TABLE 5

SIMPLE-INTEREST METHOD: BALANCES OUTSTANDING BY MONTHS AND DISTRIBUTION OF MONTHLY PAYMENT BETWEEN PRINCIPAL AND FINANCE CHARGE, BASED ON EXAMPLE

Beginning of month		*End of month*		
Month	*Balance outstanding*	*Paid on principal*	*Paid on finance charge*	*Total paid*
(1)	(2)	(3)	(4)	(5)
Number	*Dollars*	*Dollars*	*Dollars*	*Dollars*
1	150.00	19.70	0.30	20
2	130.30	19.42	.58	20
3	110.88	19.14	.86	20
4	91.74	18.86	1.14	20
5	72.88	18.60	1.40	20
6	54.28	18.34	1.66	20
7	35.94	18.09	1.91	20
8	17.85	17.85	2.15	20
Total	663.87	150.00	10.00	160

loan at its maturity date. As applied to installment credit, the simple-interest method may be thought of as a series of individual loans at the beginning of the installment term. Each is equal to the present value, at simple interest, of a future installment. Their total is equal to the difference between the cash price C and the down payment D. Each will grow to meet a periodic payment in the allotted time at the computed rate. The interest is therefore collected at maturity date out of the maturity value (periodic payment). The complexity of the calculations involved is, however, an insurmountable argument against extensive use of the method.[9]

COMPOUND INTEREST

At compound interest, the cash price ($200) must equal the down payment ($50) plus the present value, at the monthly rate r, of the series of $20 payments to be made for 8 months in the future. After solving for r, this monthly rate may then be converted to an equivalent effective annual rate i. For example, in the equation

$$\$200=\$50+\$20(1+r)^{-1}+\$20(1+r)^{-2}+\cdots+\$20(1+r)^{-8}$$

$$a_{\overline{8}|r}=7.5.$$

By interpolation in tables showing the present value of an annuity of $1 per period, $r=0.01457$. But since $1+i=(1.01457)^{12}$, by logarithms, $i=0.190$ or 19 per cent.[10]

The reasoning behind the compound-interest method is the same as for the simple-interest method: What rate will make the present value of future installments equal to the difference between the cash price C and the down payment D? This present value for each installment may then be brought forward to the due date at the required rate, at which time, with interest, it exactly equals the amount of the installment. The following tabulation shows, on this basis, the present values of the respective installments, and the amounts of interest included in each:

Present value at beginning of installment term	*Interest due at maturity date*
Dollars	*Dollars*
19.71	0.29
19.43	.57
19.15	.85
18.88	1.12
18.61	1.39
18.34	1.66
18.07	1.93
17.81	2.19
150.00	10.00

The computed monthly rate (0.01457) also may be used to amortize the debt ($150) by payments of $20 a month for 8

[9] The relation between a simple-discount rate and a simple-interest rate for a series of payments is . . .

$$d=\frac{2m}{n(n+1)}\left\{n-m\left[\frac{1}{m+i}+\frac{1}{m+2i}+\cdots+\frac{1}{m+ni}\right]\right\}.$$

The formulas $d=i/1+ni$ and $i=d/1-nd$ do not apply in converting from i to d or from d to i when a series of payments is involved.

[10] See table 2 and column 8 of table 1. The nominal rate by the small-loan and direct-ratio methods is $12r$ or 12×0.01475, which equals 17.5 per cent.