CASH FLOW PRACTICES IN CAPITAL BUDGETING DECISIONS

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ABSTRACT

We survey a cross-section of 127 companies to gain insight on the calculation of project-related cashflows and the interaction of cashflows and hurdle rates. While our results show that firms by and large compute levered and unlevered cashflows correctly, they are not as successful in matching cashflows and discount rates consistently. Additionally, a significant percentage of the survey firms correctly incorporate inflation into their discounted cash flow analysis. Similarly, they appear to successfully determine the domestic/foreign currency denomination of cashflows and discount rates of cross-border investments. However, our survey firms do not appear to perform as well when it comes to some other cashflow related issues such as sunk costs and sales erosion that new product introductions may generate. The survey firms also have a mixed record in changing their hurdle rates when market conditions change and in using firm-wide versus divisional hurdle rates.

In this paper, we discuss our findings from a survey that covers a comprehensive list cash flow related issues concerning firms' investment decisions. Previous surveys typically focus on topics such as the popularity of different capital budgeting techniques, the extent to which firms rely on CAPM, how often firms change their hurdle rates and whether multi-divisional firms use company-wide or divisional hurdle rates. Even though in making investment decisions managers use both hurdle rates and cashflows as inputs, earlier surveys typically do not analyze the cashflow dimension of investment decisions and they do not investigate whether firms take into account the interactions between project hurdle rates and cashflows. For example, in analyzing investment decisions earlier studies do not focus on how firms incorporate inflation, sunk costs, and sales erosion in existing projects caused by new product introductions. Similarly, previous surveys do not investigate whether firms use the correct definitions of levered or unlevered cashflows, and whether they match the correct cashflows and discount rates in implementing their capital budgeting methods. The major goal of this paper is to fill this gap.

Our findings on these issues are as follows: First, two-thirds of the survey firms correctly incorporate inflation when evaluating projects. Second, they also seem to successfully handle the complex problem of domestic/foreign currency denominations of cashflows and hurdle rates in cross-border projects. Firms also appear to be aware of the need to account for the value of options created by strategic projects. Third, on the negative side, firms in our survey have somewhat of a mixed record on the computation of cash flows. Also, a large fraction of the survey firms does not use the correct cashflow-discount rate combinations. Additionally, not all firms appear to correctly account for factors such as sunk costs and the erosion in the sales of existing products that may occur when competing new products are introduced.

In the next section we first describe our survey design and sample. Then we discuss our survey results on cashflow related issues, the interaction between cashflows and hurdle rates, how firms account for inflation in evaluating projects, and how they evaluate cross-border investments. Finally, we summarize our results.

SURVEY DESIGN AND SAMPLE CHARACTERISTICS

Questionnaire

In designing the survey questions we minimized the use of buzz words and names of models that are taught in a typical MBA course. For example, we avoid the term "cost of capital" in our questionnaire. Instead, the survey participants were asked questions on their "hurdle rates." Similarly, we tried to avoid using terminology such as "levered" and "unlevered" cashflows, but rather provided them with the definitions of the two types of cashflows from which to choose. It is a well documented observation in psychology, known as the social desirability hypothesis,[2] that respondents to surveys tend to try to please the conductor of the survey by providing the answers they think the survey's author expects. Therefore, we did not want to prompt them by asking questions that contain technical buzz words. The survey was sent out to a total of 4,600 CFOs of U.S. companies listed in the Compustat name file. 127 respondents filled out and returned the survey.

A high percentage of the respondents reveal the identity of their firms (106 out of the 127 respondents). Almost all surveys are filled out completely and there is no decline in the number of responses towards the end of the four-page questionnaire. We have some evidence that the

[2] See e.g. Singer, Eleanor, and Stanley Presser, *Survey research methods: A reader* (Chicago, IL: University of Chicago Press, 1989).

surveys were actually filled out by CFOs as we received a number of e-mails requesting an advance copy of the survey results and these mails came directly from the CFOs. In addition, many respondents provide elaborate comments to open questions. The survey responses appear to be accurate. For example, when we compare self-reported sales figures with the numbers retrieved from Compustat, we find that a reassuring 92.3% of the respondents checked the correct sales range.

