THE THEORETICAL AND PRACTICAL ASPECT OF SELECTING THE CAPITAL BUDGETING METHODS

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Abstract

This paper reports the results of a survey with respect to the current practice of capital budgeting techniques in the countries with different levels of economic development. The choice of capital budgeting methods used by companies show that the main reason for the use of the NPV was its superiority as it accurately takes into account the time value of money. The IRR method is used owing to its ability to rank projects and to indicate the actual return of each project, thereby informing managers whether an investment will increase the company's value. The results indicated that the continual use of PB was based on the simplicity of the technique. Financial managers should utilize multiple tools in the capital budgeting process; these results reflect a better alignment of views between academia and business.

Keywords: Capital Budgeting, Simple Payback Period Method, Discounted Payback Period Method, Payback Period Method, Accounting Rate of Return, Net Present Value Method, Internal Rate of Return Method, Real Options

Introduction

Capital budgeting is one of the areas that have attracted a lot of academic attention during the last decades and a lot of descriptive literature has emerged. Capital budgeting decision of the firm is of strategic importance not only for the growth of the firm but for the overall growth of the economy because such decisions involve the firm committing its limited productive resources to its production system as they strengthen or renew their resources.

Corporation in Georgian play a vital role in enhancing the country's economic growth and creating employment. Capital assets are used by the corporation in the physical process of producing goods and services and are ordinarily used for a number of years.

Capital budgeting is a plan to finance long-term outlays, such as fixed assets like facilities and equipment. Previous research studies on capital budgeting have mainly focused on the application and improvement of modeling techniques; for instance: Brealey and Myers (1991), Stanley, B. (1997), Van Horne (1980) and Weston and Brigham (1981) adopted operational research techniques to model the budgeting of capital finance. Other researchers proposed the use of mathematical and optimization methods for capital budgeting Bhaskar, 1978.[15]

Our paper focuses on the latter research line, which emerged over half a century ago with Miller's (1960) and Istvan's (1961) studies on capital budgeting practices in U.S. companies, and has subsequently been updated and has spread with evidence from a wide range of countries. The puzzles of Capital budgeting was conducted as a in highly-developed countries mostly in North America, Australia and Western Europe, i.e the USA and Canada (Graham, Harvey, 2001), Germany (Brounen et al., 2004), the Netherlands (Hermes, Smid, 2007), Sweden (Sandahl, Sjögren, 2003), Swedish (Sven-Olov, Daunfeldt F. Hartwig, 2005), the UK (Brounen et al., 2004), as in developing countries Kester et al. (1999) and G. Andor, S. Mohanty, T. Toth et al. (2011).[16]

As a whole, this literature reveals that managers use multiple techniques, some of which are theoretically appropriate, while others are less so. The most popular evaluation techniques are Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Method.

[15] Stanley, B. (1997). Capital budgeting techniques used by small business firms in the 1990s. The Engineering Economist, Vol. 42, (Nos. 4, Summer) 289-302; Brealey, Richard A. Principles of corporate finance / Richard A. Brealey, Stewart C. Myers, Franklin Allen.—10th ed. Published by McGraw-Hill/Irwin, a business unit of The McGraw-Hill Companies 2011; J. C. Van Horne, John M. Wachowic. Fundamentals of Financial Management, thirteenth edition Jr. FT Prentice Hall. 2008; Bhaskar, K.N. (1978) Linear programming and capital budgeting: the financial problem, Journal of Business Finance and Accounting, 5 (2), Spring, 159–194

[16] Miller, James H., "A Glimpse at Practice in Calculating and Using Return on Investment," N.A.A. Bulletin (now Management Accounting), June, 65-76. 1960. Istvan D.F.The economic evaluation of capital expenditures. J. Bus., 36 (1) (1961), pp. 3–53; Graham, J. & Harvey, C. The theory and practice of Corporate Finance: evidence from the field. Journal of Financial Economics, 60 (Nos. 2-3, May), 2001. 187-243; D. Brounen, A. de Jong, K. Koedijk Corporate finance in Europe: confronting theory with practice. Financ. Manage., 33 (4) (2004), pp. 71–101; N. Hermes, P. Smid, L. Yao. Capital budgeting practices: a comparative study of the Netherlands and China. Int. Bus. Rev., 16 (5) (2007), pp. 630–654; G. Sandahl, S. Sjögren. Capital budgeting methods among Sweden's largest groups of companies. The state of the art and a comparison with earlier studies. Int. J. Prod. Econ., 84 (1) (2003), pp. 51–69. Gyorgy Andor. Sunil K. Mohanty. Tamas Toth. Capital Budgeting Practices: A Survey of Central and Eastern European Firms. Word Bank, 1 (2011), pp. 1–45.

