



Factors determining the selection of capital budgeting methods in companies operating in Poland

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Abstract

The paper aimed to explore the extent of the use of capital budgeting methods and also factors determining their selection in companies operating in Poland. The study fills the gap in the literature regarding capital budgeting practices by verifying two hypotheses: H1, stating that the diffusion of capital budgeting methods in companies operating in Poland is similar to other Central and East European (CEE) countries and lesser than in more developed countries, and H2, stating that the type of a company's activity, equity capital origin, company size and magnitude of capital expenditure budget is associated with capital budgeting method (CBM) selection.

The research carried out enabled Hypothesis 1 to be verified partly positively, meaning that the majority of companies use: NPV, sensitivity analysis, scenario analysis and formalization of investment appraisal. The diffusion of CBM in Poland is therefore similar to other CEE countries and lesser than in more developed countries, e.g. the USA or UK. The study results also enabled Hypothesis 2 to be verified partly positively, meaning that: the large size of a company's capital expenditure budget and company size have a positive association with the use of 6 methods respectively, foreign ownership has a positive association with the use of 5 methods and the company's activity is associated with the use of 1 method. The study results also enabled Hypothesis 2 to be verified partly positively meaning that the use of two capital budgeting techniques based on discounted cash flows (together IRR and NPV) significantly increases when a company has foreign ownership and when the capital expenditure budget is large. Other tested independent variables (type of main activity and company size) show no significant association with the use of capital budgeting appraisal methods based on discounted cash flows.

Keywords: management accounting, capital budgeting, Poland, survey, investment decisions.

Streszczenie

Czynniki determinujące wybór metod budżetowania kapitałowego w przedsiębiorstwach działających w Polsce

Celem artykułu jest zbadanie stopnia wykorzystania metod budżetowania kapitałowego oraz czynników determinujących wybór tych metod w przedsiębiorstwach działających w Polsce. Badanie wypełnia zidentyfikowaną w literaturze lukę badawczą poprzez zweryfikowanie dwóch hipotez: H1, stwierdzającej,

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że dyfuzja metod budżetowania kapitałowego w przedsiębiorstwach działających w Polsce jest podobna jak w innych krajach Europy Środkowej i Wschodniej i mniejsza niż w krajach wyżej rozwiniętych, oraz H2, zgodnie z którą rodzaj działalności przedsiębiorstwa, pochodzenie kapitału własnego, wielkość przedsiębiorstwa oraz wielkość budżetu inwestycyjnego mają wpływ na wybór metod oceny opłacalności inwestycji.

Przeprowadzone badanie pozwoliło na zweryfikowanie hipotezy 1 częściowo pozytywnie, ponieważ większość przedsiębiorstw działających w Polsce wykorzystuje NPV, analizę wrażliwości, analizę scenariuszy oraz formalizację oceny opłacalności inwestycji. Dyfuzja metod oceny opłacalności inwestycji w Polsce jest podobna jak w innych krajach Europy Środkowej i Wschodniej i mniejsza niż w krajach wyżej rozwiniętych, takich jak np. Stany Zjednoczone czy Wielka Brytania. Otrzymane rezultaty umożliwiają częściowo pozytywną weryfikację hipotezy 2, co oznacza, że stosowanie dwóch metod oceny opłacalności inwestycji opartych na zdyskontowanych przepływach pieniężnych (łącznie NPV i IRR) zwiększa się istotnie, kiedy firma jest finansowana kapitałem zagranicznym oraz kiedy jej budżet kapitałowy jest duży. Pozostałe testowane zmienne niezależne (rodzaj głównej działalności i wielkość firmy) nie wykazują istotnego związku z wykorzystaniem metod oceny opłacalności inwestycji opartych na zdyskontowanych przepływach pieniężnych.

Słowa kluczowe: rachunkowość zarządcza, budżetowanie kapitałowe, Polska, badanie ankietowe, decyzje inwestycyjne.

Introduction

Capital budgeting practice has drawn the attention of researchers for many years but the vast majority of the research dedicated to the problem of capital budgeting was conducted in highly-developed countries, mostly in North America, Australia and Western Europe, e.g. Australia (Truong *et al.*, 2008), Canada (Graham and Harvey, 2001), France (Brounen *et al.*, 2004), Germany (Brounen *et al.*, 2004), the Netherlands (Hermes *et al.*, 2007), Sweden (Sandahl and Sjögren, 2003), the UK (Brounen *et al.*, 2004), and the USA (Graham and Harvey, 2001). The results of the studies are widely known, especially in academic circles, and they undoubtedly had an influence on the development of theory and its teaching as well as its practical use.

Studies investigating capital budgeting in countries which are characterized by a lesser degree of development, most of all Asian countries, but also countries from Central and Eastern Europe (CEE), are definitely less common, however, one should mention two works. The first is by Kester *et al.* (1999) which is 15 years old and embraces countries such as Hong Kong, Indonesia, Malaysia, the Philippines and Singapore. The second is the work by Andor *et al.* (2011) which studied the practices of ten CEE countries e.g. Bulgaria, Croatia, Czech Republic, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. There have of course been more such studies, however, the practical use of capital budgeting methods in CEE countries is not researched enough, especially when compared to research carried out in more developed countries. Studies of capital budgeting practices in companies based in CEE seem interesting due to the historical conditioning of these countries. They have been undergoing political transformations which started at the end of the 1980's and resulted in profound changes in their economies, which over the years have come a long way from communism to capitalism, and since 1999 have been integrating with European Union structures. The economies of these countries opened to foreign capital, which they have to compete with locally and more often globally. The competition manifests itself *inter alia* in investments undertaken by these companies and which, for the sake of efficient competitiveness with other firms, must be effective – it requires both good business ideas and the proper use of the evaluation of these ideas (investments) – methods which are widespread and commonly used in companies based in more developed countries.

Research on capital budgeting methods use has also been conducted in Poland (e.g. Zarzecki, 1997; Szychta, 2001; Rogowski and Kasiewicz, 2006) but it was partial and focused mainly on identifying the extent of the diffusion of basic methods. In the light of the above observations, some questions on capital budgeting practice in companies operating in Poland emerge: (a) do companies in Poland use similar methods of capital budgeting to their counterparts in other countries? (b) do they use one method seen as the „best” or do they use a whole spectrum of methods? (c) are there any differences between companies of different characteristics (e.g. type of activity, size, origin of capital, magnitude of capital expenditure budget) in using those methods?

