The British Accounting Review 47 (2015) 225–236

Contents lists available at ScienceDirect

The British Accounting Review

journal homepage: www.elsevier.com/locate/bar

Uncertainty, irreversibility and the use of 'rules of thumb' in capital budgeting

Francis Chittenden [a], Mohsen Derregia [b,*]

[a] Manchester Business School, Harold Hankins Building, Booth Street West, Manchester M13 9PL, UK
[b] Libyan Investment Authority, 22nd Floor Tripoli Tower, Tripoli, Libya

ARTICLE INFO

Article history:
Available online 21 December 2013

Keywords:
Capital budgeting
Real options
Uncertainty
Irreversibility

ABSTRACT

Numerous studies of capital budgeting practice report continued use of simple techniques to evaluate decisions, a result that appears at odds with theory. Some theoretical developments in the real options literature that highlight the influence of uncertainty and irreversibility on capital budgeting, however, suggest that these techniques may be used as proxies for more complex and theoretically correct evaluation. We survey the use of simple capital budgeting techniques to capture the effect of uncertainty and irreversibility on capital budgeting decisions in practice. We find that firms adjust payback time and discount rates in the presence of uncertainty and irreversibility and delay investment decisions. We also find that there are variations in responses received from firms by size, sector, and ownership. While most small and large firms find demand uncertainty important in delaying decisions, small firms find interest rate uncertainty significantly more important than large firms. Further, listed firms delay capital budgeting decisions less frequently than other firms. Irreversibility also affects the value of the option to abandon and the option to expand, and firms value flexibility, reversibility and first mover advantages.

1. Introduction

The practical application of capital budgeting techniques is often seen as inconsistent with theoretical recommendations, and is characterised by the use of payback (PB) along with discounted cash flow (DCF) techniques and the adjustment of discount rates and cash flows in response to risk (Arnold & Hatzopoulos, 2000; Pike, 1988, 1996). Graham and Harvey (2001) find that many firms continue to use PB and adjust cash flows and discount rates in response to a variety of risk factors other than market risk. They also report that the use of PB is more widespread in smaller firms where it is as frequently used as net present value (NPV) and the internal rate of return (IRR). These results are contrary to the advice often found in finance and management accounting textbooks published in 1970s and 1980s, which, in line with the theory dominant at the time, recommends the use of DCF techniques and the Capital Asset Pricing Model (CAPM) (Scapens, 2006; Scapens & Sale, 1985). The theory explains PB's inferiority to DCF techniques by highlighting its neglect of the time value of money and of cash flow beyond a cut-off date. It also explains why CAPM should be employed to find an appropriate discount rate that takes into account market risk for use with DCF techniques.

More recently, following the emergence of real options pricing theory in the 1980s, textbooks point out the importance of considering real options in capital budgeting and some of the problems posed by the 'naïve' use of DCF (for example, Brealey, Myers, & Allen, 2007; Dixit & Pindyck, 1994). The application of real options pricing theory in capital budgeting is reportedly

* Corresponding author.
E-mail address: M.Derregia@lia.ly (M. Derregia).

0890-8389/$ – see front matter © 2013 Published by Elsevier Ltd.
http://dx.doi.org/10.1016/j.bar.2013.12.003

limited (Alkaraan & Northcott, 2006; Brounen, de Jong, & Koedijk, 2004; Graham & Harvey, 2001), and does not appear to have challenged the dominance of NPV, IRR and PB. Several theoretical arguments and simulations, however, show that rules of thumb based on commonly used capital budgeting techniques, such as PB and DCF, can approximately capture the effect of uncertainty and irreversibility on capital budgeting decisions (e.g., Berry, Coad, Harris, Otley, & Stringer, 2009; Dixit & Pindyck, 1994; McDonald, 2000; Stark, 1990). Simulations by McDonald (2000) show that rules of thumb could serve as proxies for 'rational economic considerations' absent from the standard or 'Naïve' DCF.[1] By simulating capital investment decisions and comparing results obtained using PB, discount rates and the Profitability Index, he finds that these rules proxy for optimal investment timing behaviour. He also finds the timing option is the most valuable amongst other options and it is the least sensitive to deviations from the optimal investment rule. Other simulations by Klumpes and Tippet (2004) use a real options model of an irreversible investment project to show that, given a discount rate of 10% and a variance parameter – a measure of uncertainty – increasing from 1 to 4, the optimal instantaneous cash flow increases making the PB time of their example fall from 3.7062 years to 2.6402 years. The simulated results they present further support the possibility that, in practice, shorter required PB time approximates the impact of higher uncertainty on irreversible decisions.

