ECON 180

Introduction to Principles of Microeconomics and Financial Project Evaluation

Lecture 15: Introducing Taxes

June 14, 2021

Version 1

Required Reading and Viewing

- Edspira. (2015, March 20). Tax Deductions vs. Tax Credits [Video File]. https://youtu.be/GGbANc-iFzE
- Graham, N. (2019, April 16). Marginal Tax vs Average Tax Rates in Canada [YouTube Video]. Retrieved from https://youtu.be/77RhcwscEOQ
- Tedds, L. (2014, January 10). Stupid tax policy, mining edition [Web Page]. Retrieved from https://deadfortaxreasons.wordpress.com/2014/01/10/stupid-tax-policy-mining-edition/

Optional Reading

- Corporation Tax Rates [Web Page] (2020). Retrieved from https://www.canada.ca/en/revenue-agency/services/tax/businesses/topics/corporations/corporation-tax-rates.html
- Dual tax rates [Web Page]. (2020). Retrieved from https://www.canada.ca/en/revenue-agency/services/tax/businesses/topics/corporations/provincial-territorial-corporation-tax/dual-tax-rates.html
- *Engineering Economics*, 6th edition, 8.2-8.7
- Leach, A. (2014, November 20). Just how much is the oil price drop hurting oil sands projects? [Web Page]. Retrieved from https://www.macleans.ca/economy/economicanalysis/just-how-much-is-the-oil-price-drop-hurting-oil-sands-projects/
- Milligan, K. (2021). Average Tax Rates in the Canadian Personal Income Tax. *National Tax Journal, 74*(2), 513-527. https://www-journals-uchicago-edu.ezproxy.library.uvic.ca/doi/10.1086/714386
- Personal Income Tax Rates [Web Page]. (2020). Retrieved from https://www2.gov.bc.ca/gov/content/taxes/income-taxes/personal/tax-rates
- PWC. (2016). *Canadian mining taxation*. Retrieved from https://www.pwc.com/ca/canminingtax
- PWC. (no date). Oil and gas taxation in Canada. Retrieved from https://www.pwc.com/ca/en/industries/energy/publications/oil-gas-taxation.html

Optional Reading on Capital Gains Taxes & Inflation

- Lochan, F. (2002). Should Inflation Be a Factor in Computing Taxable Gains in Canada? *Canadian Tax Journal*, 50(5), 1833 – 1867. Retrieved from https://www.ctf.ca/ctfweb/Documents/PDF/2002ctj/2002ctj5_lochan.pdf
- **Inflation and capital gains.**
- Aldridge, J. L. & Pomerleau, K. (2013). Inflation Can Cause an Infinite Effective Tax Rate on Capital Gains [Fiscal Fact No. 406]. Retrieved from http://taxfoundation.org/article/inflation-can-cause-infinite-effective-tax-rate-capital-gains
- Written from a U.S. perspective, but the logic applies to Canada.
- Di Verdi, S. (2019, March 4). Capital gains taxes explained [Web Page]. Retrieved from http://www.moneysense.ca/save/taxes/capital-gains-explained/
- **Includes links to the relevant CRA pages.**

Optional Reading on Flow Through Shares

- Flow-through shares (FTSs) [Web Page]. (2008, April 28). Retrieved from https://www.canada.ca/en/revenue-agency/services/tax/businesses/topics/flow-through-shares-ftss.html
- **Official information on flow through shares.**
- Tax Treatment of Income from Investments in Flow-Through Shares (FTSs) [Web Page]. (2020, March 4). Retrieved from https://www.taxtips.ca/personaltax/investing/taxtreatment/flowthroughshares.htm
- **A thorough explanation of how flow-through shares work.**
- Young. (2019, December 5). Flow Through Shares…Explained! [Web Page]. Retrieved from https://youngandthrifty.ca/flow-through-shares-explained/
- **A small investor's perspective on flow-through shares.**

Optional Reading on After-Tax MARR & IRR

- Bullard, S. H., Straka, T. J. & Caulfield, J. P. (2001). Inflation and the rule-of-thumb method of adjusting the discount rate for income taxes. *Canadian Journal of Forestry Research*, *31*(1), 52-57. https://doi-org.ezproxy.library.uvic.ca/10.1139/x00-139
  - **This article helpfully provides 'rule of thumb' approximations to MARR adjustments for taxes and inflation.**
- Guo, H. (2020). After-Tax Discounting: A Research Edge. *Journal of Accounting, Business and Management, 27*(1), 86-100. https://api.semanticscholar.org/CorpusID:219052478
  - **A reminder that as of 2020, properly adjusting the discount rate (MARR) for taxes is still 'a research edge'.**
- Levy, H. (1968). The connection between pre-tax and post-tax rates of return. *The Journal of Business, 41*(4), 477-483. https://www-jstor-org.ezproxy.library.uvic.ca/stable/2351548
  - **A classic paper on the rule of thumb and the IRR.**
- Niemann, R. (2010). The impact of tax uncertainty on irreversible investment. *Review of Managerial Science, 5*, 1-17. https://doi-org.ezproxy.library.uvic.ca/10.1007/s11846-010-0042-5
  - **Analyzes the impact of tax uncertainty on investment decisions.**

