Do Managers follow the Shareholder Value Principle when applying Capital Budgeting Methods?

A Comparison of Theory and Practice based on German Survey Results and Return Data

Preliminary draft, March 4, 2008

ABSTRACT

This paper presents a comprehensive comparison of theory and practice of the most established capital budgeting methods in Germany based on our survey results. For this purpose we have sent questionnaires to CEOs and CFOs of all companies listed in the German all share index (CDAX) to find out which capital budgeting methods are currently used by German managers and how accurately they apply them. We cover with our survey not only the most important capital budgeting methods classified in the three groups of fundamental capital budgeting methods, risk adjustment methods and valuation methods but also other relevant fields of corporate finance like cost of capital and capital structure. We confront some of our survey results with prior German and recent international studies to obtain an insight into current domestic developments and to gauge how up-to-date German managers are in an international context. Based on these findings, we are able to examine whether executives follow the shareholder value principle when applying capital budgeting methods. We regress the most prominent corporate performance figures, return on equity and total investment return on the application frequency of particular capital budgeting methods to assess whether the usage of such methods has an impact on performance. To the best of our knowledge our paper is the first to exploit this approach. We conclude that German managers do not seem to follow the shareholder value principle when applying capital budgeting methods. Furthermore, we show that executives seem to be hesitant to implement residual income valuation methods as a key tool for the ex post performance measurement of a company. Finally, we provide evidence that the usage of capital budgeting methods and their proper application has a much greater impact on corporate performance than observable personal characteristics of top managers and fundamental properties of their companies.

KEYWORDS: Shareholder value; performance; capital budgeting; cost of capital; valuation.

JEL CLASSIFICATION: G31, G32, L25.

1. INTRODUCTION

This paper presents a comprehensive comparison of theory and practice for Germany about the most established capital budgeting methods based on our own survey results. For this purpose we have sent a questionnaire to the CEOs and CFOs of all companies noted in the German all share index, CDAX, with the intention to find out which capital budgeting methods are currently used by German managers and how accurate they apply them according to theory instructions. Additionally, we confront some of our survey results with prior German and recent international studies for getting an insight into the current domestic developments and for seeing how up-to-date the German managers are in the international context.

Since in the mid-1980s the development in the United States regarding the management's primary responsibility has gone towards the so-called shareholder value (Rappaport, 1986) or value-based management (Copeland, Koller and Murrin, 1990) approach; instead of focusing on improving accounting earnings figures as before, the importance of capital budgeting methods that are able to contribute to a shareholder value appreciation has risen rapidly. Both approaches have in common that they determine the economic value of an investment by discounting forecasted cash flows by the cost of capital. These cash flows, in turn, serve as the foundation for shareholder returns from dividends and share-price appreciation (Rappaport, 1998). Before the survey was conducted it was not known to what extent the managers of German public companies have already incorporated the value-based management approach when carrying out an investment decision. The foundation of a successful value-based management policy is surely every single investment decision. Thus, it is essential for corporate leaders that they use appropriate capital budgeting methods, which should be furthermore state-of-the-art in management research. Through the results of the survey we are able to examine whether the executives follow the shareholder value principle

when applying capital budgeting methods and whether they are really up-to-date in management research.

Reducing the already ex ante expected theory-practice gap in capital budgeting in Germany is an additional purpose of the study. The findings later on in this text show that this above-mentioned theory-practice gap really exists. An further motivation for this article and the accomplished extensive research was to provide corporate leaders with information about the current capital budgeting methods used by their competitors, so that they have a useful benchmark for their own investment decisions. An other incentive for this paper was the fact that the last scientific studies in Germany about this issue were published by Grabbe (1976), Bröer and Däumler (1986) and Wehrle-Streif (1989). In addition a supplementary goal of this paper is to convince practitioners that an adoption of current academic recommendations helps them more to create shareholder value than using out of date capital budgeting methods. On the other hand we also hope that researchers will use the results to revise existing convictions and develop new theories if there is a theoretical lack of knowledge about certain pattern of behavior in practice. It is also strongly recommended that academics not neglect capital budgeting methods that are popular in practice in their business courses.

The structure of the survey is similar to the most famous study in this field of Graham and Harvey (2001), but takes into account that there are differences between Germany and the United States in the way capital budgeting methods are taught in theory and in the way they are established in practice. However, our survey is unique for Germany in the field of corporate financial research because of the following points:

First, the scope of the survey is broad and covers all important topics of corporate finance: Capital budgeting, valuation, risk, cost of capital and capital structure. This allows the linking of responses across areas. For example, we investigate whether firms that frequently apply the weighted average cost of capital approach also pursue a value-based policy (debt tied to corporate value) as it is necessary in theory. Whether companies use the capital asset pricing

model as tool for determining their cost of equity, as it is recommended by many acadcemics is also examined.

Second, not only the scope of our survey is broad but also the scope of our target audience. For our survey we chose all companies that are noted in the CDAX. Thus, the population of our survey consists of 587 companies that are all belong to the CDAX and that have not been in insolvency. Since our questionnaire was completed and returned by 76 companies our response rate is 13%. Although the absolute amount of returned questionnaires and therefore our sample is rather small our achieved response rate compares favorably with other well-known studies like Trahan and Gitman (1995), Graham and Harvey (2001) and Ryan and Ryan (2002), which obtained a 12%, 9% and 20.5% response rate, respectively. Furthermore we investigate whether our sample is representative and conclude that it doesn't represent the population, but rather the largest German public companies that are all noted in the three indices, DAX, MDAX and SDAX.

Third, we analyze the responses conditional on various firm characteristics. Although we have adopted this approach from Graham and Harvey (2001), we use different firm features to explore if there is any impact of these factors on the application frequency of the various capital budgeting methods. We examine the relationship between these methods and index-membership, industry, market capitalization, capital expenditures, debt-to-equity ratio, return on equity, CFO age, CFO tenure and CFO education. Additional we apply the t-test for equal means to figure out if mean-distinctions caused by different firm characteristics are really significant.

Fourth, our paper is - as far as we know - the first to introduce a regression, in which measures of corporate performance (dependent variables) were regressed directly on the application frequency of particular capital budgeting methods (independent variables). To be sure, Dittmann, Maug and Kemper (2004) already conducted a similar regression for venture capitalists but they were only able to regress measures of corporate performance indirectly,

with the variable write-off rate, on the use of capital budgeting methods because at this time there was no performance data available for venture capitalists. However, with the outcomes of our regressions we are now able - for the first time in corporate financial research - to show that certain capital budgeting methods have a positive or negative impact on corporate performance. Furthermore we have the ability to quantify this impact in absolute terms. This approach surely provides a deeper insight into the connection of corporate performance and investment decisions.

Before we present the results of our survey it is necessary to take a look at the potential problems that come along with the survey approach. Regarding surveys, a response bias can not be fully ruled out. Schall, Sundem and Geijsbeek (1978) mentioned that it is possible that firms using more sophisticated capital budgeting methods would be more likely to respond than firms using less sophisticated capital budgeting methods. Although Schall *et al.* (1978) found in their study that there was only a little response bias, we can't draw this conclusion for our survey under the assumption that bigger companies use more sophisticated capital budgeting methods, because of the fact that we have a quite higher response rate for DAX, MDAX and SDAX companies compared to the remainder as shown in figure 1.
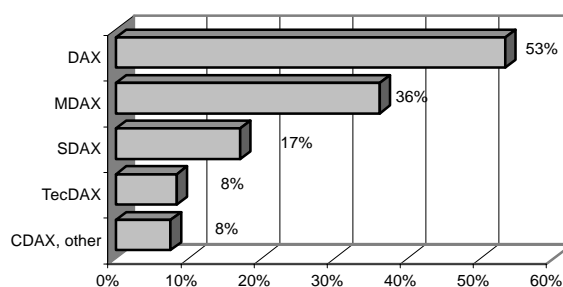

Fig. 1. Questionnaire response rate within each index, in percent.

A further potential pitfall for our study is the non-response bias. Most papers, like Sandahl and Sjögren (2003) and Graham and Harvey (2001), try to test for a possible non-response bias by comparing some answers from companies that returned the survey before the first reminder with those from companies after. By testing for non-response bias, both studies

came to the conclusion that such a bias doesn't exist. In contrast, we have the opinion that such a statistical test is not appropriate to address the non-response bias problem because companies that reject their participation remain unconsidered. It is also possible that companies had already decided to participate in a survey but didn't have the time or had other problems to fill out the questionnaire at the time before the first reminder came. Corporate finance surveys are additionally criticized because of the circumstance that responses to questionnaires by major corporations do not always reflect the corporate-wide situation (Aggarwal, 1980) and that often individuals without profound knowledge of sophisticated capital budgeting methods are charged with responding to survey questionnaires. Moore and Reichert (1983) attempted to attenuate this problem by addressing the survey to the individual occupying the position of highest financial responsibility in the firm. Comparable with this approach, we sent our survey personalized to every CEO and also to every CFO when available in a company. Nevertheless, as we can confirm with our replied questionnaires, it is rare that a CEO or CFO actually filled out the questionnaire personally. That questionnaires measure beliefs and not actions is another potential challenge that all inquiries have in common. Furthermore, interview questions could be misunderstood. However, we feel very comfortable with our findings and conclusions because we come to the result that our sample is representative for DAX, MDAX and SDAX noted German public companies as we have already stated above. Moreover, we would like to point out that all studies are faced by the above mentioned potential pitfalls in the same way, with the consequence that our survey is as good as all our predecessor inquiries.

The results of our survey are both encouraging and discouraging. They are encouraging due to the fact that the usage of net present value techniques indicates a sound development within Germany and they are discouraging because we have to arrive at the conclusion that it doesn`t seem that German managers follow the shareholder value principle when applying capital budgeting methods. We constitute this conclusion thereby with many facts throughout the

study. Furthermore, we find out not only that it doesn`t seem that German managers follow the shareholder value principle ex ante, when applying capital budgeting methods but also ex post because they are seem to be hesitant to implement the residual income valuation methods as a key tool for the performance measurement of a company. Moreover, we reveal that many German managers don`t apply the CAPM formula as actually required by the assumptions which form the basis of the CAPM. Finally, we supply evidence that the question which capital budgeting methods are used by managers and how accurate they apply them has a much greater impact on corporate performance than their own personal characteristics like age, tenure or education and than the fundamental properties of their companies like firm size, capital expenditures or debt-to-equity ratio. Thus, managers are more able to enhance shareholder value by conducting well-planned and calculated capital expenditures in the long run than by extending the firm size or the debt-to-equity ratio in the short run. In other words, the quality of the capital expenditures counts more than the quantity.

The paper is organized as follows: In the second chapter, we present the survey methodology and we have a look at the questionnaire, the population and the course of the survey. In the third chapter we introduce the properties of our sample. We analyze the results in the areas of capital budgeting, cost of capital and capital structure in the fourth chapter. In the area of capital budgeting, a comparison of theory and practice and a comparison with other studies will enhance the findings, additionally. In the fifth and final chapter we briefly summarize the four most important findings of our survey.

2. METHODOLOGY

2.1 Questionnaire

The questionnaire is the core of our entire survey. Our main goal was to provide an easily understandable tool for corporate leaders, so that they wouldn't have any problems when completing it and so that they wouldn't need too much time to fill it out. After analyzing the

replied questionnaires we conclude that we have achieved this goal, because we didn`t see a single question mark or additional comment on the pages. Consequently, we conclude that the respondents did understand our questions with a high probability. A further goal for us was to ensure that we include in our questionnaire all important capital budgeting techniques that are usually taught at German and American universities. The standard textbooks Ross, Westerfield and Jaffe (2005) and Brealey, Myers and Allen (2006) gave us a good benchmark to see what capital budgeting methods were currently taught in the United States. The same thing held with the textbooks Drukarczyk and Schüler (2007), Kruschwitz (2005), Blohm, Lüder and Schaefer (2006), Schäfer (2005) and Ernst, Schneider and Thielen (2003) for Germany.

Based on a careful review of these textbooks and of existing journal papers, we developed a draft survey. This interim questionnaire was then reviewed in several steps by ourselves and afterwards by students of the faculty of economics and business administration at the University of Regensburg. The group of students did check the survey intensively concerning spelling, conceptual design, understandability, simplicity and time needed for completion. For the latter, the students required on average 10 minutes. Therefore, we wrote in the accompanying letter of the questionnaire that the respondents would only need approximately 10 minutes for completion. In this regard, the most often mentioned objection referred to the answering options predetermined in the capital budgeting methods questions. The students suggested us that there shouldn't be only the answering options "never", "rarely", "sometimes", "often" and "always" but also an option "unknown". After a longer discussion between us we came to the conclusion that such an answering option could embarrass and expose the CEOs and CFOs, with the consequence that we didn`t change our predetermined answering options. But we incorporated their remaining suggestions and revised the survey. The final version of the questionnaire contained 14 questions, most with subparts, and was 5 pages long. The sixth page was prepared with a preprinted address of our chair to ease the

return for the respondents. The survey project was a joint effort with O&R Corporate Finance Consulting Firm GmbH, Munich. O&R is specialized in transaction, restructuring and corporate finance consulting.

The questionnaire is organized as follows: In the first part, we ask questions regarding themes such as inflation and taxes in capital budgeting decisions. The second part addresses the question of how frequently a company uses a specific capital budgeting or valuation method with or without considering the uncertainty of future cash flows. In the third part, we focus on the determination of a company`s cost of capital, in which the CAPM obtains our special attention. We are interested in capital structure issues in the final part.
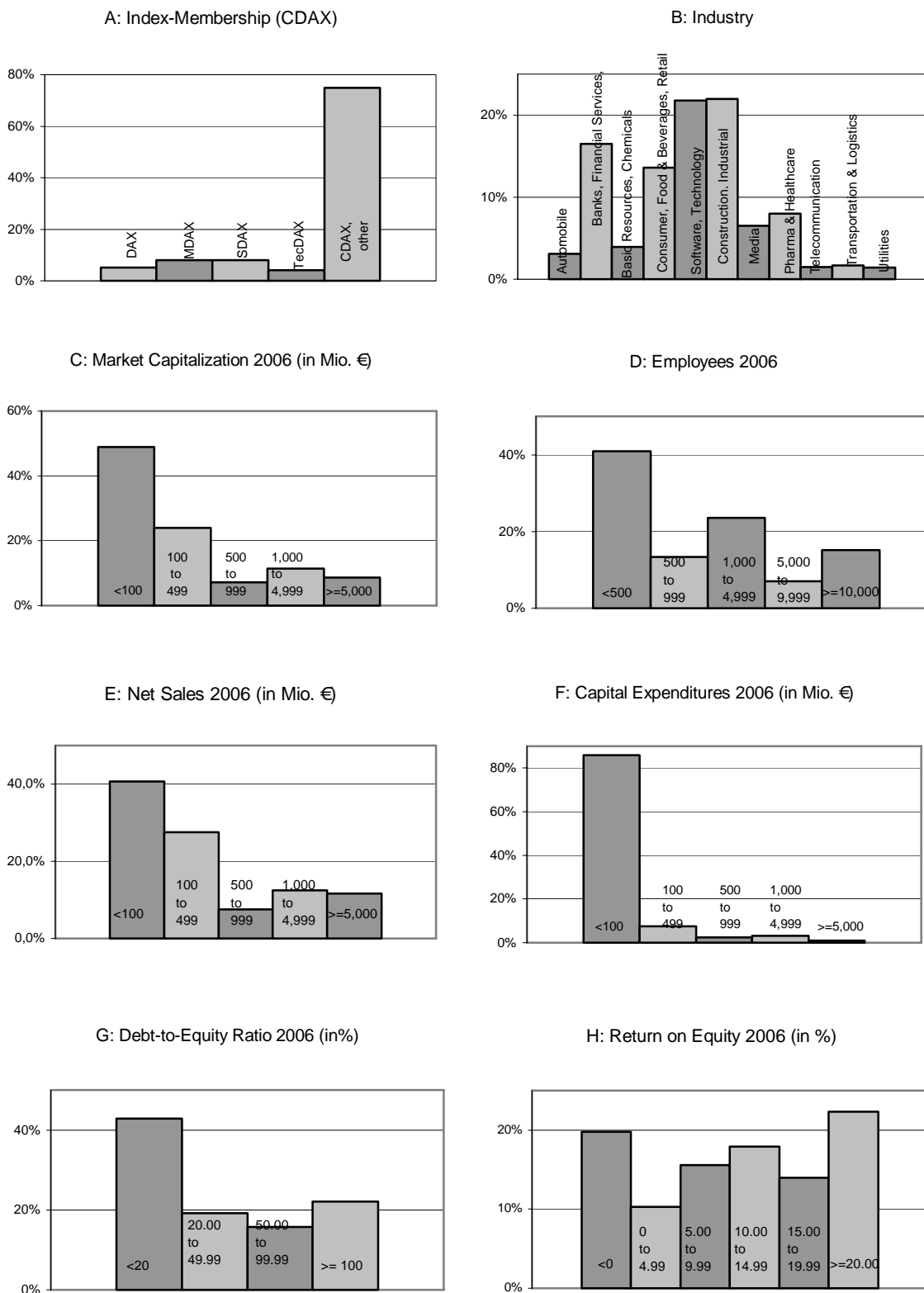
2.2 Population

Regarding the population of our survey we were restricted to choose the subpopulation public companies listed on the stock exchange because of the fact that only for these companies current data and information useable for statistical analysis is available. We then selected the CDAX, because this index represents the German equity market in its entirety, i.e. all companies listed on Frankfurt stock exchange. In addition, the CDAX has the advantage that it is contained in the Thomson Financial Worldscope Database. Therefore, the scope of our survey is fairly broad and covers all important existing public companies in Germany, with the effect that we get a deep insight into the capital budgeting methods of these firms. The CDAX consisted of 657 firms at the time we prepared the data for our survey. Surprisingly, the CDAX included also 70 enterprises which were in insolvency or didn`t exist no longer at that time. Thus, the population consists of 587 companies, altogether.

Contrary to the majority of the existing literature we analyze the descriptive statistics not only for the sample but also for the population. We find it makes sense getting a first overview of the distribution of particular firm characteristics because one is better able to understand the correlations between the properties and later on also why our sample is only representative for

the subpopulation DAX, MDAX and SDAX companies. Furthermore, the analysis of the correlations is more substantial and significant for the population as it would be for our sample.

Fig. 2 presents summary information about the firms in our population. The CDAX index mainly consists of exclusively in the CDAX noted companies (75%) and of in the more known indices DAX (5%), MDAX (8%), SDAX (8%) and TecDAX (4%) noted firms (Fig. 2A). The two sectors Software/Technology and Construction/Industrial (22%) have the biggest part in the industry distribution (Fig. 2B), followed by Banks/Financial Services/ Insurance (17%). The other sectors have only a small part except for the sector Consumer/Food & Beverages/Retail (14%). The industry classification was taken thereby from the Deutsche Börse Group. Considering the figures 2C, 2D and 2E one can see on the one hand that the firm characteristics market capitalization, employees and net sales had a fairly similar distribution in 2006 and on the other hand that the CDAX index includes primarily smaller companies with a market capitalization below 100 Mio. €, with less than 500 employees and with net sales below 100 Mio. € Thus, our sample should also consist of smaller companies to be representative for the population. We examine this issue later in chapter 3.2. Eighty-six percent of the firms made capital expenditures less than 100 Mio. €, although 2006 should actually have been a year with increased investment activity in Germany (Fig. 2F). It is noticeable that only a few investments (14%) were taken with a volume more than 100 Mio. € Furthermore, we have incorporated the two firm figures debt-to-equity ratio and return on equity, instead of total debt and net income, respectively, because these are not influenced by the firm size. Hence, these two figures show an adjusted picture of the real performance on the individual corporate level. Figure 2G reveals a good result for the financial leverage in Germany. Almost 80% of the companies possess less debt than equity. 43% of them even have a debt-to-equity ratio below 20%. These findings indicate that the majority of the CDAX companies should be healthy. The distribution of the return on

equity figure is quite uniform (Fig. 2H). It is remarkably that exactly 80% of the firms have a positive return on equity, whereas half of them (54%) have a return on equity higher than 10%.