Sample Description

Figure 1 describes the characteristics of the 127 firms in our sample. Panel A shows the breakdown by industry. Similar to previous surveys, most firms in our survey belong to the manufacturing sector (41.7% of the sample).[3] Firms in the technology and energy/transportation sectors constitute 13.4% and 10.2%, respectively, of the sample. We excluded firms in the financial sector from the survey.[4]

[3] E.g. Graham, John R., and Campbell R. Harvey, "The theory and practice of corporate finance: evidence from the field," *Journal of Financial Economics*, Vol. 60 (2001), pp. 187-243; Poterba, James M., and Lawrence H. Summers, "A CEO survey of U.S. companies' time horizon and hurdle rates," Sloan Management Review, Fall (1995), pp. 43-53. In a number of surveys the fraction of manufacturing firms is even more pronounced. For example, in Gitman, Lawrence J., and Vincent A. Mercurio, "Cost of capital techniques used by major U.S. firms: Survey and analysis of Fortune's 1000," *Financial Management*, Vol. 11 (1982), pp. 21-29, this ratio is 93.8%, while in Gitman, Lawrence J., and John R. Forrester Jr., "A survey of capital budgeting techniques used by major U.S. firms," *Financial Management*, Vol. 6 (1977), pp. 66-71, it is 74%.

[4] Financial firms account for 15% of the respondents in Graham, John R., and Campbell R. Harvey, "The theory and practice of corporate finance: evidence from the field," *Journal of Financial Economics*, Vol. 60 (2001), pp. 187-243. Specifically, we exclude all finance and insurance companies with the major SIC code in the ranges 6000-6499, 6700-6799; and utilities (4900-4999) in order to exclude regulated firms. We also discard radio and TV broadcasting, cable, and other pay TV services (4840-4949), as these firms might be driven by non-commercial interests, e.g. religious radio stations. Finally, we exclude health, education, social services, and museums (7200+).

Firm size measured by (self-reported) sales is below $100 million for 35.2% of the companies (see Panel B) and 31.2% of the responding firms report sales in excess of $1 billion. The majority of the firms (72.0%) have multiple product lines. The survey CFOs has the following profiles: Nearly half (44.6%) are between 40 and 49 years old. Seventy-eight percent fall into the age group 40-59. Experience in the job is evenly distributed across the three categories "less than 5 years", "5-9 years", and "10 years or more." Two-thirds of the CFOs (65.5%) graduated from an MBA program and an additional 12.9% hold a non-MBA masters degree or a higher degree.

CASHFLOW RELATED PRACTICES AND INTERACTIONS BETWEEN CASHFLOWS AND HURDLE RATES

First, we discuss our survey results on cashflows related issues. Second, we turn our attention to the interaction between cashflows and hurdle rates, and how firms account for inflation in evaluating projects. The third sub-section addresses how firms evaluate cross-border and strategic investments.

Calculation of Cashflows, Sunk Costs, and Cannibalization of Existing Product Sales

Table 1 shows that in evaluating projects, 45.5% of the firms compute cashflows as earnings before interest and after taxes (EBIAT) + depreciation – capital expenditures – net change in working capital (i.e., unlevered cashflows). Levered cashflows, which are defined as net income + depreciation – capital expenditures – change in net working capital, are the next popular cashflow measure (25.2% of the survey firms use it). 16.3% of the firms apply an

incorrect "unlevered cashflow" definition by not subtracting fixed and current assets investments. Overall, about 71% of the firms employ correct definitions of either levered or unlevered cashflows while the remaining 29% of the survey firms define cashflows incorrectly. Needless to say, firms may rely on either levered or unlevered cashflows in evaluating projects, provided that they use the correct cashflows and discount rate combinations. We examine this issue in Section B.

