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Capital Budgeting Management Practices in Japan

— A Focus on the Use of Capital Budgeting Methods* —

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Capital budgeting is one of the most important factors in the process of corporate decision-making. Data from numerous previous studies show that managers prefer the simple payback period method (non-discounted payback model) over the net present value method (discounted cash flow model), which academics consider as superior. In particular, almost all investigative research in Japan has shown that the managers of Japanese firms tend to prefer a non-discounted cash flow model, such as a simple payback period method. This interesting gap between business practice and academic theory has long been a puzzle to the academic community.

From October, 2008, to January, 2009, I conducted a survey in the form of a questionnaire sent to 225 people in charge of capital budgeting at firms listed on the Tokyo Stock Exchange, with a focus on capital budgeting practices. This paper presents the results of the questionnaire survey and evaluates the capital budgeting practices in Japanese firms. The results show that Japanese firms manage their decision-making by a combination of payback period method and net present value method. While most financial managers utilize multiple tools in the capital budgeting process, these results reflect a better alignment of views between academia and business.

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1. Introduction

Corporate capital budgeting decision models are used by corporate managers in the process of critically important decision-making about capital budgeting. There are a variety of capital budgeting methods: the net present value (NPV) method, the internal rate of return (IRR) method, the simple payback period (SPP) method, the discounted payback period (DPP) method, the accounting rate of re-

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turn (ARR) method, such as ROI, and the real option (RO) method[1].

Almost all academic articles and textbooks recommend that managers should use the most appropriate and exact methods to ensure the highest return for the least risk in order for their firm to maximize shareholder value. Academic literature, in particular that devoted to finance theory, has therefore indicated that discounted cash flow models, such as NPV, are desirable for decision-making concerned with capital investment because an increase of NPV is connected directly with increased corporate value.

While managers have, over the long term, used various capital budgeting models, the use of such models has not always been in agreement with finance theory. In particular, the payback period method is said to be theoretically irrelevant and mistaken because the simple payback period (SPP) method ignores the time value of money and cash flows beyond the cutoff date: the cutoff is usually arbitrary. Even if we use the discounted payback period (DPP) method, which was modified in order to eliminate the limitations imposed by ignoring the time value of money, we cannot resolve the difficulty of ignoring cash flows beyond the cutoff date[2]. Even so, some previous surveys in Japan have indicated that Japanese managers have most frequently used SPP and have rarely used NPV or IRR.

This study re-examines the capital budgeting decision-making methods used by managers of listed companies on the Tokyo Stock Exchange in Japan. The purpose of this study is to discover how Japanese firms currently use capital budgeting methods: it shows that Japanese management still prefers the payback period method as a capital budgeting tool. At the same time, however, the number of Japanese companies using NPV and IRR has gradually increased. In Japan, the payback period method is used more widely than the NPV and IRR methods, and other capital budgeting tools. It is of interest that there is a lack of agreement between Japanese capital budget practices and finance theory. This paper also discusses the correspondence relationship between the types of investments and capital budgeting methods. That is, this research focuses on whether managers of Japanese firms, when making decisions about different types of investment plans, have changed their thinking about assessing the importance of the several capital budgeting methods.

In this paper, I will outline some recent data, in particular data based on descriptive statistics, on the use of capital budgeting methods in Japan. I do not at present report results or reach conclusions based on statistical analyses, such as statistical tests; these will be published in another research paper at a later date.

This paper is composed of 5 sections. Section 2 provides a review of prior capital budgeting studies in United States and Japan. Section 3 discusses sample selection and survey methodology. Section 4 presents the results, while Section 5 offers a conclusion.

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1) See e.g., Brealey et al. (2007) and Northcott (1992) for full accounts of capital budgeting methods.

2) See Rappaport (1965) for a detailed explanation of DPP.

2. Review of Previous Research

Here, I describe American business situation with regard to the use of capital budgeting techniques and compare it with current practices in Japan. I offer first a representative overview and two recent surveys in United States: Graham and Harvey (2001) and Ryan and Ryan (2002). I then present some previous studies carried out in Japan[3].

2.1 United States

Several studies conducted in America have shown how businesses use capital budget methods and how large corporations determine the cost of capital used in capital budgeting decisions. On the basis of recent investigations in United States, Graham and Harvey (2001) and Ryan and Ryan (2002), for example, have shown that corporate managers and academics are not always in agreement with regard to their choice of theoretical method.

