Factors Determining the Selection of Capital Budgeting Techniques

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Abstract

Many studies explore only use or non-use of capital budgeting methods, and not the factors that determine the selection of the method used in UAE or the region. The relationships between use and independent variables that affect the selection of the method have been studied. The study attempts to fill a gap in the existing literature of capital budgeting practice in the developed and developing economies. The study analyzes the questionnaire collected from 35 companies out of the 61 listed in DFM.

The study found a sizable number of UAE companies that use capital budgeting techniques in their capital investment decisions. The widely used methods are: PB, NPV, and IRR by most of the UAE companies.

The study also revealed that many financial and nonfinancial factors influence the selection of capital budgeting technique such as the size of the company, revenues, profitability, leverage level, expenditure, familiarity with the project, availability of cash, and the level of education of decision makers. Significant differences were found between the methods selected and the factors influencing the selection of the technique. It has been found that there is a positive association between most of the financial factors and the methods but negative with majority of the nonfinancial variables.

JEL classification Numbers: G31, M41, M13, L52.

Keywords: Capital budgeting techniques, UAE companies, Determinants of capital budgeting methods, Selection variables, NPV, PB, IRR.

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1 Introduction

Capital budgeting decision is one of the major decisions to be taken by financial managers as it affects the value of the firm. The selection of an investment project depends on the method used to assess the feasibility of the project. The use of capital budgeting technique has been surveyed by many researchers (Sangster, [1]; Block, [2]; Hermes et al., [3]; and Holmén, M., and Pramborg, [4]).

It has been the trend in most of the developing countries to delegate more powers to financial managers especially in financial matters. It is expected that such autonomy coupled with increasing exposure to market compels managers of these enterprises to think deeply about the financial viability of their enterprises. The growing cost of funds, global trend towards the market-economy and the concern over profitability by external parties have pressed managers to think commercially. Management pays special attention to capital budgeting decisions because they involve substantial costs and benefits that span a number of years. McGuigan, Moyer, and Harris; [5] indicate that firms usually classify capital expenditure projects according to expected benefits.

The preceding discussion leads to the theme of this study; whether the above-mentioned trends and concerns have translated into formal adoption and selection of capital budgeting techniques by the UAE companies? However, focusing on public sector corporations would have been logical if there is an existing literature on the methods followed by private sector companies.

Many studies over the years have made extensive efforts to survey and identify the quantitative techniques used by companies all over the world, especially in the developed and developing countries. Some studies have focused on investment decisions and finance (Klammer [6], Brookfield [7], Eljelly and AbuIdris [8]). Some other studies have focused on behavioral aspects and environmental factors affecting capital budgeting techniques (Brien [9], and May [10]). Pike [11] surveyed a large sample of British companies for capital budgeting methods used in 1980 and 1986. The aim was to trace emerging trends towards using certain methods more than others. The study found that there was a growing tendency to use discounted cash flow methods and that the NPV method was the most widely used technique followed by IRR.

However, Gerrans and Chandra [12] found that the payback is the most widely used method by the largest proportion of a sample of Australian companies and its use is persistent across investment size, type, and the industry to which the company belongs. Further, when the investment size is large, payback and NPV are the most widely used techniques.

Some attempts have been made to document the capital budgeting techniques in developing countries and emerging markets. For example, as part of a study on the use of management accounting techniques by Qatari companies, Alhamoud and Ibrahim [13] surveyed all the 29 publicly owned Qatari companies. The study found that the payback method was the most widely used method (64.2% of the 24 respondents) followed by IRR (58%), profitability index (37.5%), NPV (20.8%), and ARR (8.3%). However, no significant differences were found among industries regarding the use of one technique over another, although discounted cash flows are mainly used by the manufacturing sector.

Some of the researches on the use of capital budgeting in the developed economies reflect a move towards introducing practical aspects that are intended to refine the existing capital budgeting methods. Recently, Ibrahim and Sayed [14] examined capital budgeting process in 98 companies in UAE and the results indicate that majority of the surveyed UAE companies adopted discounted cash flows when making capital investment decisions and the company size is a determinant factor of selecting a technique. Their study concentrated on differences in practices between large and small companies.

