Supplementary Survey

The Choice of Valuation Techniques in Practice: Education versus Profession*

Lilia Mukhlynina
University of Zurich

Kjell G. Nyborg
University of Zurich,
Swiss Finance Institute,
and CEPR

September 2018

1 Introduction

This short document reports on the results from a supplementary survey intended to examine the robustness of one of our conclusions from the original survey that "confusion reigns with respect to interest rate tax shields and the WACC." As such, the supplementary questionnaire, which is in Appendix B, is much shorter than the original. It is comprised of the same preliminary questions, a subset of the multiperiod model/DCF questions, and a new question, essentially a quiz, on the basics of implementing a valuation using the

*We are grateful to Ivo Welch for working with us to finalize the design of the supplementary survey.
Nyborg (corresponding author): Department of Banking and Finance, University of Zurich, Plattenstrasse 14, CH-8032 Zurich, Switzerland; Swiss Finance Institute and CEPR. Email: kjell.nyborg@bf.uzh.ch. Mukhlynina: lilia.mukhlynina@bf.uzh.ch.

WACC. Because the purpose is to check a part of the original survey, the supplementary survey was sent to a relatively small set of valuation professionals. In total, there are twenty-four respondents.

The results from the supplementary survey support our original conclusions. Valuation professionals' preferred multiperiod approach is DCF and they discount cash flows using the WACC. However, their answers to questions designed to test the depth of their understanding suggest that they are confused with respect to interest tax shields and the WACC, just as in the original survey. Their answers on the quiz confirm this. The quiz examines comprehension on three dimensions: (i) adjusting the WACC for leverage, (ii) avoiding double counting the tax shield, (iii) which cash flows to discount. Respondents are uniformly confused about how to adjust the WACC for leverage. In addition, approximately one third of the respondents double count tax shields, failing to recognize that the WACC is a tax-adjusted discount rate. However, there is little confusion with respect to the basic cash flows that should be discounted.

2 The supplementary survey

There are three parts to the questionnaire. The first part asks a series of background and personal questions that relate to the purpose of valuation, educational level achieved, experience, gender, regional focus, and so on (15 questions, including subquestions). These are the same as in the original survey. The second part focuses on multi-period models and is also taken from the original survey (8 questions). The third part contains the new question on WACC implementation – the quiz (3 questions).

The supplementary survey was conducted online with the help of the LimeSurvey tool.[1] Email invitations with the link to the survey were sent to 432 investment professionals on July 6 and a reminder on July 31, 2018. None of these participated in the first survey. We have 13 complete and 11 partly complete responses, for an overall response rate of 5.6%. This is similar to the response rate of 6.0% for the original survey. We define a survey response as "complete" if the respondent has answered at least one question in all three parts of the survey. Partly complete responses, apart from having some missing questions throughout the survey, all stop before part 3. Evidently, the exam-like nature of this

[1] LimeSurvey is a free software for conducting online surveys. See www.limesurvey.org.

part served to discourage some respondents from attempting it. Given the low number of respondents, we have not subdivided them into subprofessions or educational levels in the tables below.

The twenty-four respondents are almost equally divided between those who have a bachelor or master as the highest basic degree. Roughly half of them also have CFA, MBA, or PhD degrees. Most respondents are middle-aged (30-40 years). Complete responses are tilted towards relatively younger professionals. The majority of respondents are highly experienced (10+ years). On the whole, respondents do not have a sector focus and their firm size focus is smaller than EUR 500 mill. They do both national and cross-border deals and have a regional focus on Western Europe. All subprofessions are represented and there are no two respondents from the same firm.

As in the original survey, respondents have several valuation purposes. As seen in Table 1, for type of investment, the strength of response is highest for unlisted firms for both the complete and partly complete groups (3.58 and 3.64, respectively). Merger and acquisitions and investment decisions are the top two choices for type of transaction. Respondents in the complete group are mostly in an advisory role (3.45), while the partly complete group are mostly buy-side (3.00).

Insert Table 1 here.

3 Findings

This section summarizes the answers to Part 2 (multiperiod models and WACC, questions 13 to 16) and Part 3 (the quiz) of the questionnaire.

3.1 Multi-period models and WACC

Table 2 summarizes the responses to questions 13, 14, and 16. As seen, DCF is the favored multiperiod approach, with a strength of response of 3.62 and 3.14 for the complete and partly complete groups, respectively. IRR is in second place (2.23 and 2.71, respectively).

