NPV

1. Today's date is January 1, 2015 and Sanjana needs some advice. Suppose Project A has cash flows of $32 starting at the end of this year, and continuing on for three more years (thus 4 years total). The cash flows then decrease by 2% each year after that, for 4 years. After that, cash flows increase by 8% for 5 years, and then decrease by 3% for 3 years. Assume the discount rate is 12%.

a) What is the NPV for Project A? [5 points]
   Solution: NPV = $232.14

2. Today's date is January 1, 2015 and Wei needs some advice. Project A has cash flows of $89 starting at the beginning of this year (i.e. today), and continuing on for three more years (thus 4 years total). The cash flows then increase by 3% each year after that, for 5 years. After that, cash flows decrease by 8% for 6 years. Assume the discount rate is 12%.

a) What is the NPV for Project A? [5 points]
   Solution: NPV = $683.65

Cash Flows

3. The current date is January 1, 2015. You are thinking about building a plant for a project run by Sager Enterprises that will cost $40K today. The plant will start producing immediately, and will generate revenues for 3 years, starting at the end of this year (December 31, 2015). Each year, the revenue will be $80K. The material costs for the project each year will be $40K, also starting at the end of this year. Labor costs will start at $10K at the end of this year, and stay constant. The plant has a 4 year depreciation schedule, as prescribed by the IRS. Assume a tax rate of 40%, and that all taxes are paid at the end of the year. Assume a discount rate of 9%. At the end of the project, you expect to sell the plant for $2K (i.e. on December 31, 2017). You need to maintain working capital levels of $15K at the end of this year and the end of next year; assume new working capital is fully recovered by December 31, 2017. The current level of working capital on January 1, 2015 is 0.

a) Should you invest in this plant? [15 points]
Yes: NPV = $17.53K

b) Suppose that the tax rate is now 50%. By how much will your NPV decrease? [5 points]
Solution: New NPV = $13.08K. Decrease is $4.45K.

	1/1/2015	12/31/2015	12/31/2016	12/31/2017			
						Tax rate	0.40
Revenues		80	80	80		Depreciation Schedule	4
COGS		40	40	40		Discount Rate	0.09
Labor		10	10	10			
EBITDA		30	30	30			
Taxes on EBITDA		12	12	12			
After-tax EBITDA		18	18	18			
Depreciation Tax Shield		4	4	4			
Capex	40						
Salvage				2			
Book Value				10			
Tax on Salvage				3.2			
NWC Level		15	15	0			
NWC Change		15	0	-15			
Opp Costs							
Cash Flow	-40	7	22	42.2			
NPV	$17.53	at tax = .4					
NPV	$13.08	at tax = .5					

4. The current date is January 1, 2015. You are thinking about building a plant for a project run by Wayne Enterprises that will cost $50K today. The plant will start producing immediately, and will generate revenues for 3 years, starting at the end of this year (December 31, 2015). Each year, the revenue will be $120K. The material costs for the project each year will be $40K, also starting at the end of this year. Labor costs will start at $20K this year, and stay constant. The plant has a 4 year depreciation schedule, as prescribed by the IRS. Assume a tax rate of 40%, and that all taxes are paid at the end of the year. Assume a discount rate of 9%. At the end of the project, you expect to sell the plant for $20K (i.e. on December 31, 2017). You need to maintain working capital levels of $10K at the end of this year and the end of next year; assume new working capital is fully recovered by December 31, 2017. The current level of working capital on January 1, 2015 is 0.

a) Should you invest in this plant? [15 points]
Solution: yes, NPV = $65.46

b) Suppose the depreciation schedule for the plant is now over 5 years, instead of 4 years, as originally prescribed by the IRS. By how much does your NPV change? [5 points]
Solution: NPV decreases by $~~3.30~~ $0.21

	1/1/2015	12/31/2015	12/31/2016	12/31/2017		Tax rate	0.40
Revenues		120	120	120		Depreciation Schedule	4
COGS		40	40	40		Discount Rate	0.09
Labor		20	20	20			
EBITDA		60	60	60			
Taxes on EBITDA		24	24	24			
After-tax EBITDA		36	36	36			
Depreciation Tax Shield		5	5	5			
Capex	50						
Salvage				20			
Book Value				12.5			
Tax on Salvage				-3			
NWC Level		10	10	0			
NWC Change		10	0	-10			
Opp Costs							
Cash Flow	-50	31	41	68			
NPV	$65.46						
Suppose Depreciation Schedule is over 5 years instead of 4.							
By how much does NPV change?							
NOW Depreciation amount is 10 per year; DTS = 4							
New Book value of asset at sale is 20, instead of 12.5							
DTS lost	($12.66)						
DTS Gained	$10.13						
NPV of tax change on salvi	$2.32						
Total NPV change	($0.21)						

5. True/False and Explain:

A shorter depreciation schedule increases the NPV of a project, all else equal (and assuming the discount rate is positive and constant over time).

Solution: True, a shorter depreciation schedule implies a larger depreciation amount each year, and therefore a larger depreciation tax shield. Given the discount rate, the NPV of larger tax shields realized sooner rather than later is higher than the NPV of smaller tax shields realized over a longer amount of time. You can show this analytically as well.

6. True/False and Explain:

An increase in initial inventory requirements for a project decreases the project's NPV, all else equal.

Solution: True, an increase in inventory is effectively a cash expenditure; reductions in cash flows lead to reductions in NPV.