In the context of the above research questions, the aim of the paper was formulated – its aim is to study the practice of capital budgeting methods in companies operating in Poland and, in particular, to check what methods are used and what factors are associated with their selection. The aim of the study was fundamentally concurrent with the aims of similar studies conducted around the world, however, some aspects were slightly different. Firstly, this study was carried out on a sample of companies operating in Poland, a country which is different in terms of culture, institutions or significance of capital market for the economy from more developed countries where most of the research was carried out. Secondly, the study not only aimed to present the methods used, but it also focused on the analysis of procedures and the organization of capital budgeting. Thirdly, this study explores not only the use of capital budgeting methods (like all studies done in Poland so far) but also factors that determine their selection.

It should be stressed that capital budgeting decisions are much more than the application of „a theoretically correct approach” involving the use of financial measures such as discounted cash flow – DCF, real options *etc.* to evaluate and rank investment opportunities. Capital budgeting decisions comprise general management problems (Miller and O’Leary, 2007). The formal procedures analysed in the paper address only a small proportion of the process of capital budgeting decision making. The research concentrates on analyzing evidence on the formal usage of known evaluation techniques and it is an effort to broaden the knowledge and understanding of investment appraisal practices, the research of which, especially in Poland, remains seriously underdeveloped.

The rest of the paper is organized as follows: first the methodology underlying this research is discussed, which is followed by a short presentation of the research method. Then the results of the research in terms of capital budgeting methods used and factors determining their use are analysed. The paper finishes with conclusions.

1. Research methodology and method

The research into the practice and factors determining capital budgeting method selection in companies operating in Poland was preceded by an extensive literature review. The review embraced literature on investment appraisal methods and the organization of the investment process. In particular, it included research into the diffusion of capital budgeting methods and factors influencing their use (e.g. Klammer *et al.*, 1991; Graham and Harvey, 2001; Sandahl and Sjögren, 2003; Brounen *et al.*, 2004; Verbeeten, 2006; Bennouna *et al.*, 2010; Daunfeldt and Hartwig, 2011).

As previous studies show (Table 1) DCF methods are most commonly used by companies in North America, Asia and Pacific countries. DCF methods are less common among companies from Western Europe and they are least commonly used in the countries of Central and Eastern Europe – CEE.

Table 1. Diffusion of investment appraisal methods

Country	Usable responses	DCF	NPV	IRR	PB	ARR
Australia (Truong <i>et al.</i> , 2008)	77	92%	86%	64%	59%	19%
Bulgaria (Andor <i>et al.</i> , 2011)	20	35%	N/A	N/A	40%	30%
Canada (Baker, <i>et al.</i> , 2011)	214	N/A	75%	68%	67%	40%
China (Hermes <i>et al.</i> , 2007)	45	92%	49%	89%	84%	N/A
Croatia (Andor <i>et al.</i> , 2011)	16	56%	N/A	N/A	69%	63%
Czech Republic (Andor <i>et al.</i> , 2011)	57	37%	N/A	N/A	53%	40%
Finland (Liljeblom and Vaihekoski, 2004)	144	N/A	52%	44%	97%	21%
France (Brounen <i>et al.</i> , 2004)	61	55%	35%	44%	51%	16%
Germany (Brounen <i>et al.</i> , 2004)	132	60%	48%	42%	50%	32%
Hong Kong (Lam <i>et al.</i> , 2007)	46	N/A	72%	65%	85%	83%
Hungary (Andor <i>et al.</i> , 2011)	46	43%	N/A	N/A	63%	76%
India (Verma <i>et al.</i> , 2009)	30	N/A	63%	77%	80%	27%
Indonesia (Leon <i>et al.</i> , 2008)	108	N/A	64%	64%	86%	41%
Latvia (Andor <i>et al.</i> , 2011)	9	44%	N/A	N/A	33%	67%
Lithuania (Andor <i>et al.</i> , 2011)	14	43%	N/A	N/A	57%	50%
Malaysia (Kester <i>et al.</i> , 1999)	35	89%	71%	68%	70%	35%
Netherlands (Hermes <i>et al.</i> , 2007)	42	100%	89%	74%	79%	2%
Poland (Szychta, 2001)	60	N/A	30%	25%	40%	35%
Poland (Andor <i>et al.</i> , 2011)	143	58%	N/A	N/A	81%	59%
Romania (Andor <i>et al.</i> , 2011)	57	58%	N/A	N/A	61%	68%
Singapore (Kester <i>et al.</i> , 1999)	54	82%	59%	70%	70%	44%
Slovakia (Andor <i>et al.</i> , 2011)	25	56%	N/A	N/A	64%	72%
Slovenia (Andor <i>et al.</i> , 2011)	13	46%	N/A	N/A	62%	77%
Sweden (Daunfeldt and Hartwig, 2011)	88	N/A	61%	30%	54%	24%
UK (Brounen <i>et al.</i> , 2004)	68	68%	47%	53%	69%	38%
USA (Ryan and Ryan, 2002)	205	N/A	85%	77%	53%	15%
USA and Canada (Graham and Harvey, 2001)	392	97%	75%	76%	57%	20%

* Total internal rate of return and net present value

Source: own research.

