

ปัจจัยที่มีผลต่อการใช้วิธีงบประมาณจ่ายลงทุน

DETERMINANTS OF CAPITAL BUDGETING METHODS USE

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บทคัดย่อ

งานวิจัยนี้มีวัตถุประสงค์เพื่อศึกษาปัจจัยที่มีผลต่อการเลือกวิธีงบประมาณจ่ายลงทุนที่ใช้ในบริษัทในประเทศไทย กลุ่มตัวอย่างที่ใช้ในการศึกษาคือบริษัทจดทะเบียนในตลาดหลักทรัพย์แห่งประเทศไทย การผนวกรวมข้อมูลเกี่ยวกับการใช้วิธีงบประมาณจ่ายลงทุน กับชุดของตัวแปรอิสระต่างๆจะช่วยให้ในการการระบุอิทธิพลของลักษณะบริษัท ลักษณะของประธานเจ้าหน้าที่บริหารในสายงานการเงิน และขนาดโครงการของงบประมาณค่าใช้จ่ายลงทุน ที่มีต่อการเลือกใช้วิธีงบประมาณจ่ายลงทุน เราพบว่า ในกรณีของวิธีการประเมินการลงทุน วิธีการประเมินโดยใช้มูลค่าปัจจุบันสุทธิ เป็นวิธีที่นิยมและใช้ในบริษัทไทยถึงร้อยละ 33.6 ขณะที่วิธีอัตราผลตอบแทนภายในเป็นวิธีที่นิยมและใช้ในบริษัทไทยถึงร้อยละ 36.3 การวิเคราะห์ลักษณะของบริษัทได้พบว่า การถือครองหุ้นโดยต่างชาติ การถือครองหุ้นโดยผู้บริหาร ขนาดของบริษัท การทำการค้ากับต่างประเทศ และระดับของหนี้สิน มีผลต่อการใช้วิธีงบประมาณจ่ายลงทุนอย่างมีนัยสำคัญทางสถิติ ผลการศึกษายังระบุว่า การถือครองหุ้นโดยนักลงทุนภายนอกมีผลต่อการใช้วิธีงบประมาณจ่ายลงทุนเช่นกัน

คำสำคัญ: งบประมาณจ่ายลงทุน งบประมาณค่าใช้จ่ายลงทุน การบัญชีบริหาร การตัดสินใจในการลงทุน

Abstract

The research focuses on the investigation of determinants of the choice of capital budgeting methods (CBM) applied by companies in Thailand. Samples of the study are the companies listed in the Stock Exchange of Thailand. Combining the data on CBM use with a rich set of dependent variables enabled identification of influence of certain company characteristics, chief financial officer's (CFO) characteristics and project magnitude of capital expenditure budget (CAPEX) on the use of CBM. We found that in the case of investment appraisal methods, net present value (NPV) was used (often or always) by 33.6% of Thai companies whereas IRR was used (often or always) by 36.3% of Thai companies. Analysis of the company's characteristics shows that foreign ownership, management ownership, the size of the company, foreign sales and leverage levels influence the use of CBM with a statistical significance. The result of the study also reveals that public ownership influences the use of capital budgeting methods.

Keywords: Capital Budgeting, Capital Expenditure Budget, Management Accounting, Investment Decisions, Thailand

Introduction

This study explores an adoption of capital budgeting methods (CBM) used in Thailand. This area of research is important because capital budgeting decisions are one of the most important areas of company finance management. Thailand has rapidly developed in recent years and still remains less developed in many respects in a comparison to developed economies in which most of the research were conducted so far. Thailand can also represent a typical economy of Asia where capital budgeting practice remains seriously underdeveloped. Although the process of diffusion of CBM in developed countries (especially in large companies) is almost complete (e.g. Graham & Harvey, 2001; Ryan & Ryan, 2002; Hermes & Smid, 2007; Truong, Partington & Peat, 2008) this is not the case for Thailand (Rajatanavin & Venkatesh, 2007; Champathed & Chansa-ngavej, 2015). The study will focus on narrowing the gap between theory and practice of capital budgeting by measuring the extent to which theoretical concepts are adopted in practice. The results of the survey will be useful for practitioners as they will learn more about capital budgeting practices in Thailand.

Capital budgeting practice has drawn the attention of researchers all over the world for many years but vast majority of the studies dedicated to it was conducted in highly-developed countries, mostly in North America, Australia and Western Europe, e.g. Australia (Truong et al., 2008), Canada (Graham, Harvey, 2001), France (Brounen, De Jong, & Koedijk, 2004), Germany (Brounen et al., 2004), the Netherlands (Hermes & Smid, 2007), Sweden (Daunfeldt & Hartwig, 2011; Sandahl & Sjogren, 2003), the UK (Brounen et al., 2004), the USA (Graham & Harvey, 2001; Ryan & Ryan, 2002). The results of these 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. Although there were so far surveys focusing on capital budgeting methods diffusion in Thailand, yet their results were partial and usually focused only on the extent of different CBM diffusion lacking more detailed analysis.

The study on CBM in Thailand is quite limited. The study by Champathed and Chansa-ngave (2015) confirmed that the capital budgeting techniques were used by Thai firms especially on investment projects (74.1%) and the most popular methods were IRR, payback period and NPV (17.0, 14.1, and 11.9 % respectively). The methods used were the same as in the studies of Rajatanavin and Venkatesh (2007) and Olufemi and Adegbola (2013) where they made a comparison of the capital budgeting used by Thai and US firms and found that payback period was the most popular method among Thai firms followed by net present value and internal rate of return while in the US, most popular method was internal rate of return followed by net present value and hurdle rate. Even though such capital budgeting methods have been concerned, Champathed and Chansa-ngavej (2012) suggested that researchers should investigate other variables besides what had been used and studied as a criterion to determine capital investment projects. Most financial managers used capital budgeting techniques but not for all projects. Many Thai firms used both capital budgeting techniques and non-financial data; many firms used a combination of techniques.

