



UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

SOPHISTICATED CAPITAL BUDGETING TECHNIQUES

- A study of the interaction between the *degree of sophistication* in capital budgeting techniques and the *investment horizon* of Swedish firms

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Abstract

Title	Sophisticated Capital Budgeting Techniques – A study of the interaction between the degree of sophistication in capital budgeting techniques and investment horizon of Swedish firms
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This paper contributes to the research regarding capital budgeting techniques and its interaction to the investment horizon of Swedish firms. Prior empirical studies have been unable to establish any clear relationship between the degree of sophistication in capital budgeting practices and investment horizon of a firm. This may depend on the fundamental issue of reliable observation and measurement within this area. The present study, based on data gathered from 67 Swedish firms examines the relationship between the degree of sophistication in capital budgeting techniques and investment horizon of Swedish firms. Using multiple regression analysis and controlling for the corporate characteristics of size, ownership concentration, family ownership and pressure from the stock market, the results were not unlike previous research. It appears to be no significant relationship between the degree of sophistication in capital budgeting and investment horizon of Swedish firms.

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1. INTRODUCTION

1.1 BACKGROUND

During the last century, researchers and academics from all over the world have developed methods and theories in the field of resource allocation and investment decision making (Brounen et al., 2004). Corporate managers constantly try to allocate resources as effective as possible among competing investment alternatives during the capital budgeting process. There are several techniques of capital budgeting that can be applied to evaluate and accept or reject proposed investments (Haka et al., 1985).

The capital budgeting techniques can be grouped into two basic classes; the sophisticated and the unsophisticated techniques. Sophisticated capital budgeting techniques are those that consider the risk-adjusted discounted net cash flows expected from a project (Pike, 1984). Thus, risk, cash flows and the time value of money are considered. Frequent used sophisticated techniques are the net present value and the internal rate of return (Haka et al., 1985; Sandahl and Sjögren, 2002). Unsophisticated techniques, on the other hand, does not take risk, future cash flows and the time value of money into consideration. Common used unsophisticated techniques are accounting rate of return and the payback period (Haka et al., 1985; Sandahl and Sjögren, 2002).

Many empirical studies have been made in different parts of the world (see .e.g. Graham and Harvey, 2001; Sandahl and Sjögren, 2002; Brounen et al., 2004) to understand the practice of capital budgeting techniques in investment decisions. These studies showed that the corporations used capital budgeting techniques in different degrees around the world, where the use of simpler techniques like the payback period and accounting ratios was used in a higher extent by smaller firms. The studies also concluded that the US corporations apply the more sophisticated techniques to a higher degree than the corporations in Europe. This was explained by Graham and Harvey (2001) as a result from a larger shareholder focus, a lot of large companies, and that the U.S firms in a high extent were listed on the stock exchange.

The American as well as the European studies also showed that unsophisticated techniques, which have been criticized by researchers, was used frequently within the

corporations in the US and Europe as well, although more common in Europe (Graham and Harvey, (2001): Brounen et al., 2004).

There is still an ongoing discussion of whether the use of sophisticated or unsophisticated capital budgeting techniques will have the best outcome in financial investment decisions. In spite of the fact that the theories about capital budgeting techniques indicate that the use of them will create the most efficient resource allocation, as mentioned above the techniques advocated in the literature differs from the techniques used by the corporations in the real world (Brounen et al., 2004).

Although there are many researchers who advocate sophisticated capital budgeting techniques, there is also many critics claiming that the techniques make companies to invest sub-optimally and that the sophisticated capital budgeting techniques creates short-termism¹ (Segelod, 1999). Hayes and Garvin (1982) argued that the widespread use of the discounting cash flow techniques in connection with excessive hurdle rates and short time horizons favoured cost reduction and causing bias against new technology and basic investments.

It has long been claimed that the sophisticated capital budgeting techniques makes managers focus on measurable effects and on evaluating individual projects instead of on their contribution to the long-term development of the firm as a whole, and for that reason the sophisticated capital budgeting techniques is biased toward short-termism (Segelod, 1999).

As earlier studies have shown, there seems to be a connection between capital budgeting techniques and managers behaviour in investment decisions. This paper will focus on the relationship between the degree of capital budgeting sophistication and investment horizon of firms. In this paper we have studied 67 Swedish firms who mainly invest in physical assets and how their degree of capital budgeting sophistication affects the investment horizon.

¹ Short-termism has been defined as representing decisions and outcomes that pursue a course of action that is best for the short term but sub-optimal over the long term.

However, in Sweden there have been several studies made concerning capital budgeting practices. The first general approach, within the Swedish context, concerning capital budgeting techniques was written by Sandahl and Sjögren (2002). They showed that there is a significant disparity in the use of sophisticated capital budgeting techniques within Swedish firms. In their survey they could also find evidence showing that the size of the company had a major impact on the use of sophisticated capital budgeting techniques.

1.2 PROBLEM DISCUSSION

The usefulness of capital budgeting techniques and its impact on firm's investment behaviour has long been debated among researchers (see .e.g. Pike (1986): Hayes and Garvin (1982): Segelod, 1999). Critics claim that sophisticated capital budgeting techniques make managers act myopically² (Lavery, 1996: Hayes and Abernathy (1980): Segelod, 1999). Hayes and Abernathy (1980) stated that the increased use of sophisticated capital budgeting techniques to evaluate investment projects results in an undervaluation of the future and it is responsible for a decrease in long-term investments.

It has long been claimed that sophisticated capital budgeting techniques make managers focus on quantifiable effects and on individual projects instead of focus about the long-term development of the firm as a whole and for that reason, these techniques makes managers biased towards short-termism³ (Segelod, 1999). The discussions about short-termism have been focused on pressure from the stock market, high cost of capital and capital budgeting techniques and systems. Thus there are other factors causing short-termism such as the agency problem, moral hazard, asymmetric information and pressure from banks and financial institutions etc (Lavery, 1996).