Learning Objectives

- Understand the interaction between IRR, MARR and taxes.
- Have a basic understanding of the issues arising when taxes are levied on nominal, rather than real, income (capital gains example).
- Be able to adjust the net present value of annual savings for a uniform income tax rate.
- Understand how corporate tax rates affect project evaluation, and how they are calculated in Canada at the federal and provincial level.
- Understand the difference between tax credits and tax deductions.

Relevant Solved Problems

- From Engineering Economics, Chapter 8
- MARR and taxes: Example 8.1, 8.1,
- First Cost and Taxes: Example 8.2B,
- Annual Savings and Taxes: Example 8.2C,
- Salvage and Taxes: Example 8.2D,
- (Simplified) Present Worth and Taxes: Example 8.2E
- IRR, ERR and taxes: Example 8.2G, Example 8.2H, Example 8.3, 8.2, 8.3, 8.4, 8.11, 8.15, 8.16, 8.24, 8.28, 8.35, 8.36, 8.37, 8.38, 8.39

Notation Dictionary

(Not provided on quiz/final formula sheet)

- f = rate of inflation
- at (subscript) = after-tax
- bt (subscript) = before-tax
- C (superscript) = non-inflation-adjusted value
- CTF = Capital Tax Factor
- CSF = Capital Salvage Factor
- NPV = Net Present Value
- R (superscript) = Real, inflation-adjusted value
- S = Salvage/Scrap value
- t = tax rate

- Conversion factors are of the form

  (X/Y,z)
- Read as: X, given Y and z.
- X is the element we want.
- Y is the element we have.
- z represents additional parameters.
- e.g. (P/F,i,N)
- Present Value, given a Future Value at time N and interest rate i.

$f(x)$

Equations

- Notation: The orange symbol on a slide indicates a formula sheet formula is introduced there.
- After-tax IRR: $\mathrm{IRR}_{\mathrm{at}} \cong (1 - \mathrm{t})\mathrm{IRR}_{\mathrm{bt}}$
- After-tax IRR: $\mathrm{MARR}_{\mathrm{at}} \cong (1 - \mathrm{t})\mathrm{MARR}_{\mathrm{bt}}$

We've been neglecting an important cost…

- TAXES.
- Most countries (including Canada) tax corporate income.
- (Counterexamples: Bahamas, Virgin Islands, Bahrain…)
- Unlike the costs we've been looking at so far…
- Operating/Maintenance, first cost, etc…
- Taxes are governed by very complicated and often unintuitive rules.
- Today we'll take a quick look at how the most basic tax rates work.
- Next lecture, we'll dive into the complicated world of tax allowances for depreciable assets.

The impact of taxes on IRR: not straightforward

- Consider the following investments, all of which have an IRR of 10%:
- Pay $100 today for $110 a year from now. ($100 = $110(P/F,0.1,1))
- Pay $100 today for $259.37 ten years from now. ($100 = $259.37(P/F,0.1,10))
- Pay $100 today for $16.27 a year for ten years, starting next year. ($100 = $16.27(P/A,0.1,10))
- (Recall that the IRR is the interest rate that makes the present worth of an investment zero. In the above cases the present worth equals the future payment, minus the present cost of $100.)
- Suppose the income from these investments is taxed at a rate of t = 25%. What happens to the IRR?

Year	Before Tax			After Tax		
	A	B	C	A	B	C
0	-$100.00	-$100.00	-$100.00	-$100.00	-$100.00	-$100.00
1	$110.00	$0.00	$16.27	$82.50	$0.00	$12.20
2		$0.00	$16.27		$0.00	$12.20
3		$0.00	$16.27		$0.00	$12.20
4		$0.00	$16.27		$0.00	$12.20
5		$0.00	$16.27		$0.00	$12.20
6		$0.00	$16.27		$0.00	$12.20
7		$0.00	$16.27		$0.00	$12.20
8		$0.00	$16.27		$0.00	$12.20
9		$0.00	$16.27		$0.00	$12.20
10		$259.37	$16.27		$194.53	$12.20
IRR	**10%**	**10%**	**10%**	**-18%**	**7%**	**4%**
All IRR calculated using Excel's IRR function.						