A: Index-Membership (CDAX)

B: Industry

C: Market Capitalization 2006 (in Mio. €)

D: Employees 2006

E: Net Sales 2006 (in Mio. €)

F: Capital Expenditures 2006 (in Mio. €)

G: Debt-to-Equity Ratio 2006 (in%)

H: Return on Equity 2006 (in %)

I: Age CFO (in years)

J: Tenure CFO (in years)

K: Education CFO
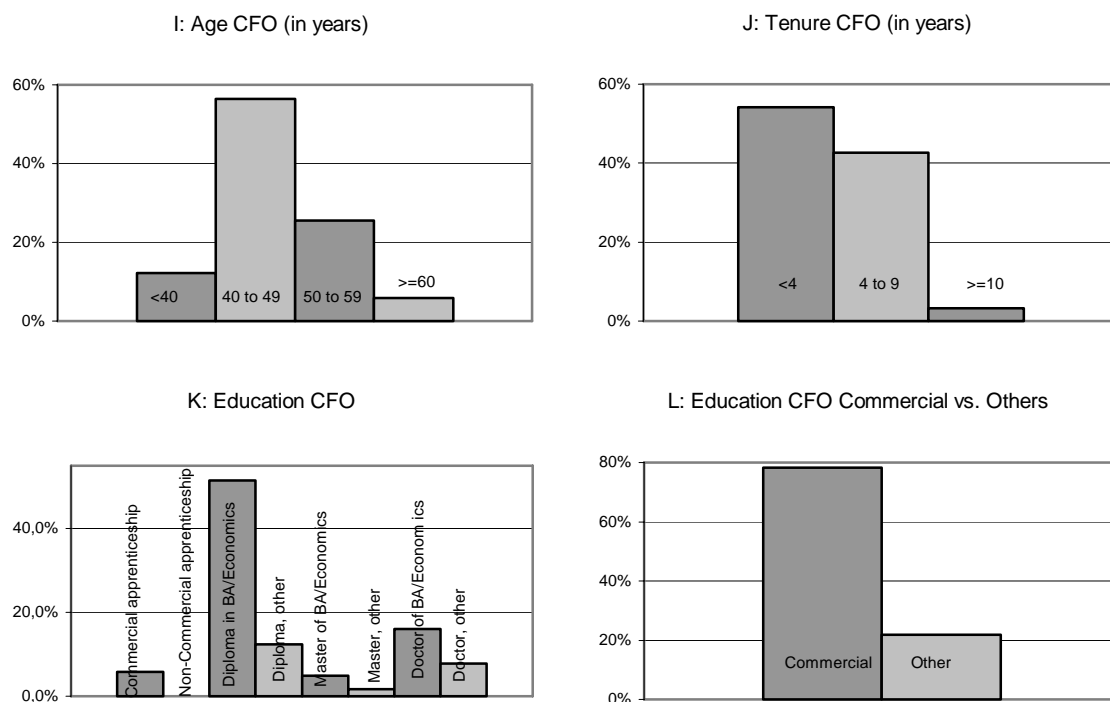

L: Education CFO Commercial vs. Others

Fig. 2. Population characteristics of 587 non-insolvent CDAX companies.
Sources: Fig. A to B: Deutsche Börse Group, Fig. C to H: Thomson Financial Worldscope Database
and Fig. I to L: Internal Calculations

The next four graphs of figure 2 contain information about the personal characteristics of the CFOs working for the companies that are included in our population. We have selected to present the personal characteristics exclusively for the CFOs, although we hold the same data for the CEOs, because after conducting a deep statistical analysis we found out that the explanatory power of both groups is almost the same. Considering that in the majority of the companies mainly the CFOs deal with capital budgeting methods, we have decided to include only the CFOs in the statistical analysis of our entire survey. In addition, incorporating only one group is reasonable for clarity reasons. However, approximately two-thirds of the CFOs (68%) are younger than 50 years old (Fig. 2I). Twenty-six percent of the CFOs in the population are between 50 and 59 years old. Responsible for the remaining 6% is the group of the over 59-year-old. The mean and median age of the CFOs is in each case exactly 47 years. The survey reveals that financial managers change jobs frequently. Over 50% of the CFOs have been in their jobs less than four years (Fig. 2J). 43% remain in their position for 4 to 9 years and the

huge minority of the financial managers, only 3%, stay for ten years or more at their workplace. The mean tenure of the CFOs is thereby 3,94 years and the median tenure 3 years. Figure 2K reveals that most of the CFOs (52%) hold a diploma in business administration (BA) or economics as their highest level of university degree. In this context we didn´t distinguish whether a CFO holds a university diploma or a diploma from a university of applied science. The second most held university degree of the CFOs is the doctor of business administration or economics (16%) followed by a diploma from other faculties (12%). That altogether only 7% of the German CFOs in our population hold a MBA is an interesting result and shows that there wasn't a globalization of university degrees at the time when the current generation of these CFOs was leaving the universities. Finally, the overwhelmingly majority of the CFOs (78%) have completed a commercial or a economic education. Considering the high degree of expert business knowledge necessary for executing this position this outcome is not a big surprise. Table 1 presents correlations between several firm characteristics. As we have already mentioned above, the analysis of the correlations is more substantial and significant for the population as it would be for our sample. On this account, we investigate the correlations between the firm characteristics only for the population and not for the sample. Not surprisingly, the correlations between the variable "Index-Membership (CDAX)" as an approximation for firm size (DAX = group with the largest companies, MDAX = group with the second largest companies and so on…) and the variables that truly indicate the firm size (market capitalization, employees, net sales and capital expenditures) are all negative and significant, even though these correlations are only marginal. It is also noticeable that in lower-indexed companies the CFOs are younger and the return on equity is smaller. Furthermore, the correlations among the above mentioned firm size variables are all highly significant and at least mid-strong. That the correlations between the firm size and the return on equity figure are all insignificant should be a hint for corporate leaders that the equation larger firm size = higher return on equity does not automatically hold.

Table 1
Population correlations between firm characteristics[a]

	Index-Membership (CDAX)[b]	Industry (Industrial to others)	Market Capitali-zation 2006	Employees 2006	Net Sales 2006	Capital Expen-ditures 2006	Debt-to-Equity Ratio 2006	Return on Equity 2006	Age CFO	Tenure CFO	Education CFO (Com-mercial to others)
Industry (Industrial to others)	-0.074*										
Market Capitalization 2006	-0.259***	0.078*									
Employees 2006	-0.252***	0.060	0.717***								
Net Sales 2006	-0.262***	0.081*	0.861***	0.859***							
Capital Expenditures 2006	-0.244***	0.072	0.546***	0.595***	0.752***						
Debt-to-Equity Ratio 2006	-0.110**	0.024	0.078	0.034	0.073	0.020					
Return on Equity 2006	-0.147***	0.092*	0.052	0.037	0.039	0.019	0.062				
Age CFO	-0.310***	0.16**	0.129*	0.217***	0.218***	0.182**	0.019	0.055			
Tenure CFO	-0.064	-0.109*	-0.036	-0.026	-0.024	0.008	-0.040	0.002	0.244***		
Education CFO (Commercial to others)	-0.093	0.103	0.037	0.003	0.007	0.013	0.048	0.059	-0.132*	-0.122*	

***,**,* denotes a significantly different from zero at the 1%, 5% and 10% level, respectively
[a] we apply the Pearson correlation coefficient for interval variables and the Spearman correlation coefficient for ordinal variables
[b] the ordinal variable "Index-Membership (CDAX)" is coded as follows: 1 = DAX, 2 = MDAX, 3 = SDAX, 4 = TecDAX, 5 = CDAX

The same holds for the calculation higher debt-to-equity ratio = higher return on equity. However, correlations don`t prove causality but show only that variables tend to move in the same direction. On account of this, we have run a regression of return on equity on all selected firm characteristics as shown in table 2.

Table 2

Multiple regression result of return on equity 2006 (dependent variable) on
all selected firm characteristics (independent variables)[a]

Dependent Variable: Return on Equity 2006		
Variable	Coefficient	Probability (p-Value)
Intercept	-43.63	0.2630
Index-Membership (CDAX)[b]	2.97	0.3075
Industry (Industrial to others)	-12.35	0.2063
Market Capitalization 2006	0	0.2057
Employees 2006	0	0.4724
Net Sales 2006	0	0.6854
Capital Expenditures 2006	0	0.7758
Debt-to-Equity Ratio 2006	-0.04	0.0001
Age CFO	0.99	0.1786
Tenure CFO	-0.97	0.5093
Education CFO (Commercial to others)	8.15	0.4462
R-squared	0.172941	
Adjusted R-squared	0.094917	
F-statistic	2.216505	
Probability (F-statistic)	0.022034	

[a] The White test for heteroskedasticity shows that the residuals of this regression are homoscedastic
[b] the ordinal variable "Index-Membership (CDAX)" is coded as follows:
 1 = DAX, 2 = MDAX, 3 = SDAX, 4 = TecDAX, 5 = CDAX

The outcome of this regression definitely confirms the conclusions we have already made above because no single independent variable is significant except the debt-to-equity ratio. But even the coefficient of the debt-to-equity ratio indicates with -0.04 percentage points only a slight impact on the return on equity. In addition, the adjusted R-squared shows that only a small fraction of the sample variation in return on equity is explained by the firm characteristics. As a consequence of this, there have to be other firm specific influencing factors that are able to explain the sample variation in return on equity.

2.3 Course of the Survey

In this chapter we shortly describe the course of the survey from the moment when we were

sending the questionnaire to all CDAX companies for the first time to the cut-off date when we

were considering the last returned questionnaire for the analysis of our survey. We had decided

to send our study not only the CFOs but also the CEOs for improving the response rate.

Therefore we mailed altogether 1,133 surveys, including an accompanying letter, on May 29th,

2007, because we had collected before 657 CEO names and 476 CFO names of the CDAX

companies. We mailed the survey to 657 CEOs although our population includes only 587

CDAX companies because we didn`t wrongly consider the 70 insolvent companies for the first

time. We requested that the surveys must be returned by June 8th, 2007. To encourage the

executives to respond, we offered them a copy of the results if desired. Though we had been

waiting two weeks longer as announced up to June 22nd, 2007 only 35 questionnaires were

returned for an intermediate response rate of only 6% (35 of 587) at that time. Hence, because

of the nonsatisfying response rate it became necessary for us to send the survey a second time.

Immediately on June 22nd, 2007 we mailed altogether 921 surveys, including a revised

accompanying letter, to now 532 CEOs and 389 CFOs. In the second stage we requested that

the surveys must be returned by July 6th, 2007. To ease the corporate leaders the return of their

questionnaires, we offered them several possibilities: by mail, by fax, by e-mail and even

through the internet by filling out the online form. However, a total of 76 companies returned

the survey (41 more than during the first stage) for a now favorable total response rate of 13%

(76 of 587). This time we waited one week longer than the announced final cut-off date, until

July 13th, 2007. Remarkably, 34 companies (5.8% of 587) rejected their participation in our

survey. The majority of these companies stated that they usually don`t participate in surveys.

Other often-mentioned causes for the refusal were, for instance, limited time and personal

reasons, high workload of their employees, the "special business" in which they operate and

limited resources for the processing of such requests. One company declared that it is in the

middle of a current squeeze-out process and another that it considers information about its capital budgeting methods as a confidential topic. Another 9 of these 34 companies rejected their attendance either by phone or by e-mail without giving reasons. In addition, 4 other firms stated that they were not able to fill out the questionnaire because they usually don`t use capital budgeting methods. In summary, 76 firms (13%) returned the questionnaire, 34 firms (5.8%) rejected their participation and 4 firms (0.7%) usually don`t use capital budgeting methods. Hence, we reached with our survey a total of 114 companies (19.5% of 587).

3. SAMPLE

3.1 Descriptive Statistics

Now we will present information about the most important firm characteristics of the 76 companies in our sample. We introduce the descriptive statistics for the sample in the same way as we already did for the population in chapter 2.2, except that we here additionally consider the total investment return (total shareholder return) figure. We are only able to show the total investment return figure for the sample and not for the population because of the fact that we didn`t find any resource in which this figure would have been available for the entire CDAX so that we had to calculate the total investment return for every company in our sample by ourselves. At the end of this chapter we show the correlations between all selected firm characteristics and the newly introduced total investment return figure as supplementary information. We found that the consideration of the total shareholder return figure substantially enriches our study because this performance figure indicates the real market return compared to the return on equity, which is only an accounting figure. Therefore, through the availability of the total investment return figure for the sample we are now able to investigate the impact of capital budgeting methods on actual corporate performance as well. Considering that the majority of investors are mainly interested in the development of their portfolio investments, it is not surprising that they are more focused on total investment return than on return on equity.

In a next step we would like to examine whether the two named performance figures exhibit identical values and therefore whether they measure corporate performance in the same way. The Scatterplot in figure 3 shows that the two variables don`t move into the same direction. This gives us a first hint about the correlation between the two variables. The Pearson correlation coefficient confirms this first finding, because its value is 0.25, implying that there is just a marginal correlation between the two variables, different from zero only at the 10% level (see Table 4). The single regression result in Table 3 verifies the only marginal correlation, too, because it shows that the independent variable total investment return is insignificant at the 5% level and has therefore no bearing on the variation of return on equity. But this must be the case when both variables should be highly correlated.
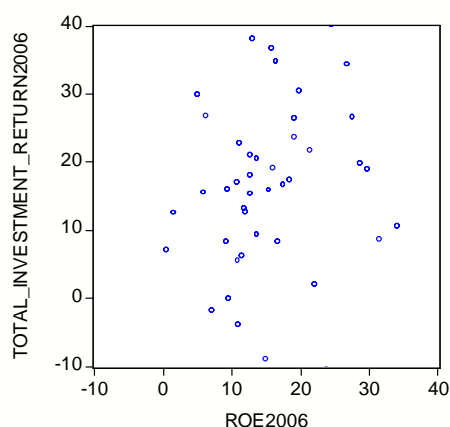

Fig. 3. Scatterplot of total investment return
against return on equity

Table 3
Single regression result of return on equity 2006 (dependent variable) on
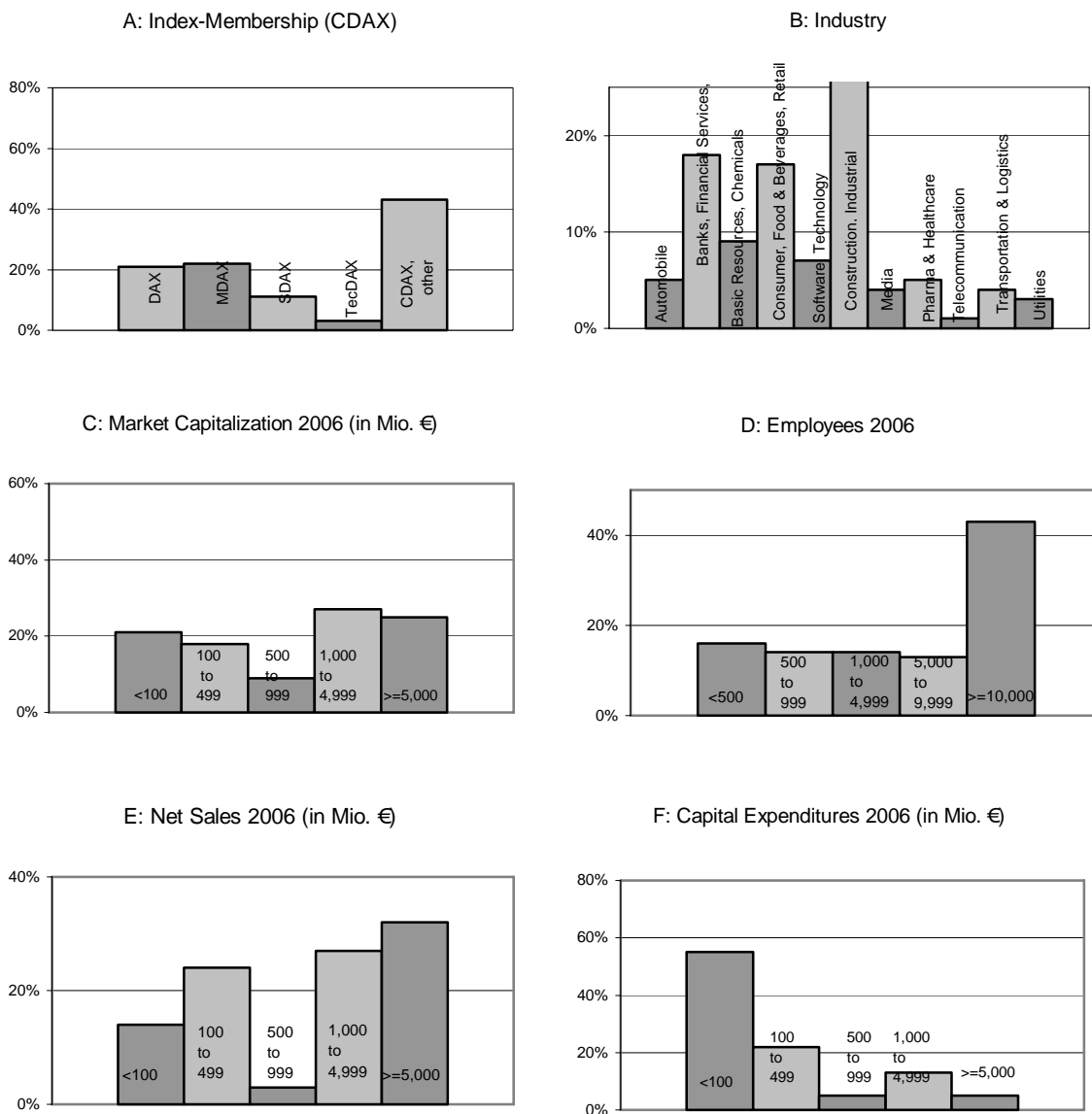total investment return (independent variable)[a]

Dependent Variable: Return on Equity 2006		
Variable	Coefficient	Probability (p-Value)
Intercept	10.79	0.0011
Total Investment Return 2006	0.19	0.0518
R-squared	0.062577	
Adjusted R-squared	0.046689	
F-statistic	3.938505	
Probability (F-statistic)	0.051849	

[a] The White test for heteroskedasticity shows that the residuals of this regression are homoscedastic

In addition, the R-squared shows that only a very small fraction of the sample variation in return on equity is explained by the total investment return. As a consequence of this, we conclude that there necessarily exists a slightly correlation between return on equity and total investment return but that this correlation has no relevance at all and therefore the two performance figures don`t exhibit identical values and measure corporate performance in a different way.

Fig. 4 presents descriptive statistics for the 76 companies in our sample. We kept the scaling of the size axis (y-axis) for all graphs, compared to figure 2, unchanged because we find that this approach eases the direct comparison of the sample graphs with the population ones. The index-membership is the first of the most important firm characteristics we want to describe (Fig. 4A). The companies in our sample mainly belong to the CDAX (43%). Compared to the population, however, DAX and MDAX noted companies are overrepresented (21% and 22% respectively in the sample unlike 5% and 8% in the population). The values for the SDAX and TecDAX noted firms are nearly identical. Thus, alone through the comparison of the two index-membership distributions one can recognize why our sample couldn't be representative for the population. The industry distribution (Fig. 4B) is roughly the same as in the population with the exception that the sector Software/Technology is noticeably less represented (7% in the sample as opposed to 22% in the population). This could have the consequence that our sample isn`t representative for the population regarding its industry distribution, too. We examine this problem in the next chapter. Comparing the figures 4C, 4D and 4E with their counterparts in figure 2 one can perceive that our sample, in contrast to the population, primarily includes larger companies with a market capitalization greater than 1,000 Mio. € with more than 10,000 employees and with net sales greater than 1,000 Mio. € We have stated in chapter 2.2 that our sample should consist of smaller companies to be representative for the population. But this doesn`t seem to be the case here. In the next chapter we conduct a chi-square goodness-of-fit test to give a final answer to the question whether our sample is representative. It is striking that

the companies in our sample made in 2006 more capital expenditures than the ones in our

population. 45% of the firms carried out investments with a volume of more than 100 Mio. €in

contrast to only 14% in the population (Fig. 4F). Figure 4G shows a less satisfying result for the

sample regarding the financial leverage compared to the population. Almost one-third of our

responding firms posses more debt than equity. The change of minus 17% in the category

"Debt-to-Equity Ratio below 20%" also confirms this less satisfying outcome. Only 26% of the

firms in our sample belong to this category, whereas 43% of the firms in our population are

classified in this category.

A: Index-Membership (CDAX)

B: Industry

C: Market Capitalization 2006 (in Mio. €)

D: Employees 2006

E: Net Sales 2006 (in Mio. €)
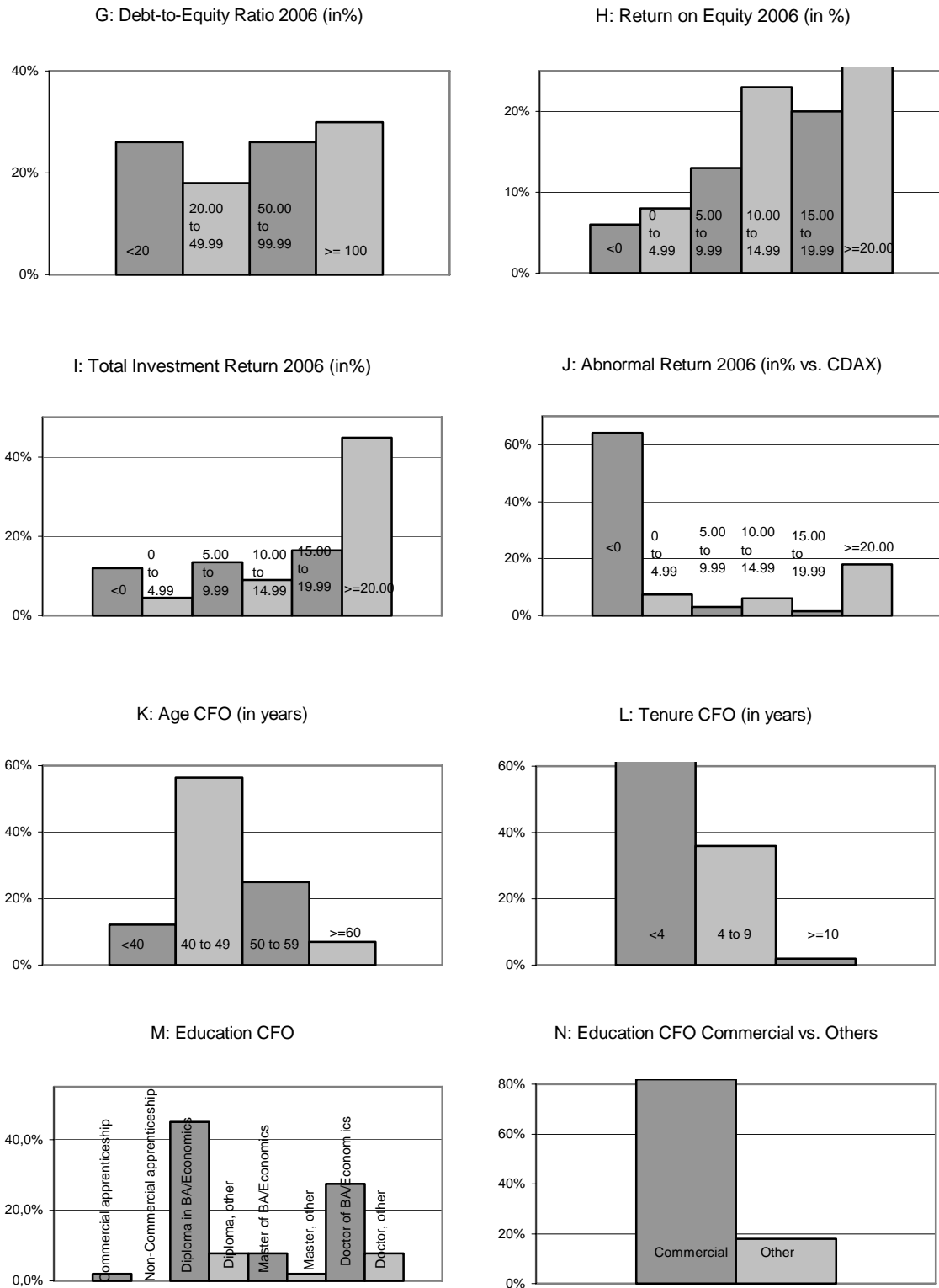
F: Capital Expenditures 2006 (in Mio. €)

Fig. 4. Sample characteristics based on the survey responses of 76 companies.