In 1999, Graham and Harvey (2001) sent questionnaires to the chief financial officers (CFOs) of 4,400 American companies, and 392 usable responses were received. Using the responses, they examined the financing practices of American companies. Table 1 offers a summary of the results that Graham and Harvey (2001)

Table 1. Summary of Results of Graham and Harvey (2001)

Capital Budgeting Method	Always or Almost Always (%)	Mean
NPV	74.93	3.08
IRR	75.61	3.09
SPP	56.74	2.53
DPP	29.45	1.56
ARR	20.29	1.34

obtained. Respondents to their survey were asked to rate each factor on a scale of 0 (never) to 4 (always) and they reported the overall mean as well as the proportion of respondents that answered 3 (almost always) or 4 (always). According to the data gathered by this survey, almost all respondents selected NPV and IRR as their most frequently used capital budgeting methods: 74.9% of CFOs always or almost always used NPV (rating of 3.08), while 75.7% always or almost always used IRR (rating of 3.09). In other words, IRR is the most appreciated method, while NPV and IRR are more popular than SPP, DPP, or ARR.

Ryan and Ryan (2002) is a comprehensive article that surveys numerous previous studies of capital budgeting; it also reports recent results of fact-finding on

[3] A discussion of surveys from all over the world is beyond the scope of this brief paper. For further information on surveys in U.K., see e.g., Pike (1996), Arnold and Hatzopoulos (2000), and Alkaraan and Northcott (2006). Additionally, for useful information on the results of surveys in European nations, see Brounen et al. (2004).

the capital budgeting of businesses in America. The survey was conducted by questionnaire: questionnaires were sent to the CFOs of the Fortune 1000 corporations and 205 usable responses were received. Table 2 offers a summary of the results of the survey of Ryan and Ryan (2002). They asked how frequently CFOs use each of

Table 2. Summary of Results of Ryan and Ryan (2002)

Capital Budgeting Method	Never (%)	Rarely (%)	Sometimes (%)	Often (%)	Always (%)	Always or Often (%)
NPV	1.0	3.0	10.9	35.3	49.8	85.1
IRR	1.5	6.4	15.3	32.2	44.6	76.7
SPP	8.7	16.8	21.9	33.2	19.4	52.6
DPP	22.2	21.1	19.1	22.2	15.5	37.6
ARR	5.3	16.4	18.5	9.5	5.3	14.7
RO	65.4	23.2	9.7	1.1	0.5	1.6

the budgeting methods on a five-point scale: always, often, sometimes, rarely, and never. In Table 2, it can be seen that 85.1% of the respondents frequently ("always" and "often" combined) use NPV. If we include the "sometimes" category, the cumulative use of NPV climbs to 96% of the firms. 76.7% of the respondents frequently ("always" and "often" combined) use IRR. If we include the "sometimes" category, the usage rates increase to 92.1% of all respondents. The results show that NPV and IRR are preferred over all other capital budgeting methods.

At the start of the 1960s, Miller (1960) and Istvan (1961), for example, showed that firms did not often use the discounted cash flow models: around that time 15~30% of firms in U.S.A. used DCF models[4]. From the 1980s, however, the use of NPV and IRR rapidly expanded[5]. In recent years, NPV and IRR have become the most frequently used capital budgeting methods, as the results of both Graham and Harvey (2001) and Ryan and Ryan (2002) show. This is an observable shift because in the 2000s there has been a notable alignment of financial theory and practice of firms in United States.

According to both these surveys, with the exceptions of NPV and IRR, SPP is the most frequently used capital budgeting technique. Because DPP is an improved method of SPP, it is reasonable to expect that managers will avoid using SPP and DPP in parallel. If this expectation is reasonable, quite a number of managers of US firms attach importance to the payback period itself. More specifically, the sum of usage frequencies of SPP and DPP provides the proportion of firms that are in-

4) Miller (1960) is one of the earliest surveys on capital budgeting practices in U.S.A. This survey was conducted in 1958. In this survey, questionnaires were sent to 200 of Fortune 500 companies and 127 responses were received. This research indicated that 30% of those who returned usable responses used the discounted cash flow method. The survey of Istvan (1961) was carried out in 1959 and included 48 large US companies. It showed that 15% of those who returned the 48 usable samples used the discounted cash flow method.