IRR and cash flows before and after a 25% tax on investment income $f(x)$

Year	Before Tax			After Tax		
	A	B	C	A	B	C
0	-$100.00	-$100.00	-$100.00	-$100.00	-$100.00	-$100.00
1	$110.00	$0.00	$16.27	$82.50	$0.00	$12.20
2		$0.00	$16.27		$0.00	$12.20
3		$0.00	$16.27		$0.00	$12.20
4		$0.00	$16.27		$0.00	$12.20
5		$0.00	$16.27		$0.00	$12.20
6		$0.00	$16.27		$0.00	$12.20
7		$0.00	$16.27		$0.00	$12.20
8		$0.00	$16.27		$0.00	$12.20
9		$0.00	$16.27		$0.00	$12.20
10		$259.37	$16.27		$194.53	$12.20
IRR	**10%**	**10%**	**10%**	**-18%**	**7%**	**4%**
All IRR calculated using Excel's IRR function.						

For years 1-10, the after-tax values are the before-tax values times (1 – 25%) = 75%. For now, we're assuming no taxes on the initial cost.

The same tax of 25% on investment income affected each of these investments very differently. While the IRR fell, it fell by different amounts.

Taxes affect the IRR in ways that are not straightforward, or easy to solve for analytically except in the simplest cases. Thankfully, an approximation is often enough.

For more realistic cash flows and tax codes,

$$\mathrm{IRR}_{\mathrm{at}} \cong (1 - \mathrm{t})\mathrm{IRR}_{\mathrm{bt}}$$

Here, at = 'after-tax', bt = 'before-tax' and t is 'the' tax rate (in practice, various tax rates and exceptions may apply to a project).

For our values, this would give us

$$\mathrm{IRR}_{\mathrm{at}} \cong (1 - 25\%)10\% = 7.5\%$$

Which of these projects is worthwhile?

$f(x)$

- Suppose your firm's MARR is 8%. It's tempting to say that before taxes, all of the projects are viable, and after taxes, none of them are.
- BUT the MARR is derived from some alternative investment or the cost of borrowing. If these are taxed (or subsidized), then the MARR also needs to be adjusted for taxes.
- Textbook, Chapter 8: "Generally speaking, if a MARR is given without specifying whether it is on a before- or after-tax basis, it can be assumed to be a before-tax MARR." (This makes a lot of sense if tax codes change often or unpredictably.)
- When possible, it's best to calculate the exact after-tax MARR. When this is not feasible, the following approximation may be used:

$$\mathrm{MARR}_{\mathrm{at}} \cong (1 - \mathrm{t})\mathrm{MARR}_{\mathrm{bt}}$$

- (The 't' used is usually the corporate income tax rate.)

IRR, MARR and taxes

- The bad news: no easy shortcut to the new values.
- (A peer-reviewed, published article ***from 2020*** is entitled “After-Tax Discounting: A Research Edge”)
- The good news: $(1 – t) \times IRR_{bt}$, $(1– t) \times MARR_{bt}$ is often good enough.
- More bad news (MARR): Often, before-tax and after-tax MARR are chosen entirely independently and not linked by this relationship.
- More bad news (IRR): This ballpark figure is inaccurate and usually *higher* than the actual IRR, meaning firms that rely on it may greenlight bad projects.
- → If for the before-tax IRR, $(1 – t) \times IRR$ is close to the MARR, a detailed calculation is in order.

In a bit more detail (Bullard et al., 2001)

- “The rule-of-thumb method of adjusting discount rates for income taxes is (after-tax rate) = (before-tax rate) × (1 – tax rate).”
- “Previous researchers have concluded that the rule-of-thumb adjustment for income taxes is accurate only when the investment alternative used to define the opportunity cost of capital has certain characteristics:”
- “if other investments are limited to land rental, taxable bonds, and bank certificates of deposit, for example.”
- “[I]nflation is also an important factor in the rule-of-thumb’s accuracy in accounting for income taxes.”

IRR, MARR, Taxes *and inflation*

- In 2001, a group of Canadian forestry scholars published a short paper that carefully generalizes these 'rules of thumb' for cases where you're dealing not only with taxes, but also with inflation.
- (For example, clarifying that when you want the *real, after-tax* MARR, you can calculate it as $(1+i_{at}/1+f - 1)$, where f is inflation and i_{at} is the after-tax nominal MARR.)
- Some of you may want to save the reference (and perhaps print out a copy of page 57 of the paper to keep on hand when doing this sort of work):
- Bullard, S. H., Straka, T. J. & Caulfield, J. P. (2001). Inflation and the rule-of-thumb method of adjusting the discount rate for income taxes. *Canadian Journal of Forestry Research*, *31*(1), 52-57. https://doi-org.ezproxy.library.uvic.ca/10.1139/x00-139

‘More realistic’ tax codes?