Sources: Fig. A to B: Deutsche Börse Group, Fig. C to H: Thomson Financial Worldscope Database
and Fig. I to N: Internal Calculations

The increased participation of high-levered firms in our survey indicates maybe that these firms could have a bigger incentive to use more sophisticated capital budgeting methods than low-levered firms. The reason for this incentive could be restrictive financial covenants. We investigate this issue in more detail in subsection 4.1.2. The distribution of the return on equity figure in our sample is surprisingly left-skewed (Fig. 4H). In other words, this means that the large majority of the responding firms have a return on equity higher than 10%. More concretely, this is the case for exactly 73%. Comparing these results with the outcomes for the population one can see that both the distribution of the return on equity figure and the amount of firms that have at least a return on equity of 10% have changed. Furthermore, the increased fraction of firms with a return on equity higher than 10% leads one to suspect that primarily successful companies participated in our study. Figure 4I strengthens this assumption. It is interesting that almost three-fourths of the sample firms achieved a total investment return in 2006 higher than 10%, whereas as many as 45% of them attained a return higher than 20%. The increased participation of successful firms in our survey indicates maybe that there is a correlation between the usage of sophisticated capital budgeting methods and company performance. We investigate this issue in more detail in subsection 4.1.2, too. In addition to the total investment return we have also calculated the abnormal return for the companies in our sample. We have subtracted the CDAX overall performance of 24% for the year 2006 from the total investment returns. Figure 4J reveals the surprising result that the majority of the responding firms (64%) couldn`t beat the entire index in 2006. Only one-third achieved this, whereas anyhow 18% beat the CDAX by more than 20%. This finding slightly diminishes our assumption that only successful companies participated in our survey. We describe the last four graphs of figure 4 very briefly because the distributions in the sample regarding the four personal characteristics of the CFOs are similar to the ones of the population. The only big change that has occurred concerned the education of the CFOs. Figure 4M shows that more CFOs in our sample hold a doctor of business administration or

economics compared to our population (28% compared to 16%). The higher education level of the CFOs in our sample suggests also that successful companies potentially apply sophisticated capital budgeting methods more often than others.

Table 4 presents sample correlations between total investment return and all selected firm characteristics. For the correlations between the variables that reflect firm size (market capitalization, employees, net sales and capital expenditures) and the total investment return figure we can draw the same conclusions as for the relationship from these variables to the return on equity figure in the population: No single correlation is significant. This outcome confirms that the equation larger firm size = higher total investment return does not automatically hold. Through the insignificant correlation between debt-to-equity ratio and total investment return we can additionally confirm that the simple equation higher debt-to-equity ratio = higher total investment return is also not valid. The total investment return of lower-indexed firms is significantly smaller at the 10% level.

Table 4
Sample correlations between total investment return and firm characteristics [a]

	Index-Membership (CDAX)[b]	Industry (Industrial to others)	Market Capitalization 2006	Employees 2006	Net Sales 2006	Capital Expenditures 2006
Total Investment Return 2006	-0.239*	0.175	-0.050	0.070	0.016	-0.066

	Debt-to-Equity Ratio 2006	Return on Equity 2006	Age CFO	Tenure CFO	Education CFO (Commercial to others)
Total Investment Return 2006	-0.006	0.250*	0.386**	-0.266*	0.297**

***,**,* denotes a significantly different from zero at the 1%, 5% and 10% level, respectively
[a] we apply the Pearson correlation coefficient for interval variables and the Spearman correlation coefficient for ordinal variables
[b] the ordinal variable "Index-Membership (CDAX)" is coded as follows:
1 = DAX, 2 = MDAX, 3 = SDAX, 4 = TecDAX, 5 = CDAX

This is almost identical to the result for the population saying that the return on equity of lower-indexed firms is significantly smaller at the 1% level. But the most interesting outcomes of table 4 affect all the personal characteristics of the CFOs. Contrary to the non-existent correlation between the personal characteristics (CFO age, CFO tenure and CFO education - Commercial to others) and the return on equity in the population (see Table 1), these personal

characteristics are significantly correlated with the total investment return in the sample. On the one hand we find that this discrepancy also proves that the two figures total investment return and return on equity are different and on the other hand that these personal properties of financial managers possibly influence share prices but not company internal accounting returns. Summarized, these correlations suggest that the total investment return of a company is higher when a more experienced CFO with a lower tenure and a commercial education is working for it. However, as we have already mentioned above, correlations don`t prove causality but only show that variables tend to move in the same direction. Therefore we have run a regression proving whether there really is a statistically significant impact of the selected firm characteristics on total investment return. This regression is shown in table 5. The result of this regression only partially confirms the conclusions we have already drawn for the correlations.

Table 5
Multiple regression result of total investment return 2006 (dependent variable) on
all selected firm characteristics (independent variables)[a]

Dependent Variable: Total Investment Return 2006		
Variable	Coefficient	Probability (p-Value)
C	-24.23	0.4707
Index-Membership (CDAX)[b]	-5.37	0.1275
Industry (Industrial to others)	-1.02	0.9202
Market Capitalization 2006	0	0.0446
Employees 2006	0	0.7423
Net Sales 2006	0	0.2127
Capital Expenditures 2006	0	0.4124
Debt-to-Equity Ratio 2006	-0.01	0.2736
Age CFO	1.29	0.0346
Tenure CFO	-2.28	0.2280
Education CFO (Commercial to others)	16.57	0.2040
R-squared	0.487660	
Adjusted R-squared	0.264904	
F-statistic	2.189208	
Probability (F-statistic)	0.058276	

[a] The White test for heteroskedasticity shows that the residuals of this regression are homoscedastic
[b] the ordinal variable "Index-Membership (CDAX)" is coded as follows:
   1 = DAX, 2 = MDAX, 3 = SDAX, 4 = TecDAX, 5 = CDAX

Only the two independent variables "Market Capitalization" and "Age CFO" have a significant impact on the total investment return at the 5% level, whereas the zero coefficient of the market

capitalization goes against this inference. Furthermore, the regression disproves for the two variables "Tenure CFO" and "Education CFO – Commercial to others" the outcome that they have a statistically significant influence on the total investment return. Thus only the age of the CFOs exerts a significant influence. When one CFO is 1 year older than another CFO, the total investment return of his/her company is then ceteris paribus about 1.29 percentage points higher. This result clearly suggests that an older and more experienced CFO implies a higher total investment return for his/her company. However, this regression model should be viewed as rather poor than good because although the adjusted R-squared shows that a small fraction of the sample variation in total investment return is explained by the firm characteristics, the overall F test indicates at the 5% level that none of the firm characteristics has an effect on total investment return. As a consequence of this, there have to be other firm-specific influencing factors that are able to explain the sample variation in total investment return. Considering that we have found out the same for the return on equity figure in our population, we conclude that corporate performance is not influenced by our selected firm characteristics. In subsection 4.1.2 we investigate whether managers are able to improve corporate performance with particular capital budgeting methods.

3.2 Examination of Representativeness

In the previous chapters we have often mentioned that our sample is not representative for our population but rather for the largest German public companies that are all noted in the three indices, DAX, MDAX and SDAX. We present the results of the conducted chi-square goodness-of-fit tests in table 6. The tests that verify whether the sample is representative for the population are all entered in the second column. One can see that our sample is not representative for the population regarding the index- and industry membership, the firm size (approximated by market capitalization and net sales) and the debt-to-equity ratio. We have already hinted in this paper that the reason for this non-representativeness should be seen in the

consistency of our sample. We have followed from the descriptive statistics for the population

that our sample should primarily consist of smaller companies but the companies in our sample

are rather large. That the sector Software/Technology is noticeably less represented in the

sample compared to the population is another factor especially for the non-representativeness of

the index-membership. Nevertheless, in terms of return on equity and the personal

characteristics of the CFOs our sample describes our population. We conclude therefore that

our sample is representative for financial managers and thus for the main decision makers

regarding the application of capital budgeting methods.

Table 6
Chi-Square Goodness-of-Fit Tests for selected firm characteristics
H_0: Sample represents a specific distribution
Tests that don`t reject the null hypothesis at the 2.5% significance level are shaded

Selected firm characteristics	Sample/ Population[a]	Sample/DAX, MDAX and SDAX noted companies (Subpopulation)[b]
Index-Membership (CDAX)	69.849[c] 0.000[d]	
Industry	20.792 0.023	14.206 0.164
Market Capitalization 2006	49.556 0.000	11.126 0.025
Net Sales 2006	45.306 0.000	9.202 0.056
Debt-to-Equity Ratio 2006	10.147 0.017	2.214 0.529
Return on Equity 2006	11.438 0.043	5.376 0.372
Age CFO	0.076 0.995	
Tenure CFO	1.520 0.468	
Education CFO	7.550 0.273	
Education CFO (Commercial to others)	0.563 0.453	

[a] test whether the sample is representative for the population (entire CDAX)
[b] test whether the sample is representative for the DAX, MDAX and SDAX companies
[c] Chi-square
[d] Probability (p-Value)

The tests that verify whether the sample is representative for DAX, MDAX and SDAX noted

companies are all entered in the third column of table 6. Not surprisingly, we get the expected

result that our sample is representative for this subpopulation regarding all selected firm

characteristics. This is the case because our sample, just like the DAX, MDAX and SDAX

noted companies, primarily consists of larger firms. Before we come to the final statement

about the representativeness we would like to give an answer to the question of whether primarily successful companies participated in our study. We are convinced that this is not the case in our survey because one can notice in consideration of the two test results for the variable "Return on Equity" that the distributions sample vs. population and sample vs. subpopulation are not different at the 2.5% significance level. Finally, we are sure that the conclusions of this chapter justify our statement that our sample is representative and meaningful for the population regarding the personal characteristics of its financial managers and also for the subpopulation DAX, MDAX and SDAX noted companies in terms of the selected firm characteristics.

4. RESULTS

Chapter 4 investigates how firms evaluate their investment projects and which capital budgeting methods they apply for this purpose. Chapter 4 is organized as follows: In chapter 4.1 "Capital Budgeting" we first analyze what minimum amount an investment must have in order that firms use capital budgeting methods and whether companies consider inflation and taxes in investment decisions (subsection 4.1.1). Afterwards in the subsection 4.1.2 we investigate how frequently companies use particular capital budgeting methods, whether selected firm characteristics have any impact on application frequency of these methods and finally whether a statistically significant correlation between the usage of capital budgeting methods and corporate performance can be proven. This subsection is at the same time the core of the entire survey. A throughout comparison of theory and practice and a comparison with other studies published by authors throughout the world are also given in this subsection. In addition we examine the areas of cost of capital and capital structure in chapter 4.2 and 4.3, respectively.

4.1 Capital Budgeting

4.1.1 Minimum Amount of Investment, Inflation and Taxes

Minimum Amount of Investment

First, we have a look at the minimum amount an investment must have so that the German

companies use a capital budgeting method for their investment decisions. Figure 5 indicates

that almost three-fourths (exactly 74%) of the responding companies use a specific capital

budgeting method when the initial investment is less than €500,000, whereas the majority of

these companies (36%) apply such a method not until the investment amount lies between

€100,000 to €500,000. Even though this result is okay, we find that it could be improved

considering that 61% make investments with an initial investment below €100,000 without any

capital budgeting method. Of course, also many small unprofitable investments can reduce
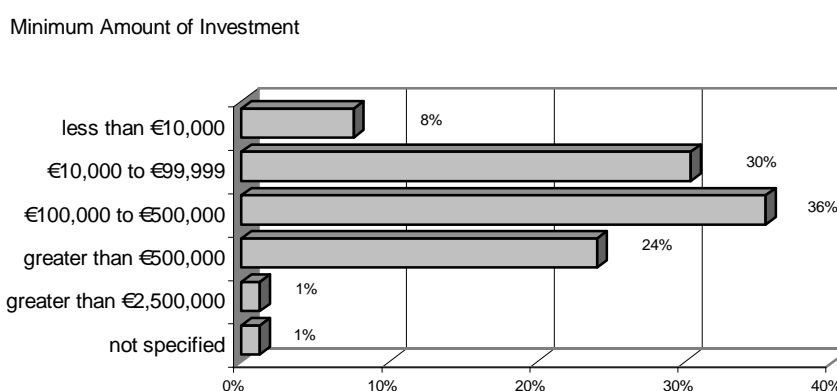
shareholder value.

Fig. 5. Survey responses to question 2:
What minimum amount must an investment have so that your company
uses a capital budgeting method for its investment decision?

It is difficult to find in the established corporate finance textbooks a benchmark for the

minimum initial investment that definitely requires the application of an appropriate capital

budgeting method. We assume that the current opinion in these textbooks is, that an appropriate

capital budgeting method should be used for every single investment decision. Therefore, only

the comparison of our results with other outcomes in the existing literature remains. Gitman

and Forrester (1977) come to the result that 82% of the major U.S. firms require an initial

investment less than $500,000 to justify the use of formal capital budgeting methods and 41% of them make investments below $100,000 without any capital budgeting method. Ryan and Ryan (2002) determine almost the same results for the Fortune 1000 companies: 80% of the Fortune 1000 companies require a capital expenditure less than $500,000 for formal capital budgeting analysis and 51% of them make investments below $100,000 without any capital budgeting method. Although the question in their surveys is a little bit different to ours, the results are comparable. Hence, the German companies should catch up their backwardness, compared to the major U.S. firms, particularly in the usage of capital budgeting methods for investments below €100,000.

Inflation

Second, we give an answer to the question whether German companies calculate in nominal or real terms when they consider inflation in capital budgeting decisions. Figure 6 exhibits that 61% of the responding companies calculate with nominal values, 28% with real values and the remainder rely on other approaches, e.g. application of both real and nominal values depending on each individual case, deduction for risk, inflation adjusted costs and depending on the strongness of foreign currency in case of an external investment.
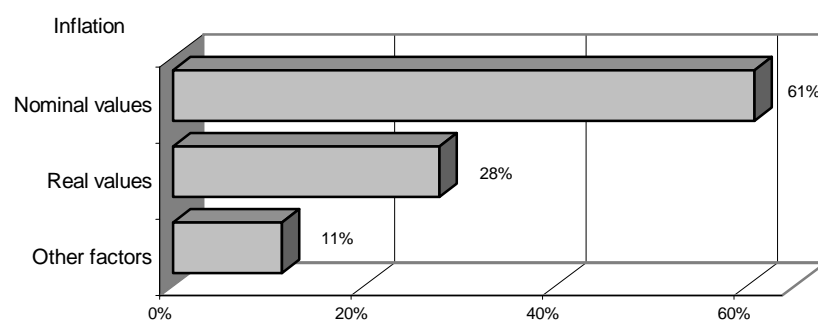

Fig. 6. Survey responses to question 3:
Considering inflation, does your company calculate in nominal or real terms?

Regarding inflation it is not difficult to find suggestions of corporate finance textbooks how inflation should be treated ideally. Brealey *et al.* (2006) state clearly that nominal cash flows should be discounted with a nominal discount rate and real cash flows with a real rate. They also state that one should never mix real cash flows with nominal discount rates or nominal

flows with real rates. In addition, they argue that real and nominal discounting, properly applied, always give the same present value. Ross *et al.* (2005) and Koller, Goedhart and Wessels (2005) thereby completely agree with Brealey (*et al.*). But Koller *et al.* (2005) explicitly recommend the application of nominal rather than real terms because interest rates are generally quoted nominally and therefore, projecting future statements in real terms is difficult and confusing. Drury and Tayles (1996) similarly remark that observed rates of return, available from investments in capital markets, incorporate an implicit adjustment for inflation and are therefore already expressed in nominal or "money" terms. Furthermore, they state that the forecasted cash flows have to be adjusted for incorporating inflation when nominal rates are used. It is difficult to determine whether our respondents fully understood the difference between nominal and real values and thus whether they correctly apply both approaches corresponding to theory. However, the result that 61% calculate with nominal values maybe indicates that the majority of the German companies correctly incorporate inflation in their capital budgeting decisions. Interestingly, we found in the literature only capital budgeting studies from and for the United Kingdom which survey how British firms incorporate inflation effects in their capital budgeting decisions. Pike (1996) reveals that in 1992 70% of the largest UK noted companies applied real values by specifying cash flows in constant prices and using a real rate of return and 58% used nominal values by adjusting cash flows for estimated changes in general inflation. In this context it is noticeable that Pike's survey approach is criticized by Drury and Tayles (1996) because they find that it is not observable whether or not firms have been dealing with inflation correctly. But also the study from Drury and Tayles doesn`t contribute to a better understandability of this problematic issue. However, in a 1997 survey Arnold and Hatzopoulos (2000) investigated that 42% of the largest UK firms apply real values and 39% use nominal values. These results can be viewed as meaningful due to an understandable question. Considering the recommendations of Koller *et al.* (2005) and the different outcomes for Germany and the United Kingdom we conclude

on the one hand that almost two-thirds of the German companies apply nominal values with large probability according to theory recommendations and on the other hand that the German companies seem to be more state-of-the-art in corporate financial research regarding inflation than the British ones.

Taxes

Third, we investigate how many German companies incorporate taxes in their investment decisions and how they do this when really considering taxes. We place emphasis in this connection not only on our survey results but also on recommendations from the theory regarding the optimal consideration of taxes. Before we analyze the results we would like to highlight that it is not easy to find uniform suggestions in the literature about this issue. Furthermore, due to the fact that every country has its own specific taxation laws, a comparison of theory and practice does only make sense for Germany. Nevertheless, we are able to provide a benchmark for the most recommended consideration of taxes in investment decisions. Figure 7 shows that exactly 78% of our responding companies incorporate taxes in investment decisions. Considering that the majority of the standard German capital budgeting and valuation textbooks, e.g. Drukarczyk and Schüler (2007), Ernst *et al.* (2003), Blohm *et al.* (2006) and Kruschwitz (2005), declare that capital budgeting decisions can be properly made only in consideration of taxes this outcome is not a surprise. We follow from our survey results not only that most of the German companies agree here with the prevailing opinion in the literature but also that almost one-fourth of them haven`t adopted the theory suggestions so far. Blohm *et al.* (2006) justify why taxes must be incorporated in investment decisions: First, because otherwise the most profitable investment (in consideration of taxes) of mutually exclusive alternatives could be wrongly eliminated. Second, because otherwise an unprofitable investment (in consideration of taxes) could be realized. Third, because all investment projects should be realized that are profitable in consideration of taxes. In addition, Levy and Sarnat (1994) justify the consideration of taxes in a more straightforward

way, by stating that taxes are a cash outflow and therefore must be taken into account when evaluating a project's desirability.
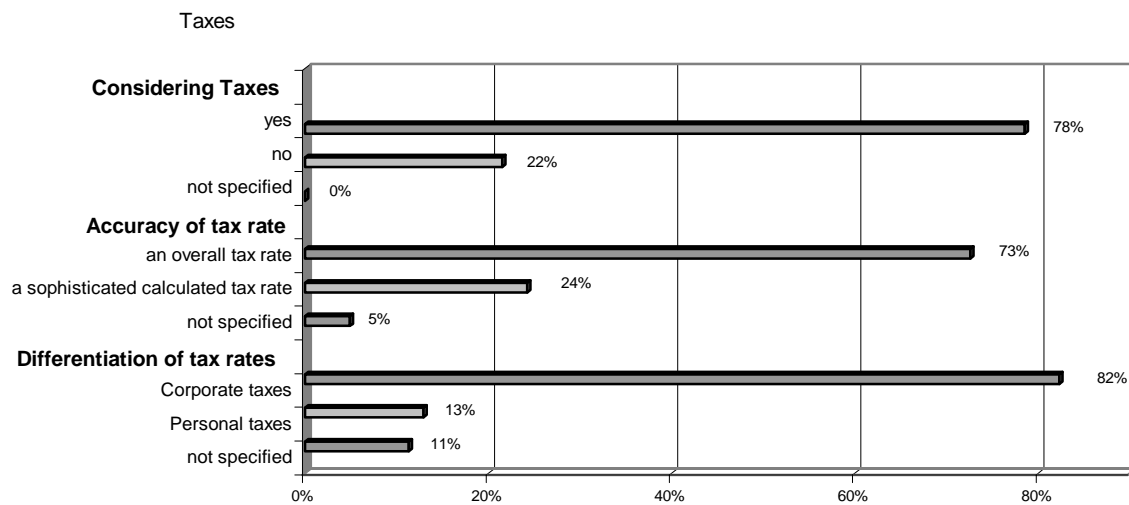
Taxes

Fig. 7. Survey responses to question 4:
Does your company consider taxes in investment decisions?
If "yes": Do you consider ....(answering options subdivided in accuracy of tax rate and differentiation of tax rates; multiple answers were possible)

However, the question of how the German companies incorporate taxes is of greater interest. Taxes are distinguishable with respect to their computational accuracy and their vertical differentiation. Regarding the computational accuracy our recipients had the possibility to chose between the two answering options "overall tax rate" and "sophisticated calculated tax rate" whereas multiple answers were possible. The former denotes thereby a determination of tax rates by the rule of thumb, e.g. by estimating an overall tax rate without considering German taxation laws. The latter denotes an appraisal of tax rates with sophisticated mathematical methods like the so-called "net-method" in conjunction with tax rates given by German taxation laws. The "net-method" is thereby suggested by all standard German textbooks that we have presented further above. We are aware of the danger that our respondents have possibly confused the two answering options. Considering that we have received a definite result for this question we find that we can use and interpret this one. Regarding the vertical differentiation our recipients were able to chose between taxes at corporate level (Corporate taxes) and taxes at personal level (Personal taxes), whereas

multiple answers were here possible, too. Figure 7 exhibits for the computational accuracy that nearly three-fourths of the sample firms which consider taxes calculate rather with an overall tax rate than with a sophisticated calculated tax rate. Whether this result is a good or bad one depends on the vertical differentiation of tax rates, or in other words, whether the German companies incorporate taxes both at corporate and personal level. However, figure 7 reveals that exactly 82% of the responding firms (which consider taxes) incorporate taxes at corporate level and 13% at personal level. Interestingly, only 4 out of 62 firms (6.4%) have together marked both answering options "Corporate taxes" and "Personal taxes" although multiple answers were possible. Hence, these results clearly indicate that the German companies consider taxes only at corporate level and not also at personal level. This behavior happens in conformity with international practices according to Ernst *et al.* (2003). But the revealed outcomes hold a substantial inconsistence because almost all of the above-mentioned German textbooks clarify that the tax rate at corporate level could be definitely determined. Therefore, the application of an overall tax rate at corporate level could lead to unprofitable investment decisions. Drukarczyk and Schüler (2007), Blohm *et al.* (2006) and Kruschwitz (2005) show how corporate taxes can be appropriately determined for German limited liability corporations (and Kruschwitz also for German private companies). We have mentioned that taxes are incorporated international only at corporate level. The German literature, by contrast, has more and more recommended the consideration of personal taxes in capital budgeting decisions in recent years. For example, Ernst *et al.* (2003) have the opinion that the main focus of company and project valuations should lie on cash inflows of investors. They state furthermore that personal taxes are relevant for valuations and investment decisions because they have an impact on the wealth of investors and therewith also on the profitability of mutually exclusive investment alternatives. Drukarczyk and Schüler (2007) demonstrate throughout their text that personal taxes have to be deducted from dividends because the German taxation system is not neutral to investment decisions.