Although there were some studies on CBM methods diffusion in Thailand, yet the use of these methods is not researched enough, especially when compared to research carried out in more developed countries. Studies of capital budgeting practices in companies based in Thailand seem interesting due to the historical conditioning of the country and its recent development.

The research on capital budgeting conducted so far in Thailand did not address sufficiently such questions as: (a) are there any differences in using of CBM between companies of different characteristics? (b) are there differences in using the methods between companies with different CFO's characteristics?, (c) are the use of CBM influenced by the magnitude of capital expenditure budget or (d) is the process of investment appraisal formalized, (e) and is the diffusion of CBM similar in companies in Thailand?

Hypotheses development and theoretical model

When analyzing diffusion of capital budgeting methods in Thai companies we expect (according to literature) that certain company characteristics will influence the use of CBM. In particular we expect companies listed on a stock exchange (PUB) will use CBM more often than companies which are not listed. It can be suggested that listed companies are generally bigger, better managed, more sophisticated and having appropriate resources to use these methods (e.g. Brounen et al., 2004). Anand (2002) found that public companies use sensitivity analysis more often than private companies and Graham and Harvey (2001) found that public companies are significantly more likely to use NPV and IRR than are private companies. As far as company 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 & Hartwig, 2011). As foreign ownership is concerned we expect companies with foreign capital (FOWN) 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 Thailand (e.g. Graham & Harvey, 2001; Hermes & Smid, 2007; Ryan & Ryan, 2002; Truong et al., 2008), some research however did not confirm this results (Leon, Isa & Kester, 2008). Another variable characterizing companies taken into account in the research was management ownership – we expect companies owned by managers (MANOWN) will use CBM more often than companies which are not owned by managers. Management ownership can influence decisions made (e.g. Klassen, 1997; Warfield, Wild & Wild 1995), managers/owners have more to lose if the company has significant problems and it may make managers use these methods more often. Literature suggest that company size is one of the most important variables influencing CBM selection – we expect larger companies (LSIZE) 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. Ahmed, 2013; Andor, Mohanty, & Thoth, 2011; Bennouna, Meredith, & Marchant, 2010; Brounen et al., 2004; Correia, 2012; Daunfeldt & Hartwig, 2011; Graham & Harvey, 2001; Hartwig, 2012; Hermes & Smid, 2007; Payne, Health, & Gale, 1999; Pike, 1996; Sandahl & Sjogren, 2003; Verbeeten, 2006). Also sales direction could influence capital budgeting method selection – we expect companies with foreign sales (FSALES) will use CBM more often than companies with no foreign sales. Companies with a significant proportion of sales abroad must compete globally with large and efficient competitors from abroad often using these methods and what is the more high uncertainty of doing business abroad may increase the use of risk assessment methods (Daunfeldt & Hartwig, 2011). Hermes et al. (2007) showed that Chinese companies with foreign sales use NPV more often than companies with no foreign sales, also Holmen and Pramborg (2009) showed that the use of payback can increase with increase of political risk which is connected with foreign sales (it should be noted that payback may be used as a rough risk measure). The literature suggests that company leverage and dividend payment can influence capital budgeting method selection. As leverage is concerned we expect companies with high leverage (HLEV) will use CBM more often than companies with low leverage. Graham and Harvey, (2001), Daunfeldt and Hartwig (2011) and Ahmed (2013) found that leveraged companies use NPV more often). Graham and Harvey (2001) also showed that leveraged companies more often use sensitivity and scenario analysis. It may be suggested that highly geared companies often use bank loans to finance their investments and it is a common practice that banks require the use of these methods before they agree to finance investments. It can also be found in the literature (e.g. Ahmed, 2013; Binder & Chaput, 1996; Daunfeldt & Hartwig, 2011; Hartwig, 2012) that highly leveraged companies use payback more often than companies with low leverage (the explanation for this could be that payback use is associated with uncertainty and geared companies are riskier). If we take into account dividend payment, we expect companies paying

dividends (DIV) will use CBM more often than companies not paying dividends. Daunfeldt and Harvey (2011) found that companies paying higher dividends use DCF methods and sensitivity analysis more often than those paying lower dividends. Graham and Harvey (2001) found that companies paying dividends use NPV, IRR and sensitivity analysis more likely than companies that do not pay dividends. Hence, we hypothesize:

H1: Company characteristics, such as public ownership, manufacturing activity, foreign ownership, management ownership, large size, foreign sales, high leverage and dividend payment, influence the frequency of capital budgeting methods selection.

While analyzing the influence of certain chief financial officer (CFO) characteristics, we expect they will influence the frequency of CBM selection. In particular we expect companies with young CFO (YOUNG) will use CBM more often than companies with old CFO. Literature (e.g. Daunfeldt & Hartwig, 2011; Hermes et al., 2007) seem to suggest this as younger managers can be more familiar with more sophisticated methods and they may be also more open in their use. Hermes et al. (2007) showed that younger CFO uses NPV (and other methods) more often than older CFO. We also expect companies with CFO highly educated (HEDU) in business/economics will use CBM more often than companies with CFO not highly educated (Ahmed, 2013; Leon et al., 2008). For managers who are better educated in business/economics the use of these methods may seem to be “natural”, they may use these methods more often because they were “taught” to do so (e.g. Ahmed, 2013; Hermes & Smid, 2007). Anand (2002) found that better educated CFO use sensitivity analysis more often than CFO not having higher education in business/economics. According to our expectations companies with short tenure CFO (STEN) will use CBM more often than companies with long tenure CFO. CFO who does not stay a long time in the company may tend to use these methods more often. In contrast CFO who stays longer time in their position may tend to use their judgment and experience more often and thus prefer simpler methods viewing them as “not that bad” (Daunfeldt & Hartwig, 2011). Thus, we hypothesize:

H2: Chief financial officer characteristics, such as young age, high education and short tenure, influence a frequent use of capital budgeting methods selection.

