Explanation and Example of APR, "Rule of 78" and Repayment for Instalment Loans

(A) Explanation of Annualised Percentage Rate (APR)

The Annualised Percentage Rate ("APR") is calculated according to the following "Net Present Value" (NPV) method specified in the guidelines set out in the Code of Banking Practice.

The formula:

$$A = \sum_{k=1}^{n} \frac{X}{(1+i)^{t_k}} \quad \text{where}$$

A = Original loan amount
n = Total number of instalments
X = Instalment amount
t_k = k/t, where t is the frequency of instalment in a year
k = Number identifying a particular instalment
i = Unknown APR

(B) Explanation and example of "Rule of 78"

- The "Rule of 78" is the method most banks and financial companies use to apportion the principal and interest in each instalment amount. Under this rule, the apportionment of interest in each instalment amount decreases over the course of the loan period.

- For example, if a loan is to be repaid over 12 months, the total interest will be divided into 78 portions (12 + 11 + 10 + … + 1 = 78). 12/78 of the interest is allocated as the first instalment's portion of the total interest, 11/78 of the interest is allocated as the second instalment's portion and so on until the twelfth instalment, at which time 1/78 of the interest is allocated as that instalment's portion of the total interest.

- The total interest portions for different loan tenors are illustrated as below:

Loan Tenor (Months)	Interest Portion
12	78 (12 + 11 + 10 + … + 1)
24	300 (24 + 23 + 22 + … + 1)
36	666 (36 + 35 + 34 + … + 1)

Example

Assuming a customer who borrows HK$12,000 with a tenor of 12 months, monthly flat rate of 0.296% and handling fee of 1% p.a.. Each instalment amount will be HK$1,035.52. The calculation of interest is as follow:

- Based on the monthly flat rate of 0.296%, the total interest will be:

Total Interest = Loan principal x monthly flat rate x tenor (months)

= HK$12,000 x 0.296% x 12

= HK$426.24

- According to "Rule of 78", the denominator of the loan with a 12-month tenor is the sum of the numbers 1 to 12, which is 78 (12 + 11 + 10 + …+ 1 = 78). Hence, 12/78 of the total interest is allocated as the portion to be paid in the 1st instalment.
- Interest in each instalment = Total interest x interest portion
  - Interest of the 1st instalment   = HK$426.24 x 12/78 = HK$65.58
  - Interest of the 2nd instalment = HK$426.24 x 11/78 = HK$60.11
  - Interest of the 3rd instalment   = HK$426.24 x 10/78 = HK$54.65
  - Interest of the last instalment = HK$426.24 x 1 /78 = HK$5.46

The above example is for reference only. The figures are rounded to 2 decimal places.

(C) Apportionment of the principal and interest in each instalment amount

The amount of interest in each instalment amount is calculated by method as mentioned in (B). The apportionment of the principal and interest can be obtained by deducting the interest from each instalment amount.

Tenor (months): 12

Interest Rate (monthly flat rate): 0.296%

Total Loan Amount (HK$): 12,000

Instalment No.	Instalment Amount (HK$)	Interest (HK$)	Principal repaid (HK$)
1	1,035.52	65.58	969.94
2	1,035.52	60.11	975.41
3	1,035.52	54.65	980.87
4	1,035.52	49.18	986.34
5	1,035.52	43.72	991.80
6	1,035.52	38.25	997.27
7	1,035.52	32.79	1,002.73
8	1,035.52	27.32	1,008.20
9	1,035.52	21.86	1,013.66
10	1,035.52	16.39	1,019.13
11	1,035.52	10.93	1,024.59
12	1,035.52	5.46	1,030.06
Total	12,426.24	426.24	12,000.00

The above example is for reference only and the amounts are rounded to 2 decimal places.

(D) Calculation of the principal and interest payable in early repayment with "Rule of 78"

Early repayment

1. The formula of early repayment for a customer who wants to full repay the loan on due date of any instalment:

$$A=(L+I)-R-I \times \left[\frac{M(M+1)}{T(T+1)} \right] \quad \text{(Formula 1)}$$

2. The formula of early repayment for a customer who wants to full repay the loan on a date which is not an instalment date:

$$A=(L+I)-R-I \times \left[\frac{M(M-1)}{T(T+1)} \right] \quad \text{(Formula 2)}$$

> A ：Sum of the principal and interest payable for early full repayment
> L ：Total loan amount
> I ：Total interest for the entire loan period if no early full repayment is made
> R ：Total amount of the principal and interest which have already been repaid
> M ：Number of remaining instalments
> T ：Total number of instalments

Example: Assuming a customer who borrows HK$12,000 with a tenor of 12 months, monthly flat rate of 0.296% and handling fee of 1% p.a.. The instalment amount will be HK$1,035.52. The customer wants to make early full repayment after the 6th instalment.