Table 1 shows that in some countries (e.g. Australia, Canada, China, Malaysia, the Netherlands, Singapore and the USA), the process of investment appraisal methods diffusion is almost finished, as their use (DCF methods) is close to 100%. In other countries (France, Germany, UK) these methods are also commonly used although their diffusion is far from finished. The diffusion of investment appraisal methods in other countries, especially in CEE countries, is still smaller. As far as companies' practice in the use of CBM in Poland is concerned, Szychta (2001) found that 30% of companies use net present value (NPV) and a 25% internal rate of return (IRR). Research conducted ten years later (Wnuk-Pel, 2011) showed that the diffusion of these

methods had increased to 53% (NPV) and 47% (IRR) – these results were confirmed by Andor *et al.* (2011), who found that 58% of Polish companies use discounted cash flow (DCF) techniques. What is also interesting is that, together with the increase in use of methods based on DCF, also other methods (e.g. payback – PB or accounting rate of return – ARR) are more popular than before. While Szychta (2001) found that these methods were used by 40% and 35% of the companies respectively, Wnuk-Pel (2011) found that their use had increased to 81% and 59% (Wnuk-Pel's findings were generally confirmed by Andor *et al.* (2011), who found their use at a level of 61% and 68% respectively). Altogether, the studies carried out so far show that the diffusion of capital budgeting methods in Poland is lesser than in more developed countries and similar to other Central and East European countries. Hence, Hypothesis 1 can be formulated:

H1: the diffusion of capital budgeting methods in companies operating in Poland is similar to other CEE countries and lesser than in more developed countries.

The studies carried out in Poland so far have focused mainly on the diffusion of capital budgeting methods, and did not contain more detailed analysis of their use and especially ignored influences on CBM practice. When analysing the diffusion of capital budgeting methods in Poland, it is expected (according to the literature) that certain company characteristics will be associated with the use of capital budgeting methods. As far as a company's main activity is concerned, we expect manufacturing companies (MAN) will use CBM more often than non-manufacturing companies (manufacturing companies are often larger and they realize bigger capital investment projects – e.g. Daunfeldt and Hartwig, 2011). As far as foreign ownership is concerned, we expect companies with foreign capital will use CBM more often than companies with only domestic capital, because companies in more developed countries (from which the capital usually comes from) use these methods more often than companies in Poland (e.g. Graham and Harvey, 2001; Ryan and Ryan, 2008; Hermes *et al.*, 2007; Truong *et al.*, 2008). The literature suggests that company size is one of the most important variables associated with CBM selection – we expect larger companies will use CBM more often than small companies (e.g. large companies have resources to use more sophisticated methods and they are also dealing with bigger projects, making the use of more sophisticated methods cheaper – e.g. Pike, 1996; Payne *et al.*, 1999; Graham and Harvey, 2001; Sandahl and Sjögren, 2003; Brounen *et al.*, 2004; Verbeeten, 2006; Hermes *et al.*, 2007; Bennouna *et al.*, 2010; Andor *et al.*, 2011; Daunfeldt and Hartwig, 2011; Correia, 2012; Hartwig, 2012; Ahmed, 2013). When analysing the diffusion of capital budgeting methods, we expect (according to the literature) that the size of a company's capital expenditure budget will be associated with the use of capital budgeting methods, more specifically we expect companies with larger capital budgets will use CBM more often than companies with small capital expenditure budgets (use of more sophisticated methods in the case of large projects is comparatively less costly than in small projects – e.g. Hermes *et al.*, 2007). Verma *et al.* (2009) showed that companies with large capital expenditures use NPV more often than those with small ones (the difference was not significant for other methods), similar results were obtained by Correia (2012). Hence, we hypothesize:

H2: company characteristics, such as manufacturing activity, foreign ownership, large size and also the large size of a company's capital expenditure budget, are positively associated with the frequency of capital budgeting method selection.

When evaluating investments, managers can choose from different methods to facilitate their decision:

- 1) formalization of investment appraisal (FORMAL_APR),
- 2) the investment appraisal method used: accounting rate of return – ARR (APR_ARR), payback – PB (APR_PB), discounted payback – DPB (APR_DPB), internal rate of return – IRR (APR_IRR), net present value – NPV (APR_NPV),
- 3) the discount rate used in DCF methods: marginal cost of capital – MCC (COST_MCC), weighted average cost of capital – WACC (COST_WACC), cost of debt (COST_DEBT), arbitrary cost (COST_ARBITRARY),
- 4) the methods of risk assessment: sensitivity analysis (A_SENSITIVITY), scenario analysis (A_SCENARIO),
- 5) monitoring investment during implementation (AUD_DUR_IMPLEMENT),
- 6) post-investment audit (AUD_POST_INVEST).

To analyse the determinants of capital budgeting method selection (for testing Hypothesis 2), the following notions were accepted: CBM_{ij} is the reported use of the capital budgeting method j ($j = 1, 2, \dots, 14$; see Table 4) by the company i ($i = 1, 2, \dots, 99$); MAN_i is the type of activity the company i ($i = 1, 2, \dots, 100$) is engaged in (if the company is manufacturing – MAN, if the company is non-manufacturing – NMAN); $FOWN_i$ is foreign ownership of the company i ($i = 1, 2, \dots, 99$) as defined by the percentage of shares owned by foreign capital (if there is foreign ownership (any percent) – FOWN, if there is not foreign ownership – NFOWN); $LSIZE_i$ is the size of the company i ($i = 1, 2, \dots, 99$) as defined by the number of employees (if the company has up to 100 employees – SMALL_COMP, if the company has 101–500 employees – MEDIUM_COMP, if the company has 501–1000 employees – LARGE_COMP, if the company has more than 1000 employees – VERYLARGE_COMP); $LCAPEX_i$ is the magnitude of the capital expenditure budget of the company i ($i = 1, 2, \dots, 99$) defined in PLN where 1 EUR = 4 PLN (if capital expenditure budget is up to 10m PLN – LOW_CAPEX, if the capital expenditure budget is between 11–50m PLN – MEDIUM_CAPEX, if the capital expenditure budget is between 51–100m PLN – LARGE_CAPEX, if the capital expenditure budget is more than 100m PLN – VERYLARGE_CAPEX).

