

"A man is
great by
deeds, not by
birth"

-Chanakya

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Valuation Methods: A Reconciliation

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Valuation Methods: A Reconciliation¹

Abstract:

This case involves reconciling the various valuation methodologies. There are three commonly used methodologies for valuation: WACC-FCF, APV, and Flow to Equity. The firm's leverage policy determines the appropriateness of each of these methods within a given context. If the company's debt policy is a constant debt ratio, the WACC-FCF method is the most convenient to use. If the (un)levering equation is carefully chosen to reflect the leverage policy, regardless of the technique used, all methods will yield the same result. In this instance, the APV and WACC-FCF methods produce distinct valuation figures. The case illustrates the difficulties associated with implementing the WACC-FCF method when the leverage policy is to maintain a constant level of debt with a known repayment schedule. It also discusses the modifications necessary for valuing the same project using the WACC-FCF method.

Atul has been diligently working for the past six hours without a break. He has double-checked all his computations five times and is still unable to determine where he made a mistake, as he is unable to get the value of the project using the WACC methodology to match the valuation obtained using the APV method. He recalled the class discussions and re-read the class notes, cross-checked them with the textbook, and compared them with his workings, but he is still unable to determine why the methods are yielding two different numbers and why the final answers differ by approximately Rs 2,77,000; he believes that the discrepancy is due to a small error in some of the computations because the difference is so small. It was nearly 3:30 a.m., and he had to present on behalf of his team in the first class the following day. He was tired from spending so much time in front of the computer, so he went to bed to try to sleep for a couple of hours. Even in bed, he cannot stop thinking about the valuation case, so he decided to post the query to the instructor and seek his assistance. Immediately, he restarted the computer and composed the following email:

Hello Sir,

I am Atul, a student in your Corp Fin class from Section Z. As homework for today's class, you assigned Query No. 12 from Chapter 18. I was able to solve the APV problem, but when I repeated the valuation using the WACC-FCF method, I obtained different results. Here are my calculations²; could you tell me where I went wrong?

Thank you in advance, Atul

After sending the email, he felt at ease and was able to fall asleep. Later that morning, Atul's presentation in the first class was well-received by the case instructor, and he was satisfied with how things were progressing. The following class is Corporate Finance, and he is avidly anticipating an appreciation as well as hints about the source of the errors he made in his valuations. He informed his classmates with a grimace about the ordeal he endured last night

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² The problem and the workings are given in the Appendix.

and the email he sent to their professor, Professor RF. As Professor RF is an intemperate individual occasionally mocks students who ask questions in class, his friends were immediately alarmed. In fact, many students had difficulty passing the course in the previous term due to the difficulty of the midterm exam. Atul, who had no idea about these facets of Prof RF's character, is taken aback and hoping against hope that he will not be ridiculed in class. At the start of class, Professor RF informed the students that he would not be covering any conceptual material today and would instead give them the day off, with the caveat that they needed to complete an assignment and turn it in by noon. He also mentioned that the question had been posed to him as a doubt by one of the students in the class, though he would not reveal which one. Atul was worried that Professor RF was behind the question emailed to him last night, but he could breathe easy after hearing that the professor would not be disclosing the questioner's name. However, Prof RF revealed his email aloud to the class, and it was immediately clear who had sent it. He then gave the following questions and asked the students to submit the answers as part of the assignment:

1. Identify any mistakes in the valuation of the given project (details given in Appendix).
2. Evaluate the same project using the WACC-FCF method and confirm that both APV and WACC-FCF yield the same valuation figure.

The entire class believed that the assignment fell to them because of Atul's e-mail; some were gnashing their teeth and others were cursing, but they were all disappointed with Atul.

Appendix

The problem that was initially assigned as a self-work exercise was chosen from Chapter 18 and Problem No. 12 of the recommended course textbook "*Corporate Finance*" by Ross, Westerfield, Jaffe, and Jordan. Atul's workings are given below:

Information from the Problem:

D/E	0.5	From the problem
Tax rate (t)	0.21	From the problem
Ke	0.15	From the problem
Ku	0.133010753	Working note 1
Kd	0.09	From the problem

Working note 1: Unlevered cost of equity is estimated from the following equation.

$$K_e = K_u + (K_u - K_d)(1 - t)\frac{D}{E}$$

Table 1

Time (i)	FCF from project (ii)	Debt related CFs (iii)	Interest on outstanding loan (iv)	Interest tax shield (v)
0	(1,47,00,000.00)	93,00,000.00	-	
1	54,00,000.00	(31,00,000.00)	8,37,000.00	1,75,770.00
2	89,00,000.00	(31,00,000.00)	5,58,000.00	1,17,180.00
3	86,00,000.00	(31,00,000.00)	2,79,000.00	58,590.00

Working note 2:

(a) FCFs and loan related CFs are given in the problem

(b) Interest is computed at 9% pa on loan outstanding at the beginning. Interest amount for year 1 = 93,00,000 * 0.09 = 8,37,000 and for the 2nd year it will be 62,00,000*0.09 = 5,58,000.

(c) Interest tax shield for year 1 = 8,37,000 * 0.21 = 1,75,770 so on so forth

APV = Base-case NPV + NPV Financing

$$\text{Base case NPV} = \frac{5400000}{1.133010753^1} + \frac{8900000}{1.133010753^2} + \frac{8600000}{1.133010753^3} - 14700000 = ₹29,11,917.44$$

$$\text{NPV Financing} = \frac{175770}{1.09^1} + \frac{117180}{1.09^2} + \frac{58590}{1.09^3} = ₹3,05,127.17$$

$$\text{APV} = 29,11,917.44 + 3,05,127.17 = ₹32,17,044.61$$

Valuation based on WACC- FCF method:

As the debt level varies annually, so will the weights, causing the WACC to fluctuate annually as well; therefore, we must estimate the WACC for each year using the new D/E ratios. Subsequently the FCFs from the project can be discounted at the re-estimated WACCs.

Table 2

Beginning of period	Firm Value	Debt	Equity	D/V	E/V	WACC
1	₹1,70,79,970.41	93,00,000.00	₹77,79,970.41	54.45%	45.55%	10.70%
2	₹1,42,41,965.97	62,00,000.00	₹80,41,965.97	43.53%	56.47%	11.57%
3	₹74,78,260.87	31,00,000.00	₹43,78,260.87	41.45%	58.55%	11.73%

Working note 3:

$$\text{Firm value at the beginning of year 1: } \frac{5400000}{1.15^1} + \frac{8900000}{1.15^2} + \frac{8600000}{1.15^3} = ₹1,70,79,970.41$$

$$\text{Firm value at the beginning of year 2: } \frac{8900000}{1.15^1} + \frac{8600000}{1.15^2} = ₹1,42,41,965.97$$

$$\text{Firm value at the beginning of year 3: } \frac{8600000}{1.15^1} = ₹74,78,260.87$$

As debt is known to be repaid in three equal instalments, we can estimate the value of equity from the following identity:

$$V = D + E$$

After estimating the D/V and E/V ratios for each year WACC is calculated as follows:

$$\text{WACC for year 1} = 54.45\% * 0.09 * (1 - 0.21) + 45.55\% * 0.15 = 10.70\%$$

Similarly, WACC is estimated for the remaining two years.

$$\text{NPV of the project} = \frac{5400000}{1.1070^1} + \frac{8900000}{1.1157^2} + \frac{8600000}{1.1173^3} - 14700000 = ₹34,94,216.53$$

References:

Ross, S. A., Westerfield, R. W. Jaffe, J. and Jordan, B. (2019). *Corporate Finance*. 12/e McGraw Hill Education, Chennai

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