- For our introductory example, we assumed investment income was taxed at a rate t, and there was no tax adjustment to the initial cost.
- In this lecture and the next, we’ll relax these assumptions in two ways:
- If the investment is in physical capital (such as a machine) there are often tax incentives that lower the present worth of the first cost. We’ll look at that in detail next lecture.
- Often, only capital gains are taxed, and at a favorable rate. Capital gains are the (positive) difference between the selling price of an asset, and its original cost. If the selling price is lower than the initial cost, this is a capital loss and may lead to a reduction in payable taxes.
- Currently in Canada, only half of capital gains are taxable, and this portion is usually taxed at the appropriate income tax rate. (Capital losses lead to equivalent tax breaks.)
- (For details, see http://www.taxtips.ca/filing/capitalgain.htm)
- Problem: Capital gains taxes are levied on nominal gains…

Capital Gains Taxes and Inflation

- Suppose you buy a property for P = $100,000, and 30 years later you sell it. You don't wish to make a profit, so you sell it for the amount that will let you break even in terms of purchasing power.
- Assume that inflation is 2% a year, that is, f = 2%. You'll want to sell your property for the *nominal* equivalent of 100,000 base year dollars. Call this amount F. Then
- $F = \$100{,}000(\mathrm{F/P}, 2\%, 30)$ = $181,136.16
- Now suppose that the relevant income tax rate, t, is 35%, and that (as is the case in Canada) 50% of capital gains count as taxable income.
- In real terms, there's been *no* gain. Thanks to 2% inflation a year, $181,136.16 has the same purchasing power as $100,000 did 30 years ago, when the property was first purchased.
- However, the tax is on *nominal* gains..

Thanks to taxes, a negative real IRR!

Year	Real	Nominal
0	$100,000	$100,000
30	$100,000	$181,136.16
Capital Gain	$0	$81,136.16
Taxable		$40,568.08
Taxes	$7,839.76	$14,198.83
After Tax Income	$92,161.24	$166,937.33
IRR	**-0.27%**	**1.72%**

- Inflation = 2% a year
- Tax = 35% on 50% of nominal capital gains
- In this investment, an initial cost P led to a single payment F, 30 years later, so

$$\mathrm{NPV} = -\mathrm{P} + \frac{\mathrm{F}}{(1+\mathrm{i})^{30}}$$

$$\mathrm{IRR} = \left(\frac{\mathrm{F}}{\mathrm{P}}\right)^{\frac{1}{30}} - 1$$

What would it take to not lose (real) money?

Year	Real	Nominal
0	$100,000	$100,000
30	$109,501.53	$ 198,346.86
Capital Gain	$54,294.44	$ 98,346.86
Taxable	$27,147.22	$ 49,173.43
Taxes	$9,501.53	$ 17,210.70
After Tax Income	$100,000	$ 181,136.16
IRR	**0.00%**	**2.00%**

- We need F such that

$$P = \frac{F - \frac{t}{2}(F - P)}{(1 + \pi)^N}$$

- (F-P) are capital gains, and t/2 is the rate they're (effectively) taxed at. The denominator adjusts for inflation. Solving,

$$F = \frac{P}{2 - t}\left(2(1 + f)^N - t\right)$$

- For our values, F=$198,346.86.
- This is 9.5% higher than the break-even value in the absence of capital gains taxes (F in the previous slide).
- →Capital gains taxes could contribute to inflation…

Also, about that ‘t’…

- We’re going to glibly assume there is *a* ‘t’.
- That’s not how it works.
- For businesses: not a bad assumption. Provinces typically have only two possible tax rates for businesses – a lower and a higher – and it’s pretty clear which one applies to a particular firm.
- For *individuals* like you, though, you need to think about *marginal tax rates* charged on **personal income**.
- There are different income ‘buckets’, or ’brackets’. The income in that bracket, and ONLY the income in that bracket, is taxed at the corresponding marginal tax rate.
- If you hear politicians say that the tax rate on the rich is going to be raised to 50% (say), this does NOT mean the wealthy are going to pay 50% on all their income – that’s probably just the tax rate on the highest bucket.

Average vs marginal income tax rate

- Average tax = Total taxes you pay / Taxable Income
- Marginal tax = % tax you pay on the next dollar of income
- These can be very different!
- If a government charges 0% tax on the first $50,000 of income, and 20% tax on income above $50,000, then…
- If you earn $80,000 a year, your *marginal* tax rate is 20%...
- BUT the total tax you pay is 0% x $50,000 + 20% x ($80,000 - $50,000)
- Total tax = 20% x $30,000 = $6,000
- → AVERAGE tax rate is $6,000/$80,000 = 7.5%

Personal Income Tax Brackets and Rates - 2020 Tax Year

Taxable Income - 2020 Brackets	Tax Rate
$0 to $41,725	5.06%
$41,725.01 to $83,451	7.70%
$83,451.01 to $95,812	10.50%
$95,812.01 to $116,344	12.29%
$116,344.01 to $157,748	14.70%
$157,748.01 to $220,000	16.80%
Over $220,000*	20.5%

*Budget 2020 proposes adding a new tax bracket for income above $220,000 at a rate of 20.5%. (B.C. Government)

For various yearly incomes….