The survey research method was selected to verify the adopted hypotheses. In the author's opinion (see also e.g. Graham and Harvey, 2001; Daunfeldt and Hartwig, 2011), research in the form of a questionnaire has some advantages when compared to case studies, which may also be used to analyse the practice of capital budgeting. Although research carried out by means of a case study gives the opportunity to get to know in-depth the real practice of a given company, and questionnaires present the opinions of the respondents rather than the actual practice, survey research bears one more advantage – it enables a large number of companies to be analysed and provides the basis for the generalization of prospective outcomes resulting from the study. Despite the many shortcomings of research carried out by means of a survey, the

author is convinced that it will facilitate a unique analysis of company practice in Poland in terms of capital budgeting and it will contribute to the modification of existing beliefs on the use of methods enumerated in textbooks and factors influencing their use (it enables a comparison in the time dimension with previous studies carried out in Poland). Another argument which made the author use survey research was the desire to compare the study results with the results of research conducted in other countries – a comparison in the space dimension (e.g. Kester *et al.*, 1999; Arnold and Hatzopoulos, 2000; Graham and Harvey, 2001; Sandahl and Sjögren, 2003; Bruonen *et al.*, 2004; Hermes *et al.*, 2007; Truong *et al.*, 2008 or Andor *et al.*, 2011) – such a comparison would not be possible using the case study method.

In order to analyse capital budgeting methods in companies operating in Poland, two basic groups of variables have been used – variables characterizing companies and variables characterizing capital budgeting methods used by the researched companies. The questionnaire contained multiple-choice questions, but the respondents were asked to provide more expansive answers and comments. The choice of groups and individual variables was made taking into account the study's aims, so that the methods of capital budgeting used were analysed in a credible manner. The questionnaire used for the research is shown in Appendix.

The author pre-tested the survey instrument on graduate students in the Faculty of Management of his University and, after some corrections, tested it again on a small group of practitioners, which was also followed by some changes in the questionnaire. When distributing the final version of the questionnaire, the author made sure that the respondents understood that capital budgeting decisions refer to all non-routine investments – if it was not clear, the respondents would probably not be able to provide credible answers. Initially, the author wanted to conduct the research by means of a questionnaire sent by mail to a group of randomly selected companies. However, he came across an extremely important problem during the research – out of the companies to which the questionnaire was sent, only 0.5% filled it in and send it back. The situation made the author change the way the questionnaire was distributed. Finally, it was conducted among management accountants participating in post-graduate studies or participating in different courses in the field of management accounting (the issue of capital budgeting was not brought up during the courses). 99 questionnaires were returned and filled in correctly (response rate 24.8%). All calculations were made using SPSS statistical software.

The author hopes that an analysis of the provided answers, depending on the characteristics of the researched companies (type of activity (manufacturing or non-manufacturing), foreign origin of equity capital, size of company and magnitude of capital expenditure budget), will enable the discovery of some commonalities which will shed light on the practical use of capital budgeting methods. Yet the results of the research must be interpreted in a cautious manner due to some limitations of the tool (survey) which was used – despite those limitations, the author is convinced that the research is complementary in relation to previous research, and in particular to the research carried out by means of other methods.

2. Results of the empirical research

Among the researched companies, the majority (60%) were non-manufacturing companies and the rest (40%) were manufacturing companies. Within the sample, there were firms whose equity capital had different origins: 51% of the companies had solely domestic capital while 49% had a share of foreign capital. It needs to be emphasized that small and medium-sized companies were dominant in the researched sample (67%) whereas large and very large companies constituted 33% of the sample (the number of employees was the determinant of the size of the analysed companies).

The research carried out revealed that the magnitude of annual capital expenditure budget in one third (33%) of the companies does not exceed 10 million PLN (such a budget was determined as small – 1 EUR = 4.2 PLN). In the case of 27% of firms, the annual capital budget is between 11 and 50 million PLN (such a budget was determined as average) whereas in the case of 16% of companies the budget was 51–100 million PLN (large budget). It should be stressed that in almost a quarter of the companies (24%), the average annual capital expenditure was very high and exceeded 100 million PLN.

The correlation between independent variables was investigated using Spearman's rank correlation coefficients (Spearman's rho) (Table 2). The correlation coefficient matrices in Table 2 suggest that large companies, as expected, have large capital expenditure budgets and, moreover, companies with a share of foreign capital have large capital expenditure budgets too. Even though some independent variables correlate, the multicollinearity problem is limited and there is no need to perform a robustness check (the highest correlation $\rho = 0.404$ and most were much lower so robustness checks, where the results could be controlled for size or other independent variables, were not conducted).

Table 2. Spearman's rank correlations coefficients of independent variables

Item	MAN	FOWN	LSIZE	LCAPEX
MAN	1			
FOWN	0.086	1		
LSIZE	-0.096	0.154	1	
LCAPEX	0.011	0.251*	0.404**	1

* Correlation is significant at the $p < 0.05$ level (two-tailed)

** Correlation is significant at the $p < 0.01$ level (two-tailed)

Source: own research.

The research carried out revealed that the key aims of investments undertaken by companies in Poland are the following (from the most important to the least important):

- increase of company capacity in the case of existing products,
- extending the range of products on offer,

- reduction of costs,
- modernisation of the company's capacity,
- improvement of customer service quality,
- improvement of product quality.

In the majority of the analysed companies, the investment process involves entire teams of managers representing different functions realized within the company (e.g. core business, sales and marketing, logistics and accounting/finance). In three quarters of the companies, investment projects are evaluated by teams, whereas in the rest of the firms, projects are evaluated by one person or by top managers (usually the chairman of the Board). The survey helped to draw attention to the fact that that decisions about investments are made at the level of: the Board, directors of departments responsible for investment, managers of sections that realized investments and headquarters. For a better analysis of the way the capital budget was shaped within the researched companies, the level at which decisions about investments were made was set together with the magnitude of capital investment projects. Further analysis leads to the conclusion that when the size of a capital investment project grows, the level at which the project is finally accepted changes – generally, the bigger the investment, the higher the level at which the investment decision is accepted (with a probability of error of 0.01 it may be assumed that the relationship is statistically significant and fairly strong – Cramer's $V = 0.551$).

Four different groups of methods used in capital budgeting decisions were analysed: (1) investment appraisal methods used (ARR, PB, DPB, IRR and NPV), (2) discount rate used in DCF methods (MCC, WACC, cost of debt, arbitrary cost), (3) methods of risk assessment (sensitivity analysis and scenario analysis) and (4) procedures used in investment appraisal (the formalization of investment appraisal, monitoring investment during implementation and post-investment audit). Use of individual capital budgeting methods in the researched companies and their frequency of use are presented in Table 3.