According to Lavery (1996) a basic problem for a researcher is the difficulty of reliable observation and measurement: How to objectively determine whether either a single decision or a firm's investment strategy reflects the most adequate valuation of outcomes that will maintain only over the long run. Although many observers argue that the use of sophisticated capital budgeting techniques and paying attention to maximization of the

² Managerial myopia refers to maximize current earnings at the expense of long-term investments.

³ There are other factors affecting short-termism, this will be presented in the literature study (2.3)

current stock price will create the optimal outcome, critics argue that these factors are, in fact, the most important causes of economic short-termism (Lavery, 1996).

Sandahl and Sjögren (2002) believes that the use of sophisticated capital budgeting techniques leads to more long-term behaviour than the use of less sophisticated capital budgeting techniques, such as payback and accounting ratios. The net present value of a project should theoretically be the same as the increase in shareholder wealth. Based on the discussion above we have studied the relationship between the degree of sophistication in capital budgeting techniques and investment horizon in Swedish firms. This leads to the following question:

**How does the degree of sophistication in capital budgeting techniques
affect the investment horizon of Swedish firms?**

1.3 PURPOSE

The purpose of this paper is to increase the empirical knowledge on how the use of sophisticated capital budgeting techniques affects the investment horizon of Swedish firms.

2. LITERATURE STUDY

2.1 CAPITAL BUDGETING TECHNIQUES CONTRIBUTION TO SHORT-TERMISM

Economic Short-termism is defined by Laverty (1996) as when firms make decisions that will maximize its value in the short term but is suboptimal for the firm in the long run. According to Laverty (1996) researchers have debated which the best course of action considering both short-term and long-run perspectives. Some researchers believe that using sophisticated capital budgeting techniques and try to maximize the stock price produce the best outcome; critics believe these practices are the major causes for creating economic short-termism (Laverty, 1996).

The concept of intertemporal choice is basic to the discussion of economic short-termism. Laverty (1996) defines intertemporal choice from a management perspective as the best course of action in the short-term is not the same in the long-run with respect to maximizing profit or achieving some other objective. An example of intertemporal choice is when a firm has an opportunity to invest in two different production technologies, where the first technology leads to a bigger profit in the short term and the other in the long run. To solve an intertemporal choice problem you have to discount future cash flows because of time and uncertainty. Explanations of how economic short-termism can exist will be discussed below. This paper will primarily focus on capital budgeting techniques and managerial opportunism to explain the concept of economic short-termism.

Segelod (1999) writes in his article that sophisticated techniques makes managers focus on measurable effects and on evaluating individual projects instead on their contribution to the long-term development of the firm as a whole. This is why sophisticated techniques may lead to short-termism according to Segelod (1999). In Hayes and Abernathy's (1980) article they state that the increased use of discounting techniques to evaluate future projects results in an undervaluation of the future and is responsible for a decline in investments. According to Hayes and Abernathy (1980) sophisticated techniques ignores intangible and hard-to-quantify payoffs.

Hayes and Garvin (1982) stated that the wide-spread use of sophisticated capital budgeting techniques in connection with high hurdle rates and short time horizons, leads to firms favouring cost reduction strategies instead of investments in new technology and modernizing its production. Hayes and Garvin (1982) divided modern management orthodoxy into three different categories: financial control, corporate portfolio management and market driven behaviour. This management theory evaluates managers with short-term measurements such as ROI (return on investment).

Portfolio management promotes caution and risk aversion when it comes to allocate resources to projects. Projects that are uncertain such as, developing new products and new technology is not prioritized. The focus on market driven strategies leads to customer satisfaction and lower risk in the short run at the expense of superior products in the future. Tight financial control with a short-term focus will be biased towards less innovative and less technology advanced alternatives. The key to long-run success in business is, to invest, to innovate and to lead. To do this, leaders need to be more than just financial controllers, market analysts and portfolio managers (Hayes and Garvin, 1982).

When managers use accounting measures for evaluating financial performance leads inevitably to short-term goals (Sliwka, 2002). This is also a problem for divisions within a company; division managers who are evaluated from quarterly and annual reports have no motivation to invest in projects which have only long run returns (Loescher, 1984). If the long-run well-being of the firm is dependent on long-run investments, then the lack of motivation from managers is a critical problem. The ability of the firm to increase reported profits while sacrificing long-term investments is a fundamental weakness in the accounting model (Johnson and Kaplan, 1987).

According to Narayanan (1985) and Holmstrom and Ricart i Costa (1986) managers desire to make investments that offer shorter payback period, in order to more rapidly enhance their own reputations. In situations where managers makes decisions that maximizes their own utility rather than maximize the value of the firm is called managerial opportunism (Laverty, 1996). Moral hazard and information asymmetries are concepts that are used to explain how managerial opportunism can exist. The projects with the

shortest payback period may have lower return than projects with a longer payback period. Managerial mobility creates a myopic behaviour from decision makers. Managers can behave opportunistic by choosing projects that will give a big payoff in the short-term but will not be a good investment in the long run. Such managers reap the benefits of the investment before they leave the firm for another (Campbell and Marino, 1984).

2.2 COUNTER ARGUMENTS

Laverty (1996) writes that there are two fundamental counter arguments against economic short-termism, first competitive markets ensure efficient intertemporal choice and secondly efficient markets exist for the long run. Paying attention to the stock price leads managers to make the optimal decision between short-term and long-term investments. From an efficient market viewpoint an investment that increases the firm's value is expected to increase its stock price, whether the payback on the investment is one year or ten.