When analysing diffusion of capital budgeting methods we expect (according to literature) that size of company's capital expenditure budget will influence the use of CBM, more specifically we expect companies with larger capital budgets (LCAPEX) 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 & Smid, 2007). Verma, Gupta, and Batra. (2009) showed that companies with large CAPEX use NPV more often than those with small CAPEX (the difference was not significant for other methods), similar results were obtained by Correia (2012). Some studies however show no significant differences in CBM use in relation to size of CAPEX (Leon et al., 2008). Hence, we hypothesize:

H3: Capital expenditure budget of the companies with a large size influences the frequency of capital budgeting methods selection.

Research method

Survey research method has been selected to verify adopted hypotheses. Despite many shortcomings of research carried out by means of survey research (in comparison to case study method which enables to analyse in greater detail actual practices used in companies), the authors are convinced that it will facilitate unique analysis of companies' practice in Thailand in terms of capital budgeting and it will contribute to modification of existing beliefs on the use of methods and factors influencing their use (it enables comparison in time dimension – with previous studies and also in space – between companies in Thailand). Another argument which made the authors use survey research was the desire to compare the study results with results of research conducted

in other countries (e.g. Ahmed, 2013; Anand, 2002; Andor et al., 2011; Arnold & Hatzopoulos, 2000; Bennouna et al., 2010; Brounen et al., 2004; Daunfeldt & Hartwig, 2011; Graham & Harvey, 2001; Hartwig, 2012; Hermes & Smid, 2007; Holmen and Pramborg, 2009; Klassen, 1997; Leon et al., 2008; Pike, 1996; Sandahl & Sjogren, 2003; Truong et al., 2008; Verbeeten, 2006; Verma et al., 2009; Warfield et al., 1995). As a broad and rich overview of capital budgeting practice has never (according to authors knowledge) been made in Thailand before. The study is therefore unique.

In order to analyze capital budgeting methods diffusion and factors influencing their selection in companies operating in Thailand the respondents were asked four groups of questions.

1. Company characteristics (11 questions),
2. Chief financial officer's characteristics (3 questions),
3. Organization of investment process (4 questions),
4. Use of investment appraisal methods (5 questions).

The questionnaire contained both one-choice and multiple-choice questions, but respondents were asked to provide more expansive answers and comments (questions 4.1, 4.2, 4.3, 4.4 and 4.5). In several questions (questions 3.4, 4.1, 4.2 and 4.3) 5 grade Likert scale was used and the answer "never" has "1" value, "rarely" has value "2", "occasionally" has value "3", "often" has value "4" and "always" has value "5". Only companies which answered "often" or "always" are classified as users of the method.

The authors pre-tested survey instrument on fellow colleagues at their Faculties first and after some corrections tested it again on the small group of practitioners in both countries which was also followed by some changes in the questionnaire. When distributing final version of the questionnaire, the authors made sure that respondents understand that capital budgeting decisions refer to all non-routine investments – if it would not be clear, respondents would probably not be able to provide credible answers.

The questionnaire was delivered to the companies listed on Thai stock exchanges (the Stock Exchange of Thailand) and to hand-picked selected non-listed (private) companies using convenience sampling method. In general, 800 questionnaires in Thailand (500 among listed and 300 among private companies) were delivered. The authors received, 220 in Thailand (52 from listed and 168 from private companies) after leaving incomplete questionnaires. Thus the response rate was in general 27.5 %.

Not a lot of research conducted so far (e.g. Bennouna et al., 2010; Burns & Walker, 2009) examined the issues concerning formalization of investment appraisal process. To analyze these issues we took as dependent variables: formalization of evaluation before investment decision, monitoring investment during implementation and post-investment audit. All capital budgeting methods analyzed are shown in Table 1.

Table 1: Capital budgeting methods analyzed

Capital budgeting method	Symbol
Formalization of investment appraisal:	
- formal evaluation before investment decision	FORMAL_APR
- monitoring investment during implementation	AUD_DUR_IMPLEMENT
- post-investment audit	AUD_POST_INVEST
Investment appraisal method used:	
- Net Present Value (NPV)	APR_NPV
- Internal Rate of Return (IRR)	APR_IRR
- Payback (PB)	APR_PB
- Discounted Payback (DPB)	APR_DPB
- Accounting Rate of Return (ARR)	APR_ARR
Discount rate used in DCF methods:	
- Weighted Average Cost of Capital (WACC)	COST_WACC
Methods of risk assessment:	
- sensitivity analysis	A_SENSITIVITY
- scenario analysis	A_SCENARIO

Capital budgeting methods specified in Table 1 will serve as dependent variables and it will be surveyed if (how often) they are used and what (independent variables) influence their use. Hypothesis 4 was tested by statistical comparison of capital budgeting practice in Thailand whereas hypotheses 1-3 were tested with a multiple regression in the form shown in Equation 1 (this is a modified version of the equation used by Daunfeldt & Hartwig, 2014).

