AEM 2241
Finance
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AEM 2241 - Finance - Prelim II

Different exams had similar problems, but the details (e.g., the numerical values) may have been slightly different. We do not publish to all versions of all problems. If your problem is not directly listed, please solve it by analogy to the problems listed below. If you have any questions, the course staff will be happy to help.

1 Problem 1

This was not a problem, just a required acknowledgment that the rules of Academic Integrity would be respected.

2 Problem 2

The difference between a company's future cash flows if it accepts a project and the company's future cash flows if it does not accept the project is referred to as the project's

- ✗ erosion effects.
- ✗ financing cash flows
- ✓ incremental cash flows
- ✗ external cash flows
- ✗ internal cash flows

Answer:

The answer should be obvious, as it was stated many times.

3 Problem 3

Changes in the net working capital requirements:

- ✗ are excluded from project analysis as long as they are recovered when the project ends
- ✗ only affect the initial and final cash flows of a project

✓ can affect the cash flows of a project every year of the project's life

✗ only affect the initial cash flows of a project

✗ are generally excluded from project analysis due to their irrelevance to the total project

Answer:

There is nothing that prevents NWC from changing every year, or even within the year. For example, we may change (adjust) our policy to sell on credit, thus potentially impacting A/R. We may benefit (or not) if our suppliers adjust their payment policies, thus leading to changes in our A/P. The cost of raw materials may go up or down; a project may have several phases, which are all characterized by different levels of working capital. These are only some of the changes that may impact NWC.

4 Problem 4

The operating cash flow for a project should exclude which one of the following?

✗ depreciation tax shield

✗ fixed costs

✓ interest expense

✗ variable costs

✗ taxes

Answer:

We can answer this question by elimination. Depreciation (and the benefit it offers, the "tax shield") is part of OCF. Costs, whether fixed or not, are part of the OCF. Taxes are part of OCF. This leaves just "interest expense" as potentially not being part of OCF. Indeed, we have never seen an example of OCF calculation that included interest expense.

5 Problem 5

Brickhouse is expected to pay no dividend over the next two years. In year 3, the company will pay a dividend of \$2.4. After that, the company is expected to increase its annual dividend at 3.6 percent. What is the stock price today if the required return is 11 percent?

✗ \$36.42

✗ \$27.26

✗ \$32.43

✓ \$26.32

✗ \$29.96

Answer:

The stream of dividends forms a growth perpetuity. Our formulas for annuities (of which this is but one kind) compute the present value of such an annuity one time-period before the first cash flow (here, first dividend). So we compute $P_2 = \frac{D_3}{r-g} = \frac{2.40}{0.11-0.036} = \$32.43$. So, **if** we waited until time t=2 **and** our current assumptions about future dividends held, then the price of the stock at time 2 would be P_2. There are no dividends between time 0 and time 2, so to get to the price of the stock at time 0, we discount P_2 over two time periods. $P_0 = \frac{P_2}{(1+r)^2} = \frac{32.43}{(1+0.11)^2} = \$26.32$.

6 Problem 6

A project that will last for 10 years is expected to have equal annual cash inflows of \$98,500. If the required return is 7.8 percent, what maximum initial investment would make the project acceptable?

✗ \$579,104.36

✗ \$1,413,445.24

✓ \$666,947.08

✗ \$620,468.96

✗ \$637,742.44

Answer:

We use the calculator to compute the NPV of a series of 10 yearly cash flows of \$98,500. We hit CF, 2ND, CLR WORK (to clear the worksheet); 0, ENTER, arrow down, 98,500, ENTER, arrow down, 10, ENTER, NPV, 7.8, ENTER, arrow down, CPT. We get \$666,947.08.

We could have used the "old style" TVM functions for this calculation, as this is an ordinary annuity. N=10; I/Y=7.8; PMT=98,500; FV=0, CPT PV yields the same result as before: -\$666,947.08. As you will recall, the negative sign indicates the direction of the cash flow.

The NPV of the **project** includes the initial investment. The highest initial investment would make the project barely acceptable, leading to an NPV of 0 (or just a hair above 0), so this investment must be at most \$666,947.08 (in fact, we rounded down the NPV of the 10 payments by a fraction of a cent, so this value provides and ever-so-small positive NPV).