This is also the view of Sandahl and Sjögren (2002) who states that the NPV (sophisticated capital budgeting technique) of a project should theoretically be the same as the increase in shareholder wealth. An efficient market implicates the following, optimal intertemporal choice is a condition for maximizing stock price, maximizing stock price and maximizing long-run firm value are identical and managers should not try to maximize current accounting profits instead for profits in the long-run (Laverty, 1996). According to Jensen (1986) managers can be myopic but markets are not. He argued that capital market pressure assures that manager's makes value-maximizing decisions, by doing an optimal trade-off between long-run and short-term investments.

There is little empirical evidence connecting capital budgeting techniques and economic short-termism. According to Hayes and Garvin (1982) the usage of discounting techniques was to blame for the decline in R & D spending, with the biggest decline in basic research. Louge (1985) offered an opposite argument, he found that during the period when discounting techniques become popular investment in plants and equipment did not decline. Louge (1985) also found that the average age of U.S. factories decreased during the period from 1977 through 1984 and that U.S. factories were more modern than those in Japan.

Research has been inconclusive with regard to how accounting measures relates to short-termism. Merchant (1990) found a positive correlation between the usage of accounting measures and short-termism. Bhimani and Langfield-Smith (2007) found evidence that accounting measures can be used to support a long term view, Marginson et al (2010) concludes that if managers use accounting measures have no impact on short-termism.

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There exists no empirical evidence that managerial opportunism makes firms less likely to invest in the long run (Lavery, 1996). However studies have been made on managers with limited tenure. Bizjak, Brickley and Coles (1993) found no evidence that CEOs close to retirement were more likely to invest short sighted. Mannix and Loewenstein (1994) reached the conclusion that tenure makes CEOs invest in an opportunistic manner. Schotter and Wiegelt (1992) found that it was possible to align the incentives of the managers with the owners through bonus schemes. Future outcomes are discounted at higher rates when bonuses are paid for current performance. If bonus reflects long-run performance then the discount rate decreases.

2.3 ALTERNATIVE FACTORS AFFECTING SHORT-TERMISM

Segelod (1999) writes that the pressure from the stock market to perform in the short run causes firms to invest in a more short-term manner. Firms must maximize the stock price or risk a takeover (Drucker, 1986). By pursuing stock price maximization, decision makers destroy long-term value (Freeman, 1984). Managers sell off long-term assets in order to maximize the stock price in the short-term (Stein, 1988).

The term fluid capital is defined by Porter (1992) as funds supplied by external capital providers move rapidly from company to company, usually because of short-term opportunities. This leads to under investments in long-term projects. Fluid capital is common in the USA, and typical owners in USA are pension funds and mutual funds. In

Germany and Japan equity is more likely to be held by banks and other firms. According to Porter (1992) this system provides firms with owners who understand more about the firm's value and long-run prospects than investors in USA, Porter characterized these systems as "dedicated capital".

Thakor (1990) stated that the lack of information on the stock market leads the market to undervalue firm's long run investments. On account of information asymmetries investors do not have a complete picture about a firm's value. That is why managers overemphasize short term performance at the expense of the future of the firm. Short-term performance is a way for managers to show investors and owners that the firm's assets are being managed to maximize value.

According to Segelod (1999) Swedish managers does not believe that the stock market, managerial short-termism, high cost of capital, or the capital budgeting techniques (sophisticated or unsophisticated) are the main factors for the investment horizon. According to Swedish managers it is market growth and political risk that are the most important factors for the investment horizon. A high growth rate indicates a longer investment horizon.

2.4 HURDLE RATES CONTRIBUTION TO SHORT-TERMISM

From an academic view managers should use sophisticated capital budgeting techniques to evaluate different investment projects (Jagannathan and Meier, 2002). To be able to apply sophisticated capital budgeting techniques one have to use a hurdle rate to discount future cash flows. According to Jagannathan and Meier (2002) current financial literature advises financial officers to calculate the cost of capital by using the CAPM model (Capital Asset Pricing Model). The project's cost of capital is the rate investors require to undertake the investment and the rate future cash flows should be discounted with. If the firm is financed with both equity and debt the financial officer should use WACC (Weighted Average Cost of Capital) to discount future cash flows with. However it seems that the discount rate most commonly used is significantly higher than the firm's cost of capital (Dobbs, 2009).

Dobbs (2009) discusses the consequences if a firm sets a hurdle rate higher than the firm's cost of capital, the firm is less likely to invest in new projects. It is a risk that a

project with a positive NPV when the financial officer use the firm's cost of capital to discount future cash flows would become negative when the firm sets a higher hurdle rate. This would make the project unattractive to invest in; the future cash flow would need to increase for the project to become attractive for the investors again. The firm will invest in fewer long-term projects and will contribute to a short-term behaviour.

However, some researchers mean that this type of short-termism can be rationalized (Statman and Sepe, 1984; Pike 1985; Jagannathan and Meier, 2002). They mean it is a way of adjusting for a flamboyant optimism concerning project manager's cash flow forecast. These researchers also mean it is not in the firm's best interest to invest in a project that have marginally positive NPV, because that might mean that they will not be able to invest in a better project in the future. At such a time given this opportunity cost, it is essential for a project to have sufficient positive NPV to be worth undertaking. Setting a higher hurdle rate can be seen as a way to accomplish that.

2.5 SUMMARY OF THE EMPIRICAL STUDY

Managers focus on measurable affects and that the increased use of discounting techniques to evaluate future projects results in an undervaluation of the future and is responsible for a decline in investments. The wide spread use of sophisticated capital budgeting techniques in connection with high hurdle rates and short time horizons, leads to firms favouring cost reduction strategies instead of investments in new technology and modernizing its production. The ability of the firm to increase reported profits while sacrificing long-term investments is a fundamental weakness in the accounting model. Managers desire to make investments that offer shorter payback period, in order to more rapidly enhance their own reputations.