Table 3. Proportion of companies that use each capital budgeting method

Capital budgeting method	Symbol	Use %*	Non-use %
Formalization of investment appraisal	FORMAL_APR	81	19
Investment appraisal method used:			
– ARR	APR_ARR	15	85
– PB	APR_PB	35	65
– DPB	APR_DPB	32	68
– IRR	APR_IRR	47	53
– NPV	APR_NPV	53	47

Capital budgeting method	Symbol	Use %*	Non-use %
Discount rate used in DCF methods:			
– MCC	COST_MCC	6	94
– WACC	COST_WACC	36	64
– cost of debt	COST_DEBT	24	76
– arbitrary cost	COST_ARBITRARY	14	86
Methods of risk assessment:			
– sensitivity analysis	A_SENSITIVITY	54	46
– scenario analysis	A_SCENARIO	61	39
Monitoring investment during implementation	AUD_DUR_IMPLEMENT	28	72
Post-investment audit	AUD_POST_INVEST	40	60

* For questions regarding use of investment appraisal methods (ARR, PB, DPB, IRR and NPV) the answers range was between 0 and 4, where 0 (zero) indicated that the method was „never” used and 4 indicated that the method was „always” used. Respondents who answered that they „always” (represented by the highest score – 4) or „almost always” (represented by 3) used a method are defined as „users”.

Source: own research.

The carried out research enabled Hypotheses 1 to be verified partly positively, meaning that:

- 1) the majority of the companies use: NPV (53%), sensitivity analysis (54%), scenario analysis (61%) and the formalization of investment appraisal (81%);
- 2) other methods are also used but the extent of their use is smaller: ARR (15%), PB (35%), DPB (32%), WACC (36%), MCC (6%), cost of debt (24%), arbitrary cost (14%), monitoring investment during implementation (28%) and post-investment audit (40%);
- 3) the picture of capital budgeting practice in companies operating in Poland is somewhat mixed because quite a lot of firms do not use methods such as: NPV (47%), WACC (64%), sensitivity analysis (46%), scenario analysis (39%), formalization of investment appraisal (19%), monitoring investment during implementation (72%) or post-investment audit (60%);
- 4) altogether, the research showed that the diffusion of CBM in companies operating in Poland is similar to other CEE countries and lesser than in more developed countries e.g. the USA or UK (see Table 1).

The study revealed that most companies (64%) perceive the procedures and methods of capital budgeting used in their firms as appropriate and changes are not planned. More than a quarter (26%) of respondents think that the current methods are inappropriate and should be replaced – despite that, changes are not planned. Only

10% of companies claimed that the current methods of investment appraisal should be replaced and that such replacement is planned in the near future. The changes aim to e.g.: (a) adapt to the requirements of the corporate group (an energy distribution company), (b) introduce a unified model of investment appraisal (a retail sales company), (c) introduce appraisal in general and get assent from the financial department for investment appraisal before it is approved by the management or before it is introduced for approval to the Board (a big trading company).

The study shows that in terms of use of investment appraisal methods based on DCF in companies in Poland, some progress is evident. In comparison to the study carried out by Szychta (2001), the percentage of companies using NPV has grown from 30% to 53%, while the use of other capital budgeting methods like WACC or sensitivity analysis increased together with the improvement in applying better procedures in the investment appraisal process (e.g. formalization of the process or post-implementation audit). Although the study showed that investment appraisal methods are used more often than was shown in previous studies (Zarzecki, 1997; Szychta, 2001; Rogowski and Kasiewicz, 2006) many companies do not use particular methods at all or their use is rare. What is more, 15% of the companies do not use even one method of investment appraisal. The frequency of use of particular methods is shown in Table 4.

Table 4. Frequency of the use of investment appraisal methods (%)

Method	Never	Rare	Sometimes	Often	Always
Accounting Rate of Return	33	22	25	13	2
Payback	24	13	23	21	14
Discounted payback	29	16	18	21	11
Net Present Value	22	5	18	29	24
Internal Rate of Return	21	12	12	21	26
Together	100	100	100	100	100%

Source: own research.

Further detailed analysis was performed to test Hypothesis 2, stating that company characteristics, such as manufacturing activity, foreign ownership, large size and also large size of company's capital expenditure budget, are positively associated with the frequency of capital budgeting method selection. Mean values and standard deviations for the investment appraisal methods analyzed (ARR, PB, DPB, IRR and NPV) are presented in Table 5. Higher mean values indicate more extensive use of the method.

Table 5. Mean values, standard deviations, Mann-Whitney p-values and Kruskal-Wallis p-values of investment appraisal methods

Items		ARR	PB	DPB	IRR	NPV	
MAN	MAN	mean	2.92	3.44	2.92	3.17	2.37
		standard deviation	1.55	1.39	1.55	1.54	1.22
	NMAN	mean	2.52	3.25	2.85	3.31	2.22
		standard deviation	1.30	1.53	1.31	1.55	1.09
	ALL TOGETHER	mean	2.68	3.33	2.88	3.26	2.28
		standard deviation	1.41	1.47	1.41	1.54	1.14
Mann-Whitney p-value		0.6476	0.7958	0.2113	0.6479	0.6660	
FOWN	FOWN	mean	2.07	3.10	2.79	3.61	3.60
		standard deviation	1.01	1.39	1.32	1.37	1.40
	NFOWN	mean	2.30	2.61	2.41	2.80	2.57
		standard deviation	1.21	1.37	1.45	1.49	1.50
	ALL TOGETHER	mean	2.20	2.84	2.59	3.20	3.08
		standard deviation	1.12	1.40	1.39	1.48	1.53
Mann-Whitney p-value		0.3971	0.1161	0.1836	0.0083*	0.0026*	
LSIZE	SMALL_COMP	mean	1.85	2.54	2.64	2.50	2.08
		standard deviation	1.08	1.48	1.60	1.61	1.22
	MEDIUM_COMP	mean	3.05	3.55	2.84	3.36	2.08
		standard deviation	1.49	1.31	1.28	1.45	1.04
	LARGE_COMP	mean	3.09	3.45	3.64	3.55	2.09
		standard deviation	1.30	1.51	1.29	1.44	0.94
	VERYLARGE_COMP	mean	2.74	3.68	2.80	3.71	2.86
		standard deviation	1.33	1.49	1.40	1.45	1.20
	ALL TOGETHER	mean	2.66	3.30	2.87	3.22	2.26
		standard deviation	1.41	1.47	1.41	1.55	1.14
Kruskal-Wallis p-value		0.0822	0.2628	0.0055**	0.0174**	0.0495**	
LCAPEX	SMALL_CAPEX	mean	2.44	2.75	3.00	2.58	2.38
		standard deviation	1.44	1.41	1.27	1.43	1.21
	MEDIUM_CAPEX	mean	2.67	3.30	2.69	2.96	2.00
		standard deviation	1.41	1.38	1.35	1.49	0.93
	LARGE_CAPEX	mean	2.73	3.81	2.50	3.79	2.06
		standard deviation	1.44	1.33	1.46	1.42	1.12
	VERYLARGE_CAPEX	mean	3.10	3.77	3.30	4.05	2.45
		standard deviation	1.33	1.51	1.56	1.43	1.26
	ALL TOGETHER	mean	2.69	3.31	2.89	3.22	2.24
		standard deviation	1.41	1.46	1.39	1.55	1.14
Kruskal-Wallis p-value		0.5447	0.2928	0.3992	0.0138**	0.0017**	