Additionally, Ernst *et al.* (2003) describe why the application of an overall tax rate is appropriate at personal level in contrast to corporate level. They mention that it is problematic to determine an exact tax rate when the corporate value or the value of an investment project must be calculated for investors with unequal fiscal circumstances. Furthermore, they state that an overall income tax rate of 35% derived from statistical studies should be applied in practice in this case. After all, we find although it is actually a good result that 78% of the German companies incorporate taxes in their investment decisions that there nevertheless exists a large theory-practice gap concerning the appropriate application of taxes. In particular with regard to the following two outcomes: First, the German companies mainly use at corporate level an overall tax rate instead of an exactly calculated one and second, they incorporate only corporate taxes and not also personal taxes as it is recommended by theory. Surprisingly, we found in the literature only capital budgeting studies from and for Germany which have already addressed the problem of taxes in capital budgeting decisions. On this account we are now able to investigate if the consideration of taxes in investment decisions has changed over time. Grabbe (1976) found out that 61% of the responding firms in his survey incorporated taxes at that time. Ten years later, Bröer and Däumler (1986) established their far-reaching study about capital budgeting methods in practice. Their study reveal that exactly 71% considered taxes in 1986. The study of Wehrle-Streif (1989) reports with 70% almost the same result for 1989. Comparing these results with ours, one can see that the number of companies that incorporate taxes has risen about 8% in the last 20 years. Moreover, both the study from Bröer and Däumler (1986) and the one from Wehrle-Streif (1989) indicate that most of the German companies incorporated an overall tax rate at corporate level at that time, similar to the results of our survey. Therefore, concerning this issue, there hasn't been a switch to more sophisticated mathematical methods and also personal taxes haven't been considered as recommended by theory in recent years. Finally,

this reluctance to adopt new theory developments could certainly lead to a reduction of shareholder value.

4.1.2 Methods

Valuation of Investment Projects

Under the headline "Valuation of Investment Projects" we combine all prevalent capital budgeting methods which are used for the evaluation of single capital budgeting projects. Moreover, we also integrate in this point risk adjustment methods that firms often apply to incorporate the uncertainty of future cash flows and other risk factors, respectively. First, we have a look at the fundamental capital budgeting methods that can be divided into static and dynamic methods. The fact that the latter consider the time-value-of-money is the main difference between the two methods. Interestingly, the static methods are still popular in Germany although the prevailing opinion in the existing international literature indicates that the static methods are inferior to dynamic methods because they don´t consider the time-value-of-money. Blohm *et al.* (2006) state that the static methods only provide an approximation for the results determined by dynamic methods. The outcomes for the fundamental capital budgeting methods are summarized in figure 8. Payback period and accounting rate of return (ARR) are the most popular static methods among practitioners in Germany. Both approaches are always or often used by almost the half of our responding companies (payback period 48%, ARR 41%). We find that investment decisions made with static methods, in particular with the comparative cost and profit analysis, are inappropriate to prove whether shareholder value will be created with a project implementation or not. By contrast, most of investment decisions made with dynamic methods are able to document this depending on the characteristics of each single investment project. However, the net present value (NPV) method is the only one that always indicates, independently of project characteristics, whether shareholder value will be created or not. On this account, NPV is recommended as the best method by almost all corporate finance textbooks worldwide.
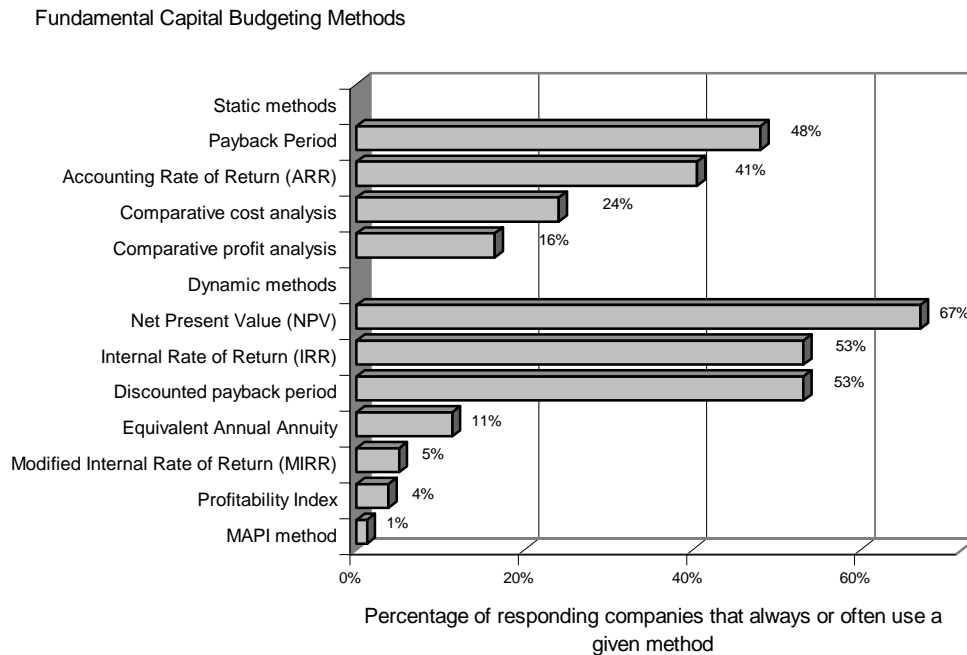
Fundamental Capital Budgeting Methods

Fig. 8. Survey responses to question 5:
How frequently does your company use the following capital budgeting methods?

For example, Brealey *et al.* (2006) write that companies could best help their shareholders by investing in all projects with a positive NPV and rejecting those with a negative NPV. Ross *et al.* (2005) give a short overview why the NPV method is superior to all other approaches. First, NPV uses cash flows instead of accounting figures. Second, NPV uses all the cash flows of a project and third, NPV discounts the cash flows properly. Moreover, the NPV method is able to establish an explicit connection between the NPV of a project and the firm value: The value of a firm rises with respect to a positive NPV and falls with respect to a negative NPV. It is proven in theory that no other prevalent capital budgeting method combines the same advantages of the NPV method. Although the theory clearly suggests the application of the NPV method only 67% of the German companies always or often use this approach so far. The two methods internal rate of return (IRR) and discounted payback period are also popular among practitioners. The two methods are always or often used by exactly 53% of the responding companies. Whereas the IRR method leads to similar results than the NPV method under particular circumstances, the discounted payback period mostly implicates different

outcomes compared to the NPV method. But also the IRR method contains several potential pitfalls as revealed by Brealey *et al.* (2006), for example.

For determining how up-to-date the practitioners are in Germany not only a comparison of theory and practice but also a comparison of our survey results with prior studies for Germany and recent international studies is necessary. Table 7 gives an overview of prior German and recent international studies. However, in general, it is not easy to draw meaningful conclusions from survey comparisons because most of the studies survey different target groups and therefore work with different samples that are hardly comparable. Moreover, the way the questions are asked is different from survey to survey. Nevertheless, we point out the most important distinctions between our survey, prior German surveys and current international studies. Surprisingly, the application frequency of the two static methods payback period and ARR constantly remains on a high level in Germany and has even risen for the latter (columns 3 to 7). But compared to the US, the UK, the Netherlands and France (columns 8 to 11) the payback period is fewer used by German companies. The reverse is true for the ARR method. It is most used among practitioners in Germany. This result maybe proves that accounting figures as fundament for capital budgeting decisions are still popular among German managers. The inferior comparative cost analysis method shows a better development: The usage of this method has fallen to its lowest level since only 24% of the responding companies always or often use it. However, the fact that 24% of the German firms still apply the comparative cost analysis and 16% the comparative profit analysis method is not a good result considering that these methods play no role abroad. Regarding the application frequency of the NPV method the progress is satisfying because our study reveals that 67% of the German companies always or often use this approach, the highest usage in practice ever. But this outcome must be slightly relativized considering that the latest US study from Ryan and Ryan (2002) revealed that already 85% of the US firms always or often apply the NPV method.

Table 7
Fundamental capital budgeting methods
Comparison of our survey results with prior studies for Germany and recent studies for the US, the UK, the Netherlands and France

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)		
	Authors (year published)	Grabbe (1976)	Bröer and Däumler (1986)	Wehrle-Streif (1989)	Brounen, de Jong and Koedijk (2004)	This study	Graham and Harvey (2001)	Ryan and Ryan (2002)	Arnold and Hatzopoulos (2000)	Brounen, de Jong and Koedijk (2004)		
	Country	Germany	Germany	Germany	Germany	Germany	US	US	UK	UK	Netherlands	France
Capital Budgeting Methods	Question	usage in %	usage in %	usage in %	usage always or almost always in %	usage always or often in %	usage always or almost always in %	usage always or often in %	usage always or mostly in %	usage always or almost always in %		
Static methods												
Payback period		66	50	37	50	48	57	53	46	69	65	51
Accounting Rate of Return		31	37	39	32	41	20	15	41	38	25	16
Comparative cost analysis		26	43	46	-	24	-	-	-	-	-	-
Comparative profit analysis		10	15	14	-	16	-	-	-	-	-	-
Dynamic methods												
Net Present Value		21	48	59	48	67	75	85	63	47	70	35
Internal Rate of Return		43	52	59	42	53	76	77	68	53	56	44
Discounted payback period		10	-	36	31	53	29	38	-	25	25	11
Equivalent Annual Annuity		7	23	25	-	11	-	-	-	-	-	-
Modified Internal Rate of Return		-	-	-	-	5	-	9	-	-	-	-
Profitability Index		-	-	-	16	4	12	21	-	16	8	38
MAPI method		1	1	1	-	1	-	-	-	-	-	-

It seems that the US companies are more progressive in the adoption of theory standards than their German counterparts. The development of the IRR and discounted payback period method in Germany is also interesting: While the trend shows a constant development for the former, the usage of the latter has enormously risen in recent years. This trend is observable similarly in the US and the UK. We assume that the discounted payback period method has become more popular among financial managers because on the one hand they have become more familiar with discounting techniques and on the other hand they are still averse to use the more sophisticated NPV method. It is furthermore noticeable that the usage of the IRR method in Germany lies far behind the one in the US and the UK. Considering that the IRR method is inferior compared to the NPV method, this outcome militates rather for Germany. Finally, we observe an amazing variety of fundamental capital budgeting methods for the evaluation of single investment projects. Blohm *et al.* (2006) constitute this variety, among other things, with personal preferences of decision makers and the application of different methods for different investment decision problems.

Further interesting results can be derived from examining the responses conditional on various firm and CFO characteristics as shown in table 8. Respondents were asked to score how frequently they use the different capital budgeting methods on a scale of 1 to 5 (1 meaning "never", 5 meaning "always"). DAX, MDAX and SDAX noted companies and firms with a market capitalization greater than 1,000 Mio. €are significantly more likely to use the more sophisticated capital budgeting methods NPV, IRR and modified internal rate of return (MIRR) and are significantly less likely to use the comparative cost analysis method. This outcome is not surprising considering that bigger companies have larger finance departments that are more able to spend time and manpower in complex investment decisions.

Table 8
Survey responses to question 5 conditional on various firm characteristics
Question 5: How frequently does your company use the following capital budgeting methods?
Cells with significant different means at the 1%, 5% and 10% level are shaded

Capital Budgeting Methods	% always or often	Mean	Index-Membership (CDAX)		Industry		Market Capitalization		Capital Expenditures		Debt-to-Equity Ratio	
			DAX, MDAX, SDAX	Others	Con-struction, Industrial	Others	Small < 1,000Mio €	Large >= 1,000Mio €	Low < 500Mio €	High >= 500Mio €	Low < 50%	High >= 50%
Static methods												
Payback period	48.10	3.22	3.15	3.31	3.15	3.25	3.41	3.08	3.33	3.21	3.19	3.40
Accounting Rate of Return	40.51	2.82	2.76	2.89	2.85	2.80	3.06	2.59	2.71	2.93	2.26	3.11**
Comparative cost analysis	24.05	2.51	2.22	2.86**	2.50	2.52	2.94	2.16***	2.65	2.14	2.63	2.43
Comparative profit analysis	16.46	2.11	1.93	2.31	2.10	2.11	2.29	1.97	2.24	1.79	2.26	2.00
Dynamic methods												
Net Present Value	67.09	3.79	4.15	3.37**	4.00	3.71	3.32	4.38***	3.86	4.43	3.96	4.03
Discounted payback period	53.16	3.17	3.37	2.94	3.45	3.07	3.00	3.49	3.37	3.36	3.44	3.40
Internal Rate of Return	53.16	3.12	3.63	2.51***	3.50	2.98	2.74	3.68**	3.31	3.36	3.00	3.66
Equivalent Annual Annuity	11.39	1.66	1.83	1.46	2.05	1.52	1.50	1.86	1.73	1.71	1.63	1.86
Modified Internal Rate of Return	5.06	1.25	1.51	0.94***	1.50	1.16	1.03	1.51**	1.18	1.86	1.37	1.34
Profitability Index	3.80	1.04	1.00	1.09	0.90	1.09	1.00	1.11	1.04	1.00	1.00	1.09
MAPI method	1.27	1.03	1.10	0.94	1.05	1.02	0.97	1.11	1.10	0.93	1.11	1.06

***,**,* denotes a significant difference at the 1%, 5% and 10% level, respectively

Table 8 (continued)

Capital Budgeting Methods	% always or often	Mean	Return on Equity		Age CFO		Tenure CFO		Education CFO	
			Low < 10%	High >= 10%	>= 50 years	younger	< 4 years	>= 4 years	Commercial	Other
Static methods										
Payback period	48.10	3.22	3.71	3.15	3.93	2.48***	2.82	3.25	2.90	3.11
Accounting Rate of Return	40.51	2.82	3.24	2.64	2.79	2.66	2.67	2.25	2.57	2.11
Comparative cost analysis	24.05	2.51	3.12	2.36**	2.14	2.28	2.24	2.20	2.31	1.78
Comparative profit analysis	16.46	2.11	2.29	2.09	1.93	2.00	2.06	1.60	1.95	1.33
Dynamic methods										
Net Present Value	67.09	3.79	3.71	4.04	4.14	4.03	3.88	4.40	3.83	4.56
Discounted payback period	53.16	3.17	2.88	3.49	3.29	3.38	3.42	2.75	3.07	3.33
Internal Rate of Return	53.16	3.12	2.47	3.60**	3.14	3.59	3.70	3.00	3.21	3.89
Equivalent Annual Annuity	11.39	1.66	1.35	1.85	1.79	1.79	1.61	1.75	1.76	1.44
Modified Internal Rate of Return	5.06	1.25	1.12	1.40	1.86	1.31	1.58	1.10*	1.50	1.00
Profitability Index	3.80	1.04	0.94	1.06	0.93	1.17	1.00	1.15	1.00	1.33
MAPI method	1.27	1.03	0.94	1.11	0.93	1.17	1.15	0.95	1.12	0.89

***,**,* denotes a significant difference at the 1%, 5% and 10% level, respectively

The fact that there is no connection between the amount of capital expenditures or investments annually made by a firm and the application of capital budgeting methods is indeed remarkable. The same is valid at the 5% significance level for the industry membership, the debt-to-equity ratio with the exception of the ARR method, the CFO tenure and the CFO education. However, the main intention of our paper is to examine whether certain capital budgeting methods have a positive or negative impact on corporate performance. The return on equity figure in table 8 indicates that firms with a higher return on equity are significantly more likely to use the IRR method and significantly less likely to use the comparative cost analysis method. It also makes sense to examine the ranking of capital budgeting methods with the highest application in practice conditional on firms which have achieved a return on equity higher than 10%. It is striking that these firms primarily use the dynamic methods NPV (rating of 4.04), IRR (rating of 3.6) and discounted payback period (rating of 3.49) before the rely on static methods like the payback period method (rating of 3.15). We investigate in the subsection "Impact of Capital Budgeting Methods on Corporate Performance" whether the NPV method really has a positive impact on corporate performance in contrast to the other three methods. Regarding the age of the CFOs we find out that younger CFOs (younger than 50 years) use the payback period method significantly fewer than their older counterparts. This result could indicate that the importance of the static methods in practice will decrease in future. Interestingly, firms which employ younger CFOs primarily rely on the dynamic methods NPV (rating of 4.03), IRR (rating of 3.59) and discounted payback period (rating of 3.38) as well as firms with a higher return on equity as mentioned above.

Next we will have a look at the consideration of risk in capital budgeting methods. The risk adjustment methods can be classified into three groups. Thereby it is of particular importance that the application of these methods is not mutually exclusive and therefore it could be reasonable to use more of them for each single investment decision simultaneously. The first

group contains risk adjustment methods that try to manage the uncertainty of future cash flows. The second group exclusively includes methods that address the individual risk tolerance of investors as well as market-determined risk premiums or certainty equivalents. Capital budgeting techniques which take the sequential nature of decision-making into account and therewith incorporate risk are summarized in the third and last class. Figure 9 demonstrates the results for the three risk adjustment methods. Obviously, the methods that account for the uncertainty of future cash flows are the most popular among practitioners in Germany. In this connection, the almost similar approaches scenario analysis (54% always or often use this method), sensitivity analysis (52%) and risk analysis[1] (51%) are most widespread in practice. The standard corporate finance textbooks don`t look upon a specific one as predominant. But they describe the purpose of the three similar approaches and make recommendations for which problems they should be applied. Brealey *et al.* (2006) state that the sensitivity analysis considers in turn each of the determinants of the project`s success and recalculates NPV at very optimistic and very pessimistic levels of that variables. Hence, the main purpose of it is to identify the sensitivity of NPV to various project determinants. However, because of the fact that the sensitivity analysis treats each variable in isolation when, in reality, the different variables are likely to be related (Ross *et al.*, 2005), it is necessary to resort to the more realistic scenario analysis. Unlike the sensitivity analysis, the scenario analysis allows for dependencies between the determinants of the project`s success. The scenario analysis is therefore an enhancement of the sensitivity analysis and estimates the NPV of the project under different scenarios and compares these results with the expected base case. But also the scenario analysis does not sufficiently cover all sources of variability because it is restricted to only a few particular scenarios which could be derived from current developments in the global and domestic economy or from the prevailing situation in the

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[1] The notation "Risk Analysis" is usual in German textbooks whereas the same method is known as "Monte Carlo Simulation" in English ones. The outcome of our survey that only 3% of our responding companies always or often use the Monte Carlo simulation (not included in figure 9) while 51% always or often use the risk analysis method proves that the notation "Monte Carlo Simulation" is not known by German managers.

industry, for instance. On account of this Brealey *et al.* (2006) clearly recommend the application of the risk analysis (Monte Carlo simulation) if a company insists on a detailed analysis of complex future cash flows combinations. They have the opinion that if a company wants to go whole hog and look at all possible combinations of variables, then it will probably use risk analysis to cope with the complexity.

Risk Consideration in Capital Budgeting Methods regarding.....
(Risk Adjustment Methods)

Percentage of responding companies that always or often use a given method
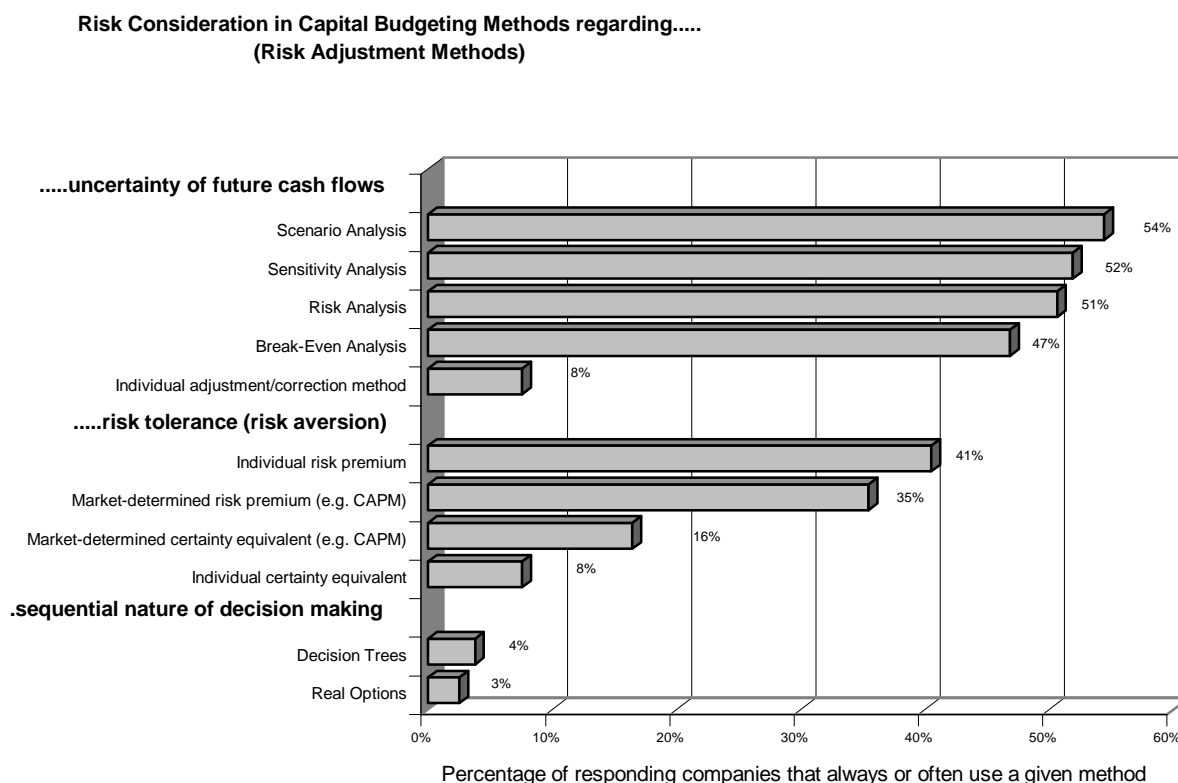
Fig.9. Survey responses to question 6:
How frequently does your company use the following capital budgeting methods when incorporating the uncertainty of future cash flows?

Ross *et al.* (2005) agree thereby with Brealey *et al.* by saying that the Monte Carlo simulation provides a more complete analysis and goes beyond sensitivity or scenario analysis, at least in theory. Considering that only 67% of the responding companies in our sample use NPV analysis, it is a satisfying result that all three methods are always or often used by more than 50% of them.