Insert Table 2 here.

When using DCF, 85% and 86% of respondents use the WACC almost always or always

in the complete and partly complete groups, respectively. As in the original survey, APV is rarely used. Most respondents in either group also report that they use NPV almost always or always. The choice of DCF approach may depend on the transaction type and debt policy. Forty-six (thirty-three) percent of respondents in the complete (partly complete) group report that they recalculate the WACC in their projections if capital structure changes. This suggests a relatively low level of appreciation of the result that the WACC is sensitive to leverage. On the whole, responses are similar across the two groups and concordant with the results from the original survey.

To further examine how respondents' deal with changes in leverage when using the WACC, Question 15 asks how they would go about estimating the WACC for a project given data on comparables. We first ask whether respondents use market or target weights when estimating the WACC of the comparables and then repeat the question for the WACC of the project. As seen in Table 3, with respect to the WACC for comparables, 58% in the complete group and 71% in the partly complete group correctly answer that they use market weights. For the to-be-valued project, 38% and 71%, respectively, incorrectly use market weights. As in the original survey, these numbers suggest confusion among the respondents regarding how to adjust the WACC for leverage.

Insert Table 3 here.

3.2 The quiz on WACC implementation

In Part 3 of the supplementary survey, respondents are tested on three tasks:

A. Estimating the WACC of a project given complete information for a comparable and incomplete information (missing cost of equity) for the project. The project supports a different leverage ratio than what the comparable operates with. The challenge is thus to re-leverage the WACC.

B1. Using the WACC in valuation. The main challenge here is to avoid double counting the tax shield (which is implicit in the WACC – the WACC is a tax-adjusted discount rate).

B2. Choosing the correct basic cash flows to discount.

The questions are posed as multiple choice (see Appendix B). For simplicity, there is only one comparable and the cost of debt is the same for the comparable as for the project. The setup gives a maximum tax advantage to debt (there are no personal taxes) and assumes leverage ratios are fixed so that discounting unlevered after-tax cash flows at the WACC is correct (Miles and Ezzell, 1980).[2] The thirteen respondents' answers are laid out on a person-by-person basis in Table 4. The table also includes individual answers to Question 15.

Insert Table 4 here.

The first two columns in Table 4 show the responses to Questions 15a and b (in Part 2).[3] For either question, seven individuals have the right answer ("market" and "target," respectively). However, only three respondents have both correct.

Confusion among the respondents is also apparent when we look at their answers on the quiz. With respect Question A, *none of the respondents picked the correct answer.* Only one respondent picked an answer that involves re-leveraging the WACC, but this respondent picked the answer that reverses the leverage ratios of the comparable and the project. The most common response (refer to Table 4) is to use the standard WACC formula,

$$\text{WACC} = \frac{E}{V} r_e + \frac{D}{V} r_d (1 - T_c),$$

with the target weights applied to the cost of equity *of the comparable* and the common cost of debt. In contrast, the correct approach would be to use the market weights of the comparable to calculate its WACC and then re-leverage this to reflect the different leverage ratio of the project. The most common response reveals confusion about how to re-leverage WACCs, but also includes another, more fundamental, mistake; it ignores that the cost of equity is a function of leverage. In short, the responses to Question A in Part 3 support the conclusion from the original survey that there is widespread confusion about tax shields and the WACC. For some professionals, the confusion may be even deeper.

[2]Ignoring issues relating to default (see Cooper and Nyborg, 2008). Personal taxes are ignored for simplicity and also because the original survey shows that valuation professionals rarely consider them.

[3]One individual (respondent 1) answered "other" to both questions as well as to all questions in Part 3. The respondent explained this by saying he/she does not use the WACC.

Question B1 asks about using the WACC to value a non-growing perpetuity. Forty-five percent correctly chose to discount cash flows at the WACC without any further adjustment for the tax shield. However, about a third of the respondents picked procedures that double count the tax shield, either by adding it to the cash flow or by adding the term T_cD to the final answer. One respondent did not include the tax shield at all. This individual (respondent 10) discounted at a WACC (from part A) that used the pre-tax cost of debt (so an estimate of the unlevered cost of capital). The responses to Question B1 show that the respondents are less confused about how to use the WACC, once it is given, than they are with respect to how to adjust it for leverage in the first place. Still, some confusion remains.

