

The Time Value of Money in Financial Management

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Abstract

The Time Value of Money is a important concept in financial management. The Time Value of Money (TVM) includes the concepts of future value and discounted value. It is mandatory for a financial professional to know and operate the specific techniques of TVM. Within the present article we present the basic notions and illustrate their application in the field of investment projects. The case studies presented are valuable for an efficient financial management.

Key words: time value of money, present value, future value

J.E.L. classification: G21; G32; M21

1. Introduction

The concept of Time Value of Money (TVM) has a large applicability in the financial management of companies, in banking, on the capital market and in day to day life.

Damodaran sed: „There are three reasons why a dollar tomorrow is worth less than a dollar today:

- Individuals prefer present consumption to future consumption. To induce people to give up present consumption you have to offer them more in the future.
- When there is monetary inflation, the value of currency decreases over time. The greater the inflation, the greater the difference in value between a dollar today and a dollar tomorrow.
- If there is any uncertainty (risk) associated with the cash flow in the future, the less that cash flow will be valued”. (Damodaran, 2010)

But why is TVM concept necessary in banking?

- People with spare funds and the desire to invest them could decide to directly lend them to borrowers in exchange for periodic repayments of the principal and interests. However, this would involve resources and costs for both the lender and the borrower:

(1) On the one hand, it is extremely difficult for the lender to have an accurate pictures of the borrower’s situation in terms of guarantee, so lender would have to monitor the borrower so as to assess the security of the investment;

(2) On the other hand, the borrower might want a larger loan than the lender is able to provide or perhaps needs the money for a longer period of time than the lender can afford. (Paniego, Muñoz MLM, 2015 p 4)

The concept of TVM is used in financial management and within the selections methods of investment projects.

2. The concept of Time Value of Money

The TVM is the concept according to which a sum of money owned in the present has a greater value than the value of the same sum received at a moment in the future. Thus, it is taken into account the opportunity of the one presently owning the sum of money to invest it and to obtain future gains such as interest or profit. The techniques used in order to make possible comparing and

calculating the time value of money include: Compounding, Discounting, Capitalization, Indexing. Within the present paper we shall focus on the first two techniques.

„In fact, most of Time Value of Money formulas are closely related. When introducing TVM formulas, the author can classify them under different conditions and link their relationships to organize them”. (Chen J. K, 2009, p 77)

Compounding represents the conversion of a current (today) amount of money into a future (a future year) amount of money, through the compounding factor or the compounded interest factor. The formula is:

$$V_n = V_o \times (1 + k)^n, \text{ where:}$$

V_o = the initial invested capital (the present day sum of money);

k = the profitability rate requested / expected by the investor;

n = the time interval existing between the present moment and the future moment for which the future value of the capital is estimated

V_n = the value of the capital estimated for a certain future moment;

$(1+k)^n$ = represents the compounding factor.

„Future Value is the value at some future time of a present amount of money, or a series of payments, evaluated at a given interest rate”. (Kuhlemeyer, 2008)

Discounting is the technique that calculates the present value of a future sum of money (that can be received or paid). Discounting requires computing the discounted (present) value of the amount of money (cash flows) that are going to be received at future moments in time.

$$V_0 = V_n \times \frac{1}{(1 + k)^n}$$

Present Value is the current value of a future amount of money, or a series of payments, evaluated at a given interest rate”. (Kuhlemeyer, 2008)

3. Applying discounting in the selection methods of investment projects

The evaluation of investment projects of companies is an important part of the efficient financial management and presumes taking the following mandatory steps:

1. Quantifying the costs of the investment project is the initial deciding step, with important effects over the next steps and over the final selection decision.

2. Estimating the cash flows (CF) that will result following the implementation of the investment project.

3. Determining the cost of capital or the discount rate

4. Discounting the cash flow generated by the exploitation of the investment.

5. Comparing the present value of the estimated cash flows with the prior computed costs of the project. If the present discounted value of cash flows of the respective project is larger than the implementation costs, then the project may be accepted as being profitable. Otherwise, the project is not to be implemented.

In order to select the profitable investment projects we can use the **payback period (PP)** method or the **NPV (net present value)** method.

Case study 1. A model of determining the discounted payback period

In a company it is sought to increase productivity by acquiring a new technological line. There are two options to make this investment and the incoming and outgoing flows are synthesized in

Figure no. 1. Investment options

| Year | Discounted cash-flow | |
|--------------|----------------------|------------------|
| | Option A | Option B |
| Initial cost | -3500000 | -3500000 |
| 1 | 1500000 | 1475000 |
| 2 | 1800000 | 1680000 |
| 3 | 2000000 | 1500000 |
| 4 | 1150000 + 930000 | 1450000 + 930000 |

Source: own calculations

The negative value represents the costs of the initial investment and the flows in year 4 are cumulated with the residual value of the company at the time, 930000 thousands of lei.