Finally, the literature on corporate finance practices has helped pinpoint and explore the gap between theory and practice. It is obviously that a good investment remains good business even if it is not optimally financed, but that a bad investment will be a wrong decision even with the best financing policy[17]

International studies

Capital budgeting is one of the areas that have attracted a lot of academic attention during the last decades and a lot of descriptive literature has emerged. Miller (1960), Mao (1969), Schall, Sundam, and Geijsbeek (1978), and Pike (1996) report payback technique as the most preferred method, while Istvan (1961) reports a preference for accounting rate of return.[18] Since the surveys (e.g., Klammer 1972, Brigham 1975) of capital budgeting methods used in firms, discounted cash flow (DCF)-based methods such as the Internal Rate of Return (IRR) and, especially, the Net Present Value (NPV) rule, have increasingly gained ground as the main methods for evaluating investment decisions.[19]

From the 1980s financial theoreticians (Graham and Harvey (2001) and Ryan and Ryan (2002)) proved that the number of NPV and IRR using really increased[20]. In their investigation Graham and Harvey (2001) and

[17] Brealey, Richard A. Principles of corporate finance / Richard A. Brealey, Stewart C. Myers, Franklin Allen.—10th ed. Published by McGraw-Hill/Irwin, a business unit of The McGraw-Hill Companies 2011.

[18] Miller, James H., 1960, "A Glimpse at Practice in Calculating and Using Return on Investment," N.A.A. Bulletin (now Management Accounting), June, 65-76. Schall, Lawrence D., Gary L. Sundem, and William R. Geijsbeek, Jr., 1978, "Survey and Analysis of Capital Budgeting Methods," Journal of Finance 33 (No. 1, March), 281- 288; Pike, Richard, 1996, "A Longitudinal Survey on Capital Budgeting Practices," Journal of Business Finance and Accounting 23 (No. 1, January), 79-92.

[19] In the Brigham (1975) study, 94% of the large U.S. firms in their survey use NPV, IRR or a profitability index criterion in their capital budgeting. In most U.S. studies from 1977 (Gitman and Forrester 1977) to the early 2000's (Stanley and Block 1984, Bierman 1993, Graham and Harvey 2002), NPV and/or IRR are typically the most common method(s), with IRR being either more or at least approximately equally as common as the NPV. For Europe, Brounen et al. (2004) report that payback is still the most common. See also, e.g., Jagannathan and Meier (2002) and Anand (2002) for evidence and review of capital budgeting methods and their development over time. For the Nordic markets studied here, see Holmén and Pramborg (2006) for Sweden, and Liljeblom and Vaihekoski (2004) for Finland.

[20] Binder, J. J. and J. S. Chaput (1996) "A Positive Analysis of Corporate Capital Budgeting Practices," Review of Quantitative Finance and Accounting, 6(3), pp.245-257; Haka, S. (2006) "A Review of the Literature on Capital Budgeting and Investment Appraisal: Past Present, and Future Musings," Handbooks of Management Accounting Research, vol.2, edited by C. Chapman, C., A. Hopwood, and M. Shields, Elsevier Publishing, B.V.: North Holland, pp.697-728.

Ryan and Ryan (2002) have shown that corporate managers and academics are not always in agreement with regard to their choice of theoretical method[21]. Graham and Harvey (2001) examined that IRR is the most appreciated method, while NPV and IRR are more popular than SPP, DPP, or ARR. At the same time, Ryan and Ryan (2002) proved that NPV and IRR are preferred over all other capital budgeting methods.

In connection with the point previously mentioned, payback period methods are more frequently used than NPV or IRR. This is surprising because Brealey and Myers (since 1981) have for many decades mentioned of the disadvantages of using the approach. It is a surprising and noteworthy gap between academic theory and practice. These results contrast with the situation regarding the lack of use of ARR because ARR is not theoretically regarded as an excellent tool for the evaluation of corporate value.[22] Despite some debate concerning the appropriateness of the NPV in all situations,[23] the NPV is generally considered superior to, e.g., the payback method and the IRR.[24]

There are a lot of countries practices about most commonly used capital budgeting technique in Table 1.[25]

[21] Arnold, G. C. and P. D. Hatzopoulos (2000) "The Theory-Practice Gap in Capital Budgeting: Evidence from The United Kingdom," *Journal of Business Finance and Accounting*, 27(5-6), pp.603-626; Alkaraan, F. and D. Northcott (2006) "Strategic Capital Investment Decision - Making : A Role for Emergent Analysis Tools? A Study of Practice in Large UK Manufacturing Companies," *The British Accounting Review*, 38(2), pp.149-173.

[22] Tomonari Shinoda. Capital Budgeting Management Practices in Japan. Econ. J. of Hokkaido Univ., Vol. 39 (2010), pp. 39 – 50.

