Slide 1

Economic Decision Analysis in Engineering Questions

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Slide 2

Sunk Costs Questions

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Slide 3

Question 1

What are "Sunk Costs"?

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Slide 4

Answer

Sunk costs are any costs spent in the past.

Very often people think they refer to pre-construction costs. However, they are literally ANY costs spent up to now. For example, if we are about to start production, then there will be sunk pre-construction costs and sunk construction costs.

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Question 2

How should we deal with sunk costs when projecting net cash flow to make investment decisions?

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Answer

Sunk costs have no direct effect on our future net cash flow projections.

However, we should include their indirect effects on future net cash flow. They will indirectly affect future net cash flow through the tax or other fiscal calculations. This is because in the future net cash flow we will depreciate them, or we will include them as a loss or cost carry forward.

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Slide 7

Answer

Sunk costs are irrelevant except to calculate future tax.

Only the future cash flow matters.

Slide 8

Nominal - Real
Questions

Slide 9

Question 3

What words do we use to describe the revenues we will actually receive and costs we will actually spend in the future?

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Answer

Nominal

Money-of-the-day

Escalated

Inflated

Actual

Slide 11

Question 4

What words do we use to describe the revenues and costs that exclude escalation?

Slide 12

Answer

Real

Deflated

Unescalated

Uninflated

Purchasing Power

Question 5

What procedure do we follow to derive future costs in nominal terms?

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Answer

1. Estimate the costs at today's prices (of steel, labour and so on)

2. Estimate future escalation rates.

3. Escalate the costs to derive future costs in nominal terms (actual money).

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Question 6

How (by what procedure) should we derive future net cash flow in real terms (purchasing power)?

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Answer

4. The procedure we follow to project future costs is below.

(a) Project the costs and revenues each year in nominal terms.

(b) Calculate the nominal taxes each year.

(c) Calculate the after-tax nominal net cash flow each year.

(d) Deflate (remove escalation) from the after-tax net cash flow.

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Question 7

Why is it invalid to derive future net cash flow by working entirely with real costs and revenues?

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Answer

It is invalid to work entirely in real terms because we would ignore the effects of fiscal drag.
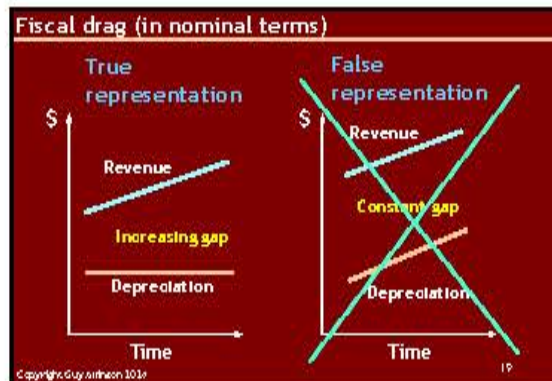
Fiscal drag is the effect of taxes increasing over time in both real and nominal terms.

It arises because one or more elements of the fiscal/tax calculations do not increase with inflation (usually depreciation).

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Fiscal drag (in nominal terms)

True representation	False representation

$ — Revenue, Increasing gap, Depreciation, Time

$ — Revenue, Constant gap, Depreciation, Time

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Incremental Analysis Questions

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Question 8

Ideally, how would you derive the net cash flow of an investment that is an increment to an existing (base) project or business?

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Answer

Ideal analysis.

(a) Calculate the ATNCF of the existing (base) project, or the existing business,

(b) Calculate the ATNCF of the base plus the incremental project (the combined project).

(c) Calculate the difference.

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Answer

After-tax net cash flow (ATNCF) of the base project plus the incremental project (combined ATNCF).

> minus

ATNCF of the base project or existing business (existing ATNCF).

> equals

ATNCF of incremental project.

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Answer – Incremental Analysis

$MM	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
ATNCF (Base + Increment)	-120	51	54	45	36
ATNCF (Base)	-100	46	40	34	28
Difference	-20	5	14	11	8

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Question 9

Ideally, why should we calculate the incremental ATNCF this way?

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Answer – Ideal Analysis

Ideal analysis.

The incremental project/business might change the timing of the tax for the combined project/business.

Therefore, if we don't follow the correct procedure, we would not take this into account and might make the wrong decision.