The evidence from Swedish companies studied by Daunfeldt O. and F. Hartwig [15] indicates that larger companies tend to use capital budgeting methods more often when deciding on investments. The choice of capital budgeting methods is also influenced by financial leverage, growth opportunities, dividend pay-out policies, choice of target debt ratio, degree of management ownership, foreign sales, and the education and other individual characteristics of the CEOs.

As outlined above, most studies explore only use or non-use, or the frequency of use, of capital budgeting methods, and not the factors that determine the selection of the method used. When relationships between use and independent variables that affect the use have been studied, (Hartwig [16]) only descriptive statistical methods such as correlation analysis and independent-samples t-tests are utilized, so the results cannot be interpreted causally. His study found a positive correlation between company size and the use of NPV method.

Therefore, the motivation for this study emanates, from the lack of methodological research on the use of capital budgeting techniques and the base of selecting the technique. Hence, this study serves two purposes, the first is to survey capital budgeting methods applied by UAE companies and the second is to investigate the determinants of selecting the capital budgeting method.

To achieve the objectives of this study, the remainder of this research is organized as follows. The second section outlines the major hypotheses of this study. Section three describes the sample, methodology, analysis and discussion. Finally, section four draws the conclusions of the study.

2 The Hypotheses

As outlined above, the intention of this study is to survey the capital budgeting practices in UAE and to examine possible differences between companies listed in Dubai Financial Market regarding the capital budgeting techniques used. However, there is a counter line of arguments that expect adoption of capital budgeting techniques even in a developed economy. This stems, as it is argued, from the increased awareness and quality of education all over the world. Sangster [1] argues that due to the enormous growth in management education, managers are "becoming more aware of the decision aids at their disposal and are more equipped to apply the benefits of information technology explosion." Furthermore, in some countries there has been a trend towards more commercialization of public sector enterprises. This trend is driven by many factors such as: The public sector enterprises are becoming more of revenue generating units than social and political programs.

Methods such as net present value (NPV) that discount cash flows, are often recommended in financial management textbooks. Brealey and Myers [17], for example, wrote a chapter on "why net present value leads to better investment decisions than other criteria". NPV is recommended since it incorporates all cash-flows that the investment generates as well as the time value of money.

Other methods, such as the internal rate of return (IRR) and pay-back methods are often

criticized. IRR can be misleading when a choice must be made among mutually exclusive projects, and also because of the so-called multiple rates of return.

As mentioned earlier, recent research has shown that there is an increased awareness of the discounted cash flow techniques in private and governmental or nonprofit organization (Pike, [11]). Specifically, Chang, [18] shows that capital budgeting is regarded as efficiency improving tool in local governments (municipalities). But in the many less developed countries (LDCs) private sector companies are more likely to engage in small scale and short-term capital investments. Thus, since the inputs to discounted cash flow techniques are not expected to change by much in the short run, the UAE enterprises are more likely to adopt discounted cash flow methods. Thus, the first hypothesis can be stated as follows:

H1: Companies in the UAE are expected to adopt discounted cash flows capital budgeting methods in evaluating capital investment opportunities.

To analyze what determines the selection of capital budgeting method, many factors are assumed to influence the selection decision. Some of the factors that make the difference lie in the size expected to be related to the use of recommended capital budgeting methods (Verbeeten, [19]; Pike, [11]) because large companies tend to deal with larger projects, making the use of more sophisticated methods less costly (Hermes et al., [3]). There might also be industry-specific differences when it comes to the use of methods. The manufacturing companies are expected to use more recommended methods because they are often larger and more capital intensive with higher sunk costs. Companies with a higher dividend payout ratio are expected to use profitability index calculations methods less often because (apart from expectations about future positive cash flows and profits) a higher dividend payout indicates that the company is liquid, making capital rationing less likely. Companies that have riskier investments and revenues instability nature of activity, size of the organization, rate of growth in revenues, profitability, leverage level, age of the company, avoidance of risk, amount of capital expenditure, productive capacity, and other factors are expected to apply more sophisticated methods of capital budgeting. Holmén and Pramborg [4] documented that the use of the payback method increases with political risk. The suggested reason for the observed positive relation (between political risk and the pay-back method) is that political risk is difficult to estimate (i.e. rendering high deliberation costs).