7 Problem 7

A project will generate annual cash flows of $237,600 for each of the next three years, and a cash flow of $274,800 during the fourth year. The initial cash outflow of the project is $763,600. What is the internal rate of return of this project?

- ✗ 9.07%
- ✓ 10.88%
- ✗ 11.79%
- ✗ 10.28%
- ✗ 9.67%

Answer:

We use the calculator: cf0=-763,600; cf1=237,600, f01=3, cf2=274,800, f02=1. We then hit IRR and CPT to get 10.88%.

8 Problem 8

The current book value of a fixed asset that was purchased two years ago is used in the computation of which one of the following?

- ✗ Tax on EBIT
- ✗ Change in net working capital
- ✗ MACRS depreciation for the current year
- ✓ Tax due on the current salvage value of that asset
- ✗ Current year's operating cash flow

Answer:

The answer is obvious and was extensively discussed in class.

9 Problem 9

A decrease in which of the following will increase the current value of a stock according to the dividend growth model?

✗ Dividend amount

✗ Both the discount rate and the dividend growth rate

✓ Discount rate

✗ Dividend growth rate

✗ Number of future dividends, provided the total number of dividends is less than infinite

Answer:

The answer is obvious by thinking intuitively about the effect of individual changes.

If we reduce the size of the dividends, their present value, both individually and collectively, goes down.

If we reduce the discount rate, we discount "less aggressively," and the present value of each dividend will go up. Same for the sum of the PVs of all dividends. So this seems to be the answer.

If we reduce the growth rate of the dividends, we reduce the dividends following the first one, so their collective NPV also goes down.

If we reduce the number of the dividends, we decrease the dividends' aggregate present value.

The stock price is given by the present value of all the future dividends. In the growth model we have $stock\,price = D_1 \frac{1-\left(\frac{1+t}{1+r}\right)}{r-g}$.

One may think that the second choice, "both the discount rate and the dividend growth rate," to be the answer. That is not so. Assume that D_1 does not change, that $n = 15$ in both cases, but that we have two situations with $r_1 = 10\%$, $g_1 = 4\%$ and $r_2 = 9\%$, $g_2 = 1\%$, respectively. The present value factors of the respective growth annuities will be $\frac{1-\left(\frac{1+0.04}{1+0.10}\right)^{15}}{0.10-0.04} \approx 9.4811$,and $\frac{1-\left(\frac{1+0.01}{1+0.09}\right)}{0.09-0.01} \approx 8.5159$. Clearly, both r and g have decreased, but the stock price has also decreased (from $D_1 \cdot 9.4811$ to $D_1 \cdot 8.5159$).

10 Problem 10

Zhu Pediatrics just spent \$148,000 to purchase some MACRS five-year property. The MACRS rates are 20%, 32%, and 19.2% for Years 1 to 3, respectively. Assume the firm opted to forego any bonus depreciation. Which one of the following will correctly give you the book value of this equipment at the end of Year 2?

✓ \$148,000(1 − .2 − .32)

✗ \$148,000[(1 + .20)(1 + .32)]

✗ [$148,000(1 − .20)](1 − .32)

✗ $148,000/(1 + .2 + .32)

✗ $148,000(.20 + .32)

Answer:

The book value starts by being equal to the capital asset's acquisition price and then it is decreased every year by the amount of depreciation recognized. So the book value started at $\$148,000$, then was decreased by $\$148,000 \cdot 0.20$ and $\$148,000 \cdot 0.32$ in years 1 and 2, respectively. Since these are formulas, no actual calculations were needed.

11 Problem 11

Pet Supply purchased $62,800 of fixed assets two years ago. The company no longer needs these assets so it is going to sell them today for $29,500. The assets are classified as five-year property for MACRS. The MACRS rates are .2, .32, .192, .1152, .1152, .0576, for Years 1 to 6, respectively. What is the net cash flow from this sale if the firm's tax rate is 23 percent and no bonus depreciation is taken?