$$\begin{aligned}
 CBM_{ij} = & \alpha_0 + \alpha_1 PUB_i + \alpha_2 MAN_i + \alpha_3 FOWN_i + \alpha_4 MANOWN_i + \alpha_5 LSIZE_i \\
 & + \alpha_6 FSALES_i + \alpha_7 HLEV_i + \alpha_8 DIV_i + \alpha_9 YOUNG_i + \alpha_{10} HEDU_i \\
 & + \alpha_{11} STEN_i + \alpha_{12} LCAPEX_i + \alpha_i
 \end{aligned}
 \quad \text{[Equation 1]}$$

where:

- CBM_{ij} is reported use of capital budgeting method j ($j = 1, 2, \dots, 11$; see Table 1) by the company i ($i = 1, 2, \dots, n$);
- PUB_i is the type of ownership of the company i ($i = 1, 2, \dots, n$) (if the company is listed on stock exchange it is regarded as public – PUB, if the company is not listed on stock exchange it is regarded as private – PRIV);
- MAN_i is the type of activity the company i ($i = 1, 2, \dots, n$) is engaged in (if the company is manufacturing – MAN, if the company is not manufacturing – NMAN);
- $FOWN_i$ is foreign ownership of the company i ($i = 1, 2, \dots, n$) 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);
- $MANOWN_i$ is the share of the company i ($i = 1, 2, \dots, n$) owned by top three managers ranging from less than 5% to more than 20% (if less than 5% of shares is owned by top three managers – NMANOWN, if more than 5% of shares is owned by top three managers – MANOWN);

- $LSIZE_i$ is the size of the company i ($i = 1, 2, \dots, n$) as defined by the number of employees ranging from less than 10 to more than 1000 employees (if company has less than 250 employees it is defined as SMALL, if company has more than 250 employees it is defined as LARGE)¹;
- $FSALES_i$ is the proportion of sales abroad of the company i ($i = 1, 2, \dots, n$) ranging from 0% to more than 50% (if foreign sales are up to 25% the company is defined as not having foreign sales – NFSALES, if foreign sales are more than 25% the company is defined as having foreign sales – FSALES);
- $HLEV_i$ is total debt to asset ratio of the company i ($i = 1, 2, \dots, n$) ranging from 10% to more than 50% (if leverage is up to 25% the company is defined as having low leverage – LLEV, if leverage is more than 25% the company is defined as having high leverage – HLEV);
- DIV_i is the dividend policy of the company i ($i = 1, 2, \dots, n$) (if the company pays dividends – DIV, if the company does not pay dividends – NDIV);
- $YOUNG_i$ is age of CFO of the company i ($i = 1, 2, \dots, n$) ranging from less than 40 years to more than 60 years (for less than 50 years CFO is defined as YOUNG, for more than 50 years CFO is defined as OLD);
- $HEDU_i$ is education of CFO of the company i ($i = 1, 2, \dots, n$) in business/economics ranging from less than bachelor to higher than postgraduate (if CFO had master's degree or higher in business/economics he/she is defined as highly educated – HEDU, in another case he/she is defined as not highly educated – NHEDU);
- $STEN_i$ is number of years CFO had been CFO in the company i ($i = 1, 2, \dots, n$) ranging from less than 4 years to more than 9 years (if CFO is in the position for less than 9 years he/she is defined as having short tenure – STEN, if CFO is in the position more than 9 years he/she is defined as having long tenure – LTEN);
- $LCAPEX_i$ is the magnitude of capital expenditure budget of the company i ($i = 1, 2, \dots, n$) ranging from less than 0.1 million USD to more than 50 million USD (if capital expenditure budget is up to 1 million USD it is defined as small – SCAPEX, if the capital expenditure budget is more than 1 million USD it is defined as large – LCAPEX).

Research results and discussion

1. Demographic data and descriptive statistics

Data collections for Thailand started in September 2015 and ended at the beginning of 2016. Financial data and relevant information of Thai companies were based on their current status at the end of 2015. The descriptive analysis of the total of 220 firms is illustrated in Table 2.

From Thai respondents, the majority of the sample is private companies (76%) and is in manufacturing industry (56%) and agriculture industry (13%). Thai respondents highly gained capital from domestic market (95%) rather than overseas and top three managers of Thai firms held usually (58%) less than 5% of the firm's equity. However, when comparing the number of years the firms are established, the Thai firms were in business less than 10 years (76%) and source of finance of Thai firms is mostly (95%) domestics and sales mostly domestic (83%). Most of the Thai firms (95%) were small and medium-sized with less than 250 employees, annual turnover less than 50 million USD (96%), and total assets less than 43 million USD (97%). The sizes of Thai firms were small and medium sized. We also see a higher proportion of Thai firms paying dividends in 2015 (67%). See Table 2.

¹Thailand by Institute for Small and Medium Enterprises Development defines SMEs as firms with 15 – 200 employees and 30 – 200 million baht (Thailand currency) in fixed assets (depending on the business sector), other companies classified as large.

Table 2: Companies demographics

Type of main activity	Details	
	Number	%
Sector:		
private company	168	76%
public company	52	24%
Type of main operation:		
non-manufacturing	176	80%
manufacturing	44	20%
Type of main industry classification:		
agriculture, forestry, fishing	28	13%
mining	8	4%
construction	6	3%
manufacturing	124	56%
transportation and public utilities	6	3%
wholesale trade	2	1%
retail trade	18	8%
finance, insurance, real estate	18	8%
services	10	5%
public administration	0	0%
Origin of capital:		
100% domestic	210	95%
share of foreign	10	5%
Equity owned by the company's three top managers:		
less than 5%	128	58%
5-10%	36	16%
11-20%	4	2%
more than 20%	52	24%
Years Company is in operation:		
< 2	32	15%
2- 5 years	68	31%
5-10 years	66	30%
10-20 years	32	15%
> 20 years	22	10%
Employees:		
< 10	24	11%
11-50	130	59%
51-250	54	25%
251-1000	10	5%
> 1000	2	1%