Situation 1: Early repayment of the loan on the 7th instalment due date (with Formula 1):
1. Firstly, repay the 7th instalment of HK$1,035.52.
2. Secondly, calculate the amount of principal payable by applying Formula 1 based on the loan repayment information (i.e. 7 instalments already paid and 5 instalments outstanding).

> Principal and interest payable on early full repayment

$$= (12,000+426.24) - 1,035.52 \times 7 - 426.24 \frac{5(5+1)}{12(12+1)} = 5,095.63$$

3. 7th instalment and principal and interest payable on early full repayment
    = 1,035.52 + 5,095.63 = 6,131.15

Situation 2: Early repayment of the loan before the 7th instalment due date (with Formula 2)：

1. Calculate the amount of principal payable on early full repayment by applying Formula 2 based on the loan repayment information (i.e. 6 instalments already paid and 6 instalments outstanding)

> Principal and interest payable on early full repayment

$$= (12,000+426.24) - 1035.52 \times 6 - 426.24 \frac{6(6-1)}{12(12+1)} = 6,131.15$$

Remark 1: The above examples are calculated under "Rule of 78", which are for reference only. The actual amount should be referred to the result of our system.

Remark 2: 2% of outstanding amount will be charged if the customer fully repays the loan before loan maturity date as prepayment fee. Only full repayment of the loan is permissible provided that prepayment shall be the sum of all the remaining instalments of the Instalment Loan after deducting the interest rebate on "Rule of 78" basis.

(E) Do I save interest expenses by making early repayment of personal instalment loan?

Generally speaking, the earlier a borrower makes loan repayment, the more outstanding interest payments are likely to be saved. Nevertheless, borrowers should consider the early repayment charges involved before deciding whether to pay off their loans early or not. Borrowers need to be aware that NCB (the "Bank") uses "Rule of 78" to apportion the principal and interest in each instalment amount (please refer to (B) and (C) above for details). Even though each instalment amount is the same throughout the loan tenor, more interest will, in general, be included in earlier repayments, and less on principal. In other words, where a borrower has been making repayments as scheduled for some time, the amount of outstanding interest is likely to be small. If the borrower chooses to pay off the loan early at this point of time, the loss may outweigh the gain as the amount of interest saved may not be enough to cover the relevant charges for early repayment. As a smart bank customer, one should first check with our Bank about the total amount involved in early repayment (including outstanding loan balance, early repayment charges and other fees, etc.) and the amount of outstanding interest. You should then compare different scenarios and consider carefully before making a decision of repaying early or not.

Example：Assuming a customer who borrows HK$12,000 with a tenor of 12 months, monthly flat rate of 0.296% and handling fee of 1% p.a.. Each instalment amount will be HK$1,035.52. The customer chooses to make early full repayment on due date of different instalments throughout the loan period, comparison of the amount of outstanding interest can be saved by early repayment and the amount of prepayment fee payable are shown as table listed below.

As shown in the below example, if the customer chooses to make early full repayment on due date of the 6th instalment or afterwards, the amount of outstanding interest can be saved by early repayment will not be enough to cover the relevant charges for early repayment.

- Outstanding interest can be saved by early repayment being the sum of interest for all the remaining instalments (please refer to (C) above); and

- Outstanding amount being the amount calculated by Formula 1 in (D) above; and
- Prepayment fee payable being 2% of outstanding amount.

Instalment No.	Outstanding interest can be saved by early repayment (HK$)	Outstanding amount (HK$)	Prepayment fee payable (HK$)
1	360.66	11,030.06	220.60
2	300.55	10,054.65	201.09
3	245.90	9,073.77	181.48
4	196.72	8,087.43	161.75
5	153.00	7,095.63	141.91
6	114.75	6,098.36	121.97
7	81.96	5,095.63	101.91
8	54.64	4,087.43	81.75
9	32.78	3,073.77	61.48
10	16.39	2,054.65	41.09
11	5.46	1,030.06	20.60
12	-	-	-

The above example is for reference only and the amounts are rounded to 2 decimal places. If you intend to make an early repayment, you can contact our Bank.

Reminder: To borrow or not to borrow? Borrow only if you can repay!