

Discounting an interest-bearing debt

To find the present value of an interest-bearing debt (or to discount the amount by the simple discount method), take the following steps:

Step 1:

Find the maturity value (the amount) according to the original interest rate and the time stipulated for the debt. Use the formula $S = P(1 + in)$, where S is the maturity value and P is the original debt.

Step 2:

Find the present value (the value on the date of discount) of the maturity value according to the interest rate for discounting and the discount period. The discount period is the period from the date of discount to the maturity date. Use the formula in the form

$P = \frac{S}{1 + in}$, where P is the present value and S is the maturity value. However, the values of i and n in this step are often different from the values in i and n in step 1.

Example 1

A man borrowed €1,000 on May 1, 1999 and agreed to repay the money plus 8% interest in six months. Two months after the money was borrowed, the creditor agreed to settle the debt by discounting it at the simple interest rate of 9%. How much did the creditor receive when he discounted the debt?

Example 2

In the last example, assume that the simple interest rate for discounting is also 8%. How much would the creditor receive when discounting the debt?

Partial Payments

If partial payments are made on a debt before it is due, there should be an agreement between the creditor and the borrower regarding the interest on each partial payment.

In general, the two methods used by a creditor in reducing the interest are:

- Merchants' Rule (A simple interest method)
- United States Rule (A compound interest method)

Merchants' Rule

Under the *Merchants' Rule*, the principal and all partial payments are treated as if they earn interest from the time they are made to the date of final settlement. The following steps may be employed:

Step 1:

Find the sum of the principal and its interest for the period from the date of borrowing to the date of final settlement.

Step 2:

Find the sum of the partial payments and the interest on each partial payment from the date of payment to the date of final settlement. This sum is the debtor's credit against the sum in Step 1.

Merchants' Rule

Step 3:

Subtract the result in Step 2 from the result in Step 1. The difference is the balance to be discharged on the date of final settlement.

Example 1

On July 1, a man borrowed €2,000 at 6%. He paid €500 on August 30 and €600 on September 29. Find the balance on October 29 of the same year, by the Merchants' Rule.

United States Rule

Under the *United States Rule*, each partial payment must first be applied to the accumulated interest up to the date of the payment. Any remainder is then credited as a deduction from the principal. Therefore, when the United States Rule is applied, the successive interest is computed from a declining balance each time a payment is made. A debtor may thus know the actual amount of unpaid balance immediately after each payment.

The following steps may be employed:

Step 1

Find the interest on the principal for the period from the date of borrowing to the date of the first partial payment.

United States Rule

Step 2:

Subtract the interest from the first payment. If there is a remainder, subtract the remainder from the principal to obtain the unpaid balance. If the partial payment is not sufficient to cover the interest due, the partial payment is then held and is included in the next payment.

Step 3:

If there are further partial payments, the process in Steps 1 and 2 are repeated, but the interest is computed on the declining unpaid balance. Each payment must be first applied to the interest that has accumulated up to the date of each payment. The final balance is the sum of the unpaid principal and the accumulated interest up to the date of the final settlement.

United States Rule

Example 2

Refer to Example 1 (Merchants' Rule). Find the balance on October 29 by the United States Rule.

Example 3

On July 1, a man borrowed €1,000 at 12%. He paid €300 on July 31, €6 on September 29, and €400 on October 14. Find the balance due November 13 of the same year by the United States Rule.

Equivalent Values involving Simple Interest

Occasionally there arises the need to replace a single debt or a set of debts by another single debt or another set of debts due at different times. In order to satisfy both the debtors and creditors, the values of the new debts should be equivalent to the values of the original debts.

When *interest* is involved a sum of money has different values at various times. For convenience, a *comparison date*, also called *focal date*, should first be chosen in comparing the values of old debts with the values of new debts. An *equation of value*, which gives the equivalent values of original debts and new debts on the comparison date at the specified interest rate, should then be arranged for obtaining the required equivalent values.

Example 1:

A debt of €200 is due in six months. If the rate of interest is 15%, what is the value of the debt if it is paid (a) two months hence? (b) six months hence? (c) nine months hence?

Example 2:

A man owes (1) €100, due in two months, and (2) €400, due in eight months. His creditors have agreed to settle his debts by two equal payments in four months and ten months, respectively. Find the size of each payment if the rate of interest is 6% and the comparison date is four months hence.