In Question B2, the respondents are asked to state which basic cash flows they are discounting. Various incorrect answers are available in the multiple-choice set, but eighty percent correctly picked the after-tax unlevered cash flows.

4 Conclusion

To summarize, the evidence from the supplementary survey supports our original conclusion that valuation professionals are confused with respect to tax shields and the WACC. They find it especially difficult to deal with the WACC being sensitive to leverage. This is seen in their confusion about when and whether to use market or target leverage ratios when estimating the WACC and in their answers on the quiz. A few valuation professionals are also prone to double counting tax shields. In general, one might say that professionals have a less than perfect understanding of the WACC as a tax-adjusted discount rate. However, on the bright side, almost all of the respondents choose the correct cash flows to discount.

References

Cooper, I.A. and K.G. Nyborg (2008). Tax-adjusted discount rates with investor taxes and risky debt. *Financial Management 37*, 365-379.

Miles, J. and J.R.Ezzell (1980). The weighted average cost of capital, perfect capital markets and project life: A clarification. *Journal of Financial and Quantitative Analysis 15*, 719-730.

Appendix A: Supplementary Survey Tables

	Complete				Partly complete			
	Replies	% 1-4	% 3-4	mean	Replies	% 1-4	% 3-4	mean
Panel A: Type of investment								
Project finance	12	75%	8%	1.17	10	70%	30%	1.40
Listed firms	13	69%	31%	1.69	9	78%	22%	1.44
Unlisted firms	12	100%	100%	3.58	11	100%	100%	3.64
Real estate	12	67%	25%	1.50	9	11%	0%	0.11
Other	2				0			
Panel B: Type of transaction								
Merger or acquisition	13	92%	85%	3.15	10	100%	90%	3.50
Investment decisions	13	85%	54%	2.38	11	100%	91%	3.27
Going public	12	42%	8%	0.58	9	56%	11%	1.11
Going private	11	18%	18%	0.64	9	44%	0%	0.56
Other	1				0			
Panel C: Role								
Buy-side	10	80%	30%	1.90	10	100%	80%	3.00
Sell-side	11	82%	36%	1.82	10	80%	60%	2.30
Advisory role	11	100%	82%	3.45	10	70%	60%	2.20
Other	0				0			

Table 1: Purpose of valuation across the complete and partly complete responses.

Description: This table reports on valuation purpose characteristics of the complete and partly complete responses.

Interpretation: The two groups have similar valuation purpose characteristics.

	Complete				Partly complete			
	Replies	% 1-4	% 3-4	mean	Replies	% 1-4	% 3-4	mean
Panel A: Different models								
DCF	13	100%	85%	3.62	7	100%	71%	3.14
RIM	13	31%	0%	0.38	7	43%	14%	0.86
EVA	13	31%	8%	0.54	7	57%	14%	1.00
DDM	13	38%	15%	0.85	7	71%	29%	1.43
IRR	13	92%	46%	2.23	7	100%	71%	2.71
Panel B: Approaches within DCF								
NPV	13	92%	62%	2.69	7	86%	57%	2.57
APV	13	31%	0%	0.46	6	50%	0%	1.50
CCF	13	38%	15%	0.92	7	57%	29%	1.29
Flows to Equity	13	46%	23%	1.25	7	57%	43%	1.57
WACC	13	92%	85%	3.38	7	100%	86%	3.43
Panel C: Factors affecting choice of (B)								
Debt policy	13	77%	46%	2.17	7	71%	57%	2.14
Tax shield risk	13	54%	8%	0.92	7	86%	0%	1.29
Credit rating	13	62%	23%	1.25	6	67%	17%	1.50
Transaction type	13	77%	69%	2.62	7	71%	43%	1.86
Other	0				0			
Panel D: Future changes in capital structure								
WACC	13	62%	46%	1.77	6	83%	33%	2.00
Flows to Equity	13	31%	8%	0.54	6	50%	17%	1.17
APV	13	46%	0%	0.85	6	50%	17%	1.00
Other	1				0			

Table 2: Multi-period models.

Description: This table reports on the results from the multiperiod and DCF questions for the complete and partly complete responses.

Interpretation: For both groups, DCF is the preferred multiperiod model and respondents discount cash flows using the WACC. Respondents typically do not recalculate the WACC in response to projected changes in leverage.