The fundamental counter arguments against economic short-termism are that competitive markets ensure efficient intertemporal choice and efficient markets exist for the long run. Paying attention to the stock price leads managers to make the optimal decision between short-term and long-term investments. The NPV (sophisticated capital budgeting technique) of a project should theoretically be the same as the increase in shareholder wealth in the long run. Earlier research has not been able to contribute with conclusive empirical evidence. Some researchers have found a connection between the use of

sophisticated capital budgeting techniques and short-termism but others have come to the opposite conclusion. That is why it is important to do empirical research in this area.

3. METHODOLOGY

3.1 COLLECTION METHODS

We have collected information about the Swedish firms from their annual reports, databases such as Retriever Bolagsinfo, SIS ägarservice and from the survey (Lindblom, Sandahl and Sjögren, 2008). From Retriever Bolagsinfo we found information about size, physical assets and depreciation. From the survey (2008) we collected data about the usage of capital budgeting techniques. The data is considered to have a high validity because of the reasonable high number of firm's within this sample and also because the survey is made by senior researchers. From SIS ägarservice we collected information about the ownership concentration of Swedish firms and we used voting rights as a measure.

We have only studied companies which primary invest in physical assets, this is because of the main variable $D_rate_{j,t+1}$. This is a measure on the depreciation rate of property, plant and equipment, therefore the focus on firms which mainly invest in physical assets. (Mavruk, 2011). The firm's in our paper is from many different industries and are both listed on the Swedish stock exchange and unlisted. From the survey (2008) we collected information about the firm's usage of capital budgeting techniques but also, risk analysis techniques, evaluation techniques and control techniques. The survey contained of a sample size of $N = 139$, although we had to reduce this sample size to $N = 67$, to adapt our data material because of the dependent variable $D_rate_{j,t+1}$, but also because that all firms did not answer the questions in a adequate manner. Our paper is based on the answers from 6 questions from the survey, which concerns the capital budgeting sophistication (see appendix 8.1).

3.2 RESEARCH DESIGN

3.2.1 MULTIPLE REGRESSION ANALYSIS

The following multiple regression model is used to estimate the relationship between the degree of capital budgeting sophistication and the investment horizon of Swedish firms.

$$D_rate_{j,t+1} = b_0 + b_1 DCBS_{jt} + b_2 SIZE_{jt} + b_3 CONC_{jt} + b_4 FAM_OWN_{jt} + b_5 ST_PRE_{jt} + b_6 I_1 \dots b_9 I_4$$

$$j = 1, \dots, n, \quad t = 2008$$
(1)

Our measurement on firm's investment horizon and our dependent variable in our equation is D_rate_{jt+1} and this depreciation rate in equation (1) is given by;

$$D_rate_{jt+1} = \frac{D_{jt+1}}{K_{jt+1}}$$
(2)

Where D_rate_{jt+1} is the depreciation rate at time t+1 (2009), D_{jt+1} is the annual depreciation rate of net fixed asset (PP&E) of firm j at time t+1 and K_{jt+1} is the capital stock in terms of net fixed asset of firm j at time t+1. The explanation of this measure is that the lower the depreciation rate is, the higher the share of long-term investment taken by the firm (Mavruk, 2011). The inverse relationship ($1/D_rate_{jt+1}$) is the investment length in years. Furthermore, D_rate_{jt+1} works only properly as a measure for investment length on firms that primarily invest in physical assets such as plant and equipment etc Mavruk (2011).

Other studies (e.g. Wahal and McConnell, 2000; Kim, 2002; Lee, Ryu and Yoon, 2003) have been made trying to measure investment length in companies which primarily invests in intangible assets such as R&D, marketing, human capital etc. These studies have used other variables to estimate the investment lengths. Either they used the change in net fixed assets plus depreciation or they used industry adjusted measure of net fixed assets (PP&E) as a proxy for investment length (Mavruk, 2011). However, Mavruk (2011)

argues that the most proper equation for estimation of investment length is the one that we also use in this paper, therefore the depreciation rate measure in equation (2) is used.

3.2.2 INDEPENDENT VARIABLES

a) DCBS_{jt}; Degree of Capital Budgeting Sophistication for firm j at time t. DCBS_{jt} is defined as;

$$\text{avgDCBS}_{jt} = \frac{1}{N} \sum_{j=1}^n u_{kj} i_{kj} w_k \quad (3)$$

Where u_{jk} is the use (1) or no use (0) of investment method k in firm j at time t (2008), i_{kj} is the primary importance of usage (1) or subordinated importance of usage of the methods (0,5) collected from the survey (Sandahl and Sjögren, 2008) and the w_k is the sophistication weight given to each capital budgeting techniques. The weight is given by;

- 1 = Not at all sophisticated
- 2 = Not to sophisticated
- 3 = Moderately sophisticated
- 4 = Very sophisticated
- 5 = Extremely sophisticated

We have through a comprehensive literature study made a relative judgment of the different capital budgeting techniques. To be considered as sophisticated; risk, cash flows and the time value of money are considered. For example, the Net Present Value method is considered extremely sophisticated and therefore it is ranked as a 5 and on the other hand the Payback period method are not considered as sophisticated and are set to 2. The reason we give NPV a 5 is because we do not include the Real Options (R-O) technique in our study, this is because no firms that were asked in the survey used that technique. R O is a more sophisticated technique than NPV because it considers the timing of the project. If a financial manager uses R O he could value the option to wait therefore it should be considered more sophisticated than a static NPV. For a more detailed explanation and motivation for the capital budgeting techniques see appendix 8.1.