This is for *personal* income. In what follows we'll be looking at firms, who are taxed differently, so assuming one single tax rate t is reasonable.

B.C. Provincial Income Tax			Taxable Income				
Bracket		Tax Rate	$50,000	$100,000	$150,000	$200,000	$250,000
$0.00	$41,725.00	5.06%	$41,725.00	$41,725.00	$41,725.00	$41,725.00	$41,725.00
$41,725.01	$83,451.00	7.70%	$8,275.00	$41,726.00	$41,726.00	$41,726.00	$41,726.00
$83,451.01	$95,812.00	10.50%		$12,361.00	$12,361.00	$12,361.00	$12,361.00
$95,812.01	$116,344.00	12.29%		$4,188.00	$20,532.00	$20,532.00	$20,532.00
$116,344.01	$157,748.00	14.70%			$33,656.00	$41,404.00	$41,404.00
$147,748.01	$220,000.00	16.80%				$42,252.00	$62,252.00
$220,000.01	Infinite	20.50%					$30,000.00
	Total Tax		$2,748.46	$7,136.80	$14,092.91	$22,330.20	$31,840.20
	Average Tax %		5.50%	7.14%	9.40%	11.17%	12.74%

Toward a complete tax calculation

- Over the next 2 lectures, we'll go over how to account for taxes in the evaluation of a simple investment composed of
  - An initial cost or purchase price
  - Annual (net) savings or income
  - A salvage/scrap payment at the end of the asset's working life
- Today, we'll look at the last two.
- Canada has some of the most complicated taxes in the world when it comes to the first item, so it deserves its own lecture.
- We'll focus on adjusting the net present value (NPV) of the investment.
- Once you have the NPV, you can easily obtain annual worth, IRR and BCR.

Review: present worth of a typical asset

- A ‘typical’ asset is one which is purchased, brings income/savings for a while, and is then sold or salvaged.
- Suppose the asset is bought at time 0 for $P, sold or salvaged at time N for $S, and in between gives income of $A from Time 1 to Time N .
- Total present worth of such an asset can be divided into:
  - PV of First Cost: -P
  - PV of Income or savings: +A x (P/A,i,N)
  - PV of Resale or Salvage value: +S x (P/F,i,N)
- →Total PV = -P + A x (P/A,i,N) + S x (P/F,i,N)

The effect of taxes on savings/revenue

- Suppose the investment yields $A in savings every year for N years.
- Suppose income is taxed at a rate t.
- To adjust for taxes, multiply A x (1 – t) and evaluate at the after-tax MARR.

$$\mathrm{PV} = (1 - \mathrm{t})\mathrm{A}(\mathrm{P/A}, \mathrm{MARR_{at}}, \mathrm{N})$$

- Inflation Note: You'll usually know A in *nominal* terms, and taxes are paid on nominal values, so to adjust for inflation, in most cases nominal cash flows and the nominal interest rate should be used.

So far: Tax-adjusted present worth calculations

- First Cost:

$$-\mathrm{P} \times \mathrm{CTF}$$ (Next Lecture)

- Annual savings:

$$+\mathrm{A}\ \mathrm{x}\ (\mathrm{P/A}, \mathrm{MARR}_{\mathrm{after-tax}}, \mathrm{N})\ \mathrm{x}\ (1-\mathrm{t})$$

- Salvage value:

$$+\mathrm{S}\ \mathrm{x}\ (\mathrm{P/F}, \mathrm{MARR}_{\mathrm{after-tax}}, \mathrm{N})$$ x CSF (Next Lecture)

Show me the money!

- All of this can be a bit abstract, so it's time to look at a numerical example.
- For our maintained example, we'll use a fictional Alberta-based oil company created by the consulting firm PWC for its report on Oil and Gas Taxation in Canada.
- While the numbers aren't real, they are representative, as are the line items in the various tables.
- Using this example, we'll look at what goes into the 't' we've been using, and take a peek at a few common tax credits and tax deductions.

Tax Deductions vs Tax Credits (IMPORTANT!)