Table 2 displays how the survey firms handle the loss of sales in existing products when new competing products are introduced (cannibalization or erosion), and sunk costs. Survey participants are asked whether or not they subtract expected losses in the sales of existing products caused by new competing product introductions in evaluating new projects. This question was answered by an unequivocal "yes" by 81.3% of the respondents, while only two respondents (1.8%) qualify their answer by checking the option that they would do so only if their competitors are unlikely to introduce similar products. Sixteen firms (14.3%) indicate that they would never account for erosion in forecasting the sales of new products. Given the highly competitive nature of U.S. industries, it is surprising that 81.3% of the firms indicate that they would forecast sales for new products as if there are significant economic, technological, or legal barriers to entry.[5]

Table 2 also displays how firms treat sunk costs. We address this topic with the following question: "In valuing projects, do you incorporate into the cashflows the money you spent before

[5] Due to patent protection in certain industries such as the pharmaceutical and technology sectors, firms would be justified not to account for sales erosion of existing products in introducing new competing products for the duration of their patents. However, given that 41.7% of our survey firms are in the manufacturing sector and an additional 10.2% are engaged in energy/transportation industries, the fact that 81.3% of the survey firms behave as if competitors would be unable to introduce similar products seems difficult to justify.

making accept/reject decisions?" Surprisingly, 52.4% of the respondents answer this question affirmatively.

Interactions between Cashflows and Hurdle Rates and How Firms Account for Inflation

As we discussed above, 71% of the firms use the correct definitions of either levered or unlevered cashflows. In this section, we first examine whether or not these firms match the cashflows they use with the appropriate discount rate. The intersection of two survey questions on cashflows and hurdle rates is displayed in Table 3. While 71.3% use WACC as their hurdle rate and 44.4% of the firms use unlevered cashflows, only 34.8% of the firms use the correct combination of unlevered cashflows and WACC in evaluating investment projects. Nineteen percent of the respondents apparently make the mistake of discounting levered cashflows at their WACC. Furthermore, while 25.2% of the firms use levered cashflows, apparently only one of these firms discounts levered cashflows at the levered cost of equity.

We next investigate how firms account for expected inflation in their investment decisions. The results are displayed in Table 4. In the questionnaire, we deliberately did not pair nominal/real hurdle rates and cashflows in the same question. Instead, we asked whether they use nominal/real discount rates and nominal/real cashflows in two separate questions. In fact, the two questions were in different sections (and different pages) of the questionnaire. We did this to minimize the possibility that the participants may pick the correct answer by guessing that discount rates and cashflows must be measured in a consistent manner (i.e., both needs to be either nominal or real). The table shows that 41.3% of the respondents use nominal cashflows and 49.6% use nominal hurdle rates. However, the table also shows that 29.8% of the respondents correctly match nominal hurdle rates with nominal cashflows. Similarly, while

58.7% of the respondents rely on real cashflows and 50.4% employ real hurdle rates, the real hurdle rate/real cashflow combinations represent 38.4% of the answers. Overall, 68.2% of our survey firms correctly incorporate inflation into their analysis.[6]

Cross-Border and Strategic Investments

The survey also contains questions on cross-border investments. One question is about the risk of domestic projects compared with similar foreign projects. Half of the respondents (50.9%) consider foreign projects to be riskier than similar domestic projects. It also appears that these firms account for this incremental risk differently: About two thirds of these firms (68.9%) use higher hurdle rates in cross-border projects than they do in similar domestic projects, while one third (31.1%) use more conservative cashflow projections to deal with the higher risk of foreign projects. The survey results also show that 90.4% of the firms handle the currency denomination of cashflows and hurdle rates of cross-border investments correctly: 50.0% of the firms indicate that they evaluate both foreign project cashflows and hurdle rates in dollar terms, while 40.4% claim that they use foreign currency-denominated cashflow and hurdle rates.[7]

Survey participants find the strategic versus non-strategic nature of the projects to be somewhat important factors in the determination of hurdle rates (on a scale of -2 to 2, the mean

[6] The survey included additional questions on hurdle rates: 52.5% of the firms have not changed their hurdle rates during the three years prior to the survey. Furthermore, a surprising 80.3% of firms with multiple divisions "always" or "almost always" use company-wide hurdle rates. Distortions in the form of under and overinvestment caused by not changing hurdle rates when conditions warrant and the use of firm-wide hurdle rates by multi-divisional firms are well documented.