Thus, the second hypothesis can be stated as follows:

H2: The selection of capital budgeting method is affected by many financial and non-financial factors.

3 The Methodology, Analysis and Discussion

In order to test the stated hypotheses, a questionnaire was sent to the CFOs of all companies listed in Dubai Financial Market (DFM). All the questions asked in the questionnaire targeted an answer related to the methods used individually or combined and the bases on which methods are selected. The dependent variables are constructed on the scale base (1 to 4, whereas, 1 indicates never or not used, 2 sometimes, 3 frequently, and 4 always. A breakdown of the sampled firms is given in Table 1. The sample covers all the companies listed in DFM and can generalize that it is a representative of the different economic sectors of the UAE economy. In general, the respondents represent our sample from the different sectors, while the response to the questionnaire was easier from

the banks and financial service companies. The received responses were used to test the stated hypotheses. The study employed simple statistical methods including:

* Frequencies and percentages to measure the extent of use of various capital budgeting methods.

* Spearman correlations and coefficients.

* Statistical tests for the equality of proportions of use between the different enterprises, and proportions of respondents considering different factors in their capital investment decisions.

Economic Sector	Population	Respondents	%
Banks	12	8	23.0%
Investment and Financial Services	12	10	29.0%
Insurance	13	6	17.0%
Real estate and Constructions	10	5	14.0%
Telecommunication and Transportation	5	3	8.5%
Materials and Consumer Staples	9	3	8.5%
Total	61	35	100%

Table1: Breakdown of the Sample by Economic Sector

To test the hypotheses of this study, this section analyzes and summarizes the responses received from the responded companies. The response rate is around 57% (35 out of the listed companies 61). The response rate is higher in the finance and banking sector as compared to other sectors. The reason may be the CFOs of the financial sector are willing to know more about projects' valuation even by other companies.

Table 2 reveals that there is a wide use of capital budgeting techniques by a majority of the companies in UAE. The table provides the detailed answers to the first question about whether capital budgeting methods are used or not by the asked company of the sample.

This finding goes counter to the first hypothesis of this study as it shows that the majority of the companies in our sample (77%) use capital budgeting techniques. However, there is a statistically significant difference between the overall rates of use of capital budgeting techniques among the different economic sectors, as demonstrated by the high percentages of use as well as the high Z-value. The banks are using capital budgeting methods at a higher rate than the others counterparts sectors as shown on table 2.

Economic Sector	Sample	Used	Not used	%of use	Z-Value
Banks	8	8	0	100.0%	
Investment and Financial Services	10	7	3	70.0%	
Insurance	6	4	2	67.0%	

Table2: Overall Usage of Capital Budgeting Techniques by UAE Companies

Real estate and Constructions	5	4	1	80.0%	2.22
Telecommunication and Transportation	3	2	1	67.0%	2.33
Materials and Consumer Staples	3	2	1	8.5%	(at 0.5 level of
Total	35	27	8	77.0%	significance)

The second question of the questionnaire is about the degree and proportion of use of capital budgeting methods. Table 3 indicates the proportion of combination use of different capital budgeting methods by all UAE economic sectors and companies. The recommended methods used frequently or always by the most listed companies in DFM were the payback period (77.6%) and the net present value (76.4%). In the second popularity come profitability index around (77%) and internal rate of return (67.5%). The less popular or not recommended methods by UAE companies are other methods namely; sensitivity analysis, accounting rate of return, and other methods as the respondents replied for never or sometimes used at high ratios (79%), (62%), (57%), and (53%), respectively.

Mean values and standard deviations are also reported in Table 3. Higher mean values indicate more extensive use of the method.

The primacy of pay back method was attributed to its easiness and understandability. But this argument is not enough in the case of UAE since the method is not used alone but usually in combination with other methods. This may lend support to the other reason given for payback popularity, that it is usually used as a screening criterion.

The pattern shown in Table 3 of the domination of the pay back (PB) method may be justified on several grounds. First, the banks and financial service companies in the UAE play a greater role in carrying out major projects. Thus, such projects could be adopted on other than pure financial grounds. Second, many projects in UAE are new and starting projects that usually require a longer time to implement, thus pay back, besides being easy, would become as risk-reflecting technique as discounted cash flow. Finally, in such situations there is no pressing reason for rigorous analysis if the results of the analysis are not used and investment decisions are weighted by other than financial reasons. In such cases either no technique is used, or easy and less complicated methods such as PB are adopted.