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Tax Relief Questions

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Question 10 A

What is tax relief?

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Answer

Tax relief is the reduction in tax caused by an increase in expenditure by a company that is already generating revenue and paying tax.

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Question 10 B

Give a simple hypothetical example.

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Answer - Tax Relief on Increase in Opex

Increase in operating costs = $10MM
This is the before-tax cost.

Reduction in taxable income = $10MM
Tax rate = 40%

Reduction in tax = $4MM
"Tax relief" =
After-tax cost = $6MM

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Example of fiscal relief - tax rate 40%

	Existing	New	Extra
Revenue	+100	+100	0
Opex	-10	-20	-10
Tax	40%(100-10)	40%(100-20)	40%(0-10)
	=36	=32	=-4
ATNCF	60%(100-10)	60%(100-20)	-60%(10)
	=54	=48	=-6

Tax relief on incremental opex

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Question 11

Quite often, we can carry out a short-cut analysis. What is this?

Under what circumstances can we carry out a short-cut analysis?

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Answer

We can work out the after-tax net cash flow of incremental project directly by analysing the incremental project on its own. This quicker and easier.

But we can only do this if we know for sure that the incremental project will not change the timing of tax

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Question 12

Apply a short cut analysis to the incremental investment with the data below.

$MM	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Incremental revenue		5	20	16	10
Incremental capex	-20				
Incremental opex		-2	-2	-2	-2

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Answer - Incremental Project Tax (Tax Rate = 40%)

$MM	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Tax on incremental revenue (Rev*40%)		-2.0	-8.0	-6.4	-4.0
Tax relief on incremental depreciation (20/4*40%)		2.0	2.0	2.0	2.0
Tax relief on incremental opex (2*40%)		0.8	0.8	0.8	0.8
Total incremental tax		0.8	-5.2	-3.6	-1.2

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Answer - Incremental ATNCF

$MM	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Incremental revenue		5	20	15	10
Incremental capex	-20				
Incremental opex		-2	-2	-2	-2
Incremental BTNCF	-20	3	18	14	8
Incremental Tax 40%		0.8	-5.2	-3.6	-1.2
Incremental ATNCF	-20	3.8	12.8	10.4	6.8

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Question 13

What procedure would you adopt to decide between two investing in two processes to do the same task?
These are mutually exclusive incremental investments. We can't do both of them.
Assume that neither investment changes the timing of tax for the underlying business

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Answer - Tax Relief

Take the difference between the costs, work out the extra tax effects and the extra ATNCF.

But ONLY if you know for sure that the each investment will not change the timing of tax

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Question 14

Apply a short-cut incremental analysis to the mutually exclusive incremental investments with the data below. Depreciation of capital costs is on a straight-line basis over 3 years starting in Year 2. Opex and Abex are immediately deductible without any depreciation.

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Analysis of Two Incremental Investments

Items	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Incremental Revenue for P1	0	0	0	0	0
Incremental Capex for P1	-20				
Incremental Opex for P1		-12	-12	-12	
Incremental Abex* for P1					-15
Incremental Revenue for P2	0	0	0	0	0
Incremental Capex for P2	-29				
Incremental Opex for P2		-7	-7	-7	
Incremental Abex for P2					-20

*Footnote - "Abex" means Abandonment Expenditure

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Analysis of Two Incremental Investments

Project 2 minus Project 1	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Extra Capex for P2-P1	-9				
Extra Opex for P2-P1		5	5	5	
Extra Abex for P2-P1					-5
Tax for Project 2 minus Project 1					
Extra tax relief on extra depreciation = 9/3*40%		1.2	1.2	1.2	
Extra tax relief on extra Opex = 5*40%		-2.0	-2.0	-2.0	
Extra tax relief on extra Abex = 5*40%					2.0
Total extra tax		-0.8	-0.8	-0.8	2.0

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Analysis of Two Incremental Investments

Project 2 minus Project 1	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Extra Capex for P2-P1	-9				
Extra Opex for P2-P1		5	5	5	
Extra Abex for P2-P1					-5
Extra Tax for P2 -P1		-0.8	-0.8	-0.8	2.0
Total extra after-tax net cash flow	-9.0	4.2	4.2	4.2	-3.0

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