There have been earlier studies of the degree of capital budgeting sophistication (see .e.g. Pike, 1984 and Farragher et al., 2001) and the correlation with for instance performance. In this paper $DCBS_{jt}$ is based from Pike's (1984) equation, although we have modified it to match our data material. The $DCBS_{jt}$ must also be divided by the number (N) of techniques used, otherwise we would just accumulate techniques and as a result we will by definition end up with a high number.

The degree of sophistication in capital budgeting consists not only with the techniques. According to Bower (1970) the capital budgeting process is a bottom up process and it is depending on other factors than just the techniques itself, such as strategy and structure. In this study we have also considered the factors of risk, control and evaluation to estimate the degree of capital budgeting sophistication. The risk, control and evaluation appraisal consists of data gathered from some questions in the survey (Sandahl and Sjögren, 2008) and can be seen in appendix 8.1.

The degree of sophistication in capital budgeting processes is seen as a concept of estimation through the formulation of a single metric variable. But capital budgeting systems can be divided into procedures and techniques. Therefore we have to consider and include sophisticated techniques, unsophisticated techniques, risk analysis techniques, control techniques and evaluation techniques in our equation to estimate the degree of sophistication in capital budgeting (Pike, 1984).

b) $SIZE_{jt}$; The size of firm j at time t. $SIZE_{jt}$ is defined as;

$$Sales_{jt}$$

(4)

Where $Sales_{jt}$ is an accounting measure for sales of firm j at time t (2008). This adjustment for $SIZE_{jt}$ is important in many aspects. The firm's investment horizon is often dependent of the size of the company and also the use of sophisticated capital budgeting techniques can be derived from the size of the company (Sandahl and Sjögren, 2002; Block, 1997; Danielsson and Scott, 2006; Pike, 1986). The smaller firm might also have lack of access to the capital markets to get funding. This might be an explanation

why smaller firms tend to use less sophisticated capital budgeting techniques and invest in a shorter perspective than do larger firms (Block, 2007).

c) $CONC_{jt}$; Ownership concentration of firm j at time t. $CONC_{jt}$ is defined as;

$$\text{Percentage of the largest shareholder}_{jt} \tag{5}$$

Where *percentage of the largest shareholder* $_{jt}$ equals the percentage of the largest shareholder of firm j at time t (2008). This measure aims to control for the concentration of the ownership in firm j. The principal agency problem is a fundamental explanation why firms tend to act myopically (Laverty, 1996). Agency theory indicates that short-term performance measures and incentive schemes may increase the desire of creating short term profits and as a result, short-term thinking in investment decision making (Hirschleifer, 1993). Thus, by controlling for the separation of ownership and control we can adjust for the principal agency problem, moral hazard and asymmetric information that might occur in a corporation.

d) FAM_OWN_{jt} ; Family owned firm j at time t. FAM_OWN_{jt} is defined as;

$$\text{Family owned firm}_{jt} = 1 \tag{6}$$

Where *Family owned firm* $_{jt} = 1$ is a dummy variable for firm j at time t (2008) otherwise it is zero. Holmén and Högfeldt (2009) mentioned this as a governance issue and they claim that not only the concentration but also the structure of ownership in a firm influences managers' investment decisions. Furthermore they suggest that family owned pyramidal ownership structure might cause firms to be overcapitalized and it also leads to reinvestment of profits rather than distribute them as dividends to the shareholders of the firm. Holmén and Högfeldt (2009) showed that lower cost of internal equity trigger pyramid firms to overinvest in long-term R&D projects, in other words,

family ownership must be controlled for because it might affect the investment horizon of a firm.

e) ST_PRE_{jt} ; Pressure from stock market for firm j at time t . ST_PRE_{jt} is defined as;

$$\text{Number of analysts monitor firm}_{jt} = 1 \quad (7)$$

Where $\text{Number of analysts monitor firm}_{jt} = 1$ is a dummy variable for firm j at time t (2008). If the firm is listed on the Swedish stock exchange the firm are monitored by analysts and will have a number equal 1. If the firm is not listed on the Swedish stock exchange the number of analytics monitoring will be equal zero, thus the firm will not be exposed of such pressure. The pressure of the stock market is a main factor that will enhance the myopic behaviour of managers. Stock market myopia was explained by Stein (1988) as that manager selling of long-term assets (knowing that this is short sighted), in order to increase the current stock price of the firm. For this reason, the ST_PRE_{jt} variable is chosen to adjust for the pressure that the companies might be exposed of.

f) $I_1 \dots I_4$; Industry classification of firm j at time t is defined as;

$$\text{Industry classification}_{jt} \quad (8)$$

Where $\text{Industry classification}_{jt}$ is the industry class of firm j at time t . Four industry dummy variables were created, using information from the survey (2008), to isolate the effects that industry might have on investment horizon of a firm. Industry classification has also been used in earlier papers (see. .e.g. Pike, 1984 and Farragher, 2001). In this paper the Industry variables are defined as:

I_1 = Production, Basic, Energy and Basic industry

I_2 = Transport industry

I_3 = Construction, Real Estate and Investment industry

I_4 = Retail industry

3.3 ANALYSIS MODEL

As the dependent variable should be normally distributed when we use it in a regression analysis, the first thing to do before the analysis was to create a non-linear transformation of the variable. This was made by plotting the variable in a histogram to determine if it was normally distributed or not. To transform the variable into normally distributed, SPSS taking the natural logarithm of it. Furthermore, the multiple regression analysis was made with a significance level of 5%.

