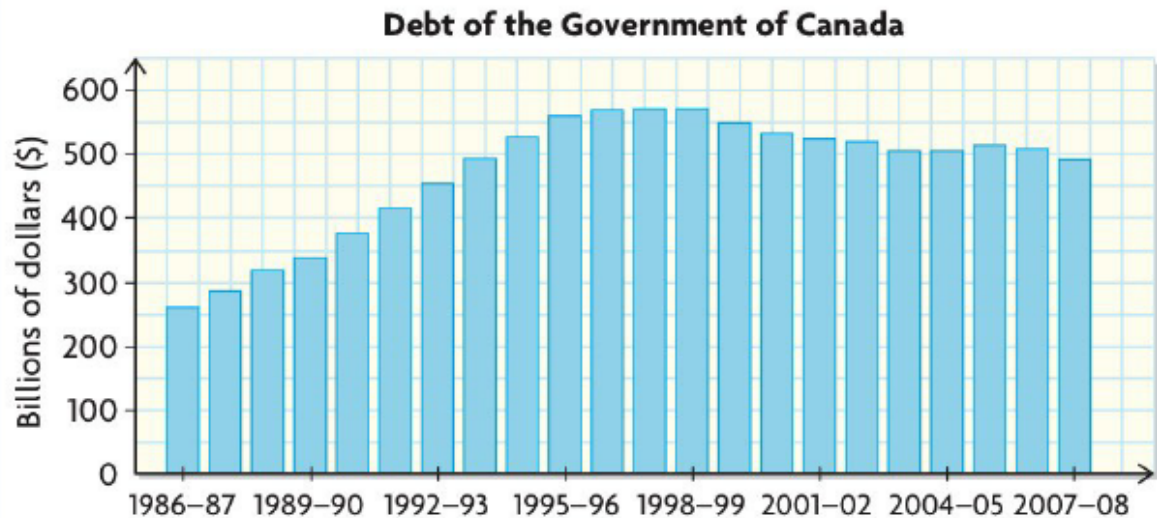


Paying the National Debt



Public Accounts of Canada; Statistics Canada

Canada's national debt fluctuates. It is affected by financial markets (such as the stock, bond, currency, and commodity markets), the gross domestic product (the gross value of all goods and services produced in the country), and the federal budget (the federal government's income and expenditures for the fiscal year). The national debt exceeded \$100 billion in 1981, \$200 billion in 1985, and \$300 billion in 1988. The size of the national debt is continually changing and is available on the national debt clock.

- Estimate the most recent value for the national debt. *~ 760 B \$*
- If the debt were shared equally by all Canadians, what would be the debt per person? *over \$20000/person*
- Suppose that no increase to the debt occurred from this moment on, and no payments were made to reduce it. How much interest would accumulate each year at 2.5%, compounded monthly? *almost 20B\$*
- How much accumulation is this per day? *over 50M\$/day*
- Suppose that the federal government paid \$4 billion each month toward the debt. How long would it take to pay off the debt at 2.5%, compounded monthly? *⇒ 242 months = over 20 yrs*

2.4 Buy, Rent or Lease?

1. lease: a **contract** for purchasing the use of a **property** such as a vehicle or building from another (the **lessor**) for a specific period of time
2. equity: the **difference** between the **value** of an item and the amount still **owing** on it; also known as the portion you own *→ property*
3. appreciation: **increase** in the value of an asset over time
4. depreciation: **decrease** in the value of an asset over time *↳ movable assets (vehicles)*

Discussion: Would you buy or rent for the following situations? Why?

1. You need a pencil *→ depreciates, inexpensive*
2. You need a computer *→ depends*
3. You need a car *→ depends*
4. You need a place to live *→ depends (finances, time frame, age...)*
5. You need furniture *→ usually buy but also depends*

LEARN ABOUT the Math

Amanda is a civil engineer. She needs a vehicle for work, on average, 12 days each month. She has been renting a vehicle when she needs it.



