Rules and Regulations

Title 12—BANKS AND BANKING

Chapter II—Federal Reserve System

SUBCHAPTER A—BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM

[Reg. Z, Supp. I]

PART 226—TRUTH IN LENDING

General Rule and Equations for Determination of Annual Percentage Rate

1. Effective July 1, 1969, Supplement I to Part 226 is added, as set forth below.

2a. Supplement I is incorporated by reference in § 226.5(b)(1). Part 226 implements the provisions of the Truth in Lending Act, which is title I of the Consumer Credit Protection Act (Public Law 90-321; 82 Stat. 146; 15 U.S.C. 1601ff). Notice of proposed rule making with respect to this part was published in the FEDERAL REGISTER of October 18, 1968 (33 F.R. 15506). Part 226 was published in the FEDERAL REGISTER of February 11, 1969.

b. Supplement I contains the general rule and equations for determining the annual percentage rate pursuant to paragraph (b) of § 226.5. These items were found in § 226.11 of the proposals in the notice of proposed rule making. They have been removed from the body of the regulation and placed in Supplement I since the information will not be needed by most creditors. Supplement I is available without charge upon written request to the Board of Governors.

Dated at Washington, D.C., this 31st day of January 1969.

By order of the Board of Governors.

[SEAL] ROBERT P. FORRESTAL,
Assistant Secretary.

SUPPLEMENT I TO REGULATION Z

GENERAL RULE AND EQUATIONS FOR DETERMINING THE ANNUAL PERCENTAGE RATE PURSUANT TO PARAGRAPH (b) OF § 226.5

(a) *General rule—other credit.* The annual percentage rate shall be that nominal annual percentage rate determined by multiplying the unit-period rate by the number of unit-periods in a year and shall be computed so that it may be disclosed with an accuracy at least to the nearest quarter of 1 percent. The unit-period rate shall be determined as that percentage rate which will yield a sum equal to the amount of the finance charge when it is applied in accordance with the actuarial method under which payments made on a debt are allocated between the amount of the finance charge and the amount financed, so that each payment is applied first to the accumulated finance charge and any remainder is subtracted from, or any deficiency is added to, the unpaid balance of the amount financed.

(b) *Unit-period.* For the purposes of determining the unit-period, all calendar months may be considered as equal periods and the following shall be applicable:

(1) The term of the transaction commences on the date of its consummation, except that if the finance charge begins to accrue on any other date, the term of the transaction shall be considered as beginning on the date the finance charge begins to accrue and ending on the date the last payment is due.

(2) Periods are the intervals of time between advances or between payments and include the interval of time between the date the finance charge begins to accrue and the date of the first advance thereafter or the date of the first payment thereafter, as applicable.

(3) A common period shall be any period which occurs more than once in a transaction.

(4) The unit-period shall be that common period, not to exceed 1 year, which occurs most frequently in the transaction; except that

(i) If two or more common periods occur with equal frequency, the smaller of such common periods shall be the unit-period; or

(ii) If there is no common period in the transaction, the unit-period shall be that period which is the average of all periods rounded to the nearest whole standard interval of time. If the average is equally near two standard intervals of time, the lower shall be the unit-period. For the purpose of this subparagraph, a standard interval of time shall be a day, week, biweek, semimonth, month, or a multiple of a month up to, but not to exceed 1 year.

(5) The unit-period in a single advance single payment transaction shall be the term of the transaction, but not to exceed 1 year.

(c) *Percentage rate for a fraction of a unit-period.* The percentage rate of finance charge for a fraction (less than 1) of a unit-period shall, at the option of the creditor, be either—

(1) The corresponding fraction of the percentage rate of finance charge per unit-period, or

(2) The corresponding actuarially equivalent fraction of the percentage rate of financed charge per unit-period.

(d) *Symbols.* The symbols used to express the terms of a transaction in the equations set forth in paragraph (e) of this section are defined as follows:

U_k=The amount of credit advanced directly or indirectly at the end of the kth period.
q_k=The number of unit-periods from the date of consummation or the date the finance charge begins to accrue, as applicable, to the kth advance.
m=The number of advances to be made by the creditor.
P_j=The amount of the payment to be made at the end of the jth period.
t_j=The number of unit-periods from the date the finance charge begins to accrue to the jth payment.
n=The number of payments.
w=The number of unit-periods in a year.
i=The percentage rate of finance charge per unit-period.
R=The nominal annual percentage rate expressed as a decimal number which shall be converted into a percentage rate by moving the decimal point two places to the right.