[23] Berkovitch, E., and R. Israel, 2004, Why the NPV criterion does not maximize NPV, Review of Financial Studies 17, 239–255.

[24] Empirical studies also indicate an increasing use of methods complementing the DCF calculus, e.g., by real options applications (see, e.g., Graham and Harvey 2002).

[25] Pablo de Andrés, Gabriel de Fuente, Pablo San Martínc. Capital budgeting practices in Spain. BRQ Business Research Quarterly (2015) 18, p.,37—56.

Table 1. Capital budgeting methods in the different countries.

Countries	Techniques						
	DCF (NPV or IRR)	NPV	IRR	PB	RO	ARR	ROI
USA	Chen (2008)	Trahan and Gitman (1995) and Ryan and Ryan (2002)	Bierman (1993),Burns and Walker (1997), Payne et al. (1999) and Graham and Harvey (2001)	Mao (1970),Schall et al. (1978), Moore and Reichert (1983) and Block (1997)		Istvan (1961)	Miller (1960)
Canada		Bennouna et al. (2010) and Baker et al. (2011a)	Payne et al. (1999) and Graham and Harvey (2001)				
UK	Busby and Pitts (1997)	Alkaraan and Northcott (2006)	Arnold and Hatzopoulos (2000)	Pike (1996),Drury and Tayles (1996) and Brounen et al. (2004)			
Netherlands		Brounen et al. (2004)and Hermes et al. (2007)					
Germany		Sridharan and Schuele (2008)		Brounen et al. (2004) and Sridharan and Schuele (2008)			
France					Brounen et al. (2004)		
Spain				Ayala and Rodríguez (2000),Iturralde and Maseda (2004) and Rayo et al. (2007)			
Sweden				Sandahl and Sjögren (2003) and Holmen and Pramborg (2009)			
Australia		Kester et al. (1999)and Truong et al. (2008)					
Hong Kong				Ann et al. (1987) and Kester et al. (1999)			
Indonesia		Kester et al. (1999)		Leon et al. (2008)			
Malaysia				Ann et al. (1987) and Kester et al. (1999)			
Philippines				Kester et al. (1999)			
Singapore				Ann et al.			

				(1987) and Kester et al. (1999)			
South Africa							Hall and Millard (2010)
Argentina	Pereiro (2006)						
Japan				Shinoda (2010)			
Colombia			Velez and Nieto (1986)				
China			Hermes et al. (2007)				
Persian Gulf		Chazi et al. (2010)					
Latin-America		Maquieira et al. (2012)					

All evidence have shown that the theory of capital budgeting supports Net Present Value (NPV) method most, which involves discounting all relevant cash flows at a market determined discount rate such as the cost of capital.

It is known that every manager should have the goal of maximizing a shareholder wealth; so NPV is aligned with this goal, it also considers the timing of these cash flows and use of relevant cash flows. In NPV the future cash flows are discounted and if NPV is positive then the project will be acceptable.[26] If there are more than one project then that project should be accepted which has higher NPV.[27] Some researches which were conducted in Japanese show that the most firms use combination of payback period method and net present value method.[28]

The budget appraisal methods, such are the internal rate of return (IRR) (disadvantage: economies of Scale Ignored; impractical implicit assumption of reinvestment rate; dependent or contingent projects; mutually exclusive projects) and pay-back (disadvantage: ignores the time value of money and also ignores cash-flows that occur after the maximum pay-back time. In time, when discounted pay-back does not ignore the time value of

[26] Michael C. Ehrhardt and Eugene F. Brigham Financial Management: Theory and Practice, Thirteen Edition Michael 2011 South-Western; Brealey, Richard A. Principles of corporate finance / Richard A. Brealey, Stewart C. Myers, Franklin Allen.—10th ed. Published by McGraw-Hill/Irwin, a business unit of The McGraw-Hill Companies 2011; Fundamentals of Financial Management thirteenth edition James C. Van Horne, John M. Wachowicz, Jr. FT Prentice Hall. 2008

[27] Financial Management for Decision Makers. Atrill P. 6th edition FT Prentice Hall. 2012; Financial Management: Theory and Practice. 13th. Education.

[28] Tomonari Shinoda. Capital Budgeting Management Practices in Japan. Econ. J. of Hokkaido Univ.,
Vol. 39 (2010), pp. 39 - 50

money, but still ignores cash-flows after the maximum pay-back point) methods are often criticized.

The earnings multiple or price/earnings (P/E) approach (which presents a variation on pay-back methods) as Pay-back methods, do not consider the time value of money.