This finding is consistent with many researchers such as; Brounen et al., [20]; Bennouna et al., [21], and Sandahl and Sjögren [22].

The popularity of net present value, profitability index, and internal rate of return is seen in many surveys of capital budgeting practices conducted by different researchers (Daunfeldt and Hartwig [15], Verbeeten [19], and Holmen [4]).

No.	Capital Budgeting Method	(1 – 2)	(3 – 4)	Mean	SD (σ)
		Percentage of	Percentage of		
		Use	Use		
1	Payback Period (PB)	22.4%	77.6%	2.72	1.53
2	Internal Rate of Return	32.5%	67.5%	2.37	1.02
	(IRR)				

Table3: Number and Proportion of Companies that Used Each Capital Budgeting Method never or sometimes (1-2) VS. frequently or always (3-4).

3	Accounting Rate of Return (ARR)	57.0%	43.0%	1.06	0.94
4	Net Present Value (NPV)	23.6%	76.4%	2.67	1.48
5	Profitability Index (PI)	30.3%	69.7%	2.53	1.35
6	Sensitivity Analysis (SA)	62.0%	38.0%	0.92	0.55
7	Adjusted Present Value (APV)	53.0%	47.0%	1.18	1.02
8	Others	78.8%	21.2%	0.66	0.85

The question regarding whether UAE companies use these methods exclusively or rely on a particular technique, Table 4 shows that these methods are used collectively rather than individually. The combined use of the payback period (PB) method, internal rate of return (IRR) and net present value (NPV) is evidenced by the correlation among the different techniques.

As Table 4 shows the Spearman Correlation Coefficients that measure the association between usages of various capital budgeting techniques. In the case of the UAE companies, (PB) is positively and significantly associated with discounted cash flow methods (IRR and NPV). It is quite possible that the payback is used primarily as an initial evaluation technique, while IRR and NPV are used in a later stage for more sophisticated level of analysis. The pattern of usage in UAE enterprises shows that the PB, PI, NPV, IRR, and ARR are positively and significantly associated with each other. However, one has to recall that a small number of firms in the sample use as single technique and a large number of firms in the sample make a combination use of these methods with other methods.

Methods	PB	IRR	PI	NPV	ARR	SA	APV	Other
PB	1							
IRR	0.28	1						
PI	0.36**	0.18	1					
NPV	0.32***	0.11	0.42**	1				
ARR	0.15	0.41**	0.23	0.36**	1			
SA	0.24	0.33	0.25	0.18	0.12	1		
APV	0.15	0.22	0.27	0.22	0.10	0.08	1	
Other	0.12	0.17	0.016	0.11	0.41**	-0.22	-0.12	1

Table 4: Spearman Correlation Coefficients of UAE Companies

** Indicates significance at 0.05 level.

*** Indicates significance at 0.10 level.

It is evidenced that UAE companies do not evaluate their projects by using only discounted cash flows but the payback period gained the first popularity. This finding contradicts the first hypothesis but at the same time discounted cash flow methods (NPV and IRR) are extensively applied by UAE companies.

4 The Determinants of the Method's Selection

It is imperative that the selection of the methods of capital budgeting decision involves a multitude of factors that may directly or indirectly affect the selection of the technique and then the outcome of the analysis and the final decision whether to adopt the successful opportunity or not. To analyze, discuss, and test the second hypothesis of our study, we have classified the determinants of the technique selection into financial and non-financial factors. The data collected for this purpose is either from the financial reports published by the companies or from the distributed questionnaire. Table 5 lists a number of those factors and how are they correlated to the capital budgeting methods selected by the UAE companies. The financial factors include the size of the organization measured by the value of assets), rate of growth in revenues, profitability, leverage level, capital expenditure of the investment opportunity, and availability of cash. On the other side, the nonfinancial factors include: the age of the company, life of the project, familiarity with investment, and other external factors.