(e) *General equations.* (1) The following equation sets forth the relationship among the terms of a transaction:

$$\frac{U_1}{(1+i)^{q1}}+\frac{U_2}{(1+i)^{q2}}+\cdots+\frac{U_m}{(1+i)^{qm}}=\frac{P_1}{(1+i)^{t1}}+\frac{P_2}{(1+i)^{t2}}+\cdots+\frac{P_n}{(1+i)^{tn}}$$

(2) The following equation applies in converting the percentage rate of finance charge per unit-period to a nominal annual percentage rate:

$$R=wi$$

(f) *Adaptation of general equations.* The general equations set forth in paragraph (e) of this section shall be adapted as follows:

(1) *Transactions involving a single advance.* (i) Payments at equal periods in equal amounts:

Assume creditor advances $1,000, and customer is to make 24 equal monthly payments of $47.50 starting 1 month from date of consummation.

Unit-period is 1 month.

U_1=$1,000	q_1=0
P_1=$47.50	t_1=1
P_2=$47.50	t_2=2
. . .	. . .
P_{24}=$47.50	t_{24}=24

The equations are adapted as follows:

$$1{,}000=+\frac{47.50}{(1+i)^1}+\frac{47.50}{(1+i)^2}+\cdots+\frac{47.50}{(1+i)^{24}}$$

w=12.
i=0.01076.
$R=wi=12\times0.01076=0.1291$ or 12.91%.

(ii) Payments at equal periods in unequal amounts:

Assume creditor advances $1,000, and customer is to make three payments of $200 each at the end of the third, sixth, and ninth months and a $600 payment at the end of 1 year from the date of consummation.

Unit-period is 3 months.

U_1=$1,000	q_1=0
P_1=$200	t_1=1
P_2=$200	t_2=2
P_3=$200	t_3=3
P_4=$600	t_4=4

The equations are adapted as follows:

$$1{,}000=\frac{200}{(1+i)^1}+\frac{200}{(1+i)^2}+\frac{200}{(1+i)^3}+\frac{600}{(1+i)^4}$$

w=4.
i=0.06357.
$R=wi=4\times0.06357=0.2543$ or 25.43%.

(iii) Payments at unequal periods in equal amounts:

Assume creditor advances $1,000, customer is to make four payments of $290 each at the end of second, sixth, eighth, and 12th months after consummation.

Unit-period is 2 months.

U_1=$1,000	q_1=0
P_1=$290	t_1=1
P_2=$290	t_2=3
P_3=$290	t_3=4
P_4=$290	t_4=6

The equations are adapted as follows:

$$1{,}000=\frac{290}{(1+i)^1}+\frac{290}{(1+i)^3}+\frac{290}{(1+i)^4}+\frac{290}{(1+i)^6}$$

w=6.
i=0.04422.
$R=wi=6\times0.04422=0.2653$ or 26.53%.

(iv) Payments at unequal periods in unequal amounts:

Assume creditor advances $1,000, and customer is to make payments as follows: $200 at end of second month, $300 at end of fifth month, $350 at end of eighth month and $300 at end of 12th month.

Unit-period is 3 months.

U_1=$1,000 q_1=0
P_1=$200 t_1=⅔
P_2=$300 t_2=1⅔
P_3=$350 t_3=2⅔
P_4=$300 t_4=4

The equations are adapted as follows:

$$1{,}000=\frac{200}{(1+i)^{2/3}}+\frac{300}{(1+i)^{1\ 2/3}}+\frac{350}{(1+i)^{2\ 2/3*}}+\frac{300}{(1+i)^4}$$

*Computed as $(1+i)^2\times(1+\frac{2}{3}i)$ in accordance with subparagraph (c)(1).

w=4.
i=0.06064.
$R=wi=4\times0.06064=0.2426$ or 24.26%.

(v) Payment periods greater than 1 year:

Assume creditor advances $1,000, and customer is to make two payments of $550 each at the end of the 18th and 36th months from the date of consummation.

Unit-period is 1 year.

U_1=$1,000 q_1=0
P_1=$550 t_1=1½
P_2=$550 t_2=3

The equations are adapted as follows:

$$1{,}000=\frac{550}{(1+i)^{1\ 1/2}}+\frac{550}{(1+i)^3}$$

w=1.
i=0.04335.
$R=wi=1\times0.04335=0.04335$ or 4.34%.

(vi) Single payment with maturity of 12 months or less:

Assume creditor advances $1,000, and customer agrees to make a single payment of $1,100, 8 months from the date of consummation.

Unit-period is 8 months.

U=$1,000 P=$1,100

The equations are adapted as follows:

$$1{,}000=\frac{1{,}100}{(1+i)}$$

w=1½.
i=0.10000.
$R=wi=1\frac{1}{2}\times0.10000=0.1500$ or 15.00%.

(vii) Single payment with maturity of more than 12 months.

Assume creditor advances $1,000, and customer is to make one payment of $1,212.42, 17 months from date of consummation.

Unit-period is 1 year.