[7] The survey also includes standard questions regarding the use of capital budgeting methods. Our results confirm the findings of earlier surveys that firms use, by a wide margin (87.5%), discounted cash flow (DCF) methods, and that DCF use increases with firm size. Since these stylized facts are widely known, we do not report our results on this issue.

score is 0.70). When survey participants are asked to how they would compare strategic projects and non-strategic projects, their responses indicate that, other things being equal, 59.3% of the respondents consider strategic projects to be more valuable than non-strategic projects. We also ask them how they would evaluate strategic projects. Their response is as follows: 24.6% of the participants express the view that they would use a lower hurdle rate to account for the option value associated with strategic projects, while 34.7% of the firms answer that they capture the incremental benefits in question by valuing the future new project made possible by a current project separately and add this amount to the value of the stand-alone value of current project. However, not all firms take the strategic nature of projects into account. In fact, 40.7% of the respondents argue that they do not treat strategic projects any differently.

CONCLUSIONS

In this study we conduct a survey to investigate how firms make investment decisions. The focus of earlier surveys has been whether or not firms use discounted cashflow methods and how they determine the appropriate discount rates. The primary findings of these studies are as follows: First, over time, firms have shown an increasing tendency to rely on discounted cash flow (DCF) methods to evaluate projects. Second, most firms apparently use their weighted average cost of capital (WACC) as the discount rate in evaluating their projects. Third, it also seems to be the case that in computing their discount rates, firms typically infer the cost of equity from the capital asset pricing model (CAPM). Figure 2 displays the increased usage of these models and techniques over time.

However, even though capital budgeting methods use both hurdle rates and cashflows as inputs, previous survey studies typically do not focus on the cashflow component of the capital budgeting methods. For example, they do not examine whether firms account for various factors (such as sales erosion, inflation, sunk costs, etc.) correctly in computing project cashflows and also do not examine cashflow/hurdle rate interactions. In this paper we fill this gap. As in earlier studies we find that firms have become increasingly sophisticated in using discounted cashflow methods, and in relying on CAPM to determine their hurdle rates. However, we also find that they have a checkered record when it comes to dealing with cashflow related issues. For example, we find that two thirds of our survey firms correctly incorporate inflation into their analysis. Similarly, they appear to successfully determine the domestic/foreign currency denomination of cashflows and discount rates of cross-border investments. Our results also show that the survey firms have a reasonably good record in computing levered and unlevered cashflows. However, they do not appear to have as good a record when it comes to matching cashflows and discount rates. Furthermore, half of our survey firms make the mistake of including sunk costs in their cashflow projections. They also do not properly account for the potential erosion in the sales of existing products that could be induced by new product introductions. The survey firms also have somewhat of a mixed record in changing their hurdle rates when market conditions change, and in using divisional versus firm-wide hurdle rates.

Table 1: Calculation of cashflows.

Summary of the answers to the question how firms calculate cash flows when evaluation projects. The questionnaire provided five alternatives to choose from, a) to e), and allowed for an open end answer under "other." Tabulated are the absolute number and the fraction of firms employing a given method. A total of 123 CFOs answered this question.

In evaluating projects the cash flows you use are calculated as	# of firms	Fraction
a) earnings before interest and after taxes (EBIAT) + depreciation.	20	16.3%
b) earnings before interest and after taxes (EBIAT) + depreciation – capital expenditures – net change in working capital.	56	45.5%
c) earnings.	7	5.7%
d) earnings + depreciation.	6	4.9%
e) earnings + depreciation – capital expenditures – net change in working capital.	31	25.2%
f) Other.	3	2.4%

Table 2: Cannibalization and sunk cost.

The table shows the number of firms and the corresponding percentage answering to two survey questions regarding cannibalization (112 respondents) and sunk costs (total of 124 respondents).

	# of firms	Fraction
1. If a new product will cause a decline in the sales of an existing product (erosion, cannibalization), do you subtract the erosion from the estimated sales figures of the new project?		
a) Yes.	91	81.3%
b) Yes, but only if competitors are likely to introduce a product similar to the new product.	3	2.7%
c) Yes, but only if the competitors are unlikely to introduce a similar product.	2	1.8%
d) No.	16	14.3%
2. In valuing projects, do you incorporate into the cash flows the money you spent before the period when you make the accept/reject decision?		
a) Yes.	65	52.4%
b) No	59	47.6%

Table 3: Consistency between hurdle rates and cashflow calculations.