- Suppose you pay a tax rate of t=30% on income.
- Tax Deductions: a tax deduction of $100 **reduces your taxable income** by $100. The *benefit* from this is only t x $100 = $30 for our example.
- Since your taxable income falls by $100, you now pay t x $100 less in taxes.
- What if a deduction would bring your taxable income below $0? In some cases, you're allowed to *carry forward* the 'extra' to a later year…
- Tax Credit: a tax credit of $100 **reduces the taxes you have to pay** by $100. The benefit from this is $100 (in the form of lower taxes).
- A refundable tax credit means you get the $100 even if your taxes due are less than $100. If you owe $25 in taxes and have a $100 refundable tax credit, your taxes due fall to $0, and the CRA pays you $75.

2020 Corporate Tax Rates (source: CRA and taxtips.ca)

Province or Territory	Federal Base Rate	Provincial Abatement	General Tax Reduction	Provincial (High)	Combined
Alberta	38%	-10%	-13%	**10%**	25%
British Columbia	38%	-10%	-13%	12%	27%
Ontario	38%	-10%	-13%	11.5%	26.5%
Northwest Territories	38%	-10%	-13%	11.5%	26.5%
Quebec	38%	-10%	-13%	**11.5%**	26.5%
New Brunswick	38%	-10%	-13%	14%	29%
Manitoba	38%	-10%	-13%	12%	27%
Saskatchewan	38%	-10%	-13%	12%	27%
Nunavut	38%	-10%	-13%	12%	27%
Newfoundland and Labrador	38%	-10%	-13%	15%	30%
Yukon	38%	-10%	-13%	12%	27%
Nova Scotia	38%	-10%	-13%	16%	31%
Prince Edward Island	38%	-10%	-13%	16%	31%

Fun fact: Technically, there's a 10% 'abatement' of federal tax to leave room for provincial income tax. (Taxable income earned abroad pays the full amount.)

.

$$t = t_F + t_P$$

t = tax rate

t_F = federal tax rate (net of abatements)

t_P = provincial tax rate

General Tax Reduction: Corporations get an additional reduction of federal tax on qualifying income. In 2019, this is 13%.

Since oil and gas firms tend to be large, I've listed only the highest provincial tax rates.

Effective Federal Tax Rate Example (PWC)

Values calculated on Dec. 31st	2009	2010	2011	2012
Basic rate	38%	38%	38%	38%
Provincial tax abatement	-10%	-10%	-10%	-10%
Small business deduction	0%	0%	0%	0%
General rate abatement	-9.00%	-10%	-11.5%	-13%
Effective federal tax rate	**19%**	**18%**	**16.5%**	**15%**

"Corporations that were Canadian-controlled private corporations (CCPCs) throughout the tax year may be able to claim the small business deduction (SBD). The SBD is 18% of [qualifying income]." – CRA.

Although there's a line entry for it, most oil and gas companies are anything but small, so the SBD does not apply.

Taxable Income and Federal Tax (PWC)

Values calculated on Dec. 31st	2009	2010	2011	2012
Taxable income				
Income for tax purposes	$272,500	$218,400	$194,328	$180,291
Charitable donations	-$5,000	-$5,000	-$5,000	-$5,000
Intercorporate dividends received	-$10,000	-$10,000	-$10,000	-$10,000
Non-capital losses from prior years	$0	$0	$0	$0
Total taxable income	**$257,500**	**$203,400**	**$179,328**	**$165,291**
Effective federal tax rate				
Basic rate	38.00%	38.00%	38.00%	38.00%
Provincial tax abatement	-10.00%	-10.00%	-10.00%	-10.00%
Small business deduction	0.00%	0.00%	0.00%	0.00%
General rate abatement	-9.00%	-10.00%	-11.50%	-13.00%
Effective federal tax rate	**19.00%**	**18.00%**	**16.50%**	**15.00%**
Tax computation				
Effective federal tax rate	19.00%	18.00%	16.50%	15.00%
Federal tax	**-$48,925**	**-$36,612**	**-$29,589**	**-$24,794**

Note: Although they're abatements, the general rate and small business abatements are often called deductions.

Taxable Income and Alberta Tax (PWC)

Values calculated on Dec. 31st	2009	2010	2011	2012
Taxable income				
Taxable income - federal purposes	$ 257,500	$ 203,400	$ 179,328	$ 165,291
Taxable income - Alberta	$ 257,500	$ 203,400	$ 179,328	$ 165,291
Tax computation				
Basic rate	10%	10%	10%	10%
Tax at basic rate	-$25,750	-$20,340	-$17,933	-$16,529
Less tax credits: Small business deduction	$0	$0	$0	$0
Net Alberta tax	**-$25,750**	**-$20,340**	**-$17,933**	**-$16,529**

Phrased as a formula…

- $T = (t_B + t_P - a_F - a_P - SBD) \times (R - C - D) - ITC$
- **This is <u>not</u> a formula you should memorize. It's just a convenient summary of our discussion so far.**
- T = Total tax to be paid
- t_B, t_P= Basic Federal tax rate (38%), Provincial tax rate
- a_F, a_P= Federal tax abatement, Provincial tax abatement
- SBD = Small Business Deduction (if applicable) (17%)
- R,C,D = Revenue, Expenses (Costs), Tax Deductions
- ITC = Income Tax Credits
- For our firms, (R – C – D) can't be negative. We'll examine one way this affects deductions later in this lecture.