In the following lines we shall answer the question: "Which of the two projects should be chosen using the project selection method PP?"

For the purpose of determining the PP of the investments there must be determined the cumulated discounted cash-flows for the two options. (Figure 2)

Figure no. 2. Cumulated discounted CF

| Year | Cumulated cash-flow | |
|---------------|---------------------|----------|
| | Opt. A | Opt. B |
| Initial costs | -3500000 | -3500000 |
| 1 | -2000000 | -2025000 |
| 2 | - 200000 | - 345000 |
| 3 | 1800000 | 1155000 |
| 4 | 3880000 | 3535000 |

Source: own calculations

Substantiating the decision in financial management is realized after computing the payback period for each project:

Project A:

The 3500000 thousands of lei initially invested are paid back in two years plus a period of t1 days that we shall determine. In the third year we recuperate 1800000 thousands of lei. We calculate the daily cash flow for year 3.

$$CF_{3/zi} \frac{2\,000\,000}{365} = 5\,479,45 \text{ thousands of lei / day}$$

The 200000 thousands of lei that remain at the end of year 2, will be recuperated in:

$$t_1 = \frac{200\,000 \text{ lei}}{5\,479,45 \text{ lei / day}} = 36,5 \text{ days} \approx 37 \text{ days}$$

For project A it results a payback period of:

$$PBP = 2 \text{ years} \ \& \ 37 \text{ days.}$$

Project B:

After 2 years, the initial investment is not fully covered. Again, we calculate the daily cash flow for year 3:

$$CF_{3/zi} \frac{1\,500\,000}{365} = 4\,109,58 \text{ thousands of lei / day}$$

The 345.000 thousands of lei that remain unpaid at the end of year 2.

$$t_2 = \frac{345\,000 \text{ lei}}{4109,58 \text{ lei/zi}} = 83,95 \text{ zile} \approx 84 \text{ zile}$$

PBP = 2 years and 84 days.

We choose project A for implementation. Project A is the one that proves again as being more effective for the company.

Case study 2. Model of determining the NPV of the investment

The financial flows generated by implementing an investment project are produced at different moments in time. In order to determine the profitability of an investment, we must compare the financial flows, at the same moment, a process realized taking into account the TVM. This may be accomplished through the discounting procedure by which all the generated flows of the investment are mathematically translated to the initial moment of implementation of the project. The method used in selecting the profitable project is the *Net Present Value (NPV)*.

If we have several projects that have positive NVP, we will implement the one with the greater net present value. If the NVPs are close, we will choose the project requiring a smaller initial investment.

For the calculation of NVP we have the formula:

$$NPV = \text{Net discounted cash flows} - \text{initial investment}$$

and

$$V_{netpresent} = \sum_{i=1}^n \frac{CF_i}{(1+k)^i} = \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \dots + \frac{CF_n}{(1+k)^n}$$

Thus, the NVP method does not offer decision makers any certain information regarding the order of acceptance for financing various analyzed investment projects, it only answers the question: "Are the projects acceptable?".

We must decide, by using the NPV method, if the following project is profitable taking into account the data:

Initial investment costs = 100000 EUR; Cash flow in the next 4 years: Year 1: 60000 EUR; Year 2: 80000 EUR; Year 3: 80000 EUR; Year 4: 100000 EUR. Discount rate: 12%.

We discount the estimated cash flows and we compare them with the prior computed costs of the investment. (Fig 3)

Figure no. 3. Net present value -EUR-

| Year | Cash flow | Discounted rate (1+k) ⁱ | Discounted cash flow |
|---------------------|-----------|---------------------------------------|-------------------------|
| 1 | 60000 | 0.8928 | 53568 |
| 2 | 80000 | 0.7972 | 63776 |
| 3 | 80000 | 0.7118 | 56944 |
| 4 | 100000 | 0.6355 | 63550 |
| TOTAL: | | | 237838 |
| Initial investment: | | | 100000 |

Source: own calculations

NPV = 237838 EUR - 100000 EUR = 137838 EUR > 0, the project is profitable and may be implemented.

4. Conclusions

TVM concept stands at the basis of the profitability analyses in financial management. As the PP represents the period at the end of which the initial investment equals that of the total cash flow generated by the investment project, we may say that this method is connected to the notion of investment liquidity. The investment liquidity is greater as the payback period is shorter.

Discounting, as a financial technique, allows the comparison of the revenue obtained at different moments in time with the initial costs necessary for the implementation of an investment. This technique is useful in determining the profitable projects, as it was presented in the case study no 2.

Damodaran sed: „Present value remains one of the simplest and most powerful techniques in finance, providing a wide range of applications in both personal and business decisions. Cash flow can be moved back to present value terms by discounting and moved forward by compounding. The discount rate at which the discounting and compounding are done reflect three factors: (1) the preference for current consumption, (2) expected inflation and (3) the uncertainty associated with the cash flows being discounted”. (Damodaran, 2016).

5. References

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