Table 2: Companies demographics (continue)

Type of main activity	Details	
	Number	%
Annual turnover (for 2015):		
< 2 million USD	144	65%
2-10 million USD	56	25%
10-50 million USD	14	6%
50-200 million USD	4	2%
> 200 million USD	2	1%
Total assets (end of 2015):		
< 2 million USD	136	62%
2-10 million USD	50	23%
10-43 million USD	26	12%
43-200 million USD	6	3%
> 200 million USD	2	1%
Share of total sales abroad:		
0%	182	83%
1-25%	32	15%
25-50%	2	1%
> 50%	4	2%
Leverage (total debt to asset ratio) (end of 2015):		
less than 10%	38	17%
10-25%	122	55%
25-50%	48	22%
> 50%	12	5%
Dividend payment (in 2015):		
not paying	72	33%
paying	148	67%

CFO's characteristics of Thai— usually education obtained in business/economics by Thai CFO's were master's degree (77%). The majority of Thai CFO's were young (50% of Thai respondents were < 40 years of age). With a younger age, Thai CFO's worked as a CFO for less than 4 years (77%). See Table 3.

Table 3: CFO's and CAPEX demographics

Type of main activity	Thailand	
	Number	%
CFO's age:		
< 40 years	110	50%
40-50 years	92	42%
51-60 years	16	7%
> 60 years	2	1%
CFO's academic degree in business/economics:		
less than bachelor	6	3%
bachelor	42	19%
master's degree	170	77%
higher than post-graduate (e.g. PhD)	2	1%

Table 3: CFO's and CAPEX demographics (continue)

Type of main activity	Thailand	
	Number	%
CFO has been sitting on the Board in Company:		
less than 4 years	170	77%
4-9 years	31	14%
more than 9 years	19	9%
The annual capital budget in Your Company:		
< 0,1 million USD	122	55%
0,1-1 million USD	48	22%
1-10 million USD	28	13%
10-50 million USD	20	9%
> 50 million USD	2	1%

The study surveyed the capital budgeting methods used by Thai firms. The respondents were asked whether they used such capital budgeting methods in their decision making on investment and how often. The scores of how often each method was used range from 1 to 5 where score of 1 was used to denote that the CFO has 'never' used such method, the score of 2 was 'rarely', the score of 3 was 'occasionally', the score of 4 was often and the score of 5 was always. See Table 4.

Table 4: Proportion of companies that use each capital budgeting method

		Thailand				
		never	rarely	occasionally	often	always
FORMAL_APR	N	98	40	50	18	14
	%	44.50	18.20	22.70	8.20	6.40
AUD_DUR_IMPLEMENT	N	14	124	46	30	6
	%	6.40	56.40	20.90	13.60	2.70
AUD_POST_INVEST	N	110	54	14	30	12
	%	50.00	24.50	6.40	13.60	5.50
APR_NPV	N	100	12	34	24	50
	%	45.50	5.50	15.50	10.90	22.70
APR_IRR	N	120	6	14	26	54
	%	54.50	2.70	6.40	11.80	24.50
APR_PB	N	164	2	16	32	6
	%	74.50	0.90	7.30	14.50	2.70
APR_DPB	N	124	12	22	14	48
	%	56.40	5.50	10.00	6.40	21.80
APR_ARR	N	146	32	12	24	6
	%	66.40	14.50	5.50	10.90	2.70
COST_WACC	N	128	14	20	56	2
	%	58.20	6.40	9.10	25.50	0.90
A_SENSITIVITY	N	116	12	44	42	6
	%	52.70	5.50	20.00	19.10	2.70
A_SCENARIO	N	120	20	42	26	12
	%	54.50	9.10	19.10	11.80	5.50

The results presented in Table 4 show main facts on capital budgeting methods use in Thai companies, these are as follows:

- formalization of investment appraisal before, during and after investments are made is done by less than 20% of Thai companies,
- IRR and NPV are the most popular investment appraisal methods; IRR is used by 36.3% of Thai companies and NPV by 33.6%,
- the majority of companies in Thailand do not use WACC for DCF calculations; WACC is used by 26.4% of Thai companies,
- risk assessment methods are used about 20% of Thai firms.

The obtained results as far as diffusion of CBM is concerned are similar to previous research in Thailand (Champhed & Chansa-ngavej, 2015; Olufemi & Adegbola, 2013; Rajatanavin & Venkatesh, 2007). It also means that the diffusion of capital budgeting methods in Thailand is lesser than in more developed countries (Brounen et al., 2004; Daunfeldt & Hartwig, 2011; Graham & Harvey, 2001; Hermes & Smid, 2007; Ryan & Ryan, 2002; Sandahl & Sjögren, 2003; Truong et al., 2008).

2 Factors influencing selection of capital budgeting methods

In our first hypothesis, we test whether company characteristics (i.e., the type of ownership (PUB), the activities of the company (MAN) etc.) influence the use of CBM. Our results show that listed and non-listed companies apply CBM differently. The results assert what were claimed by Brounen et al. (2004), Anand (2002) and Graham and Harvey (2001). More specifically, the type of ownership influences formalization of investment appraisal, discounted rates, methods of risk assessment, and the selection of all of the investment