Value-at-Risk (VaR), is a widely used measure of financial risk, which provides a way of quantifying and managing the risk of a portfolio. However, VaR does not give a consistent method for measuring risk, as different VaR models will come up with different VaR results. It should also be noted that VaR only measures quantifiable risks; it cannot measure risks such as liquidity risk, political risk, or regulatory risk. In times of great volatility, such as war, it may also not be reliable. For this reason, VaR models should always be used alongside stress testing.[29]

Liesio et al (2006.68) states that ―'Real options' explores the possibilities that the option-pricing approach offers. Especially considering the non-linearity and the cost of waiting and hedging, real options could provide valuable information in terms of capital budgeting. Real Options (RO) is a useful tool for making investment decisions, taking into account uncertainty and building flexibility in the system. RO often deals with projects that do not have a lot of historical statistics. The application of real options makes use of risk to add value to a project and therein lays its potential benefit for a field development decision process.

In many literatures, real options theory was praised for its effective capture of timing. There is even a bold argument that NPV is equal to real options only when investments cannot be postponed. In other words, net present value cannot capture value obtained by managerial flexibility to invest at the right time. However, argued quoting Schwartz (1997a)[30] study. In this literature it is concluded that DCF induces investment too early, in conformity with other researches that it cannot take into account timing. However, as good challenge to widely accepted theory, the real options approach is also criticized as inducing investment too late when it neglects mean reversion.

RO is generally used by managers who face situations that involve strategic options in the future and who must consequently conduct strategic decision-making under uncertain conditions. Since RO applies option pricing models (put option and call option valuation techniques) to capital budgeting

[29] James, T.: Energy Price Risk: Trading and Price Risk Management. Gordonsvile, VA, USA: Palgrave Macmillan, 2003, p.133.

[30] Eduardo S. Schwartz. The stochastic behavior of commodity prices: Implications for valuation and hedging. Journal of Finance, 52(3):923–973, 1997. Lundquist, C. G. (2002, Spring). Real Option Valuation vs. DCF Valuation- An application to a NorthSea oilfield. Stockholm Business School, Stockholm, Sweden.

decisions, it is a very sophisticated and advanced technique in financial theory; when put into practice, however, it seems to involve unavoidable difficulties.

Adjusted present value (APV), defined as the net present value of a project if financed solely by equity plus the present value of financing benefits, is another method for evaluating investments. It is similar to NPV. The difference is that is uses the cost of equity as the discount rate rather than WACC. The APV separates the value of operations from value created or destroyed by how the company is financed. The APV may be a better tool to analyze the value of entities with unique financing because it separates the value of the operations of a business purely from the value that is created through the way the business is financed. As such, the APV can also be used as a management tool to break out the value created from specific managerial decisions.

Discussing about the capital budgeting method, McDonald (2006) proves that the simultaneous use of many capital budgeting methods parallel to DCF, such as IRR, payback, and P/E multiples, may mean that managers perform a variety of formal calculations and then make decisions by weighing the results and using subjective judgment. A part of such judgment may represent their "adjustments" of DCF methods to take into account real option values.[31]

We can assure everyone that while most financial managers utilize multiple tools in the capital budgeting process; these results reflect a better alignment of views between academia and business.

However, there are some factors that influence on decision makers - a lot of researches proved that on the one hand use of more sophisticated capital budgeting methods is related to the CFO's education and on the other hand was showed that the use of NPV as a primary method, and the sophistication of the capital budgeting is related both to the company and CFO characteristics. [32]

Conclusion

Widespread opinion among scholars and practitioners is that a firm's future success and survival ultimately depend on it getting its current investment decisions right. All evidence have shown that the theory of capital budgeting supports Net Present Value (NPV) method most, which involves discounting all relevant cash flows at a market determined discount

[31] McDonald, R.L., 2006, The role of real options in capital budgeting: theory and practice. Journal of Applied Corporate Finance 18, 28-39.

[32] Brunzell T, Liljeblom E, Vaihekoski M (2011). "Determinants of capital budgeting methods and hurdle rates in Nordic firms". Account. Financ. 51(4):1-26.

rate such as the cost of capital. It is known that every manager should have the goal of maximizing a shareholder wealth; so NPV is aligned with this goal, it also considers the timing of these cash flows and use of relevant cash flows. The IRR method is used owing to its ability to rank projects and to indicate the actual return of each project, thereby informing managers whether an investment will increase the company's value. The results indicated that the continual use of PB was based on the simplicity of the technique.

In many literatures, real options theory was praised for its effective capture of timing. There is even a bold argument that NPV is equal to real options only when investments cannot be postponed. In other words, net present value cannot capture value obtained by managerial flexibility to invest at the right time.

A lot of researches proved relationship between the capital budgeting method used and the organization and decision maker's characteristics, also firm's size (large companies used NPV, IRR, PB, and sensitivity analysis more than small companies).

Our point of view, financial managers should utilize multiple tools in the capital budgeting process, these results reflect a better alignment of views between academia and business.

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