Nevertheless, the uncertainty of future cash flows is just one form of risk that appears in capital budgeting decisions. Once one has determined sound cash flow estimates with sensitivity, scenario or risk analysis it is also necessary to adjust either the expected cash

flows or the discount rates for the individual or market-induced risk tolerance. Before we show how this is done in practice, we would like to clarify that both the certainty equivalent and the risk premium approach must lead to equal results indifferent whether they incorporate individual or market-induced risk preferences. This is proven by Drukarczyk and Schüler (2007). Considering that 41% of the sample firms apply individual risk premiums and 35% market-determined risk premiums (e.g. CAPM) it is obvious that the firms in Germany prefer risk premiums to certainty equivalents. It is not surprising that the majority uses individual risk premiums bearing in mind that this approach mirrors subjective risk preferences that are mostly determined by the rule of thumb. Nevertheless, the fact that 35% of the German companies work with market-determined risk premiums is a good sign and shows that not all companies rely on individual risk premiums but rather use market objectified ones. Even though the individual and market-determined approach could theoretically lead to identical results when the individual risk preferences exactly equal the market-determined ones we find that the firms should primarily use the two market-determined approaches because they are less susceptible to manipulation, better comprehensible, market-oriented and therefore more objective than the two individual ones. Our statement is thereby supported by the prevailing opinion in the literature. In particular the standard American corporate finance, investment and valuation textbooks Bodie, Kane and Marcus (2005), Brealey *et al.* (2006), Koller *et al.* (2005) and Ross *et al.* (2005) consistently suggest the application of the two market-determined approaches and ignore the two individual methods completely. The same is done by the popular standard German capital budgeting textbook Kruschwitz (2005). Drukarczyk and Schüler (2007) don`t ignore the individual methods but make a clear recommendation for the market-determined approaches. On account of this, we have to relativize a little bit our conclusion from above. Of course, it is a good sign that 35% of the German companies work with market-determined risk premiums, but considering that the majority of them use individual risk premiums and that the literature consistently suggests market-determined ones

this result is not satisfying and should be improved. In particular because of the fact that almost 60% of our sample firms generally don`t adjust either the expected cash flows or the discount rates for the individual or market-induced risk tolerance.

Until now we have only discussed the first two groups of risk adjustment methods. But besides determining sound cash flow estimates with sensitivity, scenario or risk analysis and adjusting either the expected cash flows or the discount rates for the individual or market-induced risk tolerance, there also exists with the sequential nature of decision making a third group that contributes to the value of an investment project and that is able to manage risk exposure. The difference of this group to the first two ones is that it doesn`t ignore the adjustments that a firm can make after a project is accepted, or in other words, it allows managers to actively take corrective action if an investment project goes poorly or to expand or extend such a project if it is highly successful. In the literature the sequential nature of decision making is also described as managerial flexibility. The two approaches that are able to capture the value of managerial flexibility are the decision trees analysis (DTA) and the real option valuation (ROV) method. Brealey *et al.* (2006) say that one implicitly assumes that a firm will hold the project passively or in other words, one ignores the real options attached to the project - options that sophisticated managers can take advantage of - when one uses NPV to value a project. Koller *et al.* (2005) state that managerial flexibility represents a certain value, but a single projection or even multiple cash flows scenarios cannot calculate what that value is. That managerial flexibility implies in fact a certain value should be easier to understand when considering that projects which can be actively modified during their duration are more valuable than those that do not provide such a scope. In this respect, NPV underestimates the true value of a project (Ross *et al.*, 2005). The value of this flexibility is thereby higher, the riskier a project is. Both, the DTA and the ROV, are useable methods to assess the value of managerial flexibility in investment decisions whereas the latter is superior to the former because the real option valuation method allows for the circumstance that

options in investment decisions either enlarge the range of possible outcomes and therefore increase the risk of a project or reduce the spread of possible results and therefore decrease the risk of an investment. Brealey *et al.* (2006) write about this topic that there is no single and constant discount rate for options because the risk of the option changes when time and the price of the underlying asset change. They furthermore write that there is no single discount rate inside a decision tree, because if the tree contains meaningful future decisions, it also contains options. Finally, they state that the market value of the future cash flows described by the decision tree has to be calculated by option pricing methods. Hence, Brealey *et al.* clearly suggest the application of ROV in practice. On the other hand Koller *et al.* (2005) have the opinion that the answer to the question whether DTA or ROV is the best suitable approach depends on the form of uncertainty and data availability. Nevertheless, in this case, we agree rather with Brealey *et al.* than with Koller *et al.* because ROV always delivers correct results while DTA is appropriate for valuing flexibility only under particular circumstances. We carry out the comparison of theory and practice for the sequential nature of decision making (managerial flexibility) in such an extensive way although this group has almost no relevance in practice as shown in figure 9 (only 4% of our responding firms always or often use the DTA and only 3% the ROV method, respectively) because we would like to stay abreast of changes in corporate financial research. There is no question that the international development in the field of capital budgeting more and more goes towards real option valuation. Of course, the fact that DTA and ROV play no role in practice in Germany rises the question what is causal for the poor practice implementation in our country. We assume that the contradictory positions of the standard German capital budgeting and valuation textbooks towards the ROV method could be responsible for this backwardness. Whereas Drukarczyk and Schüler (2007) and Blohm *et al.* (2006) exclusively examine the DTA and not also the ROV method, Kruschwitz (2005) discusses both, the DTA and the ROV, to a great extent. But Kruschwitz (2005) denotes the ROV approach as "meander" and

strongly criticizes it because the underlying asset of a real option is a real asset that is neither infinitely divisible nor freely traded. He notes furthermore that, on this account, it is not possible to duplicate real options in the same way as it is feasible for stock options. Therefore it would be a blunder to simply adopt valuation formulas established in the theory of stock options also for the valuation of real options. In contrast, Schäfer (2004) and Ernst *et al.* (2003) patronize the ROV method. Schäfer (2004) even argues that a simple mathematical application of ROV is definitely able to improve the decision-making process due to a possible distinctive misinterpretation of investment projects evaluated only by the NPV method. We have already stated above that the NPV method always underestimates the true value of a project when real options are inherent in it. Ernst *et al.* (2003) reconsider that the ROV approach significantly contribute to the valuation of companies in many cases despite its known shortfalls. In contrast to the contradictory positions in the German literature, all standard American textbooks agree on the usefulness and benefits of the ROV approach. Brealey *et al.* (2006), for example, give a clear answer why the ROV method still makes practical sense although one can no longer rely on arbitrage arguments to justify the use of option models. He invalidates the criticism of Kruschwitz by stating that investors would pay for a real option based on the project the same as for an identical traded option written on a security or portfolio with identical risk. In addition, they indicate that such a traded option does not have to exist; it is enough to know how it would be valued by investors. In summary, one can say that the theoretical problem of real options, that they can`t be duplicated by their underlying real assets, can be healed by duplicating them instead with freely traded securities or portfolios with the same risk characteristics. Because of the fact that this key assumption also supports the use of the NPV and the discounted cash flow method, we find that it is more than justified to assign it also to the real option valuation method. In the end we agree with Brealey *et al.* (2006) who state that if one can identify real options, one will be a more sophisticated consumer of discounted cash flow analysis and better equipped to invest ones

company`s money wisely.

We contrast our survey results regarding the risk consideration in capital budgeting methods not only with theory suggestions but also with prior German and recent international studies for detecting whether the application of recommended risk adjustment methods has been improved by German practitioners in recent years and whether they are competitive in the international context. We summarize the most important prior domestic and recent international studies in table 9. However, the interpretation of distinctions between surveys should be handled with care as we have already described above. Nevertheless, we have the ability to identify trends in the application frequency of risk adjustment methods in Germany and the ability to point out the most important distinctions between our survey and other international studies. Table 9 reveals the sound outcome that the application of the three related methods scenario, sensitivity and risk analysis has considerably risen in Germany in recent years. But the big increase from 0 to 51% regarding the application frequency of the risk analysis is somewhat surprising. We guess that most of our respondents didn`t affiliate the risk analysis with the Monte Carlo simulation but rather with an individual subjective form of risk consideration. We therefore assume that there is an upward bias inherent in this answering possibility and that the real percentage of German firms that always or often use the risk analysis is much lower in reality. Our assumption about this outcome is backed up by the two US studies from Trahan and Gitman (1995) and Ryan and Ryan (2002) that show that even in the US not more than 31% firms in 1995 and 19% in 2002, respectively, have applied the risk analysis. However, considering that in the UK the scenario and the sensitivity analysis are used by 85% of the firms and that in the US and Canada the latter is still used by 65% and 60% of the companies, respectively, it becomes apparent why the German firms have an enormously backlog demand regarding the usage of these methods. Interestingly, the break-even analysis more and more becomes popular among German practitioners as a risk measure although this method plays no role in Canada, in the US and in the UK. We criticize this trend

in our country under the assumption that the break-even analysis is mainly used to determine the break-even point required for an accounting profit instead of calculating it for the crucial net present value. Ross *et al.* (2005) explain that companies that break even on an accounting basis are really losing money and therewith also the opportunity cost of the initial investment. But also when properly applied, the break-even analysis is only a complement to the sensitivity analysis and therefore not able to independently incorporate the complete risk of a project. It is remarkable that our survey is the only one, besides the study from Trahan and Gitman (1995) for the US, that asks whether the firms apply market-determined risk premiums (e.g. CAPM) for considering risk in capital budgeting methods. The result to this question that only 35% of the firms in our sample always or often use market-determined risk premiums is particularly striking when considering the following two points: First, although we reveal in subsection 4.2.1 that almost three-fourths of our respondents determine their cost of equity with the CAPM it seems that they don`t employ this discount factor also in capital budgeting methods. Second, instead of using the CAPM to get an objective figure about the risk tolerance of investors the majority of the German firms merely rely on individual risk premiums. It seems that the German companies thereby follow international standards, seeing that the surveys for Canada, the US and the UK indicate that only individual risk premiums are consulted for incorporating the risk tolerance of investors. However, the fact that the German companies use more and more risk premiums to consider the risk tolerance of investors, reports all in all a good development even though the application of market-determined risk premiums is rather suggested by theory than the usage of individual ones. Furthermore it is interesting that the two approaches that represent the sequential nature of decision making, decision trees and real options, nearly have no relevance in practice not only in Germany but also in the US and especially in the UK although in particular the standard American corporate finance textbooks suggest their use in practice. Hence, in this case, the German managers lie not far behind their counterparts in English-speaking countries.

Table 9

Risk consideration in capital budgeting methods

Comparison of our survey results with prior studies for Germany and recent studies for Canada, the US and the UK

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Authors (year published)	Bröer and Däumler (1986)	Wehrle-Streif (1989)	This study	Payne, Heath and Gale (1999)	Trahan and Gitman (1995)	Payne, Heath and Gale (1999)	Ryan and Ryan (2002)	Pike (1996)	Arnold and Hatzopoulos (2000)
	Country	Germany	Germany	Germany	Canada	US	US	US	UK	UK
Risk Consideration in Capital Budgeting Methods regarding…. (Risk Adjustment Methods)	Question	usage in %	usage in %	usage always or often in %	usage in %	usage in %	usage in %	usage always or often in %	usage in %	usage in %
....uncertainty of future cash flows										
Scenario Analysis		31	33	54	-	37	-	42	95	85
Sensitivity Analysis		39	36	52	60	63	52	65	88	85
Risk Analysis		-	-	51	-	31	-	19	-	-
Break-Even Analysis		21	46	47	-	-	-	-	-	-
Individual adjustment/correction method		26	-	8	-	46	-	-	-	46
....risk tolerance (risk aversion)										
Individual risk premium		9	14	41	49	48	47	-	65	52
Market-determined risk premium (e.g. CAPM)		-	-	35	-	30	-	-	-	-
Market-determined certainty equivalent (e.g. CAPM)		-	-	16	-	-	-	-	-	-
Individual certainty equivalent		-	-	8	-	-	-	-	-	-
....sequential nature of decision making										
Decision Trees		-	-	4	-	26	-	8	-	-
Real Options		-	-	3	-	-	-	5	-	-

Finally, we conclude that the German managers are only restricted competitive in the international comparison since especially the usage of the scenario and the sensitivity analysis is not satisfying. In addition, our argumentation should not belie that there still exists a big theory-practice gap not only in Germany but also international regarding the implementation of risk adjustment methods suggested by theory.

More important conclusions can be drawn by examining the responses conditional on various firm and CFO characteristics as shown in table 10. Similar to the fundamental capital budgeting methods we have asked our respondents to score how frequently they use different risk adjustment methods on a scale of 1 to 5 (1 meaning "never", 5 meaning "always"). DAX, MDAX and SDAX noted companies and firms with a market capitalization greater than 1,000 Mio. €are significantly more likely to use the more sophisticated risk adjustment methods risk analysis, sensitivity analysis, market-determined risk premium (e.g. CAPM), decision trees and real options. Therefore it becomes apparent that larger firms more regularly use superior capital budgeting methods which account for risk than smaller ones. This result is not astonishing considering that for bigger companies larger human resources and financial budgets are available. The results for the firm attribute capital expenditures are especially remarkable. The risk adjustment methods that are preferred by the existing literature are more often applied by companies with an annual investment budget greater than 500 Mio. € In this connection, the large distance between companies with a high annual investment budget and such with a low one is particularly noticeable. The methods sensitivity analysis (rating of 4.36– the highest single rating in table 10), risk analysis (4.21), scenario analysis (4.14), market-determined risk premium (4.07), decision trees (2.36), individual certainty equivalent (2.29) and real options (1.79) are much more often used by firms with a budget greater than 500 Mio. € Interestingly, companies that belong to the industry construction and industrial are not distinguishable from other companies regarding this issue.

Table 10
Survey responses to question 6 conditional on various firm characteristics
Question 6: How frequently does your company use the following capital budgeting methods when incorporating the uncertainty of future cash flows?
Cells with significant different means at the 1%, 5% and 10% level are shaded

Risk Consideration in Capital Budgeting Methods regarding… (Risk Adjustment Methods)	% always or often	Mean	Index-Membership (CDAX)		Industry		Market Capitalization		Capital Expenditures		Debt-to-Equity Ratio	
			DAX, MDAX, SDAX	Others	Con-struction, Industrial	Others	Small < 1,000Mio €	Large >= 1,000Mio €	Low<500 Mio €	High>=500Mio €	Low< 50%	High >= 50%
....uncertainty of future cash flows												
Scenario Analysis	54.43	3.21	3.44	2.94	2.85	3.34	3.03	3.51	3.08	4.14***	3.19	3.49
Break-Even Analysis	46.84	3.21	3.20	3.23	3.20	3.21	3.18	3.27	3.18	3.64	3.52	3.09
Risk Analysis	50.63	3.11	3.44	2.71**	3.40	3.00	2.62	3.68***	2.86	4.21***	2.81	3.49*
Sensitivity Analysis	51.90	3.05	3.61	2.40***	2.65	3.20	2.59	3.62***	2.92	4.36***	3.00	3.49
Individual adjustment/correction method	7.59	1.74	1.95	1.49	1.40	1.86	1.65	1.97	1.84	1.86	1.74	1.94
....risk tolerance (risk aversion)												
Individual risk premium	40.51	2.80	3.00	2.57	2.90	2.77	2.65	3.00	2.80	2.86	2.74	2.91
Market-determined risk premium (e.g. CAPM)	35.44	2.76	3.27	2.17***	2.65	2.80	2.26	3.46***	2.61	4.07***	2.41	3.40**
Market-determined certainty equivalent (e.g. CAPM)	16.46	1.93	2.07	1.77	1.55	2.07	1.68	2.22	1.92	2.14	1.96	2.00
Individual certainty equivalent	7.59	1.67	1.85	1.46	1.40	1.77	1.62	1.84	1.57	2.29**	1.56	1.89
..sequential nature of decision making												
Decision Trees	3.80	1.71	1.95	1.43**	1.85	1.66	1.50	2.03**	1.63	2.36**	1.59	1.91
Real Options	2.53	1.34	1.63	1.00***	1.35	1.34	1.09	1.65***	1.35	1.79*	1.19	1.66**

***,**,* denotes a significant difference at the 1%, 5% and 10% level, respectively

Table 10 (continued)

Risk Consideration in Capital Budgeting Methods regarding…. (Risk Adjustment Methods)	% always or often	Mean	Return on Equity		Age CFO		Tenure CFO		Education CFO	
			Low < 10%	High >= 10%	>= 50 years	younger	< 4 years	>= 4 years	Commercial	Other
....uncertainty of future cash flows										
Scenario Analysis	54.43	3.21	3.06	3.36	2.93	3.66*	3.52	2.95	3.40	2.78
Break-Even Analysis	46.84	3.21	3.29	3.23	2.93	3.24	3.00	3.20	3.31	2.44*
Risk Analysis	50.63	3.11	3.00	3.21	3.21	3.69	3.45	2.95	3.43	3.11
Sensitivity Analysis	51.90	3.05	3.06	3.26	3.57	3.55	3.42	3.05	3.29	3.56
Individual adjustment/correction method	7.59	1.74	1.65	1.89	1.86	1.83	1.97	1.50	2.02	1.33
....risk tolerance (risk aversion)										
Individual risk premium	40.51	2.80	2.59	2.89	2.93	3.21	2.97	3.35	3.19	2.56
Market-determined risk premium (e.g. CAPM)	35.44	2.76	2.76	3.02	3.36	3.41	3.18	3.05	3.05	3.44
Market-determined certainty equivalent (e.g. CAPM)	16.46	1.93	2.18	1.91	2.07	2.10	1.91	2.15	2.10	1.78
Individual certainty equivalent	7.59	1.67	1.71	1.72	2.21	1.55*	1.55	1.90	1.86	1.22
..sequential nature of decision making										
Decision Trees	3.80	1.71	1.82	1.79	2.00	1.83	1.94	1.75	1.98	1.11**
Real Options	2.53	1.34	1.12	1.55**	1.50	1.62	1.58	1.35	1.60	1.22

***,**,* denotes a significant difference at the 1%, 5% and 10% level, respectively

Furthermore, the answer to the question of whether firms with a debt-to-equity ratio higher than 50% are more cautious in capital budgeting decisions than the residual firms in our sample is a matter of particular interest. We find the answer by checking whether high-leveraged firms are significantly more likely to use the most theory recommended risk adjustment methods. We come to the conclusion that they are in fact more careful in such important decisions because they use the three most theory recommended methods risk analysis, market-determined risk premiums and real options significantly more often than low-leveraged firms. Therefore one can summarize that there is a connection between firm size, capital expenditures and debt-to-equity ratio on the one hand and risk adjustment methods on the other hand. However, the main intention of our paper is not to evidence such a connection but rather to examine whether certain capital budgeting methods have a significantly impact on corporate performance. On this account it is necessary to examine the connections between the risk adjustment methods and the return on equity figure as a proxy for corporate performance. Surprisingly, table 10 shows only for the ROV method are significantly higher usage by firms with a higher return on equity. Of course, it is possible that the ROV method is

the only one among the risk adjustment methods that has a positive impact on corporate performance but it is not very likely. Hence it is mandatory to further investigate whether other approaches have also a positive impact on corporate performance. We examine this issue later on in the subsection "Impact of Capital Budgeting Methods on Corporate Performance". Furthermore it is obviously that companies that have achieved a return on equity greater than 10% primarily use methods that account for the uncertainty of future cash flows. The ranking for these firms reveals that they mostly apply the scenario analysis (rating of 3.36), followed by the sensitivity analysis (3.26), the break-even analysis (3.23) and the risk analysis (3.21). The market-determined risk premium which represents the first approach in the ranking that doesn`t belong to the prior group ranges first on the 5th place with a score

of 3.02. For the three CFO characteristics CFO age, CFO tenure and CFO education it is hard to draw meaningful conclusions since for these categories only one significant difference at the 5% level is recognizable. This distinction thereby indicates that commercial educated CFOs are more likely to use decision trees than others. Nevertheless, we can take from table 10 that younger CFOs are more likely to use the scenario analysis and are less likely to apply individual certainty equivalents at the 10% level. It is also worth mentioning that the risk analysis is the most popular method of younger CFOs (rating of 3.69) and the sensitivity analysis the most popular one of their older colleagues (rating of 3.57). This outcome could indicate that the risk analysis will maybe become more important in the future.

Valuation of Mergers & Acquisitions

In this subsection we focus on mergers & acquisitions (M&A), one of the most important but also complex and difficult field in corporate finance. Until now, we have only discussed capital budgeting and risk adjustment methods that are particularly suitable for the valuation of single investment projects , e.g. building a new plant or buying a new machine. But these projects are only one part of capital budgeting. In recent years the growth capabilities of companies by investing into in-house projects has more and more diminished since many of them have already tapped the full potential of internal reorganizations, flexible operational processes and modern information systems. Therefore, if the management nevertheless wants to create shareholder value it faces the choice either to invest in further time-consuming and strenuous product developments or to expand by an acquisition. Considering the long-lasting boom in the German corporate control market, where mergers and acquisitions belong to, it is obviously that more and more domestic corporate leaders have selected to grow by acquisitions. But this strategy is not easy to pursue since the realization of mergers and acquisitions is quite complex and needs much interdisciplinary knowledge. This is proven by the fact that more than 50% of all mergers and acquisitions don`t generate the desired value added and return although they are denoted as the "supreme discipline" of investment banking

and corporate finance (Picot, 2005). On this account the valuation of a company plays a decisive role for the decision making in the planning phase of a M&A project. Therefore, it is necessary that all in the decision making involved parties, e.g. acquiring firm, target firm and diverse M&A consultants, apply the most theory recommended valuation methods. We have surveyed for this reason whether the German managers, as a part of these involved parties, are state-of-the-art in corporate financial research, with respect to M&As. Figure 10 exhibits the interesting results to our question of how frequently German companies use specific valuation methods when deciding on crucial investment opportunities (e.g. M&A). We divide the valuation methods thereby into four groups: Discounted cash flow (DCF), residual income, multiples and net asset value.
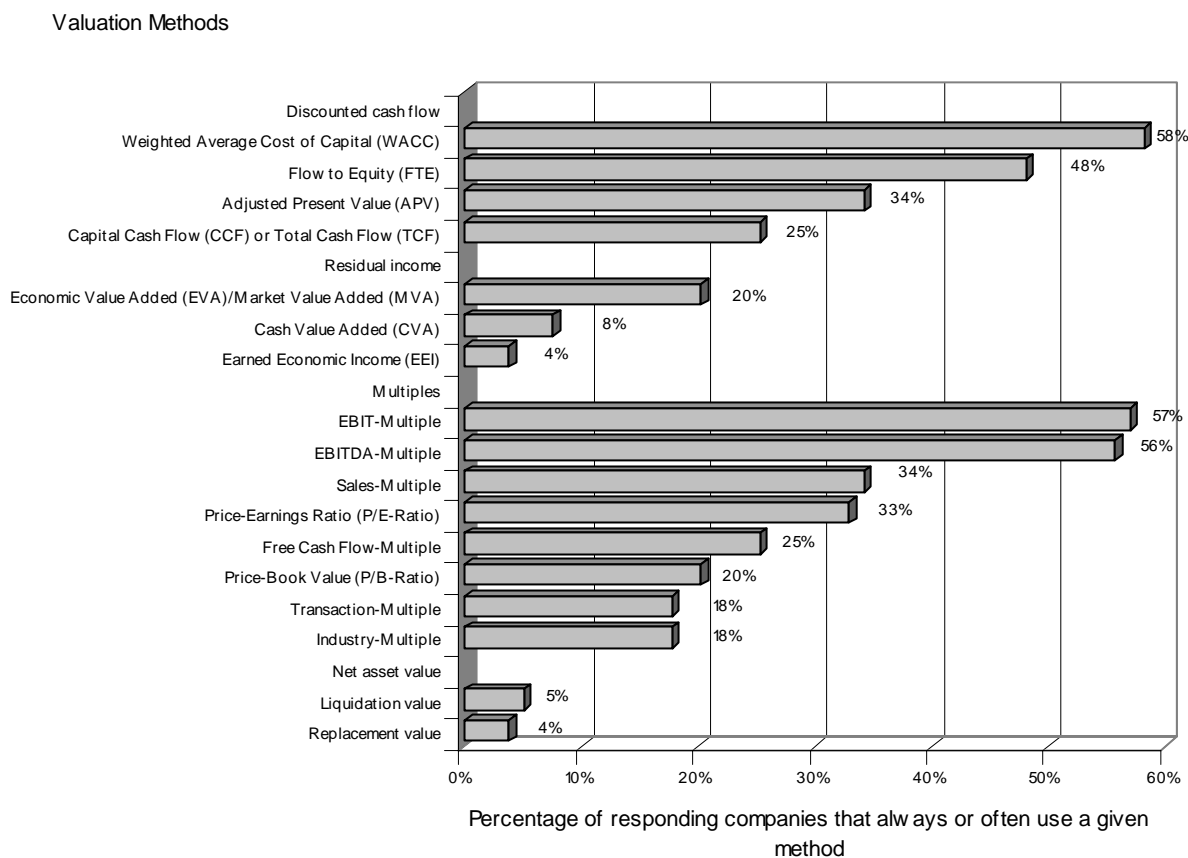
Valuation Methods

Fig. 10. Survey responses to question 7:
How frequently does your company use the following methods when deciding on crucial investment opportunities (e.g. Mergers & Acquisitions)?