Variable	Variables		PB	IRR	PI	NPV	ARR	SA	APV	Other
Class										
	Size	Coef.	0.00672	0.00883	0.0064	0.0092	0.0047	0.0072	0.05	0.062
		t-value	2.95	2.23	1.81	2.84	1.59	1.36	0.45	0.43
	Revenues Growth	Coef.	0.0045	0.0024	0.0052	0.0055	0.001	-0.003	-0.10	0.020
		t-value	2.30	1.25	1.56	1.89	0.87	-0.62	-0.03	0.22
	Profitability	Coef.	0.005	0.003	0.0048	0.0072	0.035	-0.042	-0.26	-1.51
Financial		t-value	0.07	1.02	0.58	1.78	0.06	-0.82	-0.44	-0.03
Variables	Leverage	Coef.	0.008	0.0021	0.009	0.067	0.005	0.085	-0.36	-0.03
		t-value	2.34	1.22	0.96	2.21	0.56	0.075	-0.58	-1.73
	Expenditure	Coef.	0.005	0.007	0.083	0.009	0.0032	-0.074	-0.35	-0.76
		t-value	2.45	1.04	2.01	1.88	1.90	-0.86	-1.88	-1.27
	Cash	Coef.	-0.006	-0.009	0.038	0.092	-0.007	-0.092	0.09	-1.82
		t-value	-1.55	-0.98	0.56	2.13	-0.66	-0.99	2.29	-1.78
Non-	Co. Age	Coef.	0.002	0.021	0.067	0.034	-0.078	0.057	-0.97	0.88
financial		t-value	0.067	2.25	1.99	1.72	-0.59	1.90	-1.50	1.92
Variables	Project Life	Coef.	-0.088	0.009	0.045	0.083	-0.075	0.809	0.72	004
		t-value	-1.25	1.74	0.48	1.76	-0.54	2.01	0.05	-0.77
	Education	Coef.	-0.15	0.04	0.006	0.63	0.07	0.58	-0.88	-0.65
		t-value	-1.24	0.60	0.02	1.25	1.03	1.70	-1.22	-1.58
	Quality	Coef.	-0.009	-0.08	-0.05	0.72	-0.003	0.92	-0.02	0.74
		t-value	-0.81	-1.27	-0.04	0.86	-0.66	0.08	-0.13	1.45
	Familiarity	Coef.	0.09	-0.27	0.82	-0.47	-0.48	-0.06	-0.20	0.57
		t-value	1.32	-0.02	0.05	-0.08	-1.34	-0.88	-1.00	1.77
	Other Factors	Coef.	0.004	0.06	0.012	0.09	-0.78	-0.86	-0.33	0.81
		t-value	0.95	0.11	0.05	1.22	-0.06	-0.89	-1.50	2.15

Table 5: Coefficients and T-Values of the Determinant Variables and the Methods Selected by UAE Companies

Based on the results calculated by the t-statistical analysis of Table 5 above, we are going to discuss the relationship between each independent variable and the method of capital budgeting selected by UAE companies. The purpose of this discussion is to test the second hypothesis of our study.

Regarding the first variable, which is the size of the company measured by the value of

total assets, it is found that generally the size is positively correlated with the use of the capital budgeting techniques (Daunfeldt, and Hartwig [15]; and Bennouna et al., [21]). We find that large companies use PB, NPV, IRR, IRR, and SA more than small companies; results for the other methods were smaller and less statistically significant (Table 5). Contrary to our results, Graham and Harvey [23] found a statistically significant *negative* relation between size and pay-back in particular in the U.S., while Brounen D. [20] found no statistically significant relation between size and pay-back in any of the four (Germany, France, Netherlands, and UK) countries.

The results of the second financial variable (Revenues Growth) show that companies with higher growth rates use PB and NPV more often and use SA and APV less often when compared to companies with lower growth rates.

The profitability of the company is measured by the amount of net profits as well as some profitability ratios (ROE, ROA, and Profit Margin Ratio). It is found that profitable companies use more NPV and the relationship with other methods is either not significant or negatively related to this variable. This finding may be due to the less investment opportunities required by profitable companies.