The advantage to renting is that she simply fills the gas tank and drops off the vehicle when she is done with it. The disadvantage is that she has to spend time arranging for the rental, picking up the vehicle, and getting home after dropping it off. She is wondering if renting is the most economical choice and is considering her options:

- She could **lease** a vehicle, which requires a **down payment of \$4000** and lease payments of **\$380 per month plus tax**. She would need insurance at **\$1220 each year** (which could be paid monthly) and would have to pay for repairs and some maintenance, which would average **\$50 each month**. For the 4-year lease she is looking at, she would have no **equity** in the vehicle at the end of the term, since the car would belong to the leasing company.
- She could buy a vehicle for **\$32 800** and finance it for a 4-year term at **4.5% interest**, compounded **monthly**. She would have the same insurance, repair, and maintenance costs that she would have with leasing. However, the **equity** of the vehicle would be considered an **asset**.
- She could continue to rent at **\$49.99 per day, plus tax**, with unlimited kilometres.

$$\begin{aligned}
 & \$380 \text{ (monthly)} \times 48 \text{ (months)} \\
 & = 25520 \\
 & + 4000 \\
 & \hline
 & \$29520 \\
 & \div 48 \\
 & \hline
 & \text{per month} = \$615
 \end{aligned}$$

$$\begin{aligned}
 N &= 12 \times 4 \\
 I &= 4.5 \\
 PV &= 32800 \$ \\
 PMT &= 247.95 \$ \\
 FV &= 0 \\
 P/Y &= 12 \\
 C/Y &= 12
 \end{aligned}$$

$$\begin{aligned}
 \text{total cost} &= (247.95)(48) \\
 &= 35901.81
 \end{aligned}$$

Which option would you recommend for Amanda, and why?

rent for 12 days/month:

$$(49.99)(12) = 599.88 \$$$

It looks like renting is better but with buying she has **equity**

Reflecting

- A. Mitchell made his decision based on the monthly costs of all three options. Are there other benefits that should be taken into account when comparing the three options?
 → equity
→ insurance costs
→ taxes
- B. How many more days a month would Amanda have to rent before leasing was the best option?
 → only one more day
- C. Suppose that Amanda hired an employee who needed a car from time to time. What might you recommend for her? Explain.
 → not renting
- D. When considering only monthly costs, leasing was better than buying for Amanda's situation. Why might this change if you looked at overall costs, as well as equity at the end of 4 years?
 has an asset with a purchase
- E. Suppose that Amanda had \$15 000 for a down payment on a new car. Would this change which option is best? Explain.
 → monthly = \$405.90
way better!
- F. Property can appreciate or depreciate. How does this apply to vehicles? How might this affect a decision about buying a new car versus a used car?
 used cars depreciate more slowly than new ones!

EXAMPLE 2 Solving a problem that involves vehicle depreciation

A luxury vehicle rental company depreciates the value of its vehicles each year over 5 years. At the end of the fifth year, the company writes off a vehicle for its scrap value. The company uses a depreciation rate of 40% a year.

- a) What is the scrap value of each car below?
 - i) Car A, which is currently 2 years old and has a value of \$43 200
 - ii) Car B, which is currently 1 year old and has a value of \$75 600
- b) What was the original purchase price of each car?

time in years

$$\text{depreciated value} = \text{present value} \times (1 - \text{depreciation rate})^{\text{time in years}}$$

a) A: $\text{scrap value} = 43200 (1 - 0.40)^2 = 43200 (0.6)^2 = 9331.20 \$$

B: $75600 = \text{new price} (0.6)^1$
 $\text{new price} = \frac{75600}{0.6} = 126000 \$$

b) $\frac{43200}{(0.6)^2} = \frac{\text{new price}}{(0.6)^2}$
 $\text{new} = \$120000$

$\frac{75600}{0.6} = \frac{\text{new}}{0.6}$
 $\text{new} = 126000 \$$

Homework: pg. 130 #3, 4, 7, 8