✗ $25,516.60

✓ $29,648.12

✗ $25,211.09

✗ $29,281.04

✗ $18,576.00

Answer:

The book value of the fixed assets at the end of year 2 is $\$62,800 \cdot (1 - 0.20 - 0.32) = \$30,144$. The cash flow from the sale is $29,500 - (29,500 - 30,144) \cdot 0.23 = 29,500\,(1 - 0.23) + 30,144 \cdot 0.23 = \$29,648.12$.

12 Problem 12

Home Furnishings is expanding its product offerings to reach a wider range of customers. The expansion project includes increasing floor inventory by $486,000 and increasing its debt to suppliers by 90 percent of that amount. The company will also spend $947,000 to expand the size of its showroom. As part of the expansion plan, the company expects accounts receivable to rise by $205,000. For the project analysis, what amount should be used as the initial cash flow for net working capital?

✗ −$271,000

✗ −$391,000

✗ −$176,600

✓ −$253,600

✗ −$156,400

Answer:

$\Delta NWC = (Current\, assets) - (Current\, liabilities)$, so $\Delta NWC = (A/R) + (Inventory) - (A/P)$
Of course, all amounts are **incremental**.
$\Delta NWC = 205,000 + 486,000 - 0.90 \cdot 486,000 = \$253,600$.
Net working capital **increased**, so Home Furnishings had to put more money into its business. This generated a **negative** cash flow.

13 Problem 13

A project with a life of 7 years is expected to provide annual sales of $310,000 and costs of $213,000. The project will require an investment in equipment of $565,000, which will be depreciated on a straight-line method over the life of the project. You feel that both sales and costs are accurate to +/−10 percent and that the deviations in predictions for sales and costs are independent of each other. The tax rate is 21 percent. What is the maximum annual OCF that could be achievable if these assumptions hold?

✗ $56,945

✗ $98,538

✓ $134,897

✗ $102,093

✗ $78,205

Answer:

$OCF = (Sales - Costs) \cdot (1 - T_c) + D \cdot T_c$. To maximize OCF, we need to consider the **maximum** sales and the **minimum** costs compatible with the assumptions of the problem.
Annual depreciation is $D = \frac{1}{7} \cdot 565,000 = \$80,714.29$.
We get $OCF = [(1 + 0.10) \cdot 310,000 - (1 - 0.10) \cdot 213,000] \cdot (1 - 0.21) + 80,714.29 \cdot 0.21 =$ $134,897.00.

14 Problem 14

Andrea is analyzing a project that currently has a projected NPV of zero. Which one of the following changes that she is considering is most apt to cause that project to produce a positive NPV instead? Consider each change independently.

- ✗ Decrease the sales price
- ✓ Decrease the labor hours per unit produced
- ✗ Increase the amount of the initial investment in net working capital
- ✗ Decrease the sales quantity
- ✗ Increase the materials cost per unit

Answer:

The correct choice is the second one.

The first choice would decrease revenue from sales, thus reducing OCF. The third choice would increase the negative cash flow at time 0. Decreasing the sales quantity would also reduce revenue from sales, reducing OCF. Increasing the materials cost would increase costs, which would again reduce OCF. All these choices would reduce the NPV of the project.

15 Project 15

Alina's Cafe is expanding and expects the expansion to cause an increase in operating cash flows of \$42,000 per year for seven years. This expansion requires \$78,000 in new fixed assets. These assets will be worthless at the end of the project. In addition, the project requires an investment of \$6,000 in net working capital at the start of the project, which will be recovered at the end of the project. What is the net present value of this expansion project at a required rate of return of 14 percent?

- ✗ −\$64,817
- ✗ −\$98,507
- ✗ −\$261,711
- ✓ \$98,507
- ✗ \$182,507

Answer:

We compute the project cash flow (PCF) at time 0. We know that $PCF = OCF - \Delta NWC - (Capital\ Spending)$. We have:

$PCF_0 = -6,000 - 78,000 = -\$84,000$. $PCF_7 = 42,000 + 6,000 = \$48,000$. For years 1 to 6, inclusive, we have $PCF_i = 42,000$, $i = 1, 2, \ldots, 6$.