These results, in light of the theoretical arguments and simulations present in the literature, may be more consistent with theory than they appear. The focus on the application of techniques in the accounting and finance literature rather than the wider context of investment decisions that practitioners consider (Jones & Dugdale, 1994) may be exaggerating the gap between theory and practice. Firms can be using PB time and adjustment of discount rates in response to both uncertainty and irreversibility to take into account the value of the option to wait, in the absence of strategic and expiring options. The lack of evidence on this is a significant gap in the literature and this paper uses data obtained from a survey questionnaire to address the gap. It investigates the effect of uncertainty and irreversibility on the hurdles that projects need to clear when there is an option to wait. It also investigates the importance of several factors, such as, demand uncertainty and interest rate uncertainty in raising the value of the option to wait, and the frequency of the options to abandon, mothball, expand and contract in capital budgeting decisions. In investigating the above, the paper recognises that firms are not homogeneous in their need for, and in the way they carry out, capital budgeting (Scapens, 2006). This is based on evidence that, first, the use of capital budgeting techniques is usually related to the size of investment under consideration (Schall, Sundem, & Greijsbeek, 1978) and that firms vary in their need for capital and their capital intensity – a characteristic often associated with manufacturing firms (Abdel-Kader & Luther, 2008; Klammer, 1973). Firms, therefore, are unlikely to be facing a common degree of irreversibility in their capital budgeting decisions. This will be reflected in their use of capital budgeting techniques and the effect of uncertainty on their decisions.

Second, small firms tend to be more sensitive to uncertainty and more financially constrained (Ghosal & Loungani, 2000). This implies that delay of investment decisions may also be caused by lack of funds as well as uncertainty and irreversibility. Third, the separation of ownership and control may lead managers of listed firms to be less sensitive to uncertainty when making capital budgeting decisions (Antle & Eppen, 1985; Antle & Fellingham, 1990). The paper considers potential differences between firms in their response to uncertainty and irreversibility and in their use of rules of thumb resulting from size, sector, and ownership effects.

The paper proceeds as follows. In section two we review the academic literature on the potential of adapting capital budgeting techniques to account for the price of risk associated with both uncertainty and irreversibility. Section three describes the research methodology utilised. Section four presents results of the fieldwork on the use of simple capital budgeting techniques as 'rules of thumb' to account for uncertainty and irreversibility. In this section we also explore the factors that drive the value of options to expand or contract, abandon, delay or mothball projects and the differences between firms' response to uncertainty and irreversibility on the basis of size, sector and ownership. Finally, in section five the conclusions are presented.

2. Background

This section is organised in three parts. The first part deals with the potential for common capital budgeting techniques to approximate the value of the option to wait. In the second part, the pricing of risk in real options is compared with the CAPM approach and the potential for rules of thumb to take into account the price of risk is explained. In the third and final part, characteristics of firms that may lead to variations in the use of capital budgeting techniques and in the response of firms to uncertainty and irreversibility in capital budgeting decisions are discussed.

2.1. Capital budgeting and the option to wait

Real options pricing theory considers the capital budgeting decision structure to be flexible in that it is not a now-or-never decision, with firms having the option to wait or delay decisions (e.g., Brennan & Schwartz, 1985; Dixit & Pindyck, 1994; McDonald & Siegel, 1986; Pindyck, 1991). It also considers other options, e.g., flexibility, expansion, mothballing, contraction,

[1] The use of 'naïve' here follows Dixit and Pindyck (1994) who point out that DCF techniques can be adjusted to deal with irreversibility and uncertainty. But, as often presented in textbooks, 'naïve' DCF techniques ignore the role of irreversibility and uncertainty in the value of real options that decision makers have when evaluating investment projects, and during and after implementation of projects.