appraisal methods except for PB method. Moreover, the manufacturing companies and non-manufacturing make a different decision when selecting formalization of investment appraisal and methods of risk assessment. The results support the research done by Daunfeldt and Hartwig (2011). However, the type of the activity has no effect on the selection of two investment appraisal methods, which are DPB and ARR. The foreign ownership of the company (FOWN) has a significant effect on choosing a formalization of investment appraisal, investment appraisal methods, discount rates, and methods of risk assessment. The results support what were revealed by many researchers such as Graham and Harvey (2001), Ryan and Ryan (2002), Hermes et al. (2007) and Truong et al. (2008). It is apparent that the management ownership (MAN-OWN), the size (LSIZE), the proportion of sales abroad (FSALES), the total debt to total asset ratio (HLEV) affect the way in which the companies choose CBM, namely formalization of investment appraisal, investment appraisal methods, discount rates, and methods of risk assessment. The results support the previous studies done by Warfield et al. (1995), Klassen (1997), Pike (1996), Payne et al. (1999), Graham and Harvey (2001), Daunfeldt and Hartwig (2011) and the like. Regarding the dividend policy (DIV), it can be concluded that companies with dissimilar dividend policies select CBM in a different way, as confirmed by the study of Daunfeldt and Hartwig (2011). However, among the companies with different dividend policy, there is no difference between selecting NPV, IRR, and DPB as an investment appraisal method.

Our second hypothesis is to investigate whether the characteristics of CFOs have an influence on applying CBM. The results show that age of CFOs (YOUNG) has an influence on applying a formalization of investment appraisal, investment appraisal methods, discount rates and methods of risk assessment. The results of our study support the studies of Hermes et al. (2007) and Daunfeldt and Hartwig (2011). The education of the CFOs (HEDU) has a significant influence on the way in which the companies choose CBM. It is worth to note that the result is contradicted from what was claimed by Anand et al. (2002) those CFOs with higher education use sensitivity analysis more often than CFOs with lower education. The study of Daunfeldt and Hartwig (2011) stated that CFOs with long tenure and CFOs with short tenure tend to select CBM in a different way. Our results confirm that the tenure of the CFOs, (STEN) has a significant effect on the way in which companies choose a formalization of investment appraisal, investment appraisal methods, the discount rate used in DCF methods and methods of risk assessment.

The third hypothesis is whether companies with large capital expenditure budget use CBM differently. The results affirm that the size of CAPEX budget (LCAPEX) has a significant influence on the ways in which the company chooses a formalization of investment appraisal, investment appraisal methods, the discount rate used in DCF methods and methods of risk assessment.

3. Verification of theoretical model

It appeared that Thailand did effect the use of capital budgeting methods selection. Samples on Thailand were taken into consideration to assess the relative effects of individual predictors which will also enable to examine the model with the use of multiple regression equations. A squared multiple correlations (R^2), and an adjusted squared multiple correlations (R^2_{adj}) were calculated as both indices assess how well the combination of predictor variables in the regression analysis predicts the criterion variables. With an attempt to reach conclusions about the relative importance of variables in predicting a criterion, the results were shown in Table 5.

For data's analysis (see Table 5). The first formalization of investment appraisal, formal evaluation before investment decision, was mostly influenced by the type of ownership of the company (PUB – listed on stock exchange, PRIV – private) with the highest coefficient of 1.541 and statistical significance ($p = 0.01$), and every other company's characteristics except the activity type of the company (manufacturing or not). The variable

correlation is 62.3%, $R^2 = 0.623$, adjusted $R^2 = 0.601$, $F(12, 207) = 28.539$, $p < 0.01$. The CFO's characteristics do not determine this method's selection, while the size of the capital expenditure budget determines formal evaluation before the investment decision.

Monitoring investments during implementation are influenced by company's characteristics similarly to the formal evaluation before investment decision; type of ownership of the company has the highest coefficient of 1.097 and is statistically significant ($p < 0.01$), only dividend policy of the company does not correlate to this method selection. When considering the CFO's characteristics, the education of the CFO determines this method selection, but not the size of the capital budget. The independent variables then accounted for the selection of the CBM methods significantly 53.2%, $R^2 = 0.532$, adjusted $R^2 = 0.505$, $F(12, 207) = 19.621$, $p < 0.01$.

The implementation of post-investment audit method is influenced by company's characteristics similar to the previous CBM method selection. The shares owned by top three managers and the type of ownership of the company determine this method use. The only difference is the factor of foreign ownership of the company that does not determine the method selection. Young CFO and also the size of the capital expenditure budget are factors determining post-investment audit use. The correlation of the independent variables can then predict the adoption of the post-investment audit method selection at 70.5% which indicates the highest correlation among the formalization appraisal methods where $R^2 = 0.705$, adjusted $R^2 = 0.688$, $F(12, 207) = 41.321$, $p < 0.01$.