5) See e.g., Binder and Chaput (1996) p.247 and Haka (2006) pp.706-707, for detail and further information on the 1970s and the 1990s.

terested in the payback period itself. Given this perspective, it would be safe to say that this proportion is clearly high: according to the survey of Graham and Harvey (2001) 86.19% (= 56.74 + 29.45) of managers are interested in the payback period; according to the survey of Ryan and Ryan (2002) this value had risen to 90.2%. In this regard, payback period methods (SPP and DPP) are more frequently used by managers in U.S.A. than NPV or IRR. This is surprising because some widely used financial textbooks (e.g., Brealey and Myers (since 1981)) have for many decades warned of the disadvantages of using the payback criterion. It is a surprising and noteworthy gap between academic theory and practice. These results contrast with the situation regarding the lack of use of ARR because ARR is not theoretically regarded as an excellent tool for the evaluation of corporate value.

Many earlier studies from the 1970s to the 1990s showed that IRR has been used more frequently by US firms' managers than NPV. For example, a survey by Gitman and Forrester (1977) of 103 large companies showed that only 9.8% of firms used NPV while 53.6% reported IRR as their primary method. Kim, Crick, and Kim (1986) surveyed Fortune 1000 firms and received 367 responses. Of these firms, 64% used IRR and 45% used NPV as a primary or secondary method. Although NPV and IRR are similar and will lead to the same conclusion to the extent that the same hurdle rates are used, the critical difference is that IRR is a ratio while NPV is a total amount of value added. Therefore, although IRR is an easy method to use for the purpose of performance accounting, managers who tend to maximize IRR may actually reduce corporate value and increase IRR by terminating projects with positive-NPV but low-level IRR. Although the topic of overemphasis of IRR had been discussed because of the problems described above, the recent surveys of both Graham and Harvey (2001) and Ryan and Ryan (2002) have shown that IRR and NPV are used at almost the same frequency.

Since the publication of texts in the finance academic field on real options (RO), such as those of Trigeorgis (1993, 1996), the RO method has attracted attention. RO is generally used by managers who face situations that involve strategic options in the future and who must consequently conduct strategic decision-making under uncertain conditions. Since RO applies option pricing models (put option and call option valuation techniques) to capital budgeting decisions, it is a very sophisticated and advanced technique in financial theory; when put into practice, however, it seems to involve unavoidable difficulties.

The survey of Ryan and Ryan (2002) confirmed the low frequency of the use of RO. In Ryan and Ryan (2002): only 1.6% of the respondents ("always" and "sometimes" combined) used RO. On the basis of this result, we can conclude that RO was an unpopular method in the early 2000s in United States.

According to Block (2007), however, the percentage of US firms using RO was somewhat higher than that indicated by Ryan and Ryan (2002)[6]. In Block's survey, 14.3% of the respondents were reported to use RO in the capital budgeting process (40 users and 239 nonusers). This result demonstrates an upward tendency in the recent use of RO in the U.S.A. RO may thus be undergoing a process of diffusion.

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6) Block (2007) sent questionnaires to Fortune 1000 companies and received 279 usable responses.

2.2 Japan

In Japan, several researchers have recently undertaken surveys of capital budgeting methods and this research has revealed how large firms in Japan use such methods. The results of some previous representative surveys in Japan are first discussed in more detail below.

Tsumagari and Matsumoto (1972) sent questionnaires to 777 firms (727 firms that were listed on the Tokyo Stock Exchange and 50 major firms with offices in Japan but with foreign capital) and received 307 responses. This survey found that 50.5% used SPP, 32.8% used ARR, 8.9% used NPV, and 7.9% used IRR.

On the basis of responses from 159 firms among 629 manufacturing firms that were contacted, Kato (1989) showed that 83.6% used SPP, 35.2% used ARR, 15.7% used IRR, and 14.5% used NPV.

Takahashi et al. (2003) sent questionnaires to 1,514 firms that were listed in the first section of the Tokyo Stock Exchange and received valid responses from 192 firms (102 manufacturing firms and 90 firms in the service industry). This survey showed that, of the 102 usable responses from manufacturing firms involving 'yes' or 'no' with multiple answers allowed, 45.19% used SPP, 11.85% used NPV, 18.52% used ARR, and 8.15% used IRR.