* The results are statistically significant at the level of $p < 0.05$, which means that there are differences between the analysed variables (statistically significant differences)

** The results are statistically significant at the level of $p < 0.05$, which means that there are differences between the analysed variables (statistically significant differences) (The Kruskal-Wallis H test is used when more than two categories for variables analysed are present)

Table 5 shows that, on the basis of the Mann-Whitney U test, there are statistically significant differences between companies with foreign capital and companies with only domestic capital with regard to using IRR and NPV for investment appraisal. The differences suggest that companies with foreign capital use these methods more often than companies with only domestic capital. Table 5 also shows that, on the basis of the Kruskal-Wallis H test, there are statistically significant differences between companies of different sizes with regard to using DPB, IRR and NPV for investment appraisal. The differences suggest that larger companies use these methods more often than smaller companies. One can also observe that there are statistically significant differences between companies of different capital expenditure budget with regard to using IRR and NPV – the differences suggest that companies with large capital expenditure budget use these methods more often than ones with smaller capital expenditure budget.

An interesting question to answer during the analysis of capital budgeting practices was whether companies operating in Poland use investment appraisal methods (ARR, PB, DPB, IRR and NPV) exclusively or rely on a particular technique. Table 6 shows Spearman's rank correlation coefficients that measure the association between various investment appraisal methods used.

Table 6. Spearman's rank correlations coefficients of investment appraisal methods

Items	APR_ARR	APR_PB	APR_DPB	APR_IRR	APR_NPV
APR_ARR	1				
APR_PB	0.323**	1			
APR_DPB	0.205	0.520**	1		
APR_IRR	0.201	0.264*	0.656**	1	
APR_NPV	0.122	0.219*	0.609**	0.781**	1

* Correlation is significant at the $p < 0.05$ level (two-tailed)

** Correlation is significant at the $p < 0.01$ level (two-tailed)

Source: own research.

As is evident in Table 6, PB is positively and significantly associated with the use of DPB, NPV and IRR (also with ARR). It is quite possible that PB is used as an initial technique while DPB, NPV and IRR, as more sophisticated techniques, are used at the latter stage of investment appraisal. The pattern of investment appraisal method usage shows that, in particular, techniques based on DCF, like DPB, IRR and NPV, are positively and significantly associated with each other (especially IRR and NPV with $\rho = 0.781$ at the $p < 0.01$ level (two-tailed)) – it means that if the companies in the sample use methods based on DCF, they often use all (many) of them together (it is especially true for IRR and NPV). It is evident that a large number of companies in the sample use a combination of investment appraisal methods whereas a small number of firms use only one method. Companies operating in Poland do not use only

methods based on DCF, but also PB and ARR, often together with DCF methods (this observation is supported by Hartwig (2012), for example, who stated that Swedish companies utilized different capital budgeting methods concurrently).

A more in-depth study of the relationship between the methods of capital budgeting used and selected characteristics of analyzed companies was carried out. In particular it has been tested how the type of activity (MAN), origin of equity capital (FOWN), size of company (LSIZE) and magnitude of capital expenditure budget (LCAPEX) is associated with: (1) investment appraisal methods used (ARR, PB, DPB, IRR and NPV), (2) discount rate used in DCF methods, (3) methods of risk assessment and (4) procedures used in investment appraisal. The results are presented in Table 7.

Table 7. Spearman's rank correlation coefficients of the independent variables and capital budgeting methods

Capital budgeting method	Symbol	MAN	FOWN	LSIZE	LCAPEX
Formalization of investment appraisal	FORMAL_APR	-0.023	0.260*	0.091	0.198*
Investment appraisal method used:					
- ARR	APR_ARR	-0.048	-0.101	0.214*	-0.008
- PB	APR_PB	-0.028	0.169	0.092	0.018
- DPB	APR_DPB	-0.131	0.140	0.256*	0.172
- IRR	APR_IRR	-0.048	0.277**	0.289**	0.327**
- NPV	APR_NPV	0.046	0.327**	0.283**	0.400**
Discount rate used in DCF methods:					
- MCC	COST_MCC	0.215*	-0.137	-0.169	-0.116
- WACC	COST_WACC	-0.137	0.231*	0.321**	0.271**
- cost of debt	COST_DEBT	-0.075	0.148	-0.047	0.040
- arbitrary cost	COST_ARBITRARY	0.106	-0.047	0.080	-0.093
Methods of risk assessment:					
- sensitivity analysis	A_SENSITIVITY	-0.090	0.186	0.217*	0.270**
- scenario analysis	A_SCENARIO	0.167	0.087	-0.058	-0.031
Monitoring investment during implementation	AUD_DUR_IMPLEMENT	0.035	0.021	0.108	0.132
Post-investment audit	AUD_POST_INVEST	0.032	0.360**	0.140	0.244*

* Correlation is significant at the $p < 0.05$ level (two-tailed)

** Correlation is significant at the $p < 0.01$ level (two-tailed)

Source: own research.