Companies with high debt-equity ratio are classified as high leveraged companies. Our research findings provide evidence that high leverage companies tend to use more the PB and NPV but they have insignificant or negative relationships with other techniques. High leveraged companies pay more attention to the period of time to recover their initial costs as they are subject to a high degree of financial risk. Another result indicates that high leveraged companies had a tendency to utilize more NPV and IRR than low leveraged companies. This finding is consistent with Daunfeldt and Hartwig [15]. The findings of the leverage variable are similar to the expenditure variable relationships as explained by the t-values of PB and NPV. The only difference is the strong relationship with the use of PI and negative relation with SA and APV.

The availability of enough cash is a good indicator of liquidity. Companies with large cash balances are classified as liquid companies and with less liquidity risks. Therefore, they have an opportunity to make new investments. The findings indicate that companies with more cash balance tended to use more excessively NPV and APV but they are negatively correlated with PB, SA, ARR and IRR. The result of our study is contrary to the findings of Verbeeten [19] and Holmen [4].

The second class of variables is about the non-financial factors that include the age of the company, useful life of the project, levels of education of the CFOs, quality of the project, familiarity with the project, and other external variables. For such variables the data is basically collected from the response of UAE companies to the distributed questionnaire.

Companies working for 20 years or more tended to use more IRR, NPV, PI, and SA. However, new companies (5 years or less) found to have a strong relation with PB.

Projects expected to continue for a long period tended to have excessive use of SA, NPV, and IRR. On the other side, they have negative relation with PB, PI, and ARR.

The CFOs with a high level of education (Ph. D., MBA, or Professional Certificates), tend to use more SA, NPV, and ARR, whereas they have insignificant or negative relation with PB, APV, and other techniques.

When the target of the company is the quality of the project, decision makers concentrate more on qualitative factors, which are not financial. Our findings show that there is a negative correlation between the high quality projects and most of the capital budgeting methods. As on Table 5, the relation of quality to PB, IRR, PI, and ARR is negative but only positive with other methods. This may refer to select the project on the bases of methods other than the mentioned on the questionnaire as proved by the positive relationship between the quality variable and the t-value of other methods (1.45).

If the company is familiar with the project, the company did not use any of the common capital budgeting techniques. CFOs replied that familiar projects do not need sophisticated techniques and they can select the project only by considering experience of other investors.

It has been found that there is a positive association between the size, revenues, profitability, and leverage with the mainly used techniques (PB, NPV, IRR, and PI). However, there is a positive association between a majority of the nonfinancial factors (age, life of the project, level of education, and quality of the project) with SA and other techniques of capital budgeting.

Our above discussion supports the second hypothesis of the study, which proves that the selection of the capital budgeting technique is affected by both financial and non-financial variables with different degrees of relationships.

5 Summary and Conclusion

The study surveys the capital budgeting practices of the UAE companies by analyzing the questionnaire distributed to all the 61 companies listed in Dubai Financial Market. The financial statements of the respondents (35 out of the 61 companies) as well as the questionnaire have been used to test the two major hypotheses of the study. The study fills a gap in the literature regarding capital budgeting practices in UAE and the region. Our hypotheses are to know the use or non-use of capital budgeting techniques and also the variables that determine the selection of the capital budgeting technique. The study concludes that most of the companies apply capital budgeting techniques in evaluating their investment opportunities. The percentage of frequent and always use is very high for most of the methods, and only few methods are not used or sometimes used. The payback method (PB), NPV, IRR, and PI are widely used methods by a majority of the companies. Therefore, discounted cash flows are frequently or always used by the UAE companies.

The study found that there is significant difference in this use between the different sectors of the UAE economy. The UAE companies do not use only discounted cash flow methods for evaluating their investments. Hence, one can say; the first hypothesis is not accepted.

Finally, the study also revealed a number of factors that affect the selection of the capital budgeting method. The major factors that influence the selection may be financial or nonfinancial variables such as the size of the company, revenues, profitability, leverage level, expenditure, familiarity with the project, availability of cash, and the level of education of decision makers. Significant differences were found between the methods selected and the factors influencing the selection of the technique. It has been found that there is a positive association between the size, revenues, profitability, and leverage with the mainly used techniques (PB, NPV, IRR, and PI). However, there is a positive association between majority of the nonfinancial factors (age, life of the project, level of education, and quality of the project) with SA and other techniques of capital budgeting.

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