Although the studies of Tsumagari and Matsumoto (1972), Kato (1989), and Takahashi et al. (2003) were undertaken using yes/no style questions, Yamamoto (1998) used a method where typical questions could be answered by using a Likert Scale with a five-point scale: Always - Almost Always – Often – Rarely - Never. Because the approach that was adopted by Yamamoto (1998) was similar to the approach used by Graham and Harvey (2001) and Ryan and Ryan (2002), Yamamoto's (1998) results can be compared to those of both Graham and Harvey (2001) and Ryan and Ryan (2002). Yamamoto (1998) sent questionnaires to 718 firms in manufacturing that were listed in the first section of the Tokyo Stock Exchange and received 201 valid responses. Table 3 shows the results of this survey.

Table 3. Summary of Results of Yamamoto (1998)

Capital Budgeting Method	Never (%)	Rarely (%)	Often (%)	Almost Always (%)	Always (%)	Always or Almost Always (%)
NPV	54.1	15.5	11.6	6.6	12.2	18.8
IRR	46.8	16.8	11.1	8.9	16.3	25.3
SPP	3.5	7.0	8.5	28.0	53.0	81.0
ARR	21.2	16.6	18.7	16.6	26.9	43.5

Table 3 shows that 81.0% of the respondents frequently ("always" and "almost always" combined) used SPP. If we include the "often" category, the cumulative use of NPV climbs to about 90% of the firms. 25.3% of the respondents frequently ("always" and "almost always" combined) used IRR and 18.8% frequently used NPV. If we include the "often" category, 36.4% used IRR and 30.4% used NPV. The results show that NPV and IRR are not very well-regarded in comparison with other simple methods such as SPP or ARR.

Some key points can be identified from these earlier Japanese studies. First, the most well-liked method for Japanese firms was SPP, which remained consistent and unchanged until the early 2000s. Second, the usage of NPV and IRR did not expand much in Japan from the 1970s to the early 2000s. Third, before the early 2000s, Japanese companies used ARR less frequently than the payback period method.

In the next chapter, the author will show the results of the latest Japanese survey, which was completed in early 2009, and he will discuss the results in comparison with the several previous studies in the U.S.A. and Japan noted above.

3. Sample Selection for this Survey

To determine the practical and actual conditions relevant to capital budgeting in Japan, the author conducted a survey by questionnaire from October, 2008, to January, 2009. A questionnaire form was mailed to each of the managers of 2,224 firms listed on the Tokyo Stock Exchange who act as coordinators of capital budgeting processes. As a result, 225 usable responses were received, which is comparable to the rates in other similar surveys in Japan and U.S.A.

The interpretation of survey data has, of course, some limitations[7]. Since the questionnaire form in this survey was mailed to managers who are in charge of capital budgeting, the responses were just the opinion of one individual. The data may not represent the overall opinion in the firm. To overcome this limitation as much as possible, a request that someone who is well acquainted with the capital budgeting process should complete the form was clearly stated on the questionnaire. There is one more limitation when using the adopted mailing method: since there are bound to be many non-responders, it is impossible to avoid the non-response bias. Consequently, to moderate this problem, I have undertaken to discuss the results of this survey in comparison with several surveys in foreign countries and in Japan which suffered from similar limitations.

4. Results

4.1 Frequency of Use of Capital Budgeting Methods in Japan

Table 4 shows the results of this survey on the frequency of use of capital budgeting methods. This survey asked how frequently firms use each of the specified budgeting methods on a five-point scale: always, often, sometimes, rarely, and never.

Table 4 reveals that 30.5% of the respondents frequently ("always" and "often" combined) used NPV. If we include the "sometimes" category, the cumulative use of NPV climbs to 50.5% of the firms.

In respect to the use of NPV, by comparison of the frequency of use between the results of this survey completed in 2009 in Japan and the results of both Graham and Harvey (2001) or Ryan and Ryan (2002), Japanese firms have in the recent

7) See e.g., Aggarwal (1980) and Rappaport (1979) for further discussion of the limitations of survey research.