U=$1,000 P=$1,212.42

The equations are adapted as follows:

$$1{,}000=\frac{1{,}212.42}{(1+i)^{1\ 5/12}}$$

w=1.
i=0.14386.
$R=wi=1\times0.14386=0.14386$ or 14.39%.

(2) *Transaction involving multiple advances.*

Assume a college loan in which a creditor is to make eight advances to the customer: $1,800 each September 1 for 4 years and $1,000 each January 1 for 4 years. The customer is to make 50 regular equal monthly payments of $240 beginning July 1, prior to the first advance in September.

Unit-period is 1 month.

U_1=$1,800 q_1=2
U_2=$1,000 q_2=6
U_3=$1,800 q_3=14
U_4=$1,000 q_4=18
U_5=$1,800 q_5=26
U_6=$1,000 q_6=30
U_7=$1,800 q_7=38
U_8=$1,000 q_8=42
P_1=$240 t_1=0
P_2=$240 t_2=1
P_3=$240 t_3=2
. . . . . .
P_{50}=$240 t_{50}=49

The equations are adapted as follows:

$$\frac{1{,}800}{(1+i)^2}+\frac{1{,}000}{(1+i)^6}+\frac{1{,}800}{(1+i)^{14}}+\frac{1{,}000}{(1+i)^{18}}+\frac{1{,}800}{(1+i)^{26}}+\frac{1{,}000}{(1+i)^{30}}+\frac{1{,}800}{(1+i)^{38}}+\frac{1{,}000}{(1+i)^{42}}=240+\frac{240}{(1+i)^1}+\frac{240}{(1+i)^2}+\ldots+\frac{240}{(1+i)^{49}}$$

w=12.
i=0.02522.
$R=wi=12\times0.02522=0.3026$ or 30.26%.

In case multiple real values of R are obtained, use that value of R which is nearest to the value of R obtained by assuming that the number of unit-periods from the date of consummation or the date the finance charge begins to accrue, as applicable, to each advance is:

$$\frac{U_1q_1+U_2q_2+\ldots+U_mq_m}{U_1+U_2+\ldots+U_m}$$

(3) *Transactions involving required deposit balances.* (i) Required constant deposit balance:

Assume creditor advances $1,000 and requires that the customer maintain a deposit balance of $200 during the 12-month loan. The customer is to make 12 equal monthly payments of $90 starting 1 month from date of consummation. The deposit balance will be released to the customer upon final payment of the advance.

Unit-period is 1 month.

U_1=$800 q_1=0
U_2=$200 q_2=12
P_1=$90 t_1=1
P_2=$90 t_2=2
. . . . . .
P_{12}=$90 t_{12}=12

The equations are adapted as follows:

$$800+\frac{200}{(1+i)^{12}}=\frac{90}{(1+i)^1}+\frac{90}{(1+i)^2}+\ldots+\frac{90}{(1+i)^{12}}$$

w=12.
i=0.01852.
$R=wi=12\times0.01852=0.2222$ or 22.22%.

(ii) Required variable deposit balance:

Assume creditor advances $5,000 and requires a $1,000 deposit balance which is to be released in amounts of $500 per quarter beginning at the end of the first quarter immediately following consummation. Customer is to make 6 equal monthly payments of $900 beginning 1 month following consummation.

Unit-period is 1 month.

U_1=$4,000 q_1=0
U_2=$500 q_2=3
U_3=$500 q_3=6
P_1=$900 t_1=1
P_2=$900 t_2=2
. . . . . .
P_6=$900 t_6=6

The equations are adapted as follows:

$$4{,}000+\frac{500}{(1+i)^3}+\frac{500}{(1+i)^6}=\frac{900}{(1+i)^1}+\frac{900}{(1+i)^2}+\ldots+\frac{900}{(1+i)^6}$$

w=12.
i=0.02993.
$R=wi=12\times0.02993=0.3592$ or 35.92%.

(iii) Transaction where customer is required to make periodic deposits into a restricted account:

Assume creditor advances $1,000, and customer is to make 12 equal monthly payments of $110, $90 of which is to be applied to repayment of the advance and the finance charge and $20 of which is to be deposited into an account. The account will be released to the customer upon final payment of the advance.

Unit-period is 1 month.

U_1=$1,000 q_1=0
U_2=$240 q_2=12
P_1=$110 t_1=1
P_2=$110 t_2=2
. . . . . .
P_{12}=$110 t_{12}=12

The equations are adapted as follows:

$$1{,}000+\frac{240}{(1+i)^{12}}=\frac{110}{(1+i)^1}+\frac{110}{(1+i)^2}+\ldots+\frac{110}{(1+i)^{12}}$$

w=12.
i=0.01482.
$R=wi=12\times0.01482=0.1778$ or 17.78%.

[F.R. Doc. 69-1549; Filed Feb. 11, 1969; 8:45 a.m.]