In our multiple regression analysis the Enter method was used. In the normal course of events, the Enter method is the most commonly used method in SPSS. I_1 was removed automatically by SPSS. If the independent variables correlate to each other, the regression model cannot be estimated. This problem appeared due to the several dummy variables which only can adopt the number of 1 or 0. When these small adjustments and choice of methodology was made, the sequence of events appeared as follows;

The first step was to calculate our dependent variable, $D_rate_{j,t+1}$. This was made as described in equation (2). Secondly we calculated our first independent variable, the degree of sophistication in capital budgeting techniques of Swedish firms, $DCBS_{jt}$. This was made as described in equation (3), for a more detailed description take a look at appendix. Furthermore, we adjusted for size; this was done by taking sales of firm j at time t (2008), this is described in equation (4), $SIZE_{jt}$. Equation (5) was made to control for ownership concentration, $CONC_{jt}$. The next step was again to control our dependent variable, this was made and described in equation (6), FAM_OWN_{jt} . Next step was to see if the firm's were monitored or not, this is described in equation (7), ST_PRE_{jt} . Finally, industry dummies were created to adjust for the impact that industry classification might have on investment horizon of a firm, see equation (8), $I_1 \dots I_4$.

When all the variables were calculated and gathered we used them in our multiple regression model, equation (1). To test our hypothesis we have used the statistical programme SPSS.

3.4 HYPOTHESIS

From the basis of our background, problem discussion and literature study; we believe that more empirical evidence within this area is required: thereof our hypothesis:

H_0 ; There is no relationship between the degree of sophistication in capital budgeting techniques and investment horizon of Swedish firms.

H_1 ; There is a relationship between the degree of sophistication in capital budgeting techniques and investment horizon of Swedish firms.

4 ESTIMATION RESULTS

4.1 MULTIPLE REGRESSION ANALYSIS

Our multiple regression analysis showed no statistically significant relationship between the degree of sophistication in capital budgeting techniques and investment horizon of Swedish firms. As seen below (Table 1), the R Square indicates that the dependent variable (\ln_D_rate) is explained by 11,2 percentage of the independent variables. In our case this means that Swedish firm's are investing in a shorter time horizon the more sophisticated they are, with respect to the dependent variable $D_rate_{j,t+1}$. If the degree of sophistication increases by 1 the investment horizon will increase by 0,112. Thus, because of the intuition of $D_rate_{j,t+1}$ that the lower the depreciation rate is, the higher the share of long-term investment taken by the firm, we have to interpret this result to the opposite.

The adjusted R Square tells us the relationship with a more moderate approach. R Square overvalues the relationship when we use many independent variables and therefore the Adjusted R Square also are reported in this analysis. The interpretation of this measure is that the $D_rate_{j,t+1}$ of Swedish firms will decrease by 0,01 if the degree of sophistication in capital budgeting will increase by 1. This indicates that the investment horizon will increase is barely noticeable.

However, if the result should be considered statistically significant the significance value should be 0,05 or less. According to the Anova test the significance level of our multiple regression analysis appeared to be beyond that level (0,510). In other words, no statistically significant relationship was found.

In our analysis we also estimated the investment horizon of Swedish firms by taking the inverse relationship of $D_rate_{j,t+1}$, without no significant different results. We also tested for $D_rate_{j,t+2}$ to see if the time of perhaps implementing capital budgeting techniques, this estimation did not show any significant different results.

(Table.1)

Multiple Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,335 ^a	,112	-,010	,72099

a. Predictors: (Constant), I4, St_Pre, I2, Fam_Own, I3, Size, DCBS, Conc

4.2 ANOVA TEST

Anova test were created in SPSS (Table. 2). The Anova test indicate that the degree of sophistication in capital budgeting techniques do not have a statistically significant relationship to Swedish firm's investment horizon (sig. = 0,510). Alternative estimations were made during the work of this paper. Elaborations with the independent variable $DCBS_{jt}$ were made in the sense of creating a dummy variable instead of the initial one and also creating one variable with more focus on the capital budgeting techniques and hurdle rates. However, with no significant different results (see appendix 8.2).

(Table.2)

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3,810	8	,476	,916	,510 ^b
	Residual	30,150	58	,520		
	Total	33,960	66			

a. Dependent Variable: Ln_D_rate

As seen in table 2, there is no significant relationship in our multiple regression model and if the variance analysis (Anova test) does not show a significant result, there is no reason to proceed with the analysis and study the differences between individual groups.

However, to be able to test our hypothesis we have compared the critical F-value with the Anova F-value. The F-value according to the Anova test is equal 0,916. Our critical value from the F-table is 2,10. The critical F-value could be read from the table with the degrees of freedom of 8 in the numerator and 58 in the denominator at a significance level equal

0,05 (see table.2). To be able to reject our null hypothesis, the F-value from the Anova test has to be higher than the critical F-value. In our case this is given by;

$$\text{Reject } H_0 \text{ if } F - \text{value} > \text{Critical } F - \text{value}$$

$$0,916 < 2,10$$

In other words, we cannot reject our null hypothesis which is;

H_0 ; There is no relationship between the degree of sophistication in capital budgeting techniques and investment horizon of Swedish firms.

4.3 CORRELATION COEFFICIENTS

The direction coefficient (B) and the standardized beta coefficient showing us if the variable has a positive or a negative impact on the dependent variable and how large the affect is (Table.3). The size of the coefficient indicates the expected change in the Y-axis with one unit of change in the X-axis. As seen in table 3, I_4 (Retail industry) seems to have an impact on the investment horizon of Swedish firms in a negative manner, almost statistically significant with respect to the significance level of 5%.

(Table.3)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-2,347	,825		-2,843	,006
Size	-3,702E-007	,000	-,024	-,168	,867
Fam_Own	,055	,199	,038	,274	,785
St_Pre	-,113	,311	-,075	-,365	,717
1 Conc	-,293	,516	-,128	-,568	,572
I2	-,307	,275	-,154	-1,116	,269
I3	,027	,248	,015	,110	,912
I4	,450	,256	,264	1,756	,084
DCBS	,152	,228	,099	,668	,507

a. Dependent Variable: Ln_D_rate

All in all, our estimation results gave us no empirical evidence that the degree of sophistication in capital budgeting techniques affects the investment horizon of Swedish firms.