Table 4. Frequency of Use of Capital Budgeting Methods in Japan

Capital Budgeting Method	Never (%)	Rarely (%)	Some-times (%)	Often (%)	Always (%)	Always or Often (%)
NPV	33.6	15.9	20.0	13.2	17.3	30.5
IRR	53.2	12.7	9.5	10.0	14.5	24.5
SPP	22.2	10.4	17.2	23.5	26.7	50.2
DPP	52.5	16.3	10.9	10.0	10.4	20.4
PPP	80.1	8.1	5.9	3.2	2.7	5.9
ARR	40.7	10.4	18.6	13.1	17.2	30.3
RO	93.2	5.4	0.9	0.5	0.0	0.5

past used NPV at a relatively low frequency. Nevertheless, this survey dose show an increase in the frequency of use of NPV in Japan compared with the results of past surveys, such as Yamamoto (1998): although the results are not directly comparable, we can observe an increase of about 12% over the past decade compared with the result of Yamamoto (1998).

In addition, Table 4 shows that 24.5% of the respondents frequently ("always" and "sometimes" combined) used IRR. This is a noticeably low frequency of use of IRR when compared with the results of both Graham and Harvey (2001) and Ryan and Ryan (2002). There are no significant differences in the frequency of use of IRR between the result of Table 4 and the previous survey in Japan by Yamamoto (1998).

This paper discusses the three types of payback period: SPP, DPP and PPP. The first method is the simple payback period method (SPP). It does not consider the time value of money. The second method is the discounted payback period method (DPP). As Rappaport (1965) pointed out, it is well known that DPP is modified in order to consider the time value of money. The third method is the premium payback period method (PPP). PPP was proposed by Kazusa (2003). While PPP has a function similar to DPP in considering the time value of money, the calculational procedure between DPP and PPP is somewhat different. For DPP, the payback periods needed to recover initial investment given accumulated amounts of the present value of cash inflows are calculated. Thus, in DPP, the time value of money is considered under the aspect of cash inflow. On the other hand, PPP calculates payback periods needed to recover the amount of both initial investment and interest cost given accumulated amounts of cash inflows. That is, in PPP, the time value of money is considered under the aspect of cash outflow (initial investment plus interest cost). The reason why PPP is used in Japan is that many Japanese firms are supported by major banks and financing of investment is financed by debt loan from banks. Consequently, PPP is based on the concept of calculating the period required to recover the total amount of principal and interest. These three types of payback period method tend not to be used in combination at the same time because all of them focus on estimating the payback period.

The results in Table 4 show that 50.2% of the respondents frequently ("always" and "sometimes" combined) use SPP. SPP is the most common method in Japan. Additionally, 20.4% of firms frequently use DPP and 5.9% of firms frequently use

PPP. Since total of about 76.5% of firms frequently use at least one of the three types of payback period method, we can see that Japanese firms appreciate the payback period methods. Payback period methods are frequently used not just in Japan, however, but also in the U.S.A.

Moreover, Table 4 indicates that 30.3% of firms frequently use ARR. There has been a decrease in the frequency of use of ARR in Japan compared with that recorded in the past survey by Yamamoto (1998). Although the results are not directly comparable, there has been a decrease of about 13% over the past decade. This recent trend of less use of ARR in Japan is similar to the trend in U.S.A.

It should also be added that this survey confirmed the low frequency of use of the real options method (RO). In Table 4, it can be seen that only 0.5% of the respondents frequently ("always" and "often" combined) use RO. This is considerably lower than the result (1.6%) reported by Ryan and Ryan (2002). Clearly, on a practical level, the more sophisticated method of RO is uncommon in Japan, perhaps because it is still unfamiliar.

4.2 Types of Investments and Capital Budgeting Methods

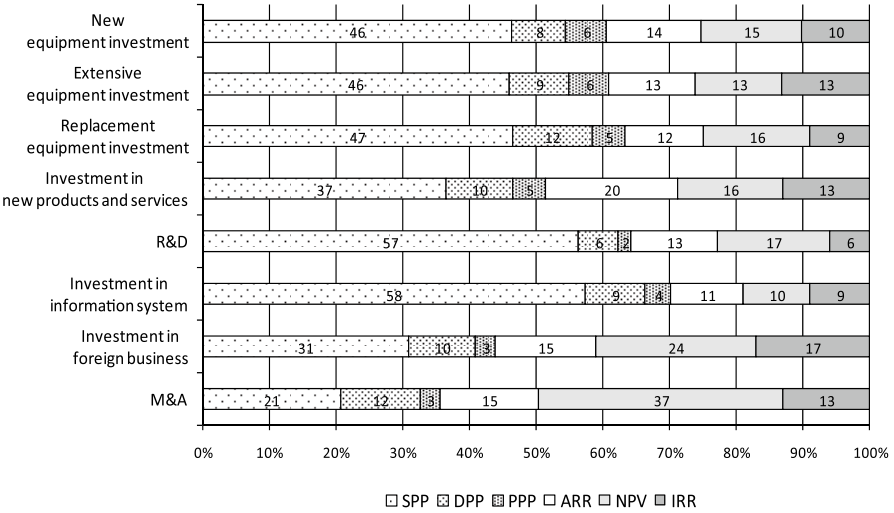
Although we sometimes oversimplify the nature of investment itself, there are actually various types of investment. Little has previously been reported about the correspondence relationship between the type of investment and the capital budgeting technique.