Table 5: An analysis of the use of capital budgeting in Thailand

	R ²	Adj. R ²	Std. Error of the Estimate	Constant	PUB	MAN	FOWN	MAN-OWN	LSIZE	FSALES	HLEV	DIV	YOUNG	HEDV	STEN	LCA-PEX
FORMAL_APR	.623	.601	.789	.619	1.541	.131	-.671	.288	-.291	.480	-.349	-.279	.105	.051	-.017	.342
Significant				.349	.000	.372	.018	.001	.014	.000	.000	.020	.414	.753	.898	.000
AUD_DUR_IMPLEMENT	.532	.505	.636	.904	1.097	.132	-.848	.239	-.168	.606	-.316	-.082	.147	.274	-.098	.061
Significant				.090	.000	.265	.000	.000	.077	.000	.000	.391	.158	.037	.350	.390
AUD_POST_INVEST	.705	.688	.708	-.400	.483	.219	-.088	.449	-.052	.436	-.386	-.046	.317	.106	.011	.256
Significant				.499	.005	.096	.727	.000	.624	.000	.000	.665	.007	.463	.923	.001
APR_NPV	.709	.692	.919	-.1744	2.567	.498	-.666	.246	.228	.308	-.334	-.322	.414	.188	-.108	.074
Significant				.024	.000	.004	.044	.012	.097	.024	.004	.021	.006	.318	.474	.466
APR_IRR	.884	.877	.613	-2.829	3.325	.203	-.983	.622	.182	.311	-.330	-.235	.007	.286	.280	-.027
Significant				.000	.000	.075	.000	.000	.048	.001	.000	.012	.944	.024	.006	.689
APR_PB	.801	.790	.573	-1.233	-.290	.128	.664	.597	-.207	.396	-.275	-.080	.027	.424	.251	.264
Significant				.011	.037	.230	.001	.000	.016	.000	.000	.355	.770	.000	.008	.000
APR_DPB	.869	.862	.621	-2.123	3.281	.116	-.699	.242	.285	.263	-.604	-.006	.344	.011	.327	-.081
Significant				.000	.000	.316	.002	.000	.002	.005	.000	.950	.001	.933	.002	.239
APR_ARR	.741	.727	.599	.681	-.226	.014	.125	.574	.015	.121	-.521	.168	-.061	.140	.285	.023
Significant				.175	.119	.899	.558	.000	.867	.172	.000	.063	.534	.254	.004	.727
COST_WACC	.846	.837	.539	-1.178	2.173	.159	-.467	.116	.545	.390	-.546	-.013	.039	-.142	.179	.114
Significant				.010	.000	.112	.016	.043	.000	.000	.000	.871	.657	.198	.045	.058
A_SENSITIVITY	.748	.733	.679	-1.999	1.877	.031	-.902	.500	-.068	.464	-.394	-.074	.347	.580	.114	.014
Significant				.001	.000	.808	.000	.000	.502	.000	.000	.466	.002	.000	.306	.853
A_SCENARIO	.774	.761	.639	-.569	.984	.185	-.485	.481	-.085	.313	-.390	-.130	.168	.189	.218	.315
Significant				.287	.000	.119	.035	.000	.370	.001	.000	.176	.109	.150	.039	.000

Once we consider the variables that influence formalization of investment appraisal methods selection, we find that four company's characteristic factors/variables strongly influence adoption, they are: i) the type of ownership (listed company), ii) the larger proportion of shares owned by top three managers, iii) the higher proportion of foreign sales and iv) the total debt to asset ratio of the company. We cannot find the common CFO characteristics that significantly influence the adoption of the formalization appraisal method, while larger size of capital expenditure budget surely supports the adoption of the formal appraisal method in Thailand.

We also investigate the relationship of investment appraisal methods used – NPV, IRR, PB, DPB, ARR – and independent variables: company characteristics, CFO characteristics and the magnitude of the capital expenditure budget. All company characteristics, except for the size of the company, show statistically significant influence (70.9%) on the selection of NPV; $R^2 = 0.709$, adjusted $R^2 = 0.692$, $F(12, 207) = 41.973$, $p < 0.01$. The most important factor determining the selection of NPV is the type of ownership of the company (listed companies use NPV more often than private companies; coefficient 2.567). The young CFO is the only CFO's characteristic's influencing the selection of NPV method, while the size of the capital expenditure budget does not determine NPV method selection.

The adoption of IRR, PB and DPB are influenced by similar company characteristics where all company characteristics affect the decision on adoption of those three aforementioned methods, except for the type of company's activity. Type of ownership of the company (listed company) does strongly influence the adoption of the IRR and DPB with the coefficient of 3.325 and 3.281, but not PB. Higher education and the short tenure also determine the adoption of IRR and PB, while the adoption of DPB is determined by age and tenure of the CFO. The magnitude of the capital expenditure affects only the adoption of the PB method. The regression equation of the selection of IRR indicates that 88.4% of the criterion variance is accounted for by its linear relationship with the independent variables; $R^2 = 0.884$, adjusted $R^2 = 0.877$, $F(12, 207) = 131.446$, $p < 0.01$, while PB indicates 80.1% ($R^2 = 0.801$, adjusted $R^2 = 0.790$, $F(12, 207) = 69.519$, $p < 0.01$), and DPB indicates 86.9% ($R^2 = 0.869$, adjusted $R^2 = 0.862$, $F(12, 207) = 114.865$, $p < 0.01$), respectively.

While most capital budgeting methods selections have several influencing factors, the selection of accounting rate of return (ARR) have only three influencing factors; the shares of the company owned by top three managers, the debt to asset ratio, and short tenure of the CFO. The regression equation of the ARR method selection indicates 74.1%; $R^2 = 0.741$, adjusted $R^2 = 0.727$, $F(12, 207) = 49.478$, $p < 0.01$. Overall, company's characteristics significantly influence investment appraisal methods used especially NPV, IRR, PB and DPB. The most influencing CFO's characteristic's factor is the short tenure of the CFO. Interestingly, the size of the capital expenditure budget does not correlate to the selection of any investment appraisal methods, except for that of PB.

As discount rate used in discounted cashflow methods is concerned, we found that type of ownership (public company) mostly influence the use of WACC with the coefficient of 2.173. Other company's characteristics, except the activity of the company and dividend policy, also significantly influence the adoption of WACC. The CFO's characteristic that correlates with the selection of WACC is a short tenure, while there is no correlation with the size of the capital expenditure budget. The influencing variables can determine the selection of WACC in 84.6%; $R^2 = 0.846$, adjusted $R^2 = 0.837$, $F(12, 207) = 94.531$, $p < 0.01$.