Hypothesis 2 was formulated to test the association of independent variables with the capital budgeting methods used. The research carried out enabled Hypothesis 2 to be verified partly positively, meaning that: (1) the large size of a company's capital expenditure budget (LCAPEX) is positively associated with the use of 6 CBMs, (2)

company size (LSIZE) is positively associated with the use of 6 CBMs, (3) foreign ownership (FOWN) is positively associated with the use of 5 CBMs and (4) the company's activity (MAN) is positively associated with the use of 1 CBM. In particular:

- 1) a company's capital expenditure budget is one of the most important independent variables (equally important as the second one) associated with the use of capital budgeting methods in the researched companies. In accordance with Hypothesis 2, the large size of a company's capital expenditure budget (LCAPEX) has generally been positively correlated with the use of capital budgeting methods (e.g. Payne *et al.*, 1999; Hermes *et al.*, 2007). Companies with large capital expenditure budgets more often use NPV, WACC, sensitivity analysis, formalization of investment appraisal and post-investment audit than companies with small budgets. It was also observed that companies with large CAPEX use IRR more often (as table 6 shows, companies using NPV also usually use IRR which is a specially true for companies with large CAPEX);
- 2) the second (equally important as the first one) independent variable associated with the capital budgeting methods used was the company size (LSIZE). In accordance with Hypothesis 2, the research showed that company size has generally been positively correlated with the use of capital budgeting methods (e.g. Graham and Harvey, 2001; Sandahl and Sjögren, 2003; Brounen *et al.*, 2004; Verbeeten, 2006; Bennouna *et al.*, 2010; Daunfeldt and Hartwig, 2011). It was found that large companies use ARR, DPB, IRR, NPV, WACC and sensitivity analysis more often than small ones. It was observed that large companies tend to use many investment appraisal methods together to see the influence of the project on different aspects of the company – accounting profits (ARR), risk (DPB could be a rough measure of it) or the maximum cost of capital for which the investment creates value (IRR);
- 3) the third most important independent variable determining the use of capital budgeting methods was foreign ownership (FOWN). In accordance with Hypothesis 2, foreign capital has generally been positively correlated with the use of capital budgeting methods (e.g. Graham and Harvey, 2001; Brounen *et al.*, 2003; Andor *et al.*, 2011). Companies with foreign capital use IRR, NPV, WACC, formalization of investment appraisal and post-investment audit more often than companies with only domestic capital. The research also showed that companies with foreign capital tend to use IRR as a supplementary technique with NPV;
- 4) the independent variable which has the smallest association with the use of capital budgeting methods is the type of the company's activity (MAN). In contradiction to Hypothesis 2, the research shows that the only difference between manufacturing and non-manufacturing companies is that the latter use MCC more often than the former (a possible explanation for this difference is that investments in manufacturing companies often tend to be bigger and possibly require financing different from the capital structure of the company – in that case, the use of MCC seems appropriate).

It should to be stressed that not even one of the independent variables from the model had significant association with the use of capital budgeting methods such as scenario analysis and monitoring investment during implementation. For other methods, however, two or three independent variables were associated with their selection.

Conclusions

There could be several reasons for the results obtained in the research (while testing Hypothesis 1 and Hypothesis 2). First of all, the increase in the use of capital budgeting methods (in comparison to Zarzecki, 1997; Szychta, 2001; Rogowski and Kasiewicz, 2006) could be caused by natural selection – meaning that managers who did not adopt efficient procedures might have been replaced or their companies might have gone out of business (market pressure). Another possible explanation is not based on the rationality principle, meaning that the company's behavior is not necessarily rational from an efficiency perspective – rather, it could be that the process of coercive, mimetic and/or normative isomorphism has taken place (DiMaggio and Powell, 1983; Carpenter and Feroz, 2001). Thirdly, the fact that large companies use recommended capital budgeting methods more often than small companies could also be explained by legitimacy and stakeholder theory (Dowling and Pfeffer, 1975; Gray *et al.*, 1996). It could be the case that in large companies, where the agent-principal gap is wider, managers need to use capital budgeting methods to justify their investment decisions.

It could be concluded that the gap in the use of capital budgeting methods in companies operating in Poland, in comparison to more developed countries, has narrowed and that the acceptance of the knowledge from university courses and textbooks has increased. The obtained results may also stem from the effectiveness of the teaching of these methods at universities and professional courses for practitioners (such teaching has become standard in Poland over the last 20–30 years) and it may also be due to the diffusion of their use by foreign companies investing in Poland (these methods are more popular among companies with foreign equity capital). The results of the study are not, however, only reassuring but also puzzling – although many companies use capital budgeting methods, many of them do not. This finding requires further thought and research. Perhaps the relatively low use of some of the techniques indicates the need to critically review their assumptions and implications. Perhaps, however, the theories and methods are right but many companies ignore them. Additional research is definitely needed to explore these issues in more detail.

The results of the research carried out on a sample of companies operating in Poland are largely consistent with the results of studies conducted in CEE (e.g. Andor *et al.*, 2011) as well as, but to a lesser extent, with results of studies in more developed countries in North America (e.g. Graham and Harvey, 2001; Ryan and Ryan, 2002; Baker *et al.*, 2011), Asia and Pacific (e.g. Kester *et al.*, 1999; Lam *et al.*, 2007; Truong

et al., 2008; Leon *et al.*, 2008; Verma *et al.*, 2009) and Western Europe (e.g. Arnold and Hatzopoulos, 2000; Sandahl and Sjögren, 2003; Brounen *et al.*, 2004; Liljebloom and Vaihekoski, 2004; Hermes *et al.*, 2007; Daunfeldt and Hartwig, 2011). The reasons for these differences may be varied. Firstly, the cross-country differences could be explained by cultural differences (Hofstede, 1983, 1984). Secondly, the differences may stem from discrepancies in institutional systems in these countries and the level of economic and social development. Thirdly, these differences may be due to the relatively minor importance of the capital market for the Polish economy in comparison with countries in North America and Western Europe (especially the UK). Fourthly, the differences may stem from the fact that, due to the difficulties in obtaining the data, the sample in the research was not random.