In this survey, investments are classified into eight types: (1) new equipment investment, (2) extensive equipment investment, (3) replacement equipment investment, (4) investment in new products and services, (5) R&D, (6) investment in information system, (7) investment in foreign business, and (8) M&A. On the basis of this classification, the author asked managers of Japanese firms to consider which capital budgeting methods are the most important when they are considering each of the eight types of investment. Figure 1 below shows the results.

As Figure 1 clearly shows, when firms undertake decision-making on investments of types (1) new equipment investment, (2) extensive equipment investment, and (3) replacement equipment investment, the payback period is appreciated by managers: about 60% of managers who undertake decision-making on equipment investment think that one of the three types of payback period method is extremely important. However, when managers consider investment for (5) R&D and (6) investment in information system, the importance of payback period methods is slightly enhanced: in particular, managers who deal with decision-making on investment in an information system consider the payback period to be very useful. On the other hand, when managers make decisions on both (7) investment in foreign business and, in particular, (8) M&A, managers tend to think that NPV is more important: 37% of the managers who face decision-making on M&A regard NPV as the most important method.

The above findings lead us to note the following important points. First, managers in Japanese firms consider payback periods to be of value when they make a decision related to simple investment plans, for example, investment in equipment. Second, when managers of Japanese firms examine the propriety of R&D investments and investment in information system, they consider payback periods as

Figure.1: Types of Investments and Capital Budgeting Methods



(*) The numbers in Figure 1 represent the percentage of the method that managers consider as the most important in terms of each of the eight types of investment.

the most important criterion. These results may indicate that when Japanese firms intend to invest in ways in which their investment can be recovered in a short period of time, such as investment in information system, then they consider payback periods. Third, managers attach importance to NPV in cases where they examine whether extremely strategic and long-range investment plans, such as M&A or investment in foreign business, are suitable and profitable. Because managers cannot evaluate long-range investment performance using payback period methods, it seems reasonable to suppose that Japanese firms apply NPV to the valuation of strategic investment plans. In addition, we note that ARR is regarded as a somewhat important method when managers consider investment in new products and services. It may be that ARR is applied to investments that are directly involved in the operating cycle.

5. Conclusion and Implications

The results of this survey and the above discussion clearly show that the difference in ways of thinking between academics and managers of firms listed on the Tokyo Stock Exchange in Japan is shrinking and that their opinions are growing closer to agreement: in Japan in the past decade the frequency of use of NPV has clearly increased.

On the other hand, firms in Japan remain heavily dependent on payback period methods. This situation in Japan is similar to that in the U.S.A. Many firms in both Japan and U.S.A combine discounted cash flow methods with non-discounted cash flow methods. This point has not yet been deeply investigated, and it needs further consideration.

In the preceding chapter, we saw that managers of Japanese firms may be able

to use capital budgeting techniques effectively, depending on the subject and situation. In other words, although managers think of payback periods as important standards when they consider simple and short-range investment plans, for example, equipment investment or investment in information system, managers may also use NPV when they consider strategic and long-term investment plans, for example, M&A, and when the evaluation of investment performance is required.

Globally, almost all firms have faced complex problems in recent years: these problems include the need for high-quality and high-value products, the short life cycle of products, the need for quick recovery of investment, and the need for speedy decision-making. In such a situation, the significance of payback period methods as well as theoretical sophisticated methods, such as NPV and RO, makes sense. It is not that rigorous academic theory is not important or is not useful, but that, in a practical sense, a multifaceted approach to the issue of capital budgeting methods is necessary in order to achieve effective decision-making on investment plans. It will be interesting to see how firms across the globe use capital budgeting methods and how in the future firms figure out ways to raise the efficiency of decision-making.

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