The selections of risk assessment methods also determined by certain company characteristics. For the selection of sensitivity method, the most influencing factor is the type of the company ownership (listed company), the coefficient 1.877 illustrates the high correlation at $p < 0.01$. Other company's characteristics that influence the selection of sensitivity analysis are foreign ownership, the proportion of shares owned by top three managers, foreign sales and leverage. The CFO's characteristics that most influence

the use of sensitivity analysis are young age of CFO and education of CFO, while the size of the capital expenditure budget does not influence the use of this method. Such influencing variables can then determine the selection of sensitivity method in 74.8%; $R^2 = 0.748$, adjusted $R^2 = 0.733$, $F(12, 207) = 51.108$, $p < 0.01$.

The last method that we investigate is the scenario analysis where certain company characteristics influence this selection of this method in a similar way as the sensitivity method selection. The most influencing factor is the type of the company's ownership (listed company) (the coefficient 0.984, $p < 0.01$). Other company's characteristics that influence the selection of scenario analysis are foreign ownership, the proportion of shares owned by top three managers, foreign sales and leverage. The selection is also determined by the short tenure of CFO and size of capital expenditure budget. The regression equation explains influence of these factors on the selection of this method in 77.4% with $R^2 = 0.774$, adjusted $R^2 = 0.761$, $F(12, 207) = 59.079$, $p < 0.01$.

If we consider the factors that influence the adoption of both risk assessment methods, the most correlated factors are company characteristics. However, considering overall factors that influence the selection of capital budgeting method as a whole, the authors see that type of company ownership as listing on the stock exchange is the most powerful factor for Thai companies.

The findings of our results are interesting. As literature in Thailand on capital budgeting management is very limited, our results add more value to Thai literature. What we found contradicts previous research conducted in Thailand. Rajatanavin and Venkatesh (2007) concluded in their study that NPV and IRR are two most frequently used capital budgeting techniques. Payback criterion was also found to be popular among Thai large firms. This is not the case from our point of view.

Conclusions

Using data for companies operating in Thailand this study examined factors determining the use of capital budgeting methods and also diffusion of these methods. As the diffusion of CBM is concerned the research shows their more frequent use in Thai companies (it is evident in the case of formalization of investment appraisal process, investment appraisal methods use, the cost of capital use in DCF calculations and methods of risk assessment). Particularly NPV was used (often or always) by 33.6% of Thai companies whereas IRR was used (often or always) by 36.3% of Thai companies – the results for other methods are similar. The correlation analysis between CBM used showed that companies tend to use a package of different methods, this is especially evident in the case of DCF methods, and companies usually use all of them.

Analysis of the company's characteristics shows that foreign ownership, management ownership, the large size of the company, foreign sales and high leverage influence the use of CBM (all independent variables are statistically significant). Also public ownership influences the use of capital budgeting methods (with the exception of PB). Influence on the use of capital budgeting methods of manufacturing activity and dividend payment was shown for only some CBM. The research also shows statistically significant influence on the use of capital budgeting methods of CFO's characteristics (the only exception was that high CFO's education influence on the use of sensitivity analysis is not statistically significant). Also large size of capital expenditure budget has statistically significant influence on the use of all CBM. As company characteristics are concerned, public ownership, foreign ownership, managers ownership, large company size, foreign sales and high leverage influence the use of CBM (it is worth stressing that contradictory to research hypotheses some of these relations are negative, especially in the case of high leverage). The only companies' characteristics which do not influence most of CBM use are

manufacturing activity and dividend payment. CFO's characteristics influence the use of capital budgeting methods but only part of the relations is statistically significant, the same could be observed in the case of CAPEX size.

The contribution of this research to prior studies is threefold. Firstly the study shows on a large sample of companies which CBM are used by Thai companies and how often they are used, to authors knowledge such a complex study has not been performed in the country before. Secondly a broader set of explanatory variables was used including company's characteristics, CFO's characteristics and magnitude of capital expenditure budget which permitted a rich description of companies practices and allowed analysis if and which companies practices are consistent with prior research. Thirdly, the study results could also be useful from a practical point of view. They could especially help practitioners to identify areas in their companies where capital budgeting practice is far from academic recommendations and where implementation of the methods, which are both theoretically, grounded and used in practice of companies in more developed countries, could possibly be beneficial for their companies due to the fact that they could facilitate activities which create value. Wider diffusion of CBM in Thai companies could improve the effectiveness of investment decisions and positively influence companies' effectiveness.

The study is limited in several respects. First of all this research measure only the reported (perceived) use of capital budgeting methods (not necessarily actions but rather beliefs) – one cannot be sure if and how the methods are actually used. Secondly, as the sample was not representative of all Thai companies, the results should be interpreted with caution. Thirdly there is a possibility of non-response bias in the results obtained, the response rates are low, so the results could show responses of people more familiar with capital budgeting methods (they could overestimate the use of CBM). The last point to be made is that survey research generally does not allow in-depth analysis of the capital budgeting practice in a way it is possible using case study research. Comparing practice of Thai companies with the use of case study method could enable more detailed analysis of not only CBM used but also an examination of the process of investment selection, appraisal, realization and control. This could be the next step in the research. Bearing these limitations in mind, however, the research permits a broad examination of CBM used in Thai companies, analysis of factors determining their use and comparisons with similar researches done in other countries.

It can be recommended that further research can be extensively conducted to investigate the ways in which capital budgeting processes are developed by using a case study method. This will allow researchers and practitioners to understand capital budgeting processes including a process of selecting capital budgeting methods and techniques in details. Moreover, insightful reasons for choosing capital budgeting methods and techniques needs to be more studied as the reasons might vary according to different types of businesses, different types of investing projects, different characteristics of the company/ CFO as well as power in the organizations. Additionally, researchers can extend their study to analyze capital budgeting issues on factors regarding multiple conflicting goals and indivisibility of projects, which might have an effect on selecting capital budgeting methods and techniques.

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