2.3 – Solving Problems Involving Credit

Line of Credit – A pre-approved loan that offers immediate access to funds, up to a pre-defined limit, with a minimum monthly payment based on accumulated interest.

Bank of Canada Prime Rate – A value set by Canada's Central Bank, which other financial institutions use to set their interest rates.

Example 1: Ed wants to buy a car and needs to use credit to finance it. The cost, with taxes, is $24 738. Ed wants to repay his loan in 4 years using monthly payments and has two credit options.

- His secure line of credit at 1.7%, compounded monthly, above the Bank of Canada rate, which is currently 0.5% $(I = 1.7 + 0.5)$
- The dealership's financing plan at 2.5%, compounded daily

a) Which option should he choose?

Line of Credit

$N = 4 \times 12 = 48$
$I = 1.7 + 0.5 = 2.2$
$PV = 24738$
$PMT = ?$ Payment: $538.86
$FV = 0$
$P/Y = 12$
$C/Y = 12$

Dealership

$N = 4 \times 12 = 48$
$I = 2.5$
$PV = 24738$
$PMT = ?$ Payment:
$FV = 0$ $542.14
$P/Y = 12$
$C/Y = 365$

⇒ Line of credit is better. Saves $3.28/month or $157.44 altogether

b) Suppose that the Bank of Canada rate changed to 1.1% after 2 years. How would this affect his line of credit payments if he still wanted to pay off the laon in 4 years?

Find out how much he still owes after 2 years (FV)

$N = 12 \times 2 = 24$
$I = 1.7 + 0.5 = 2.2$
$PV = 24738$
$PMT = -538.86$
$FV = ?$
$P/Y = 12$
$C/Y = 12$ $FV = \$12640.73$

Ed still owes $12640.73 after 2 years.

Now find new payments for years 3-4.

$N = 2 \times 12 = 24$
$I = 1.1 + 1.7 = 2.8$
$PV = 12640.73$
$PMT = ?$
$FV = 0$
$P/Y = 12$
$C/Y = 12$

New Payments:
$542.20

c) If the Bank of Canada rate changed as described in part b), does your answer to part a) change?

Total New Line of Credit:

$24 \times 538.86 + 24 \times 542.20$
$= \$25945.44$

Dealership:

$48 \times 542.14 = \$26022.72$

No. Line of credit is still better

Example 2: Jon's $475 car insurance payment is due. He does not have enough cash to make the payment, so he is considering these two credit options.

- Borrow the money from a payday loan company for a $100 fee if it is paid back in full within 2 months.
- Get a cash advance on his credit card, which is carrying a zero balance. The interest charged for cash advances is 19.99%, compounded daily, and takes effect immediately. He can afford to pay the required $5 minimum payment after the first month and then plans to pay off the balance in full at the end of the second month.

a) Which is the better option for Jon?

Payday Loan:

Must pay $475 + 100$ back in two month.

(total cost = $575)

Cash Advance

Amount owing after one month (31 days)

$$FV = 475\left(1 + \frac{0.1999}{365}\right)^{31} = \$483.13$$

* minus $5 payment *

still owes $483.13 - 5 = \$478.13$

$$FV = 478.13\left(1 + \frac{0.1999}{365}\right)^{31} = \$486.31$$

Total cost will be $486.31

Cash Advance on Credit card is best option

b) What annual interest rate (compounded monthly) would equate to the fee charged by the payday loan company?

$FV = 575$
$P = 475$
$n = 2$
$i = ?$

$$FV = P(1+i)^n$$

$$\frac{575}{475} = \frac{475(1+i)^2}{475}$$

$$1.2105... = (1+i)^2$$

$$\sqrt{ANS} \qquad \sqrt{(1+i)^2}$$

$$1.10024 = 1+i$$
$$\quad -1 \qquad -1$$

$$0.10024 = i$$

Remember:

$$i = \frac{\text{rate}}{\text{\# compoundings}}$$

$$0.10024 = \frac{r}{12} \times 12$$

$$1.20287 = r$$
(still in decimal form!!)

$$\frac{\times 100}{= 120.3\%}$$

Example 3: Nicki wants to be debt-free in 5 years. She has two credit cards on which she makes monthly payments:

   Card A – balance of $2436.98 and an interest rate of 18.5%, compounded daily
   Card B – balance of $3043.26 and an interest rate of 19%, compounded daily

Nicki has qualified for a line of credit at her bank with an interest rate of 9.6%, compounded monthly, and a credit limit of $6000. She plans to pay off both credit card balances by borrowing the money from her line of credit. How much interest will she save?
   (Assume she is not making any more payments with either card)

Without using line of credit:

Card A

$N = 5 \times 12 = 60$
$I = 18.5$
$PV = 2436.98$
$PMT = ?$
$FV = 0$
$P/Y = 12$
$C/Y = 365$

Card B

$N = 5 \times 12 = 60$
$I = 19$
$PV = 3043.26$
$PMT = ?$
$FV = 0$
$P/Y = 12$
$C/Y = 365$

Payments: $62.73   Payments: $79.19

   Total Cost: $60 \times 62.73 + 60 \times 79.19 = \$8515.20$
   So Interest paid is $8515.20 - 2436.98 - 3043.26$
                  $= \$3034.96$

Using Line of Credit:
   (borrowing $2436.98 + 3043.26 = \$5480.24$)

$N = 5 \times 12 = 60$
$I = 9.6$
$PV = 5480.24$
$PMT = ?$
$FV = 0$
$P/Y = 12$
$C/Y = 12$

Monthly Payments: $115.36

   Total Cost: $115.36 \times 60 = \$6921.60$

   Interest Paid: $6921.60 - 5480.24 = \$1441.36$

   Amount Saved: $3034.96 - 1441.36$
                  $= \$1593.60$

Example 4: Freda signed up for a special credit offer when she bought her living-room furniture. There were no payments and no interest for 12 months, as long as she paid the balance of $2643.65 in full by the end of the first year. Otherwise, a penalty equal to an interest rate of 19.95%, compounded monthly, on the full balance would be charged, starting from when she first borrowed the money.

a) If Freda missed the deadline by one day, what would she have to pay? What would the penalty be?

$FV = ?$
$P = 2643.65$
$i = \dfrac{0.1995}{12}$
$n = 13$

must also pay 13th month of interest!

$FV = 2643.65\left(1 + \dfrac{0.1995}{12}\right)^{13}$

$= \$3275.62$

Penalty:

$3275.62 - 2643.65$

$= \$631.97$

She would have to pay $3275.62 (a penalty of $631.97)

b) Suppose that she made monthly payments of $150 during the first year. What would her 12th and last payment need to be to avoid an interest penalty?

11 months × 150 = $1650

still left to pay: 2643.65 − 1650

$= \$993.65$

Her last payment needs to be $993.65

Assignment: Pg. 114 # 1 – 4, 6, 12   (Extension #17)