Before we illustrate our results, we would like to point out that every acquisition is soever an investment under uncertainty. Ross *et al.* (2005) state in this connection that the basic principle of valuation applies: A firm should be acquired if it generates a positive NPV to the shareholders of the acquiring firm. All other standard American corporate finance and valuation textbooks, e.g. Brealey *et al.* (2006), Koller *et al.* (2005) and Rappaport (1998), subscribe to the view of Ross *et al.* and additionally suggest the application of DCF methods as the best tool for calculating the NPV of M&As. Koller *et al.* (2005), representative for the others, declare that the DCF analysis is the most accurate and flexible method for valuing projects, divisions and companies. The prevailing opinion in the German literature is, on the other hand, that a explicit corporate value doesn`t exist and that the most appropriate valuation method and therefore the real value depends on the purpose of the valuation. Moxter (1983) advanced this view first in his often cited book "Grundsätze ordnungsgemäßer Unternehmensbewertung" (Principles of Correct Corporate Valuations). Drukarczyk and Schüler (2007) and Ernst *et al.* (2003) here agree with the opinion from Moxter. We find that objective corporate values are primarily ascertainable with DCF methods and follow thereby the prevailing opinion in the American literature that the DCF approaches are superior to others. But the opinion that the best valuation method depends on the purpose of the valuation has also its eligibility, particularly within each of the four valuation method groups. After discussing some theory recommendations we present now the results of our survey, beginning with the first group, the DCF methods. Before doing this, it is worth pointing out that each of the following four DCF methods can be used to value either the firm as a whole or a single project. The difference of them to the fundamental capital budgeting methods, e.g. NPV, we have already presented above is that they treat the capital budgeting decision not separately from the capital structure decision and account therewith for financial leverage. The weighted average cost of capital (WACC) method that is always or often used by 58% of the sample firms is the most popular DCF method among practitioners in Germany. The flow to equity

(FTE) approach comes with 48% close on the second place, followed by the adjusted present value (APV) approach with 34% and the capital cash flow (CCF) method with 25%. It is difficult to interpret this order because all four methods have to lead to the same corporate values according to theory. This is proven by Drukarczyk and Schüler (2007). Considering this fact we reintroduce now our statement from above that the best valuation method depends on the purpose of the valuation, particularly within each of the four valuation method groups. This is definitely the case for the group of the DCF methods. One of the most important factors that indicate which of the four methods have to be applied is the capital structure policy pursued by a company. If a company pursues a fixed-debt policy (debt not tied to enterprise value), the APV approach is the best appropriate valuation method. If a company pursues a value-based policy (debt tied to enterprise value), the WACC method and the FTE approach are suitable. We thereby follow the following guideline edited by Ross *et al.* (2005): "Use WACC or FTE if the firm's target debt-to-value ratio applies to the project over its life" and "Use APV if the project`s level of debt is known over the life of the project". We have to parenthesize that we have disregard the CCF method, similarly to Ross *et al.*, because it is identical to the WACC method except for the drawback that its cash flows are not independent of financial leverage. When we contrast these theory recommendations with the result that 58% of the sample companies always or often use the WACC method and that at the same time 56% of them pursue a fixed-debt policy (see subsection 4.3.2) we come to the conclusion that some German managers must calculate corporate values incorrectly. Considering that more than a half of our respondents prefer a fixed-debt policy, it is definitely not satisfying that only 34% always and often use the APV approach, although it is superior to others in this case. Moreover, when a fixed-debt policy is pursued, both the WACC method and the FTE approach are not solvable on a stand-alone basis as shown by Drukarczyk and Schüler (2007). At the end of the first group, we have a closer look at the FTE approach which is applied by almost a half of the sample firms in our study although it hasn`t been

supported by theory suggestions in recent years as shown above. This is not a big surprise since the German pendant to the flow to equity approach, the "Ertragswert-Methode", was recommended by the German institute of certified public accountants (IDW) as the only appropriate valuation method for many years. Regarding the identity of the FTE approach, discussed primarily in the English literature, and the "Ertragswert-Methode" it must be pointed out that they are only similar under specific circumstances: The "Ertragswert-Methode" on the one hand, when applied in conjunction with individual risk premiums, makes the unrealistic assumption that investors own no assets additional to the investment project on the date of the decision making. Second, the investors are seen as taking on the entire risk of a capital budgeting project. The FTE approach on the other hand acts on the assumption that the investors are fully diversified, paying attention only on the covariance or systematic risk. Drukarczyk and Schüler (2007) write regarding this topic that the FTE approach could be denoted as the upper interval bound of realizable diversification and the "Ertragswert-Methode" as the lower interval bound, with a zero grade of diversification. Furthermore, they make indeed the clear statement that the assumption of the "Ertragswert-Methode" that investors don`t diversify their portfolios is not supported by empirical research and that therefore an acceptation of this assumption is not admissible. As a consequence of this, the "Ertragswert-Methode" is only identical to the FTE approach when applied in conjunction with market-determined risk premiums (e.g. CAPM), instead of individual ones. Moreover, only in this case, the two methods are in accordance with theory recommendations. When we consider on the one hand the result of figure 9 that the majority of our respondents apply rather individual risk premiums (41%) than market-determined ones (35%) and on the other hand the outcome of figure 10 that 48% of them always or often use the FTE approach at the same time we guess that some German managers don`t calculate corporate values according to theory. This doesn`t even mean that the corporate values calculated with the "Ertragswert-Methode" in conjunction with individual risk premiums are wrong but rather

that the corporate leaders in Germany primarily determine subjective corporate values instead of market objectified ones. Nevertheless, the prevailing opinion is, especially in the American literature, that the FTE approach leads to appropriate corporate values only when used together with market-determined risk premiums.

The group of the residual income valuation methods is the next category for which we exhibit the results of our survey. These methods are also known in the American literature as the economic-profit-based valuation models (e.g. Koller *et al.*, 2005). Normally, the residual income valuation methods are used for the performance measurement of a company and are therefore a key tool for the value-based management approach. But they can be applied also for the valuation of companies and single investment projects, respectively. Drukarczyk and Schüler (2007) write for instance that theory and practice of value-based management revert to residual income valuation methods to determine corporate values or the values of single projects, as well as the development of them over time, as basing point for capital allocation and manager salaries. Moreover, it must be pointed out that the residual income valuation methods are only identical to the DCF methods, regarding the NPV, on the date of the valuation. Thus, residual incomes don`t represent periodical changes in value. However, this is not important for the valuation of a company or a single project since only the value on the date of the valuation is a matter of particular interest. Therefore the residual income valuation methods can be seen as substitutes for the common DCF methods. But why should companies actually use these methods for the valuation of M&As and single projects when they lead to the same results as the DCF methods? Koller *et al.* (2005) give the answer to this question. He states that a shortfall of enterprise DCF is that each year's cash flow provides little insight into the company`s performance. Furthermore he mentions that declining free cash flow can signal either poor performance or investment for the future. The economic profit model on the other hand highlights how and when the company creates value as he further remarks. Figure 10 shows that 20% of the sample companies in our survey always or often apply the economic

value added (EVA), 8% the cash value added (CVA) and 4% the earned economic income (EEI) approach. The ranking of these three methods has thereby only a restricted significance because all three methods result in the same corporate value according to theory. This is proven by Drukarczyk and Schüler (2007). However, considering the low application rate of these methods in practice it seems that German managers still predominantly rely on accounting figures like earnings and ARR for performance measurement instead of implementing economic-profit-based valuation methods suggested for example by Drukarczyk and Schüler (2007), Koller *et al.* (2005) and Rappaport (1998). We conclude for this reason that the German managers are currently making the first step regarding the adoption of theory recommendations by implementing DCF methods. But they are far away to make also the second step by implementing the residual income valuation methods, which were derived from the DCF methods for performance measurement. Hence, the practitioners in Germany are only using the DCF methods for ex ante capital budgeting decisions and not also for ex post performance measurement via their derivatives, the residual income valuation models.

Multiples represent the next group of valuation methods that we examine in our study. Compared to the two sophisticated valuation methods, DCF and residual income, the multiple approach is more straightforward and easier to apply. This is probably the main reason why multiples are so popular among practitioners in Germany. The EBIT- and EBITDA-multiple are thereby the two multiples with the highest usage in practice. 57% of our respondents always and often apply the former and 56% the latter. The sales-multiple which is always or often used by 34% of our respondents ranks on the third place followed by the P/E-ratio (33%), the free cash flow-multiple (25%) and the P/B-ratio (20%). The two multiples with the lowest usage in practice are the transaction-multiple (18%) and the industry-multiple (18%), which is the only multiple based on nonfinancial figures. Subsequently, we are able to present only a short introduction to the theoretical fundamentals of multiples since it would go far

beyond the scope of this paper to introduce all academic principles regarding the valuation of firms by multiples. Additionally, the valuation textbooks Drukarczyk and Schüler (2007), Koller *et al.* (2005) and Ernst *et al.* (2003) provide a good benchmark of how multiples should be used in practice. Nevertheless, we find it appropriate to accent the most important guidelines for the application of multiples for being able to compare these theory suggestions with the survey results. The prevailing opinion in the international literature is that a careful multiple analysis benefits most when it is employed to check or verify the results of a DCF valuation instead of trying to determine corporate values independently. Drukarczyk and Schüler (2007) broaden this view by stating that the benefit of a multiple analysis depends on the quality of their ingredients. Koller *et al.* (2005) point out that a further advantage of a careful multiple analysis is that it can also generate insight into the key factors creating value in an industry. These two statements can be easily brought together when recognizing that the ingredients of the most important multiples like the EBIT- and the EBITDA-multiple are at the same time the key factors that create value in an industry. It is therefore decisive for the significance of a multiple analysis that the key value drivers are identical for the peer group and for the company that should be valued. Key value drivers for the EBIT multiple are, for example, the corporate income tax rate, the company`s growth rate determined by the return on invested capital (ROIC) and the reinvestment rate, the cost of capital and the capital structure policy. Moreover, it is important that all key value drivers are calculated in the same way. Thus, it is better to calculate the key value drivers by oneself than to rely on figures released to the public by companies in a peer group. Considering that it needs a lot of effort to collect and calculate all this data for a careful peer group analysis, it should not be surprising that the international literature consistently represents the opinion that a well-done industry multiple actually takes the same level of effort as a good set of cash-flow forecasts (Koller *et al.*, 2005). Koller *et al.* remark furthermore that although many claim that multiples are an easy-to-apply valuation method, the converse is true. After discussing general theory

instructions we investigate from now on the specific features of the multiples included in our survey. We start with the EBITDA-multiple. The EBITDA-multiple has the advantage that it considers the earning power of a company, that it mitigates problems with capital structure and one-time gains and losses and that it is least influenced by accounting regulations. Additionally, forecasts from analysts are normally available for this multiple. The EBIT-multiple has the same benefits as the previous one, except that it is influenced by depreciations and goodwill amortizations that are different for various accounting regulations like the German HGB, the US-GAAP and the IAS. The prevailing opinion in the international literature is that the EBITDA- and the EBIT-multiple are the best multiples which should be primarily used in practice. Regarding the selection of multiples Ernst *et al.* (2003) clearly state, for example, that it is recommendable to value companies on the basis of operational earnings (EBIT or EBITDA). Considering the high usage of these two multiples in practice we conclude that most of the German managers follow the theory suggestions in this case. However, the question is not only whether the German managers use the right multiples but also whether they apply them properly. We can`t give an answer to this question. But we can present the following four practices that give an benchmark of how to properly apply multiples, established by Koller *et al.* (2005): First, choose comparables with similar prospects for ROIC and growth. Second, use multiples based on forward-looking estimates. Third, use enterprise-value multiples based on EBITA to mitigate problems with capital structure and one-time gain and losses and fourth, adjust the enterprise-value multiple for non-operating items, such as excess cash, operating leases, employee stock options and pension expenses. We continue our investigation with the sales-multiple which is similar to the two EBIT-multiples. It has the drawback that it doesn`t consider the earning power of a company and is therefore negligible. Furthermore, the P/E-ratio and the P/B-ratio, both are often used by stock market analysts, are not appropriate to value companies because of the following disadvantages: The P/E-ratio is systematically affected by capital structure, its net

income is calculated after non-operating gains and losses and it is very much influenced by accounting regulations. The P/B-ratio is easily manipulable, backward-looking and it doesn`t consider the earning power of a company. Moreover, if forecasts from analysts were available for the free cash flow-multiple, it would be the best alternative to the two EBIT-multiples because it has the same benefits as the two. That the last two multiples are not frequently used in practice meets the standard in the international literature. The transaction-multiple which is tied to the date of the transaction has the drawback that it doesn`t correspond to actual market conditions after a short time. The industry-multiple is only then a good alternative to the other multiples when the same value drivers for revenues are significant for the peer-group as well as for the company that should be valued. Since this is only the case in few industries, e.g. wireless companies, the industry-multiple should be handled with care.

The last group for which we show the results of our survey is the category of the old-fashioned net asset value methods. Because these methods are out of date in the field of valuation it is a good sign that they are in Germany only rarely used in practice. This is proved by the survey results summarized in figure 10. The liquidation value is always or often applied by only 5% of the sample firms and the replacement value by only 4% of them. Whereas the application of the liquidation value can be justified in the case of a real liquidation the usage of the replacement value is unsuitable under the going concern principle. All things considered, we subscribe here to the view of Ernst *et al.* (2003) who state that for the valuation of companies under the going concern principle the net asset value methods are normally not appropriate. On this account, we resign to present a more detailed discussion of these two approaches in this paper.

Unlike the approach we have chosen for the fundamental capital budgeting and risk adjustment methods, for the valuation methods it doesn`t make sense to present the results from our survey and other German and international studies in a table, due to the fact that we have found only one survey from Germany that also covers this topic. This survey was first

published by Brösel and Hauttmann in April 2007. Before we describe the most important results from Brösel and Hauttmann (2007) in more detail we have to parenthesize that our survey outcomes, regarding the usage of the valuation methods in practice, confirm the findings from Brösel and Hauttmann for the most part. This is in particular the case for the ranking within the four valuation method groups. Brösel and Hauttmann (2007) found out for the group of the DCF methods that the largest German companies apply most of all the WACC method (87% usage in practice), followed by the FTE approach (40%), the APV approach (25%) and the CCF method (25%). Additionally, they determined that the EVA method leads on the group of the residual income valuation methods with an usage in practice of 30% and the liquidation value the group of the net asset value ones with an application rate of 36%. Furthermore, they came to the result that the most popular multiples among practitioners in Germany are the EBIT-multiples (79% usage in practice) followed by the sales-multiple (60%). Regarding the ranking within the four groups we have got exactly the same results as one can recall when considering the findings for the valuation methods summarized in figure 10. However, it is obvious that the percentage rates in the study from Brösel and Hauttmann (2007) are much higher for many valuation methods than the ones in our survey. Nevertheless, we assume that the results of both studies are comparable due to the fact that Brösel and Hauttmann (2007) asked their respondents whether they generally use a valuation method, whereas we have chosen a different approach by asking for the application frequency with the given answering possibilities "always", "often", "sometimes", "rarely" and "never". Thus, if we include also the answering possibilities "sometimes" and "rarely" in figure 10, we will roughly obtain the same results as Brösel and Hauttmann (2007). For this reason we conclude that our survey results for the valuation methods approximately correspond to the actual values in practice.

Just as for the fundamental capital budgeting and the risk adjustment methods, we also present the survey responses conditional on various firm and CFO characteristics for the

valuation ones as shown in table 11. We proceed thereby similar to the approach that we have chosen for the other two above-mentioned categories by asking our respondents to score how frequently they use different valuation methods on a scale of 1 to 5 (1 meaning "never", 5 meaning "always"). DAX, MDAX and SDAX noted companies and firms with a market capitalization greater than 1,000 Mio. €are significantly more likely to use the valuation methods weighted average cost of capital (WACC) and transaction-multiple and significantly less likely to use the flow to equity (FTE) approach and the EBIT-multiple. The fact that the FTE approach is much more often used by smaller firms than larger ones and that the same is reciprocally valid for the WACC method is especially interesting in this connection. Considering that the WACC method is more complex and time-consuming than the FTE approach and that larger companies have more financial and human resources this outcome is not surprising. However, in particular for smaller firms in Germany it should be important that they are up-to-date in the valuation of crucial investment opportunities (e.g. M&As) because unsuccessful mergers and acquisitions can be an impediment to growth. For fulfilling this condition it is primarily necessary for smaller firms in Germany to use the FTE approach according to theory recommendations. But we are in doubt whether this is the case in reality considering our assumption from above that some German managers probably don`t calculate corporate values according to theory. In addition, companies with a market capitalization greater than 1,000 Mio. €apply the capital cash flow (CCF) method at the 5% significance level less often than the smaller ones. Interestingly, the industry-membership plays no role for the application frequency of the valuation methods, at least for the sector construction and industrial. Especially remarkable are the results for the firm attribute capital expenditures. Companies with an annual investment budget higher than 500 Mio. €apply the adjusted present value (APV) approach and the CCF method highly significant less often than companies with a lower budget. However, this is not the only conclusion we can draw in this context.

Table 11
Survey responses to question 7 conditional on various firm characteristics
Question 7: How frequently does your company use the following methods when deciding on crucial investment opportunities (e.g. Mergers & Acquisitions)?
Cells with significant different means at the 1%, 5% and 10% level are shaded

Valuation Methods	% always or often	Mean	Index-Membership (CDAX)		Industry		Market Capitalization		Capital Expenditures		Debt-to-Equity Ratio	
			DAX, MDAX, SDAX	Others	Con-struction, Industrial	Others	Small < 1,000Mio €	Large >=1,000Mio €	Low< 500Mio €	High >= 500Mio €	Low < 50%	High >= 50%
Discounted cash flow												
Weighted Average Cost of Capital	58.23	3.37	3.95	2.69***	3.65	3.27	2.79	4.00***	3.49	4.07	3.59	3.71
Flow to Equity	48.10	3.00	2.61	3.46**	2.85	3.05	3.71	2.46***	3.06	2.79	2.70	3.20
Adjusted Present Value	34.18	2.47	2.32	2.66	2.75	2.38	2.65	2.27	2.76	1.29***	3.04	2.00**
Capital Cash Flow or Total Cash Flow	25.32	1.99	1.78	2.23	1.85	2.04	2.50	1.65**	2.41	1.14***	2.59	1.83*
Residual Income												
Economic Value Added / Market Value Added	20.25	2.20	2.46	1.89	2.35	2.14	2.03	2.46	2.41	2.43	1.81	2.91***
Cash Value Added	7.59	1.43	1.49	1.37	1.50	1.41	1.53	1.43	1.55	1.50	1.44	1.63
Earned Economic Income	3.80	1.16	1.00	1.34	1.10	1.18	1.38	1.00*	1.31	1.00	1.22	1.26
Multiples												
EBIT-Multiple	56.96	3.34	3.07	3.66*	3.65	3.23	3.68	3.08*	3.39	3.36	3.26	3.46
EBITDA-Multiple	55.70	3.30	3.41	3.17	3.65	3.18	3.09	3.41	3.22	3.57	3.30	3.29
Sales-Multiple	34.18	2.64	2.83	2.43	2.75	2.61	2.76	2.68	2.73	2.86	2.70	2.77
Price-Earnings Ratio	32.91	2.47	2.27	2.71	2.35	2.52	2.79	2.22	2.45	2.71	2.15	2.77*
Free Cash Flow-Multiple	25.32	2.28	2.34	2.20	2.25	2.29	2.21	2.38	2.37	2.50	2.19	2.57
Transaction-Multiple	17.72	1.91	2.32	1.43***	1.80	1.95	1.56	2.38**	1.92	2.57	1.59	2.43**
Price-Book Value	20.25	1.83	1.93	1.71	1.80	1.84	1.97	1.84	1.78	2.43	1.63	2.20
Industry-Multiple	17.72	1.59	1.61	1.57	1.55	1.61	1.76	1.54	1.51	2.07	1.44	1.80
Net asset value												
Liquidation value	5.06	1.42	1.51	1.31	1.60	1.36	1.38	1.46	1.27	1.93*	1.33	1.51
Replacement value	3.80	1.25	1.32	1.17	1.10	1.30	1.29	1.27	1.16	1.64	1.22	1.34

***,**,* denotes a significant difference at the 1%, 5% and 10% level, respectively

Table 11 (continued)