Nothing was said about depreciation. Does it matter? For this problem, no! Why? Depreciation would impact OCF and the after-tax cash proceeds from the sale of the fixed assets. But we are given the OCF amount directly, and there is no sale of fixed assets at the end. So we do not need details about depreciation.

We can now use the calculator to determine the NPV of the project. We use the cash flow worksheet: cf0=-84,000; cf1=42,000; f01=6; cf2=48,000; f02=1. We then press NPV; I=14; arrow down; CPT. We get $98,506.63.

16 Problem 16

Your are part of a financial analysis group and are currently examining two exclusive projects, A and B, respectively, whose yearly projected cash flows are given below. As a newly hired analyst, you have been tasked to make a recommendation. You have been computing NPV values using various discount rates and you noticed that, on an NPV basis, project A seems to sometimes be better, while in other situations project B seems to be better.

Calculate the critical discount rate below which projects have one ranking and above which projects have the opposite ranking. Enter the result below in percents, like you do when using the calculator (e.g. use 5.32 and NOT 0.0532 or 5.32%). Use enough decimals in your calculations so that the answer you provide has at least two correct decimals (i.e., you provide the answer with an accuracy better than 1 basis point [1/100th of a percent]). Using 4-5 decimals will probably suffice.

Time	**Project A**	**Project B**
0	-575,325	-300,325
1	350,000	274,610
2	738,000	639,750
3	490,500	389,125
4	375,000	249,630

Hint: You solved a similar problem in Homework 3. What can you tell about the NPVs of the two projects at the "critical discount" rate mentioned above?

Answer:

We have studied NPV curves in class when we discussed (mutually) exclusive projects. In this case, it is not important for the projects to be mutually exclusive, all we need is to remember that it is possible for the NPV-based ranking of two projects to change, i.e. for the two projects' NPV curves to intersect. For discount rates below the rate where the curves intersect one project's NPV is bigger than the other project's; at the intersection, the two projects have the same NPV, while for rates greater than the rate where the curves intersect, the NPV-based ranking will be reversed.

So we need to determine the discount rate for which these projects have the same NPV. This problem was solved in one of the homeworks. All we need to do is to subtract the cash flows of Project B from the cash flows of Project A, and compute the IRR of the resulting differential cash flows.

Time	Project A	Project B	Difference	Calculator
0	-575,325	-300,325	-275,000	cf0=-275,000
1	350,000	274,610	75,390	cf1=75,390, f01=1
2	738,000	639,750	98,250	cf2=98,250, f02=1
3	490,500	389,125	101,375	cf3=101,375, f03=1
4	375,000	249,630	125,370	cf4=125,370, f04=1

We use the calculator's CF worksheet to enter these cash flows (see table). We then press IRR, then CPT. We get the answer 15.52728% $\approx$ 15.53%. This is the answer that we provide.

We can check the correctness of the answer by computing the NPV of Project A and Project B, respectively. We do this by entering into the calculator the actual cash flows for the two projects (one cash flow series at a time), and then computing the NPVs while using a discount rate of 15.52728%.

We get: $NPV_A = \$809,221.29$, $NPV_B = \$809,221.26$. Note that the two NPVs are (almost) identical. Using more decimals for the discount rate and using higher-precision computations would yield results that are even closer.

As it often happens, our explanations are long. However, to solve the problem, all you needed to do was to compute the differential cash flows between Project A and Project B, enter the resulting 5 numbers into the CF worksheet, and then compute the IRR of these cash flows. This comes down to five subtractions, entering five values into the CF worksheet, and simply triggering the IRR calculation.

17 Problem 17

An industry expert, part of your project analysis team, told you that no matter when you take (recognize) depreciation of a given capital asset, you save the same number of dollars (expressed as a simple count, not in terms of present value), as long as your tax rate stays constant. He claims that this applies equally to linear depreciation and MACRS-based depreciation. As far as you know, this person's expertise is in technology, with no special expertise in finance, but you do not really know much about him. You are pondering his statement. You decide that:

- ✗ Your colleague is not right, the number of dollars saved due to depreciation will depend on the precise depreciation schedule, the time when an asset is sold (if it is sold), and perhaps other factors.
- ✗ Your colleague is right, but only if one sells one's capital assets before they are fully depreciated.