Gross and Net Revenues Example (PWC)

Values calculated on Dec. 31st	2009	2010	2011	2012
Gross Revenues				
Oil sales	$600,000	$600,000	$600,000	$600,000
Gas sales	$400,000	$400,000	$400,000	$400,000
Royalties	$140,000	$140,000	$140,000	$140,000
Dividends	$10,000	$10,000	$10,000	$10,000
Other non-resource income	$150,000	$150,000	$150,000	$150,000
Total gross revenue	**$1,300,000**	**$1,300,000**	**$1,300,000**	**$1,300,000**
Royalty charges				
Crown Royalties	-$300,000	-$300,000	-$300,000	-$300,000
Other royalties	-$90,000	-$90,000	-$90,000	-$90,000
Total royalties	**-$390,000**	**-$390,000**	**-$390,000**	**-$390,000**
Net revenues	**$910,000**	**$910,000**	**$910,000**	**$910,000**

Expenses and Deductions Example (PWC)

Net revenues	$910,000	$910,000	$910,000	$910,000
Expenses				
General and administrative	-$100,000	-$100,000	-$100,000	-$100,000
Operating	-$100,000	-$100,000	-$100,000	-$100,000
Depletion, depreciation and amortization	-$75,000	-$75,000	-$75,000	-$75,000
Interest	-$65,000	-$65,000	-$65,000	-$65,000
Total Expenses	-$340,000	-$340,000	-$340,000	-$340,000
Net income for accounting purposes	**$570,000**	**$570,000**	**$570,000**	**$570,000**
Add or deduct				
Depletion, depreciation and amortization	$75,000	$75,000	$75,000	$75,000
Charitable donations	$5,000	$5,000	$5,000	$5,000
Capital Cost Allowance	-$175,000	-$181,250	-$160,938	-$133,203
Canadian oil and gas property expense	-$35,500	-$44,950	-$53,455	-$61,110
Canadian development expense	-$72,000	-$80,400	-$86,280	-$90,396
Canadian exploration expense	-$95,000	-$125,000	-$155,000	-$185,000
Total other additions/deductions	**-$297,500**	**-$351,600**	**-$375,673**	**-$389,709**
Income for federal tax purposes	**$272,500**	**$218,400**	**$194,328**	**$180,291**

“If you pay them, they will come.”

-Oil Field of Dreams

- Governments often use taxes to influence decisions.
- Sometimes, taxes are increased to discourage certain behaviors (e.g. smoking, polluting).
- If a government wants to *encourage* certain activities, it will often use tax credits or tax deductions.
- By making an activity cheaper, tax breaks should result in more of that activity taking place.
- Following are examples of some common tax deductions and credits in the mining industry.

- Canadian Exploration Expenses (CEE): A deduction for expenses involved in finding the location or extent of a resource, or for bringing a new mine in Canada into production.
  - 100% of qualifying costs are deductible, and this can be carried forward indefinitely.
  - Does *not* include depreciable property – that's covered by the CCA, which we'll talk about next lecture.

CEE (100%)	2009	2010	2011	2012
Opening balance	$0	$0	$0	$0
Current additions	$95,000	$125,000	$155,000	$185,000
Proceeds on sale of seismic data	$0	$0	$0	$0
Subtotal	**$95,000**	**$125,000**	**$155,000**	**$185,000**
Claim available for the year	-$95,000	-$125,000	-$155,000	-$185,000
Claim made for the year	-$95,000	-$125,000	-$155,000	-$185,000
Ending balance	**$0**	**$0**	**$0**	**$0**

In this example, the company always claims the full amount. In practice, they can claim any percentage from 0 to 100%.

- Canada Development Expenses (CDE): A deduction for expenses associated with the acquisition (land, mining rights, permits) or development costs (new mine shaft) of a Canadian mining resource property.
  - 30% of qualifying costs are deductible.
  - Does not include depreciable property.
  - Can be carried forward indefinitely.