The rows in the cross-tabulation indicate what the self-reported hurdle rate represents and the columns denote five different ways to calculate cash flows, a) to e), plus the "other" category. Each cell displays the percentage of all 113 respondents for a given combination.

The definitions of the cash flow calculations are:

a) Earnings before interest and after taxes (EBIAT) + depreciation
b) Earnings before interest and after taxes (EBIAT) + depreciation – capital expenditures – net change in working capital
c) Earnings
d) Earnings + depreciation
e) Earnings + depreciation – capital expenditures – net change in working capital

Hurdle rate	Cash flow calculation (from Table 1)						
	a)	b)	c)	d)	e)	Other	Total
WACC	11.3	34.8	2.6	3.5	19.1	0.0	71.3
Equity levered	0.9	2.6	0.9	0.0	0.9	0.9	6.1
Equity unlevered	1.7	1.7	0.9	0.9	1.7	0.9	7.8
Other	2.6	5.2	1.7	0.9	3.5	0.9	14.8
Total	16.5	44.4	6.1	5.2	25.2	2.6	100.0

Table 4: Consistency of nominal and real terms in hurdle rates and cashflows.

The rows in the cross-tabulation show whether the firm uses a nominal or real hurdle rates, and the columns indicate whether cash flows are calculated in nominal or real terms. The cells contain the percentage of firms, out of a total of 121 respondents to the two separate survey questions.

Hurdle rate	Cash flows		Total
	Nominal	Real	
Nominal	29.8	19.8	49.6
Real	11.6	38.4	50.4
Total	41.3	58.7	100.0

Figure 1: Company characteristics.

The two panels summarize the self-reported industry affiliation and sales figures and show the percentage of firms within each category.