- ✓ Your colleague is right.
- ✗ Your colleague is right, but only if one holds one's capital assets until they are fully depreciated.

Answer:

The "savings" related to depreciation refer to tax savings (lower tax payments).

As shown in class, every dollar of recognized depreciation leads to T_c dollars of tax savings (i.e. $D \cdot T_c$ of tax savings occur for D dollars of depreciation recognized). Let DR be the total amount of depreciation already recognized; then the total tax shield benefit to date is $DR \cdot T_c$. It does not matter what the depreciation schedule was, only the amount of total depreciation taken to date.

Clearly, if the asset was totally depreciated, $DR = initial\, cost$, and the total tax benefit is $(initial\, cost) \cdot T_c$. If the asset is sold after it is fully depreciated, there are no further tax savings at the time of the sale.

Now, assume that a fixed asset is sold before it is totally depreciated; i.e. when $DR < initial\, cost$. Then the book value $BV = (initial\, cost) - DR$. The book value depends on the depreciation already taken.

$(After\, tax\, salvage\, CF) = (sale\, price)\,(1 - T_c) + BV \cdot T_c$. The tax shield here is $BV \cdot T_c = (initial\, cost - DR) \cdot T_c$. If we add the tax shield due to already recognized depreciation to the tax shield due to the sale of the asset, we get $DR \cdot T_c + BV \cdot T_c = DR \cdot T_c + (initial\, cost - DR) \cdot T_c = (initial\, cost) \cdot T_c$.

So, no matter when we recognize depreciation, we ultimately reduce our tax payments by the same number of dollars. Time-value considerations, which we ignore here, imply that recognizing depreciation as soon as possible would maximize the present value of the tax shield. Also, we assumed that we have a flat-rate tax system, that tax rates do not change in time, and that "negative taxes" resulting from taxable losses can be used.

18 Problem 18

Net working capital:

- ✓ can create either an initial cash inflow or outflow.
- ✗ can be ignored in project analysis because any expenditure is normally recouped at the end of the project.
- ✗ requirements, such as an increase in accounts receivable, create a cash inflow at the beginning of a project.
- ✗ is rarely affected when a new product is introduced.
- ✗ is the only expenditure where at least a partial recovery can be made at the end of a project.

Answer:

The change in net working capital can be either positive (generating a negative cash flow) or negative (generating a positive cash flow).

19 Problem 19

Pinnacle purchased $139,700 of fixed assets that are classified as five-year MACRS property. The MACRS rates are .2, .32, .192, .1152, .1152, and .0576 for Years 1 to 6, respectively. What will the accumulated depreciation be at the end of Year 4 if the tax rate is 21 percent and no bonus depreciation is taken?

- ✗ $48,755.09
- ✓ $115,559.84
- ✗ $76,269.49
- ✗ $24,140.16
- ✗ $16,093.44

Answer:

We can add the MACRS rates for years 1 to 4, respectively: $.20 + .32 + .192 + .1152 = .8272$. By the end of year 4 82.72% of the fixed asset's initial cost has been depreciated. In dollars, the accumulated depreciation is $139,700 \cdot 0.8272 = \$115,559.84$.

20 Problem 20

You take over from an analyst colleague who left in great haste, having been fired for careless work. You have been tasked with continuing a project analysis that predicted cash flows of -$525,000, $120,000, $101,500, $175,000, $175,000 at inception (start), and in years 1, 3, 4, and 5, respectively. Unfortunately, you cannot find the projected cash flow value for year 2. Your boss remembers that the analysis was quite labor-intensive, but she cannot find the underlying documents either. She did find, however, a note that the IRR of the project was calculated to be 7.94%. She wants you to calculate the NPV of the project at a discount rate of 5.3%. To do this, you think that you must reconstruct the value of the cash flow in year 2.

Enter in the field below your estimate of the cash flow in year 2. If you believe that the cash flow cannot be determined, enter 0. If you believe the cash flow is negative, enter the cash flow as a negative number.