CDE (30%)	2009	2010	2011	2012
Opening balance	$140,000	$168,000	$187,600	$201,320
Current additions	$100,000	$100,000	$100,000	$100,000
Subtotal	**$240,000**	**$268,000**	**$287,600**	**$301,320**
Claim available for the year	-$72,000	-$80,400	-$86,280	-$90,396
Claim made for the year	-$72,000	-$80,400	-$86,280	-$90,396
Ending balance	**$168,000**	**$187,600**	**$201,320**	**$210,924**

- Canada Oil & Gas Property Expenses (COGPE): Essentially, a CDE for oil and gas, including oil sands.
  - 10% of qualifying expenses are deductible.
  - Does not include depreciable property.
  - Can be carried forward indefinitely.

COGPE (10%)	2009	2010	2011	2012
Opening balance	$225,000	$319,500	$404,550	$481,095
Current additions	$180,000	$180,000	$180,000	$180,000
Proceeds on sale of resource properties	-$50,000	-$50,000	-$50,000	-$50,000
Subtotal	**$355,000**	**$449,500**	**$534,550**	**$611,095**
Claim available for the year	-$35,500	-$44,950	-$53,455	-$61,110
Claim made for the year	-$35,500	-$44,950	-$53,455	-$61,110
Ending balance	**$319,500**	**$404,550**	**$481,095**	**$549,986**

Investment Tax Credits (ITC)

- ITC reduce tax payable *directly*: dollar for dollar.
- This is NOT true of tax deductions. A deduction of $X reduces taxable income by $X, which reduces taxes by $tX.
- Common ITC in mining include:
  - Pre-production mining expenditures (10% of expenditures)
  - Scientific Research & Experimental Development Credit (SR&ED): 35% of expenses for private Canadian corporations, 20% otherwise.
- In mining, an expense will often qualify for both a CEE and an ITC, in which case the ITC is deducted from the CEE.
- e.g. A CEE of $100 becomes a $10 pre-production ITC plus a $90 deduction.

What if Deductions > Net Revenue?

- Many mining companies have huge initial expenses, and only see substantial revenue many years down the road.
- CEE deducts 100% of exploration expenses the year they're incurred…
- BUT taxable income can't be negative and would be very small anyway, due to lack of revenue.
- e.g. R = $0.5m, C = $100m → $95.5m unusable deduction
- Are extra deductions wasted?
- Could carry the deductions forward, using them in future years…
- But money today is worth more than money tomorrow.
- Canada and other countries allowing the transformation of unused deductions into current cash via Flow-Through-Share (FTS) investments.

FTS and SFTS in Canada

- Outside investors can buy a company's 'extra' deductions as an FTS investment. The cost of the FTS is 100% deductible from income.
- →FTS are more valuable to individuals than firms, since personal income tax is (usually) higher than corporate income tax.
- Canada currently grants additional deductions to FTS investors:
- BC grants 20% of the FTS cost as a tax credit.
- The Mineral Exploration Tax Credit (METC) is an extra credits worth 15% of the cost of the FTS investment net of provincial tax credits.
- Confusingly, these credits are taxed (as grants of income).

The total benefit of a $10,000 FTS

(for a high-income earner in BC)

- For a high-earning individual in BC, t = 29% + 14.7% = 43.7%
- 100% FTS tax deduction benefit: t x $10,000 = $4,370
- BC Tax Credit: 0.2 x $10,000 = $2,000
- METC: 0.15 x (1 – 0.2) x $10,000 = $1,200
- After tax total credit: (1 – t) x ($2,000 + $1,200) = $1,801.60
- Total reduction in taxes: $4,370 + $1,801.60 = $6,171.60
- Total reduction in taxes = 61.716% of FTS Cost
- →The FTS costs the investor $3,828.40…
- …and costs taxpayers $6,171.60.

A low break-even point is a problem

- Suppose the FTS that cost $10,000 is sold later on at a price P.
- Half of capital gains are taxable at t.
- Capital gains = Sale Price of Asset – Tax-Relevant Cost of Asset
- Since 100% of the FTS cost is deductible, our Capital Gains = P
- To break even after taxes, P- t x P/2 = $3,828.40
- (Recall, after tax breaks, the investor paid $3,828.40 for the FTS.)
- Solving, we find the break-even P = $4,898.78
- If the FTS sells at this price, the mining company's value must have fallen sharply → probably no usable mineral exploration.
- The FTS investor hasn't lost anything, but…
- Taxpayers are on the hook for $5,101.26

Why have such a generous deduction?

- In the 1990s, metal prices were very low.
- →There was less interest in mineral exploration.
- The ITCE (Investment Tax Credit for Exploration) was created to encourage mineral exploration.
- In the 2000s, the price of minerals soared, but the ITCE kept being renewed and was given new life as the METC in 2006.
- The METC was set to expire in 2009, but has been renewed for one-year periods ever since then.
- It is (politically) VERY difficult to get rid of a tax break once people have become used to it!