4.4 DISCUSSION

Our expectations with this paper were to find empirical evidence which would support the view that sophisticated capital budgeting techniques contributes to long-termed investment behaviour of Swedish firms. We believe that a long-term investment horizon maximizes the firm's value and will be the best of all outcomes for all stakeholders. In this case, we do not state that all long-termed investment decisions will be the best course of action in all occasions, there has to be a trade-off between short-term and long-term. Lavery (1996) claimed that the intertemporal choice within investment decisions is, in fact, the most important problem to solve for a manager. In other words, the most efficient investment in short-term may not be the most efficient in long-term, therefore the trade-off between investments has to be optimal to be considered efficient.

As mentioned above, no empirical evidence was found in this study. Although we had hoped to find any empirical evidence in our paper, we also find this result interesting. This result maybe indicates what we already in our problem discussion mentioned; there might be a fundamental problem of measure and observation in this area. One reason why we do not find any significant relationship in our study might depend on the independent variable $DCBS_{jt}$. Which do not include all the parameters that a manager take into account when considering investment decisions. However, this possible source of error does not necessarily depend on how we have defined it, but rather how we had to adapt to our data material. In this case we mean that we had to adapt to a data material which was not designed to our purpose of this study.

In earlier studies where researchers have measured the degree of sophistication in capital budgeting they have had a more adequate and a more specific data material to their purpose (see .e.g. Pike, 1984 and Farragher et al., 2001). Because of that they were able to quantify more parameters when they measured their degree of sophistication. This makes perhaps their sophistication variable more sufficient.

Although, our result, that there is no relationship between the degree of sophistication in capital budgeting and firms investment horizon argues against Hayes and Garvin's (1982). They found that there is a relationship and that these techniques were to blame for a decline in R & D spending and decreased the investment horizon. Our result also argues

against Sandahl and Sjögrens (2002) statement that capital budgeting sophistication will lead to more long-termed investment behaviour. However, we are cautious when making these statements depending on the extent of our study.

The fact that there are different views concerning how sophisticated capital budgeting techniques affects the investment horizon of firms and that there is little empirical evidence, this area should be considered important to examine further. Previous studies mentioned that sophisticated capital budgeting techniques generated a decline in R & D (Hayes and Garvin, 1982). However other studies such as Louge (1985) found evidence that investments on new plants and equipment did not decline in the years when sophisticated capital budgeting techniques become standard within corporate investment processes. These different opinions and divergent empirical evidence confirms the fact that we did not find any empirical evidence that the degree of sophistication in capital budgeting techniques should affect the investment horizon of Swedish firms.

Hurdle rates affect the investment horizon when discounting future cash flows. Setting a hurdle rate higher than the firms cost of capital can result in the fact that the firm lose an investment which would have been profitable. This could also lead to short-term investment behaviour (Dobbs, 2009). However, other researchers (Stateman and Sepe, 1984, Pike, 1996, Jagannathan and Meier, 2002) claims that high hurdle rates are a way to adjusting for excessive optimism concerning project managers cash flow forecasts. These researchers also mean that to counteract the risk of committing capital to projects with relatively low marginal profits, a firm should set a higher hurdle rate than the cost of capital and a high hurdle rate would not at all create a short-term investment horizon.

As the cost of capital is a parameter in our independent variable $DCBS_{jt}$ we believe that the different opinions about setting a high hurdle rate confirm our result in this study. Namely, that there are no significant relationship between the degree of sophistication in capital budgeting and the investment horizon of Swedish firms.

In addition to the factors that we have analyzed in our study there are other factors that might have an effect on the investment horizon which we have not considered in this study. Segelod (1999) found in his survey that Swedish managers believe that market

growth and political risk are the two major factors causing economic short-termism. We believe that when corporations are in a growth state and when there is political stability on the market, the firms are more inclined to invest in long-term to gain market share. However, the fact that our data material are taken from 2008 – 2010 this might have an effect on our dependent variable $D_rate_{j,t+1}$ because of that time financial crisis.

Finally, to end this discussion, after our study we believe that there are no significant relationship between the degree of sophistication in capital budgeting techniques and investment horizon of Swedish firms. Although, we believe that there are several factors affecting the investment horizon, such as pressure from the stock market, keeping the owners satisfied and ownership concentration etc. However, we believe capital budgeting techniques is a tool in the investment process, these techniques are used to motivate investment proposals but also to protect the manager if the investment turn out to be a suboptimal decision. We believe that the capital budgeting techniques itself do not create short-termism, but rather the way managers apply them. This is also consistent with Jensen's (1986) opinions.

5 CONCLUSIONS

5.1 HOW DOES THE DEGREE OF SOPHISTICATION IN CAPITAL BUDGETING TECHNIQUES AFFECT THE INVESTMENT HORIZON OF SWEDISH FIRMS?

This paper did not contribute with empirical evidence that there is a relationship between the degree of sophistication in capital budgeting techniques and the investment horizon of Swedish firms who were analyzed in this study. The sample consisted of 67 Swedish firms, both listed on the stock exchange and unlisted as well. The result of this study suggests that Swedish manager's usage of sophisticated capital budgeting techniques do not affect their investment horizon. We were not able to reject our null hypothesis.

5.2 SUGGESTIONS TO FURTHER RESEARCH

Given the result of our study and the results from prior studies we suggest that more empirical research is required in this area.