Valuation Methods	% always or often	Mean	Return on Equity		Age CFO		Tenure CFO		Education CFO	
			Low < 10%	High >= 10%	>= 50 years	younger	< 4 years	>= 4 years	Commercial	Other
Discounted cash flow										
Weighted Average Cost of Capital	58.23	3.37	3.18	3.74	4.43	3.62*	3.73	3.65	3.64	4.00
Flow to Equity	48.10	3.00	3.53	2.83*	2.43	2.72	3.06	2.05**	2.60	2.56
Adjusted Present Value	34.18	2.47	2.29	2.47	2.14	2.24	2.42	2.25	2.45	1.44***
Capital Cash Flow or Total Cash Flow	25.32	1.99	2.41	2.06	1.64	1.79	2.09	1.30*	1.86	1.44
Residual Income										
Economic Value Added / Market Value Added	20.25	2.20	2.59	2.32	2.57	2.45	2.55	2.10	2.52	1.78
Cash Value Added	7.59	1.43	1.59	1.51	1.71	1.34	1.55	1.30	1.57	1.22
Earned Economic Income	3.80	1.16	1.53	1.13	1.14	0.93	1.03	1.10	1.10	1.11
Multiples										
EBIT-Multiple	56.96	3.34	3.53	3.32	3.43	3.10	3.39	2.95	3.38	2.33*
EBITDA-Multiple	55.70	3.30	3.12	3.36	3.79	3.24	3.58	3.10	3.36	2.78
Sales-Multiple	34.18	2.64	2.29	2.89	3.21	2.72	2.73	2.55	2.67	2.00
Price-Earnings Ratio	32.91	2.47	2.59	2.45	2.57	2.45	2.52	2.25	2.62	1.67*
Free Cash Flow-Multiple	25.32	2.28	2.18	2.45	2.50	2.52	2.42	2.15	2.36	1.89
Transaction-Multiple	17.72	1.91	1.53	2.23**	2.36	2.28	2.12	2.10	2.12	2.11
Price-Book Value	20.25	1.83	1.76	1.96	2.00	2.10	2.09	1.70	2.02	1.33
Industry-Multiple	17.72	1.59	1.29	1.74	1.64	1.69	1.42	1.70	1.62	1.00
Net asset value										
Liquidation value	5.06	1.42	1.18	1.49	1.43	1.62	1.64	1.00*	1.55	1.11
Replacement value	3.80	1.25	1.06	1.34	1.21	1.45	1.39	1.00	1.36	1.11

***,**,* denotes a significant difference at the 1%, 5% and 10% level, respectively

Due to the low rating of the APV approach and the CCF method (1.29 and 1.14, respectively), one can easily see that companies with larger capital expenditures almost never use these two methods. Considering that for a fixed-dept policy the APV approach is the best appropriate valuation method and that more than a half of our respondents prefer such a policy it more and more becomes apparent that some German managers must calculate corporate values incorrectly, particularly when deciding on crucial investment decisions (e.g. M&As). The fact that some German practitioners determine corporate values, especially for larger investment projects, incorrectly is one of the most important conclusions of our paper. Regarding the connection between the debt-to-equity ratio and the valuation methods it is noticeable that high-leveraged firms are at the 5% level significantly less likely to use the APV approach and significantly more likely to use the EVA concept and the transaction-multiple. The question why high-leveraged firms follow this pattern is of course justified. In particular for the APV approach and the EVA concept it is difficult to interpret this outcome. We guess that corporate leaders of high-leveraged firms probably resign to use the APV approach, due to the fact that it divides the corporate value into the value of an unlevered firm plus the value of financing side effects. This division implicates, among other things, that the value contribution generated by the operational business (value of an unlevered firm) as well as by debt financing becomes apparent. But managers of high-leveraged firms probably have no interest to reveal this information, e.g. during M&A negotiations, because otherwise everyone would receive an impression how less value is generated by the operational business compared to the financing side effects. This circumstance could also be responsible for the frequent usage of the EVA method, among high-leveraged firms, since it doesn`t split the corporate value in its two elements but rather directly determines the corporate value by discounting residual incomes with the weighted average cost of capital (WACC). Furthermore, we have to admit that we can`t find a sound answer to the question why high-leveraged firms use the transaction-multiple more often than low-leveraged ones. After all, we

find that the connection between the debt-to-equity ratio and the valuation methods should be a topic for further academic research. However, the connection between the valuation methods and the return on equity figure as a proxy for corporate performance is much more important for the purpose of our paper to prove that certain capital budgeting methods have a significant impact on corporate performance. Table 11 exhibits the surprising result that at the 5% level only the transaction-multiple is applied more often by companies which have achieved a return on equity higher than 10%. Table 11 reveals furthermore that more successful companies are less likely to use the FTE approach, but this connection is significant only at the 10% level. Moreover, also the ranking within the group of the more successful companies can provide answer to the question which valuation methods have a significant impact on corporate performance. This ranking reveals that they mostly apply the WACC method (rating of 3.74), followed by the EBITDA-multiple (3.36), the EBIT-multiple (3.32) and the sales-multiple (2.89). The FTE and the APV approach range first on the 5th and the 6th place with a score of 2.83 and 2.47, respectively. The fact that companies which have achieved a return on equity higher than 10% heavily rely on multiples, besides the WACC method, is of course a big astonishment. Hence, it seems that the WACC method, the EBITDA-multiple, the EBIT-multiple, the sales-multiple and the transaction-multiple rather have a positive impact on corporate performance and the FTE and the APV approach rather a negative one. However, it is not very likely that these valuation methods are the only ones that have an influence on corporate performance. In fact, it is mandatory to further investigate whether other methods also influence the success of a company and whether our assumptions, that we have already made for the correlation between some valuation methods and corporate performance, are true. We examine this issue in the next subsection "Impact of Capital Budgeting Methods on Corporate Performance". For the three CFO characteristics CFO age, CFO tenure and CFO education it is hard to draw meaningful conclusions as for these categories only two significant differences at the 5% level are recognizable. The first

distinction indicates that CFOs without a commercial education use the APV approach highly significant less often than CFOs with such a background. This outcome should not be surprising, due to the fact that the application of the APV approach according to theory recommendations needs a lot of business knowledge. Considering that many German CFOs weren't able to study the APV approach during their university education it is easier to understand why the APV approach hasn`t established oneself among practitioners in Germany as our study reveals throughout the paper. The second distinction reveals that CFOs which remain in their position for more than 4 years are significantly less likely to apply the FTE approach. We have to admit that we couldn`t find a persuasive explanation for this finding. Finally, it is also worth mentioning that CFOs without a commercial education are at the 10% level less likely to use the EBIT-multiple and the P/E-ratio.

Impact of Capital Budgeting Methods on Corporate Performance

We have already analyzed for the population and the sample that there have to be other company specific influencing factors besides the selected firm characteristics which are able to explain the sample variation in the return on equity as well as in the total investment return figure. Table 12 proves that particular capital budgeting methods really have an impact on corporate performance when always or often used as shown by the four multiple regression results. Before we interpret the results of theses four models we have to mention that the capital budgeting methods incorporated in table 12 are, of course, not the only ones that can have an impact on corporate performance. These methods have been included as independent variables in the four regression models because only for them a statistically significant influence, at least at the 10% level, is verifiable. In other words, only such capital budgeting methods have been incorporated in the four models for which an impact on corporate performance can be proven statistically. We primarily use the results of these four multiple regression models to examine whether the usage of a particular capital budgeting method has a positive or negative impact on corporate performance and how large this influence is

relative to the other methods.

Table 12
Multiple regression results[a]
Model 1: Return on equity 2006 on all capital budgeting methods (generated by the use of the backward elimination procedure[b])
Model 2: Return on equity 2006 on all at the 5% level significant capital budgeting methods
Model 3: Total investment return 2006 on all capital budgeting methods (generated by the use of the backward elimination procedure[b])
Model 4: Total investment return 2006 on all at the 5% level significant capital budgeting methods
All independent variables are dummy variables which equal one if the corresponding methods have been named always or often by our respondents. Each cell contains the corresponding regression estimate and the p-value of a two-sided t-test for this estimate being zero in parenthesis. Cells that indicate at the 5% level a significant negative impact of the corresponding methods on corporate performance are shaded.

Model	1	2	3	4
Dependent Variable	ROE 2006	ROE 2006	TIR 2006	TIR 2006
Independent Variables				
Intercept	1.03 (0.856)	11.02 (0.006)	3.41 (0.460)	8.51 (0.045)
Payback Period			11.61 (0.017)	13.66 (0.009)
Comparative Cost Analysis	16.25 (0.031)			
Comparative Profit Analysis	-23.74 (0.002)	-15.02 (0.014)	-21.08 (0.002)	-15.07 (0.027)
Discounted Payback Period	11.67 (0.012)	10.19 (0.022)	12.05 (0.016)	13.77 (0.008)
Modified Internal Rate of Return			54.57 (0.000)	53.74 (0.000)
Scenario Analysis	7.33 (0.095)		11.66 (0.043)	
Risk Analysis			-10.31 (0.070)	
Individual Risk Premium	-19.77 (0.000)	-9.87 (0.037)		
Decision Trees	25.33 (0.052)			
Weighted Average Cost of Capital	13.70 (0.010)			
Adjusted Present Value	20.55 (0.000)	11.95 (0.022)		
Capital Cash Flow			11.46 (0.049)	
Cash Value Added	-15.32 (0.091)			
EBIT-Multiple	-17.06 (0.002)			
Free Cash Flow-Multiple	11.75 (0.053)			
Transaction-Multiple	12.78 (0.042)	12.62 (0.034)		
Industry-Multiple	13.33 (0.047)		16.63 (0.006)	
Liquidation Value	-26.37 (0.035)	-32.81 (0.014)	36.59 (0.058)	
Replacement Value			-45.84 (0.099)	
R-squared	0.495235	0.306061	0.562157	0.409230
Adjusted R-squared	0.351016	0.233015	0.483970	0.371116
F-statistic	3.433917	4.189963	7.189959	10.73694
Probability(F-statistic)	0.000672	0.001475	0.000000	0.000001

[a] The White test for heteroskedasticity shows that the residuals of all four regressions are homoscedastic
[b] Backward elimination is a variable selection procedure in which all variables are entered into the equation and then sequentially removed. The variable with the smallest partial correlation with the dependent variable and which is at the same time not significant at the 10% level is considered first for removal and so on. The procedure stops when there are only variables in the equation that are statistically significant at the 10% level.

We are convinced that such a interpretation is justified when we consider the explanatory power of our regression results. We start our investigation with the static methods payback period, comparative cost analysis and comparative profit analysis. The payback period has surprisingly an positive impact on the total investment return (TIR) figure when regularly used as consistently shown by the models 3 and 4. The same is valid for the impact of the comparative cost analysis method on the return on equity (ROE) figure. This impact is larger than the one from the payback period on the TIR figure. All four models congruently confirm our expectation that a frequent application of the comparative profit analysis method negatively influences the success of a company to a great extent. The outcomes for the payback period and the comparative cost analysis thereby conflict with theory suggestions as well as with the responses conditional on the firm characteristic "return on equity" as described above. This probably argues for the thesis that the static methods should be used in practice for verifying the results that one has determined, for example, with the NPV method. We continue our examination with the dynamic methods discounted payback period and MIRR. We would like to parenthesize in this connection that the most theory recommended and applied dynamic method NPV is not included as an independent variable in only one of the four models and that therefore the discounted payback period and the MIRR method can`t be seen as the most superior dynamic methods even though they are the only ones for which a statistically significant impact on corporate performance can be proven. Nevertheless, we are able to interpret the regression estimates for these two approaches. A frequent application of the discounted payback period method has a positive impact on corporate performance as the regression estimates of all four models consistently indicate. This confirms the finding from above that firms with a higher return on equity more often use this method although it is not really recommended by theory. The regression output shows for the MIRR method that its frequent usage has the largest positive effect of all capital budgeting methods on the TIR figure. This result is somewhat backed by theory due to the fact that the MIRR method

addresses some but not all of the deficiencies that the conventional IRR has in comparison to the NPV method. We resign to discuss the MIRR method in this paper because we exclusively recommend the application of the NPV method in practice due to the fact that it is the only one which always calculates the right result, independently of specific project characteristics. Nevertheless, the MIRR method can also indicate whether shareholder value, measured by the TIR figure, will be created or not when it is correctly used. On this account, the large positive effect of the MIRR method on corporate performance is not surprising. We would have actually expected this large positive effect for the NPV method if it had been an independent variable in the four regression models. We guess on this score that the regression estimates for the MIRR method can also stand for the impact of the NPV method on corporate performance because the MIRR method very often (but not always) determines the same results as the NPV one when it is used conform to theory requirements. From now on we describe the regression results for the risk adjustment methods. The regression output shows for the scenario analysis a positive impact on the ROE figure as well as on the TIR figure. This finding meets our expectations. By contrast, the negative impact of the risk analysis on the success of a company doesn`t meet our expectations. Maybe the financial and personnel expenses for conducting a complicated risk analysis are higher than the benefit from its implementation. We infer from these results that the scenario analysis should be used in practice more often than the sensitivity and risk analysis, even though the latter are theoretically equivalent and are frequently used in practice, together with the break-even analysis. The regression output clearly evidences that the individual risk premium should not be used instead of the market-determined risk premium because its application destroys shareholder value to a great extent. In contrast, the decision trees analysis (DTA) has a large positive effect on corporate performance and therefore also on shareholder wealth as shown by model 1. This clearly militates for a more frequent usage of the DTA in practice. We have furthermore the opinion that this result argues also for an increased application of the real

option valuation (ROV) approach due to the high similarity with the DTA. In addition, the

four multiple regression models reveal that all discounted cash flow (DCF) methods

positively influence the performance of a company, except for the flow to equity (FTE)

approach which is not included in this regressions. In this context it is interesting that the

application of the adjusted present value (APV) approach results in a higher ROE compared

to the application of the weighted average cost of capital (WACC) method as shown by the

first model. This is the evidence that a frequent usage of the APV approach doesn`t have a

negative impact on the success of a company as it has already seemed above. Hence, the first

and the second multiple regression model prove that the APV approach can be seen at least

equivalent with the WACC method and support therefore our suggestion that it should be

used more often in practice. Remarkable is also that the capital cash flow (CCF) method is the

only DCF method for which a statistically significant impact on the TIR figure can be proven.

We are convinced that the WACC method as well as the APV approach also influence the

TIR figure of a firm, due to the fact that they are primarily applied in crucial investment

decisions (e.g. mergers & acquisitions) which definitely have an effect on stock prices. The

cash value added (CVA) approach is the only residual income valuation method for which a

statistically significant impact on corporate performance is verifiable. Surprisingly, the first

regression model assigns the CVA approach a negative slope estimate while the CVA

approach is also recommended by theory since it determines the same corporate values as the

other two approaches economic value added (EVA) and earned economic income (EEI). The

negative result for the CVA approach maybe argues rather for the usage of the EVA approach

in practice. Considering that the CVA approach calculates with annuities what is more

difficult to understand as the "traditional" EVA approach it could be that corporate leaders

decrease shareholder value when they apply the CVA approach. For the result of the EBIT-

multiple one can use this argumentation analogous. We assume that the negative impact of a

frequent application of the EBIT-multiple on the ROE figure as shown by the first model

rather argues for the usage of the EBITDA-multiple in practice. The regression results

therefore give a clear answer to our question from above which EBIT-multiple should be

primarily used in practice by proving that the EBIT-multiple reduces the return on equity of a

company. The fact that the application of the free cash flow-multiple increases shareholder

value because it positively influences the ROE figure as proven by the first model meets our

expectations. In contrast, the regression results regarding the transaction-multiple need a

differentiated interpretation, due to the fact that they are contrary to theory recommendations,

along with the findings from table 11 (survey responses conditional on various firm

characteristics). On the one hand we have found out that the transaction-multiple has the

drawback that it doesn`t correspond to actual market conditions after a short time but on the

other hand we have also verified for one thing that firms which have achieved a ROE higher

than 10% apply the transaction-multiple more often and for another, that its application has a

positive impact on the success of a company. By the way the same is also valid for the

industry-multiple. The regression results indicate a positive impact of its application on

corporate performance although we have discovered that the industry-multiple is only in few

cases a good alternative to the other multiples. We thereby infer from our regression results

that the objections against the application of the transaction- and industry-multiple raised by

the literature are not persuasive enough. The net asset value methods are the last group for

which we interpret the regression output in table 12. The fact that the frequent application of

the two net asset value methods, liquidation value and replacement value, has a negative

impact on the two return figures as shown by the first three models meets our expectations

because we have mentioned above that under the going concern principle these methods are

under normal circumstances not appropriate. In addition, the large negative effect of the

liquidation value and the replacement value on the ROE figure as well as the TIR figure

justifies our argument that the net asset value method are out of date. However, our

interpretation of the regression results regarding these methods is not complete before we

respond to the fact that in the third model the regression estimate for the liquidation value has a positive arithmetic sign although all regression estimates for the other net asset value methods have a negative one. It is difficult to find an explanation for this exemption. We find that this outcome extremely conflicts not only with the results for the other net asset value methods but also with the prevailing opinion in the literature. For this reason we are sure that it is justified when we consider this inconsistence as an unique exemption and when we therefore assume that all net asset value methods have in reality an negative impact on corporate performance. Finally, we assess now the quality of the four multiple regression models. The four adjusted R-squared values indicate in particular for the first and third model a sound degree of explanation. The adjusted R-squared of the first model shows that 35% of the sample variation in return on equity are explained by the capital budgeting methods and the one of the third model shows that 48% of the sample variation in total investment return are explained by them. But also the adjusted R-squared of the second and fourth model (23% and 37%, respectively) are respectable. The sound degree of explanation more becomes apparent when comparing these adjusted R-squares with the ones from the multiple regressions of ROE and TIR on all selected firm characteristics as shown by the tables 2 and 5. Considering that only 9% of the sample variation in ROE is explained by the firm characteristics (compared to 35% by the capital budgeting methods) and that only 26% of the sample variation in TIR is explained by the firm characteristics (compared to 48% by the capital budgeting methods) it more becomes understandable why the decision which capital budgeting methods should be used in practice is so important for corporate performance. If we combine the adjusted R-squares of the regression approach ROE/TIR on firm characteristics (9% and 26%) with the ones from the regression approach ROE/TIR on capital budgeting methods (35% and 48%) it also becomes apparent what a large fraction of the sample variation in ROE (44%) and TIR (74%) can be explained by our regression models when put together. Thus, we cover with our paper a broad spectrum of factors that influence

the success of a company. In the end, also the overall F test indicates for all four models that at least one of the capital budgeting methods has really an effect on ROE and TIR, respectively.

4.2 Cost of Capital

Beginning with this chapter we alter the way how we analyze our survey results. Unlike our chosen approach in the previous chapter "Capital Budgeting" we resign for this and the next chapter "Capital Structure" to conduct a comprehensive comparison of theory and practice because we assume that the theoretical fundamentals in the areas of cost of capital and capital structure are known not only by our respondents but also by most of the German managers. This means that we assume that they possess competent knowledge, in particular of the capital asset pricing model (CAPM) and the capital structure policy choice.[2] In addition, the focus of our survey doesn`t lie in these fields but rather in the one of capital budgeting. Additionally, we also resign to confront our survey results for this and the next chapter with other studies because we solely devote ourselves in the field of cost of capital and capital structure to inform researchers about the current developments in practice for bridging the theory-practice gap also the other way round. If there anyhow should be a keen interest to become acquainted with the recent surveys in this field for Germany, the US, the UK, the Netherlands and France we refer to our predecessor papers from Beumer (2006), Brounen, de Jong and Koedijk (2006 and 2004), Drukarczyk and Schüler (2003), Graham and Harvey (2001), Arnold and Hatzopoulos (2000), Bruner, Eades, Harris and Higgins (1998) and Richter and Simon-Keuenhof (1996).

4.2.1 Cost of Equity

In this subsection we present the received answers from our respondents to the question of how they determine the cost of equity of their companies. Furthermore, we also exhibit their

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[2] The standard American investment and corporate finance textbooks Bodie *et al.* (2005), Brealey et al. (2006) and Ross *et al.* (2005) provide a good overview of the theoretical fundamentals in the areas of cost of capital and capital structure if nevertheless a lack of knowledge in this two areas should exist.

responses to the question of how they define the components of the well-known CAPM

formula. First, we analyze the results for the cost of equity as summarized in figure 11. This

figure reveals that the huge majority of the sample firms (73%) specify their cost of equity

with the CAPM according to theory suggestions. 37% of them determine their cost of equity

by using data from comparable industries, companies, etc. On the third rank follows the

answering option "….by determining the implied cost of equity" with a percentage rate of

32%. The approach to implicitly determine the cost of equity has more and more become

popular among academics in recent years. The idea behind this procedure is to estimate an

implied cost of equity, defined as the IRR that equates the current stock price to the present

value of all future cash flows to common shareholders. In other words, the IRR is estimated

which the market implicitly uses to discount the expected future cash flows of a firm.[3] The

supporters of this theory have the opinion that the implied cost of equity are able to replace

the CAPM because they rely on ex ante expected future returns unlike the CAPM that is often

used with average realized returns against theory instructions. Moreover, the supporters refer

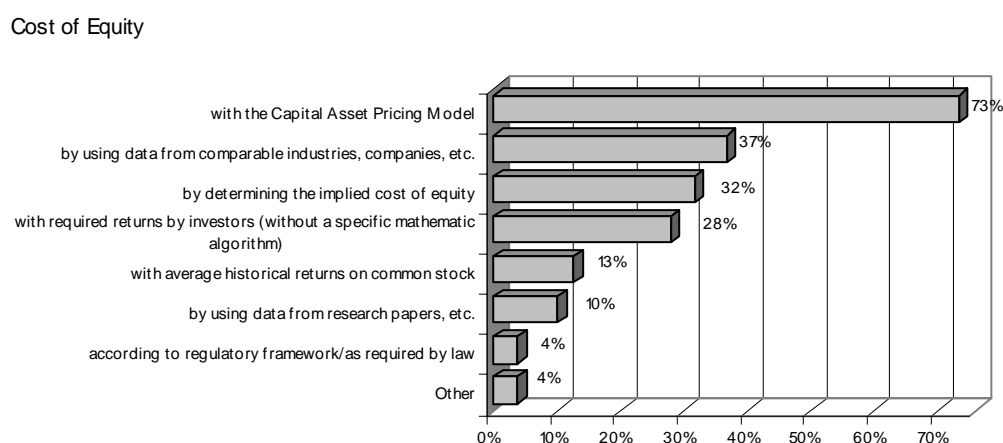to many studies that have shown that the empirical record of the CAPM is poor .

Cost of Equity

Fig. 11. Survey responses to question 8:
How does your company determine its cost of equity?

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[3] The most famous and groundbreaking study in this field has been published by Gebhardt, Lee and Swaminathan in 2001. Other recent studies that address this issue are the ones from Claus and Thomas (2001), Ballwieser (2005), Daske, Gebhardt and Klein (2005) and Reese (2005).