	Complete		Partly complete	
	Replies	% of total answered	Replies	% of total answered
Panel A: WACC: weights for comparables				
MarketW	7	58%	5	71%
TargetW	3	25%	1	14%
Other	2	17%	1	14%
Panel B: WACC: weights for valued firm/project				
MarketW	5	38%	5	71%
TargetW	7	54%	1	14%
Other	1	8%	1	14%

Note: Incorrect answers are in bold.

Table 3: WACC. Implementation and confusion.

Description: This table reports on respondents' choices of market or target weights (leverage ratios) when calculating WACCs for comparables and the to-be-valued firm or project.

Interpretation: Many respondents incorrectly use target weights to calculate WACCs for comparables and market weights for the project. This indicates confusion regarding the sensitivity of WACC to leverage.

Respondent	PART 2: Q15		PART 3		
	WACC weights		Question A	Question B1	Question B2
	(a) Comparables	(b) Project	Calculating WACC	Using WACC	Cash Flows
1	**other**	**other**	**other**	**other**	**other**
2	**target**	target	**e**	**b**	b
3	market	target	**c**	a	b
4	market	target	**c**	**b**	**a**
5	**other**	target	**other**	a	b
6	**target**	target	**c**	a	b
7	market	**market**	**c**	**c**	b
8	market	**market**	-	-	-
9	**target**	target	**a**	**other**	b
10	market	target	**b**	a	-
11	market	**market**	**other**	a	b
12	-	**market**	-	-	-
13	market	**market**	**c**	**b**	b
Total correct	58.33%	53.85%	0%	45.45%	80%

Table 4: Implementation of WACC, "Quiz."

Description: This table reports responses on an individual level for respondents in the "complete" group for Questions 15 a and b (Part 2) and Questions A, B1, and B2 (Part 3). Wrong answers are highlighted red and are in bold. Correct answers are in green. Missing responses are indicated by a dash and not included when calculating correct-answer percentages.

Interpretation: Respondents have a less than perfect understanding of the WACC as a tax-adjusted discount rate. They do not understand how to adjust the WACC for changes in leverage and about a third of them double-count tax-shields.

Appendix B: Supplementary Survey Questionnaire

Prof. Dr. Kjell G. Nyborg
Department of Banking and Finance

University of Zurich[UZH]

Survey on investment valuation practice and policy

The survey is part of a research project. This part of the survey focuses on multi-period models, especially the technique of dicounted cash flows (DCF).
We estimate that the survey will take you about 10 minutes.
Responses will be used only in aggregate and remain anonymous.

Thank you for taking the time to complete the survey.

Instructions: fill in one box per line: ○ Only one answer possible

□ Choose all that apply

1 Preliminary and Personal questions

1. What kind of investments are you usually valuing?

Never 0 1 2 3 4 Always

a. Project finance

b. Listed firms or divisions

c. Unlisted firms or divisions

d. Real estate

e. Other, please specify ...

2. What is the usual purpose of your valuations?

Never 0 1 2 3 4 Always

a. Merger or acquisition

b. Investment decision

c. Going public (Initial Public Offerings, IPOs)

d. Going private

e. Other, please specify ...

3. What side of the investment are you usually on?

Never 0 1 2 3 4 Always

a. I am on the buy-side

b. I am on the sell-side

c. Advisory role

d. Other, please specify ...

4. Age

○ 20 - 25
○ 25 - 30
○ 30 - 40
○ 40 - 50
○ 50 +

5. Education

□ Bachelor Degree
□ Master Degree
□ MBA
□ PhD
□ CFA
□ Other Professional Exam

6. Years of Work Experience

○ 0 - 3
○ 4 - 10
○ 10+

7. Professional Title (e.g. Analyst, Associate, Investment Manager, Consultant, etc.)

8. Gender ○ Female ○ Male

9. Sector focus ○ No ○ Yes, which?

10. Firm size focus (in terms of enterprise value)

□ More than €5 billion □ Between €500 million and €5 billion □ Less than €500 million

11. Transaction Focus □ National Deals □ Cross-Border Deals

12. Regional Focus

□ Western Europe □ Eastern Europe □ North America
□ South and Middle America □ Asia □ Middle East □ Africa

2 Multi-period models

13. How important are the following approaches?

Not important 0 1 2 3 4 Very important

a. Discounted Cash Flow (DCF)

b. Residual Income Model (RIM)

c. Economic Value Added (EVA)

d. Dividend Discount Model (DDM)

e. Internal Rate of Return (IRR)

14. Within DCF valuation, how frequently do you use the following approaches?

Never 0 1 2 3 4 Always

a. Net Present Value (NPV)

b. Adjusted Present Value (APV)

c. Capital Cash Flow (CCF)

d. Flows-to-Equity

e. Weighted Average Cost of Capital (WACC)

14a. What factors affect your choice in (14.)?