The fact that there seems to be a fundamental problem of measurement within this area we suggest that future researchers develop new models to investigate capital budgeting techniques and investment horizon. Further we suggest that a larger sample would probably be a good suggestion of further research.

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7 APPENDIX

7.1 DEFINITION OF THE DEGREE OF SOPHISTICATED VARIABLE

From Lindblom, Sandahl and Sjögrens (2008) survey we used answers from the questions which is presented below to calculate firms $DCBS_{jt}$. Pike's (1984) definition of $DCBS_{jt}$ is presented in chapter 3.2.2. Below we will present how we reasoned when setting different weight to the techniques valued in $DCBS_{jt}$. The weight is a relative measure where the risk and time value of money is the parameters valuated. The different parameters are primarily valuated against each other from each question. In other words, the parameters are ranked toward each other with respect to risk and time value of money. Techniques that do not incorporate risk or time value of money is not a sophisticated technique from a theoretical view. Pike (1984) used the following definition for the weight parameters:

- 1 = Not at all sophisticated
- 2 = Not to sophisticated
- 3 = Moderately sophisticated
- 4 = Very sophisticated
- 5 = Extremely sophisticated

We chose not to include real option because no firm used it. That is why NPV has a 5, if we would have included R.O then R.O would be set to 5 and NPV to 4⁴. IRR is valued as a less sophisticated technique than NPV because of the reinvestment assumption, value additive principle and multiple rates of return. We set cost calculation to 1 and Payback to 2, because cost calculation does not include any future cash flows at all. The weight set to all parameters can be seen below.

⁴ All references in appendix 8.1 is from Berk and Demarzo (2011) and Copeland et al (2008)

Which capital budgeting methods are used?	1	2	3	4	5
1. NPV					X
2. IRR				X	
3. Payback		X			
4. Accounting ratio (ROE, ROI etc)		X			
5. Only cost calculation	X				
6. Real option	-	-	-	-	-

We set WACC to 4 and market interest + risk premium were set to 3. From a theoretical point of view WACC considers risk better. A traditional hurdle rate of the company was set to 1 and a traditional hurdle rate for the industry to 2 because it incorporates risk from its industry.

How is the hurdle rate decided?	1	2	3	4	5
7. Traditional % within the firm	X				
8. Traditional % within the industry		X			
9. WACC (Weighted Average Cost of Capital)				X	
10. Hurdle rate is equal with loan interest	X				
11. Market interest rate plus risk premium is equal with loan rate			X		

We set the weight in the following way to get the maximum spread of our variable. The more often the hurdle rate was adjusted the more sophisticated technique.

How often is the hurdle rate adjusted?	1	2	3	4	5
12. Several times/year					X
13. Yearly			X		
14. Less than once a year	X				

The firm's that take risk in to consideration when setting its hurdle rate gets a higher weight as seen below. Long-term investments are more uncertain and because of that should get a higher hurdle rate from a theoretical perspective.

How well describes the following statement the Firm's selection of the hurdle rate for specific projects?	1	2	3	4	5
15. Project's with high risk adjust hurdle rate upwards				X	
16. An investment's strategic importance do not affect the hurdle rate			X		
17. Risk do not affect the hurdle rate	X				
18. For investments with a long life the hurdle rate is reduced		X			

ROE is an accounting measure, which do not discount future cash flows and because of that is not a sophisticated technique. CAPM is the technique that is taught at business schools around the world and is the most sophisticated of these techniques from a theoretical perspective. P/E use earnings from the annual report and not discounted future cash flows and is because of that not considered especially sophisticated.

How is the required return on equity decided?	1	2	3	4	5
19. ROE		X			
20. CAPM				X	
21. Bond rate plus risk premium			X		
22. P/E ratio		X			

We have assumed that the firm's that use simulations methods are very sophisticated and because of that are set to 5. Firm's that do not consider risk at all are set to 1, firm's that consider risk in different techniques gets a higher weight because of that. To use hurdle rates indicates that the firm discount future cash flows and because of that is adaption of hurdle rate given a higher weight then adaption of payback even though both techniques consider risk. The weights can be seen below.

How is risk assessed when considering investment projects?	1	2	3	4	5
23. Hurdle rate is adjusted			X		
24. Payback time is adjusted		X			
25. Under / over-valuation of payments forecasts			X		
26. Simulation techniques					X
27. Risk is not considered	X				

7.2 ALTERNATIVE ESTIMATION RESULTS

Estimation results with $DCBS_{jt}$ as a dummy variable instead of the initial one. The dummy variable was set to 1 if the firm used NPV or IRR as its primary technique when evaluating investments otherwise 0.

Multiple Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,325 ^a	,106	-,017	,72355

a. Predictors: (Constant), I4, St_Pre, DCBS_Dummy, I2, Fam_Own, I3, Size, Conc

ANOVA^a

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	3,596	8	,449	,859	,556 ^b
Residual	30,365	58	,524		
Total	33,960	66			

a. Dependent Variable: Ln_D_rate

b. Predictors: (Constant), I4, St_Pre, DCBS_Dummy, I2, Fam_Own, I3, Size, Conc

Estimation results with $DCBS_{jt}$ modified in the sense of only focus on the capital budgeting techniques and the firm's approach to estimate the cost of capital. In this case only the firm's answers from 1-14, 23-27 is considered when calculating $DCBS_{jt}$.

Multiple Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,344 ^a	,118	-,003	,71853

a. Predictors: (Constant), DCBS_modified, I2, St_Pre, Fam_Own, I3, Size, I4, Conc

ANOVA^a

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	4,016	8	,502	,972	,467 ^b
Residual	29,945	58	,516		
Total	33,960	66			

a. Dependent Variable: Ln_D_rate

b. Predictors: (Constant), DCBS_modified, I2, St_Pre, Fam_Own, I3, Size, I4, Conc