We however find that the implied cost of equity cannot substitute the CAPM because they run counter to the opportunity cost principle and the modern portfolio theory which are both generally accepted in the standard corporate finance textbooks. But the implied cost of equity have nevertheless their right to exist. By means of them, it has become possible in recent years to implicitly determine the market-risk premium (MRP), an essential component of the CAPM, what ensures that the CAPM can be applied with ex ante expected future returns according to theory instructions. We discuss this issue further in this subsection when we introduce the survey results for the CAPM. We would like to annotate in this context that it is surprising that already 32% of the German firms use this approach in practice. But it can`t be ruled out that a few of our respondents misunderstood the concept of the implied cost of equity with the consequence they have marked it although they apply a different approach to this one that we have explained above. Remarkably, 28% of our respondents have indicated that they apply the required returns expected by their investors. Some of the sample firms determine their cost of equity with average historical returns on common stock (13%) or by using data from research papers, etc. (10%) and a few of them according to regulatory framework or as required by law.

Second, we analyze the results for the components of the CAPM that are illustrated in the figures 12 to 14. We thereby begin with the survey results for the risk-free rate that are illustrated in figure 12. We infer from these results that most of the German companies use historical interest rates (71%) taken from German treasury bonds with a maturity of 10 years (66%) as a benchmark for the risk free rate. The other answering options German treasury bonds with a maturity of 30 years (12% of our respondents have marked this option), German treasury notes with a maturity less than 10 years (7%), international government bonds (7%) and average of several government bonds (7%) play only a inferior role in practice.
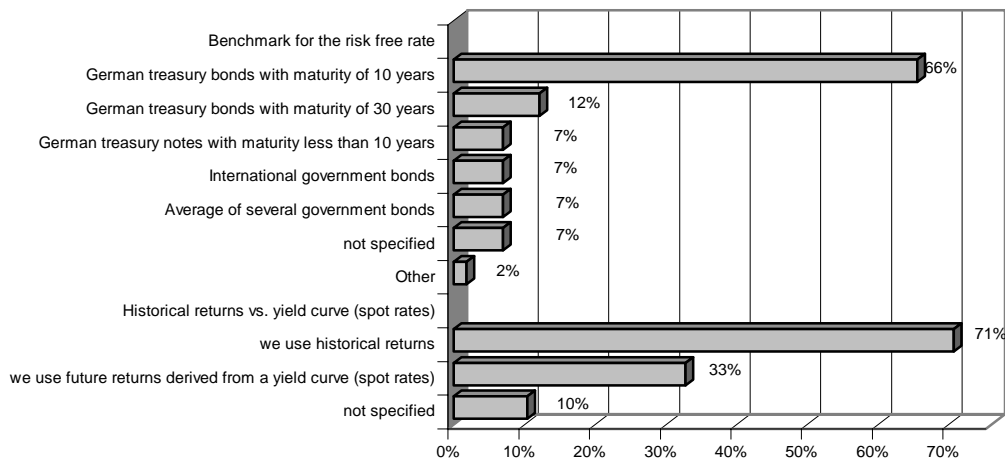
CAPM - Risk-Free Rate

Fig. 12. Survey responses to question 9:
If your company uses the CAPM: How do you determine the following components of the CAPM (Risk-free rate)?

Interestingly, only one-third of the sample firms already use future returns derived from a yield curve (spot rates) instead of historical ones which means that only a minority of the German firms insert expected returns in the CAPM formula as actually required by the assumptions which form the basis of the CAPM.

Next, we discuss the survey results for the market-risk premium (MRP) that are illustrated in figure 13. This figure reveals a more balanced picture for the MRP as the previous one has done for the risk-free rate. Nevertheless, the majority also relies on historical returns as a benchmark for the MRP. That altogether 76% of our respondents use a historical MRP evidences this fact. This high percentage rate is made up of 38% who use a historical MRP derived from research papers, etc., 21% who use data from comparable industries, firms, etc. to derive an estimate for the MRP and 17% who estimate a historical MRP independently. Thus, most of our respondents insert a historical MRP in the CAPM formula what happens against theory instructions also in this case. The alternative would be either to independently determine an implied future MRP or to use an implied future MRP derived from research papers, etc.
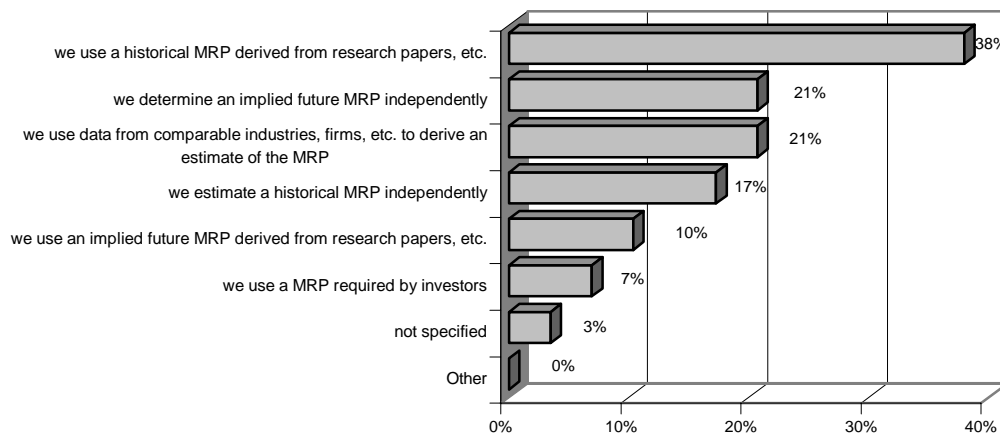
CAPM - Market-Risk Premium (MRP)

Fig. 13. Survey responses to question 9:
If your company uses the CAPM: How do you determine the following components of the CAPM (Market-risk premium (MRP))?

These two approaches which are used in practice by 21% and 10%, respectively, come along with theory instructions. After all, 7% of the sample firms apply in this context a MRP required by their investors.

Finally, we present the survey responses for the beta that are summarized in figure 14. It emanates from this figure that a peer-group beta (an industry beta) is used by almost as many firms as a company-specific beta. This result meets our expectations due to the fact that it often depends on the risk characteristics of a specific project which beta should be really used for its evaluation. Interestingly, the percentage rate of the sample firms that use historical betas is with 69% almost similar to the previous ones for the historical MRP (76%) and risk-free rate (71%). By the way, the same is valid for the percentage rate of our respondents who use forecasted betas (29% compared to 31% for the implied future MRP and 33% for future returns). This remarkable findings suggest that almost all firms apply the CAPM formula consistently either with historical figures or with expected (forecasted) ones.
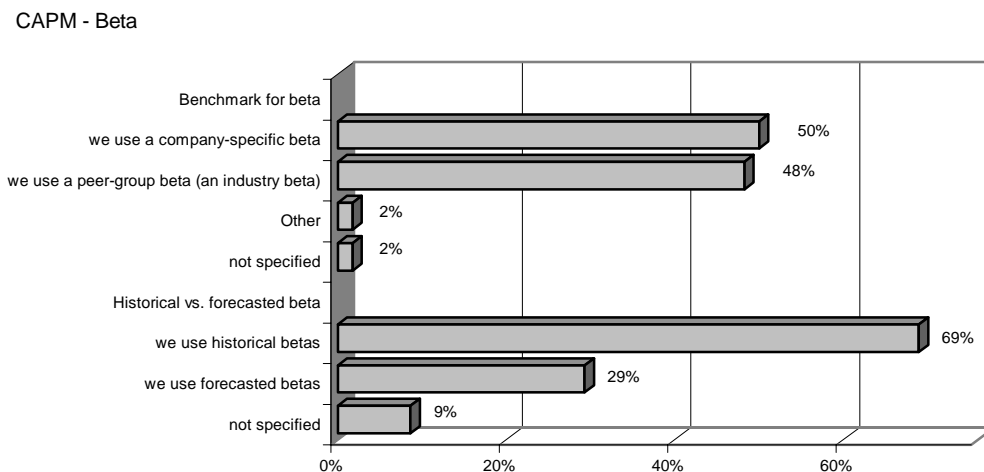
CAPM - Beta

Fig. 14. Survey responses to question 9:
If your company uses the CAPM: How do you determine the following components of the
CAPM (Beta)?

However, we can prove that this is not really the case: After reexamining the returned

questionnaires for this issue we have found out that only 53% of the sample firms consistently

apply the CAPM formula whereas anyhow 35% of them mix historical with forecasted

figures.[4]

4.2.2 Cost of Debt

The survey responses to the question of how the German companies determine their cost of

debt for their investment decisions is the issue in this subsection. Figure 15 presents accurate

these results that we have been expecting before we conducted our survey. Exactly, three-

fourths of our respondents use for their investment decisions the actual cost of debt, or in

other words, the actual borrowing rate of their firms. This is at the same time the favored

approach in the literature. Obviously, the other alternatives to determine the cost of debt of a

company only play a negligible role in practice. Only 9% of the sample companies identify

their cost of debt based on interest rates of corporate notes, debentures or bonds.

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[4] For the remaining 12% it is not identifiable whether they consistently use historical figures or expected
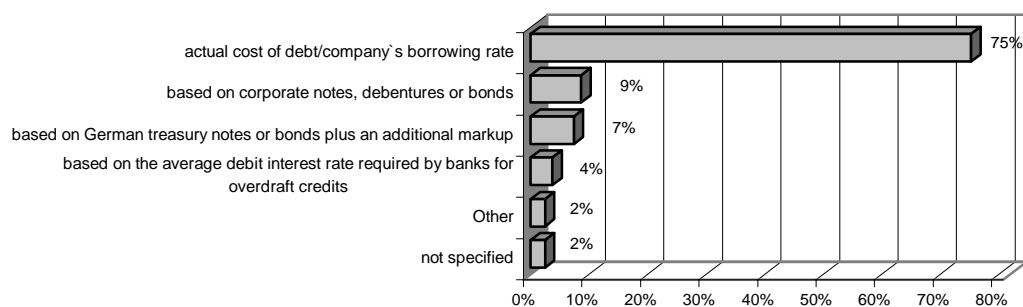(forecasted) ones

Cost of Debt

Fig. 15. Survey responses to question 10:
How does your company determine its cost of debt?

The approach to employ the returns of German treasury notes or bonds plus an additional markup as a benchmark for the cost of debt is only pursued by 7% of them and only a very few (4%) make use of the average debit interest rate required by banks for overdraft credits as a guideline for their cost of debt.

4.3 Capital Structure

We subsequently present the survey results regarding the capital structure decision of a firm. Before we go in more detail we have to mention that the questions 11 to 13 in our questionnaire only deal with such capital structure problems that are relevant for investment decisions. On this account, this chapter exclusively focuses on such financial leverage problems that have a direct bearing on investment decisions made with capital budgeting methods. We subdivide this chapter into two subsections. The first one, financing, discusses the question whether the German companies consider the financing mix in an investment decision or to be more concrete in the cash flow planning of an investment project and in the affirmative, how they do this. The second one deals with the capital structure policy issue that has not only an impact on the cash flow planning of an investment project but also on the question which valuation method should be used as we have already described above.

4.3.1 Financing

Regarding the financing one can learn from figure 16 that exactly two-thirds of the German companies consider the financing mix when assessing investment projects.
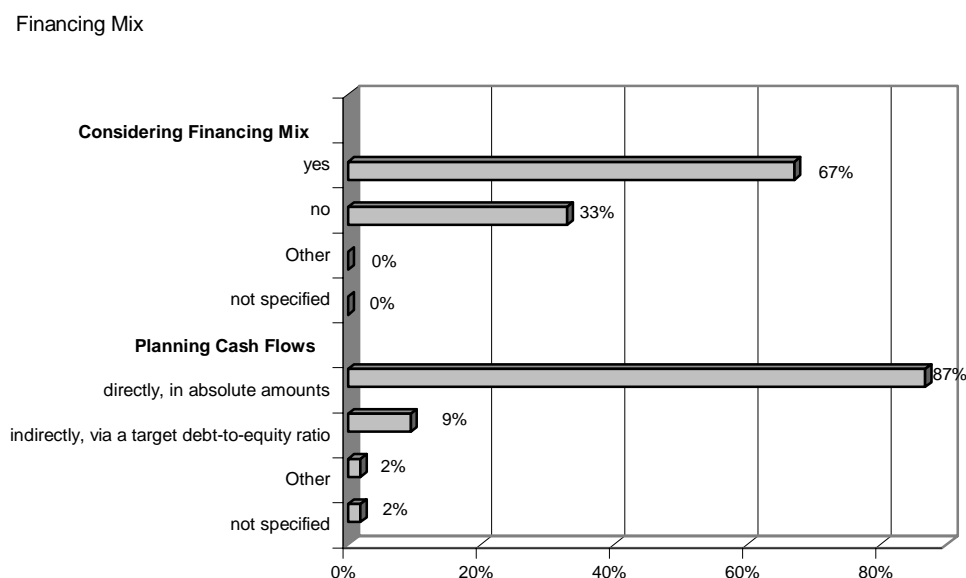
Financing Mix

Fig. 16. Survey responses to question 11:
Do you consider the financing mix when assessing investment projects?
If "yes": Do you plan cash flows from financing activites...........

Considering that most of the CDAX noted companies are leveraged, this outcome corresponds to theory instructions. The remaining 33% that ignore the financing mix and thus separately treat the investment decision from the capital structure decision are either all-equity firms or confronted with the problem that they possibly refuse projects that would be accepted otherwise. This is possible due to the fact that the cost of capital often decrease with leverage, thereby turning some negative NPV projects into positive one. The result with respect to the way how the 67% of our respondents, who consider the financing mix, incorporate the effects of financial leverage in the cash flow planning of an investment project is unambiguous. 87% of the sample companies do this directly by calculating with levered cash flows whereas the interest payments are included in absolute or actual amounts. Only 9% of them do this indirectly by estimating the interest payments via a target debt-to-equity ratio or debt-to-value ratio. We have to annotate in this connection that question 11 could have been misunderstood by our respondents because we have deliberately ignored the fact that the financing mix can

be considered not only in the cash flow planning of an investment project but also via the cost of capital. In other words, the project calculation can be adjusted for the financing mix either in the numerator (cash flows; equity-approach) or in the denominator (cost of capital; entity-approach). However, our intention was only to ask whether the German managers actually consider the financing mix and how they do this when adjusting the cash flows (and not the cost of capital). Nevertheless, we would like to point out that we have observed for investment projects (not for M&As) that the English-speaking literature primarily recommends the application of the weighted average cost of capital (WACC) and therefore the entity-approach while the German literature rather suggests the usage of levered cash flows and therefore the equity-approach. It is difficult to say which approach is the best one because in theory both approaches always lead to the same results. But, in practice, this only rarely should be the case since the equity-approach doesn`t provide an independent solution for an investment project due to the fact that it depends on the debt-to-value ratio which can be only independently determined with the entity approach. Drukarczyk and Schüler (2007) as well as Ross *et al.* (2005) prove this fact in their textbooks.

4.3.2 Capital Structure Policy

Directly or indirectly, the capital structure policy of a company is very important for the proper application of many capital budgting methods as one can see throughout this paper. On this account, the results from figure 17 are an essential part of our survey. Although we don`t go in more detail here, we discuss some basic problems of the capital structure policy before we present the results from figure 17. The well-known Modigliani-Miller Proposition I, allowing for corporate taxes, states that the value of a levered firm is the value of an all-equity firm plus the present value of the tax shield. Based on this proposition a firm can raise its value by substituting debt for equity, implying that firms should have a maximum amount of debt. However, there is no doubt that this proposition is not transferable to practice. Instead, in reality, the capital structure decision of a company involves a trade-off between tax benefits

of debt and the cost of financial distress. This is also known as the trade-off theory of capital structure. The implication of this trade-off is that there is an optimum amount of debt for any individual company, the firm's target debt level. Although the theory knows that such an optimum amount of debt exists, no formula has yet been developed to determine a firm's optimal debt level exactly. As a consequence of this, we can`t say which capital structure policy is the best one. Instead, each firm must chose its leverage ratio based on financing needs. Nevertheless, some authors provide at least a guideline for the optimal debt level of a firm. Ross *et al.* (2005) state for instance that the following three factors determine the target debt-to-equity ratio: First, firms with high taxable income should more rely on debt than firms with low taxable income. Second, firms with a high percentage of intangible assets should have low debt whereas firms with primarily tangible assets should have higher debt. Third, firms with a high uncertainty of operating income should mostly rely on equity. Moreover, firms can also base their capital structure decisions on industry averages. Ross *et al.* (2005) note in this context that this approach at least keeps firms from deviating far from the accepted practice. Figure 17 reveals that 56% of the sample firms chose a fixed-debt policy (a flexible debt-to-equity ratio), 18% prefer a value-based policy (a target debt-to-equity ratio) and 18% pursue neither of them. Since we have already discussed the implications of these results throughout this paper, we resign to present them here again. Instead, we present the comments from the 18% of the sample companies which have marked the answering option "neither of them". One company says that its capital structure policy is not assignable to a specific policy. Another company states that it uses internal financing. A further firm mentions that it orientates itself on relations in the left-hand side of the balance sheet. That its capital structure policy depends on bank-specific equity capital requirements is indicated by one firm. Interestingly, one firm declares that it needs a equity-to-value ratio of 45%. Another company says that its policy depends on the financing of a given investment project. Remarkably, one company controls its level of debt with the ratio EBITDA to net debt.
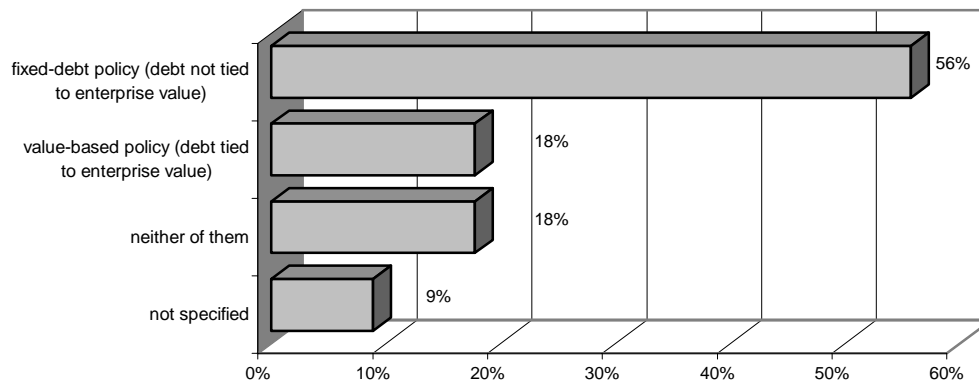
Capital Structure Policy

Fig. 17. Survey responses to question 12:
Which financial policy does your company pursue?

Two companies orientate their debt-to-equity ratio on their rating. One company uses the

right-hand side of the balance sheet as a benchmark for the debt-to-equity ratio. Finally, one

company indicates that its level of debt is strongly restricted because it is private equity-

owned.

At the end of our analysis we present the results for the last question in our questionnaire. We

have asked the recipients of our survey whether they use specific cost of capital for different

group divisions. Figure 18 exhibits that there are almost as many companies that do this as

there are firms that don`t do this.

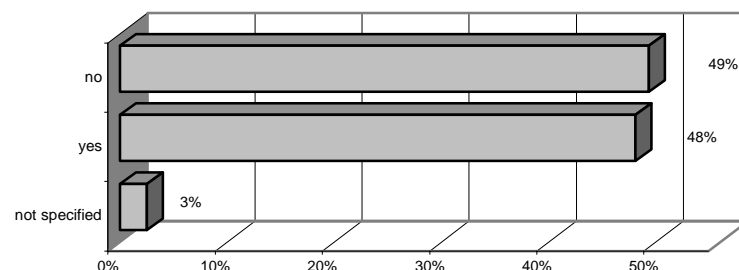Cost of capital for different group divisions

Fig. 18. Survey responses to question 13:
Does your company use specific cost of capital for different group divisions?

This result approximately meets our expectations because the theory doesn`t recommend one

approach as the best one. Instead, it depends on the risk structures of the group divisions if a

firm should use specific cost of capital for them or not. If the risk structure of a division is quite different to the one of the entire firm it is recommended that the firm uses specific cost of capital for it. Otherwise, the firm can use uniform cost of capital for all group divisions.

5. CONCLUSION

Finally, we briefly summarize the four most important findings of our survey:

First, we can clearly respond to the question that we have raised in the title of our paper: It doesn`t seem that German managers follow the shareholder value principle when applying capital budgeting methods. We constitute this conclusion with the following outcomes of our survey: For one thing, the German managers heavily rely on capital budgeting methods that are not able to indicate whether shareholder value will be created with an investment decision or not, and for another only insufficient 67% of them always and often apply the NPV method which is the only one that always indicates this, compared to 85% of the US firms. However, this is not the only reason why we negate the question in the title of our paper. Furthermore, it doesn`t seem that the corporate leaders in Germany adequately adjust capital budgeting methods for risk exposure. In particular, regarding the risk tolerance (risk aversion) of investors and the sequential nature of decision making that could be captured by the decision trees analysis and real option valuation method. In addition, many of the German managers don`t apply the valuation methods WACC, APV and FTE according to theory instructions with the implication that they often must incorrectly determine corporate values what could have far-reaching consequences for the success of M&As. Surprisingly, this is mainly the case by firms with an annual investment budget higher than 500 Mio. €

Second, we find out not only that it doesn`t seem that German managers follow the shareholder value principle ex ante, when applying capital budgeting methods but also ex post because they seem to be hesitant to implement the residual income valuation methods as a key tool for the performance measurement of a company.

Third, we reveal in our article that many German managers apply the CAPM formula with historical returns instead with expected (forecasted) ones as actually required by the assumptions which form the basis of the CAPM. Remarkably, some among them don`t consistently use the CAPM formula either with historical returns or with expected ones. We demonstrate this by showing that only 53% of our respondents consistently apply the CAPM formula whereas anyhow 35% of them mix historical with forecasted figures.

Fourth, we supply evidence in our paper that the question which capital budgeting methods are used by managers and how accurate they apply them has a much greater impact on corporate performance than their own personal characteristics like age, tenure or education and than the fundamental properties of their companies like firm size, capital expenditures or debt-to-equity ratio. Thus, managers are more able to enhance shareholder value by conducting well-planned and calculated capital expenditures in the long run than by extending the firm size or the debt-to-equity ratio in the short run. In other words, the quality of the capital expenditures counts more than the quantity. In addition, we succeeded in proving that particular capital budgeting methods have a statistically significant impact on corporate performance. Furthermore, we show that a large fraction of the sample variation in ROE (44%) and TIR (74%) can be explained by our regression results when put together.

Finally, we would like to mention that we encourage all academics that contribute to corporate financial research to discuss the results of our paper and to further investigate the impact of capital budgeting methods on corporate performance. Furthermore, we also motivate practitioners to reduce the theory-practice gap in corporate finance because an adoption of the most advocated capital budgeting methods surely supports them in their aspiration to enhance shareholder value.

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