Not important 0 1 2 3 4 Very important

a. Debt policy of firm or project to be valued (i.e. whether the firm has a target debt ratio)

b. Riskiness of Tax Shield

c. Firm's credit rating

d. Type of transaction

e. Other, please specify ...

15a. When calculating Weighted Average Cost of Capital (WACC) of your comparables, do you typically use market weights of equity and debt, or do you typically use target weights?

○ Market weights ○ Target weights ○ Other, please specify ...

15b. When calculating Weighted Average Cost of Capital (WACC) to apply to the project or firm you are valuing, do you typically use market weights of equity and debt, or do you typically use target weights?

○ Market weights ○ Target weights ○ Other, please specify ...

16. How do you deal with expected future changes in capital structure?

Never 0 1 2 3 4 Always

a. When using WACC: recalculating WACC for every forecasted year

b. When using Flow-to-Equity: recalculating cost of equity for every forecasted year

c. I use Adjusted Present Value (APV) if the capital structure is not fixed

d. Other, please specify ...

3 WACC implementation: Practical examples

Suppose you want to value AAA Corp by discounting cash flows at the appropriate weighted average cost of capital (WACC), and that:

- The corporate tax rate, T_c, is 30%. (There are no personal taxes).
- The target debt-to-value ratio is 20% (maintained in perpetuity)
- The cost of debt is 5%
- The cost of equity of AAA Corp is unknown, but BBB Corp is an excellent comparable with similar assets, operating strategy, etc, but less equity in its capital structure. BBB Corp maintains a constant leverage ratio over time.

	E/V	Cost of equity, r_e	D/V	Cost of debt, r_d
AAA Corp	Target: 0.8	no information available	Target: 0.2	5%
BBB Corp	Actual: 0.4	10%	Actual: 0.6	5%

E: Equity value; D: Debt value; $V = E + D$

Questions:

A. WACC: Which is most close to your best estimate of the WACC of AAA Corp?

Select one of the below:

a. $(E/V)r_e + (D/V)r_d = 0.8 \times 10\% + 0.2 \times 5\% = 9.0\%$

b. $(E/V)r_e + (D/V)r_d = 0.4 \times 10\% + 0.6 \times 5\% = 7.0\%$

c. $(E/V)r_e + (D/V)r_d(1 - T_c) = 0.8 \times 10\% + 0.2 \times 5\% \times (1 - 0.3) = 8.7\%$

d. $(E/V)r_e + (D/V)r_d(1 - T_c) = 0.4 \times 10\% + 0.6 \times 5\% \times (1 - 0.3) = 6.1\%$

e. $9.0\% - (D/V)r_dT_c = 9.0\% - 0.6 \times 5\% \times 0.3 = 8.1\%$

f. $7.0\% - (D/V)r_dT_c = 7.0\% - 0.2 \times 5\% \times 0.3 = 6.7\%$

g. None of the above. (Please explain.)

B. VALUE: Using the WACC in part A, which is most close to your best estimate of the value of AAA Corp given that the expected cash flows per year in perpetuity are as follows:

- Pre-tax, under 100% equity financing: USD 2.0 mill
- After-tax, under 100% equity financing: USD 1.4 mill

The formula I would use to estimate AAA Corp's value is:

Select one of the below:

a. CF/WACC

b. $(\text{CF} + T_c r_d D)/\text{WACC}$

c. $(\text{CF}/\text{WACC}) + T_c D$

d. $(\text{CF} + T_c r_d D)/\text{WACC} + T_c D$

e. None of the above. (Please explain.)

With the cash flow, CF, in the formula above being:

Select one of the below:

a. CF = USD 2.0 mill

b. CF = USD 1.4 mill

a. CF = USD 2.0 mill $\times$ 0.8 = USD 1.6 mill

c. CF = USD 1.4 mill $\times$ 0.8 = USD 1.12 mill

d. None of the above. (Please explain.)