Hints:

1. Can you determine what the PV of the missing cash flow must be?
2. If you decide to set up a cash flow worksheet on your calculator, consider carefully how to indicate to the calculator that a cash flow at time 2 is "missing."
3. Use 4-5 decimals of precision or more.

Answer:

IF we had all cash flows, including the missing cash flow from year 2, the NPV of all cash flows, when discounted at a rate equal to the (known) IRR, would be 0. Let PV_i be the PV of the cash flow at time i when discounted back to time 0 using a discount rate equal to the IRR. We have $\sum_{i=0}^{5} PV_i = 0$, thus $PV_2 = -(PV_0 + PV_1 + PV_3 + PV_4 + PV_5)$. So, if we just compute the NPV of the **known** cash flows using a discount rate equal to the IRR and then we switch the sign of the result, we get the PV of the missing cash flow at time 2! We do this using the calculator: CF; cf0=-525,000; cf1=120,000; f01=1; **cf2=0**; **f02=1**; cf3=101,500; f03=1; cf4=175,000; f04=2. We then hit NPV; I=7.94; arrow down; CPT. The NPV of the known cash flows is -\$84,768.79713. Thus $PV_2 = \$84,768.79713$ and $CF_2 = PV_2 \cdot (1 + IRR)^2 = 84,768.79713 \cdot (1 + 0.0794)^2 = \$98,764.49513$, which is approximately $\$98,764.50$.

We can check this result by updating cf02 in the calculator's CF worksheet. We set cf02=98,764.50 and then hit IRR and CPT. We get IRR=7.94000%, which indicates that we worked correctly.

21 Problem 21

As part of tax law revisions, legislators contemplate changes to the flat tax rate; it is anticipated that the tax rate would increase significantly. The accounting-standards-compliant financial statements of your firm show that the business is profitable. If sales, costs, capital expenses, pre-tax salvage amounts, and depreciation schedules would remain the same for your business even if the tax rate increased, the increase in tax rate would SURELY:

- ✗ decrease the value of the tax shield provided by depreciation AND increase the OCF
- ✓ increase the value the tax shield provided by depreciation AND decrease the OCF
- ✗ decrease the value of the tax shield provided by depreciation AND decrease the OCF
- ✗ increase the value of the tax shield provided by depreciation AND increase the OCF
- ✗ none of the other choices are correct.

Answer:

The tax shield provided by D dollars of recognized depreciation is $D \cdot T_c$. The tax shield will increase in value if the tax rate goes up. This is also true for the tax shield provided when a capital asset is sold. Under those circumstances, the tax shield is equal to $(book\,value) \cdot T_c$. If DR is the total amount of depreciation recognized before the sale of the fixed asset, the tax shield is $(book\,value) \cdot T_c = (initial\,cost - DR) \cdot T_c$. Assuming the depreciation schedule did not change, and the same amount of depreciation was recognized before the sale, the value of the tax shield resulting from the sale of fixed assets also increases. The sum of the two tax shields is $(initial\,cost) \cdot T_c$; this also increases if the tax rate goes up.

OCF will go down: a profitable firm pays taxes; if the profit stays the same and the tax rate goes up, more tax will be paid, more cash "goes out the door," thus the OCF must decrease.

We conclude that if the tax rate were to go up, then (a) the value of the tax shield would increase, and (b) the OCF would decrease.

Note: You could conclude that OCF will decrease using formulas, but that was not necessary here.

We rewrite OCF to show how it depends on T_c: $OCF = (Sales - Costs) + (D - Sales + Costs) \cdot T_c$. Now, if we use the symbol Δ to denote change, and the only things that can change is the flat tax rate, we get $\Delta OCF = (D - Sales + Costs) \cdot \Delta T_c$. Thus an increase in the tax rate ($\Delta T_c > 0$) will lead to in increase in OCF ($\Delta OCF > 0$) if and only if $D - Sales + Costs > 0$, i.e., if $Sales < Costs + D$. The problem tells us that the firm is profitable (on the usual accounting basis), so it must be that $Sales > Costs + D$, which implies $\Delta OCF < 0$ when tax rates go up.