The survey carried out does not constitute a complete source of knowledge about methods supporting capital budgeting decisions in companies operating in Poland, and there are four main reasons for this. The first one is that the chosen sample is not representative and therefore generalizations of the obtained results should be made with caution. The second one is the possible non-response bias in the results – the response rates are low, and the results may reflect the responses of people more familiar with capital budgeting techniques. The third reason is that the study measured only the reported use of capital budgeting methods, not actual use (beliefs rather than actions) – one cannot be sure if the methods are actually used. The fourth reason is the fact that the survey research itself bears some limitations, which unfortunately do not allow in-depth and detailed analysis of the investment process selection, evaluation or control in the researched companies. With these limitations in mind, however, the study allows a broad and rich overview of capital budgeting methods used in companies in Poland to be drawn, enables factors determining their use to be analyzed and facilitates comparisons in time (with other research in Poland) and in space (with other research around the world).

Conclusions stemming from the research have both a theoretical and practical significance. From the theoretical point of view, the research highlights that companies operating in Poland employ the same methods of capital budgeting as companies in more developed countries, yet their use in Poland, in comparison with more developed countries, is lesser. The study also revealed that there are differences in the use of capital budgeting methods in Polish companies and other countries; it may be due to the different institutional systems of these countries, the level of economic or social development but also the differences in the role of the capital market in the economy. Detailed analysis showed that IRR and NPV are used more extensively by companies with foreign capital, large companies and companies with large capital expenditure budgets. A generally large size of a company's capital expenditure budget, large company size and foreign ownership are positively associated with the use of most capital budgeting methods analyzed. The author believes that the study will bridge the gap in the management accounting literature and researchers will use the results of this study to question current ideas and develop new theories.

From a practical point of view, companies considering the modification or implementation of new methods of capital budgeting should be aware that these methods are commonly employed by companies which are their competitors in global markets. A wider diffusion of capital budgeting methods in companies in Poland could improve the effectiveness of investment decisions and, generally, increase company competitiveness. The results of conducted studies may help practitioners to identify areas in their companies where academic recommendations have not been implemented and their use could be beneficial for the company due to the fact that they facilitate activities which create value for the company.

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Appendix

Factors determining the selection of capital budgeting methods in companies operating in Poland

I. COMPANY CHARACTERISTICS

1.1. Type of main operation:

- a) manufacturing,
- b) non-manufacturing.

1.2. Main areas of activity:

- a) provision of mass-produced goods to many customers (cost strategy),
- b) provision of mass-produced goods to a small number of customers (cost strategy),
- c) provision of special products to many customers (differentiation strategy),
- d) provision of special products to a small number of customers (differentiation strategy).

1.3. Competition in the company's main areas of activity:

- a) small competition,
- b) moderate competition,
- c) strong competition.

1.4. Origin of equity capital:

- a) domestic (%)
- b) foreign (%)

1.5. Share of total sales abroad:

- a) domestic (%)
- b) export (%)

1.6. Number of employees:

- a) 1–100 employees,
- b) 101–500 employees,
- c) 500–1000 employees,
- d) more than 1000 employees.

II. ORGANIZATION OF INVESTMENT PROCESS

2.1. Annual capital expenditure budget:

- a) up to 10 million PLN,
- b) 11–50 million PLN,
- c) 51–100 million PLN,
- d) more than 100 million PLN.

2.2. In the last 5 years, yearly capital expenditure budget in your company:

- a) has decreased,
- b) has not changed,
- c) has increased.

- 2.3. In the coming years, yearly capital expenditure budget in your company:
 - a) will probably decrease,
 - b) will probably not change,
 - c) will probably increase.
- 2.4. What are the main investment objectives in your company (it is possible to tick more than one answer):
 - a) reduction of costs,
 - b) increase of company capacity in the case of existing products,
 - c) extending the range of products on offer,
 - d) modernization of the company's capacity,
 - e) improvement of product quality,
 - f) improvement of customer service quality,
 - g) other, please specify
- 2.5. Is the formal investment appraisal carried out in your company:
 - a) yes,
 - b) no.
- 2.6. Investment appraisal in your company is carried out:
 - a) by one person, who is
 - b) by a team with the participation of
- 2.7. At what organizational level in your company are investment decisions **final-ly made**:

Items	Minor investments	Medium-size investments	Major investments	Very large investments
manager of a department	1	2	3	4
director of a division	1	2	3	4
company manage-ment/headquarters	1	2	3	4
headquarters (e.g. parent company)	1	2	3	4

III. INVESTMENT APPRAISAL METHODS USED

- 3.1. For investment appraisal your company (you can tick more than one answer):
 - a) does not use any formal methods, and investment selection is intuitive,
 - b) uses methods based on accounting profit,
 - c) uses methods based on non-discounted cash flows,
 - d) uses methods based on discounted cash flows (DCF).
- 3.2. If your company is using discounted cash flow techniques for investment appraisal, the discount rate is determined as:
 - a) marginal cost of capital (MCC),
 - b) weighted average cost of capital (WACC),
 - c) cost of debt financing the investment,
 - d) an arbitrary chosen figure.

3.3. What methods of investment appraisal are used in your company (please tick one answer for each raw only):

Method	Never	Rarely	Occasionally	Often	Always
accounting rate of return (ARR)	0	1	2	3	4
payback (PB)	0	1	2	3	4
discounted payback (DPB)	0	1	2	3	4
net present value (NPV)	0	1	2	3	4
internal rate of return (IRR)	0	1	2	3	4

3.4. Which of the following risk assessment methods your company uses (please tick more than one answer):

- a) sensitivity analysis,
- b) scenario analysis,
- c) none of the above.

3.5. Are the investments monitored during implementation in your company:

- a) no,
- b) yes.

3.6. Is a post-implementation audit carried out for investments in your company:

- a) no,
- b) yes.

3.7. Are investment appraisal rules likely to change in your company in the near future:

- a) no, because current methods are appropriate for the company,
- b) no, despite the fact that current methods should be replaced by other methods,
- c) yes, and the changes will include.....
.....
.....

Company name

