption but risk from competitive activity-substitutes; copies (?). Tendency to exercise option early to maximise value
	Minimal	Some threat of pre-emption. Market power of dominant companies should appropriate value of shared options to themselves. Tendency to retain option until weaker competitors threaten to exercise.	No risk of pre-emption Probably hold option to expiry. Holder of option should gain maximum value
		Shared	Proprietary
		OPTION	



requirements, for example that foreign participation should be limited to 50 per cent, and so on. In pursuit of maximum net present value (inclusive of real operating option values) the firm may prefer FDI to many of the intermediate modes of entry, especially if one allows for the potential shading of value pursuant to the employment of routes with high moral hazard - see Table 2.

Nor is this model of internationalization unidirectional. The firm always has a put option - to abandon, to disengage, to retreat to a less involved form of internationalization.

The development of the theory of foreign direct investment can only produce inadequate insights without extending its horizons to encompass net present value inclusive of the promise provided by real operating options. Building these aspects into the theory of FDI greatly enriches our comprehension of one of the most important areas of international business strategy.

Conclusions

The suggestion is not that managers explicitly go through this thought process of identifying and internalizing real operating options, but rather that they do so implicitly in terms of keeping as many options as possible open. The good manager is surely loathe to give up options - especially if inadequately remunerated for surrendering them.

The whole point is that one of the strategies that adds corporate value is to maintain flexibility through structuring investments - and indeed a whole host of other managerial actions - in a manner paralleling options. Investments of this kind, which includes the lion's share of international commitments, should be:

- * Evaluated to embrace the option characteristics
- * Analysed from a standpoint beyond the traditional DCF model

Structuring investment decisions in such a way as to confer an option element enhances shareholder value over and above the base case present value scenario. Failure to evaluate investments of this kind to allow for this option aspect can only result in an understatement of the potential shareholder value created.

Theories of FDI can only be partial without reference to net present value inclusive of real operating options. Incorporating these ideas expands both the breadth and depth of our understanding of international business.

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