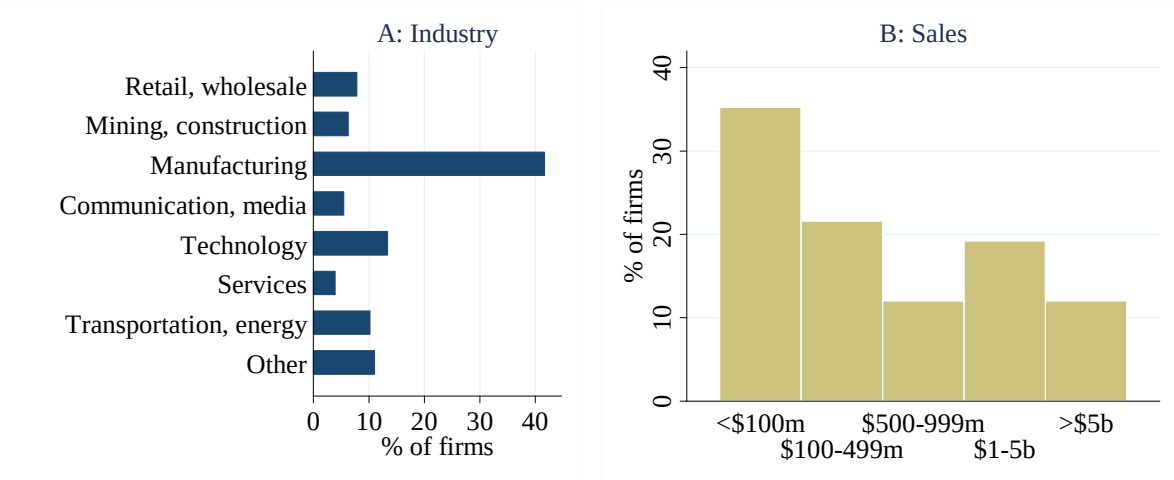
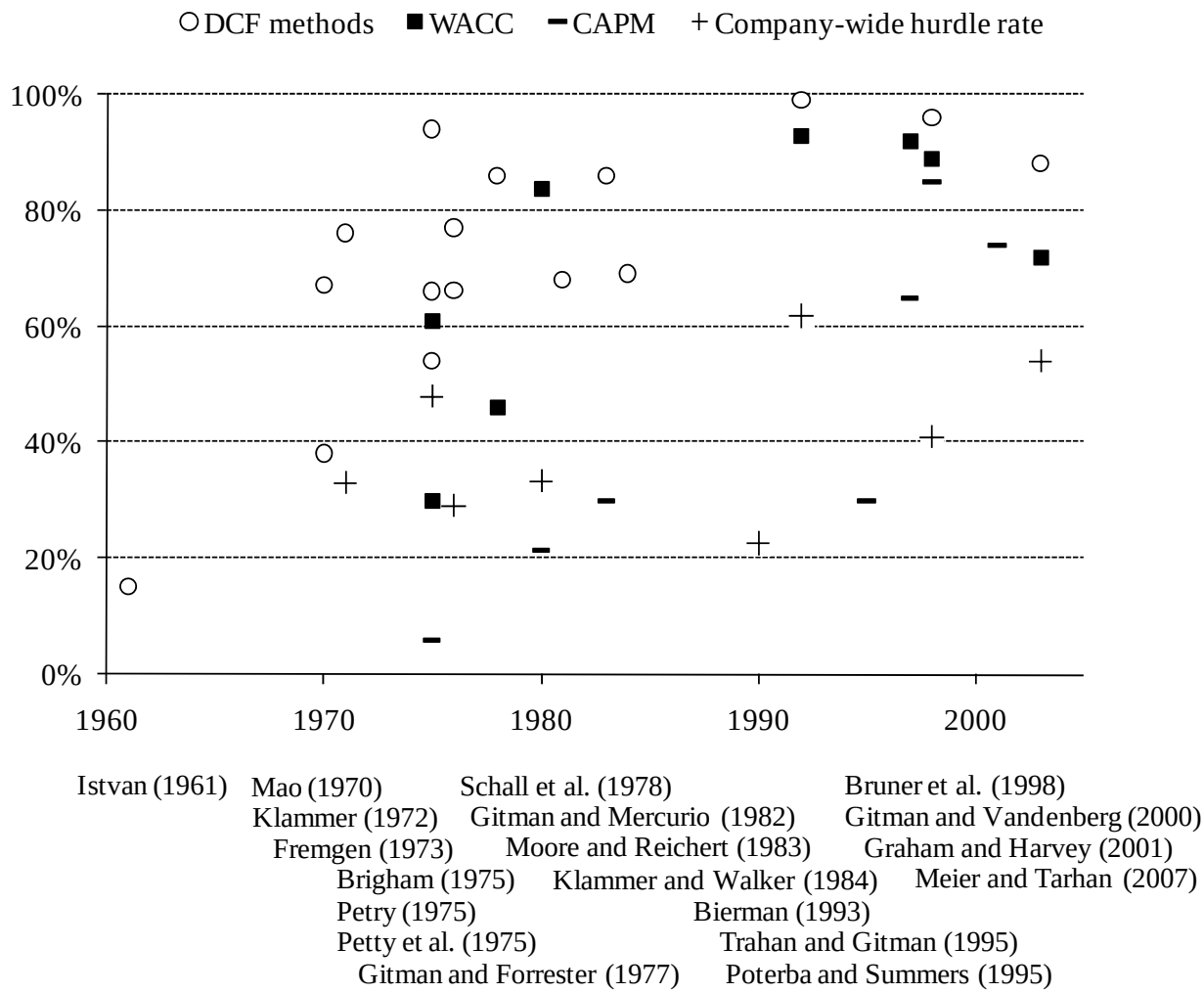


Figure 2: Adoption of DCF methods, WACC, CAPM, and company-wide hurdle rates over time.

The figure provides an overview of the survey literature on capital budgeting practices of U.S. firms. The studies are listed in chronological order below the horizontal time axis. The graph summarizes their findings regarding the percentage of firms that

a) use discounted cash flow (DCF) methods, including net present value (NPV), adjusted present value (APV), internal rate of return (IRR), and the profitability index (PI);
b) use the weighted average cost of capital (WACC) to discount cash flows,
c) employ the Capital Asset Pricing Model (CAPM) to compute cost of equity, and
d) use a company-wide hurdle rate.



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