

Time Value of Money

Though both situations are enviable, having a million dollars in the bank is not the same as someone promising to give you one million dollars a year from now. In fact, all else be equal and depending on what a bank is paying in interest on large balances, having \$950,000 in the bank today might actually be the same as having \$1,000,000 one year from now. That's because if you invest it wisely, the \$950,000 is going to earn a bunch of interest and be worth roughly the same as the million dollars you're promised down the road. Likewise, if you had one million dollars now and let it sit there and earn interest for the next 12 months, it'd be worth substantially more than a million dollars a year from now.

This concept that equal amounts of money are not in fact equal if you do not have access to them at the same time is known as the **time value of money**. As the name implies, there is a *value* to the *timing* with which you have access to funds. In the process of analyzing potential companies or investments for your clients, recognizing how the time value of money affects a company's income statements and balance sheets is crucial. Being able to adjust your analysis for the fact that one company may not collect a large portion of the money it is owed for a year, while the other can expect to collect it in the next few months, will give you and your clients invaluable insight into which company may be a better overall choice.

Future Value

In terms of the exam, there are two primary time value of money concepts that you'll need to know, the simplest of which is known as **future value**. This is the concept that the value of funds in the future will be (or should be) more than it is today, based on the ability to earn at least a minimal amount of interest. How much more the funds are worth depends on the interest rate at which the original amount grew. Future value is one of the most basic premises in investing and underlies what everyone reading this book should hope to do for their clients—make what they have in the present grow into something bigger.

When you are analyzing different aspects of a company, determining future value can be extremely helpful. Since the value of a stock or bond issue in the future often depends on the company's growth, making educated guesses about how a company's profits, expenses, and assets will grow over time can help you estimate a security's investment worthiness.

For example, let's say you're trying to decide whether to advise a client to invest in ABC Company. Based on the research you've done, especially comparing the previous five years' income statements, you've come up with the following data, including the average increase in certain categories each year.

ABC COMPANY (FROM PREVIOUS YEAR'S FINANCIAL FILINGS)

Income	\$10,000,000	Increases 2% annually, on average
Expenses	\$4,000,000	Increases 5% annually, on average
Profit	\$6,000,000	
Assets	\$1,000,000	Increases 1% annually, on average
Debts	\$1,000,000	Increases 3% annually, on average

Since your client is investing for a retirement that is 10 years into the future, determining where the figures above will be in 10 years will give you a clue as to whether you’d want to own that company as a long-term investment.

Adjusted for their estimated future values, ABC Company might be expected to show the following amounts in these categories:

ABC Company	Now	Future Value in 10 Years
Income	\$10,000,000	\$12,189,944
Expenses	\$4,000,000	\$6,515,579
Profit	\$6,000,000	\$5,674,365
Assets	\$1,000,000	\$1,104,623
Debts	\$1,000,000	\$1,343,916

While ABC Company looked pretty attractive in the present, with a \$6,000,000 profit and about the same amount of assets as debt, the picture looks a little less rosy 10 years from now. While ABC Company has grown its sales substantially, its expenses grew even more quickly, resulting in a very small increase in overall profits. Even more interesting is that 10 years from now, based on the expected growth rates of the company’s assets and debts, it will have substantially more debt than assets. Using future value calculations such as this can give you powerful insight into the direction of a company.

Calculating the Future Value (of a Present Sum)

There are two ways to calculate the future value of something that you expect to increase in value at an average rate each year. There’s a formula, a calculator trick, and a rule of thumb, all of which you should know.

The actual *formula* for calculating the future value of a sum is:

$$\text{future value} = \text{principal} \times (1 + r)^t$$

In this formula, the “r” stands for the interest rate earned during the period, and the “t” stands for the number of periods you’ll be compounding (growing) the sum over. So the formula can be rewritten:

$$\text{future value} = \text{principal} \times (1 + \text{interest rate})^{\text{number of periods}}$$

Aside from memorizing this formula, though, don’t worry about being able to compute it by hand, since a basic calculator will be provided by the testing center.

On your basic exam calculator, you can determine the future value by using the following procedure. Start by converting the percentage into a decimal and then add it to 1.00. For example, 7% becomes 0.07, which becomes 1.07 when added to 1.00. Then you multiply your present sum by this value as many times as you need to calculate years into the future, to get the future value.

Here’s how that would look. If you need to figure out what the future value of \$5,000 would be in four years at 8%, you’d get out your calculator and multiply:

$$\$5,000 \times 1.08 \times 1.08 \times 1.08 \times 1.08 = \$6,802.45$$

You can also use a **rule of thumb**, known commonly as the Rule of 72, to estimate how long it takes a present sum to double in future value, given a certain rate of return. While this will not tell you the exact future value of an item, it will help you estimate in situations where you do not have a calculator and rule out possible answers to questions on the exam.

Under the Rule of 72, you divide the rate of return at which you expect something to grow each year into 72, and the answer is the number of years it will take that present value sum to double in future value. For example, if \$10,000 was growing at a rate of 9%, you would divide 72 by 9 (the rate of return), giving you an answer of 8. This means at a 9% annual growth rate, \$10,000 will become \$20,000 in 8 years.

You can also flip this rule of thumb around to determine what rate of return an investment earned over a number of periods, if the future amount is roughly double the present amount. For example, if you know that a \$5,000 investment grew to \$10,000 in roughly six years, you could divide 72 by 6 (the number of years), which equals 12. This would tell you that the investment earned approximately 12% per year over the six years to have doubled that original amount.

Present Value

The concept of **present value** is the reverse of the concept of future value. Instead of trying to figure out what something will be worth in the future, present value calculates what the value of a future amount is today. This comes in handy in planning for the future, since many times clients or companies will decide that they need a certain amount in the future to meet certain goals or financial commitments, which in turn brings up the question of how much they would have to set aside today (the present value) to reach those goals. Likewise, when you are looking at investments as potential choices for investing a client's money, being able to analyze the present value of future amounts will help you compare apples to apples (e.g., would you rather invest in a company that has \$1 million of cash in the bank or one that will receive \$2 million in cash from a government contract seven years from now).

Calculating present value of something is not much different from calculating the future value of something, except that you use division instead of multiplication. The formula for calculating the present value of a single sum to be received or needed in the future is:

$$\text{present value} = \frac{\text{future amount}}{(1 + r)^t}$$

As before, the “r” stands for the interest rate earned during the period and the “t” stands for the number of periods you’ll be compounding (growing) the sum over. So the formula can be rewritten:

$$\text{present value} = \frac{\text{future amount}}{(1 + \text{interest rate})^{\text{number of periods}}}$$

Calculating present value on a calculator is not any harder than calculating the future value of something, except you'll be using the division button instead of the multiplication button.

Here's how that would look for calculating the present value of \$5,000 a client would need in four years, if their money could grow at a rate of 8%.

$$\$5,000 \div 1.08 \div 1.08 \div 1.08 \div 1.08 = \$3,675.15$$

Serial Payments

While it is unlikely that the exam will ask any difficult calculation questions about the time value of money and serial payments, you need to be familiar enough with this concept to answer conceptual questions on the topic. Thus far, you've learned about the computation of the present or future value of a single amount or lump sum. However, financial advisers and investors also need to calculate the present or future value of numerous fixed amounts that will be received in the future. This stream of payments is commonly referred to as **serial payments**. *Investors receive serial payments on fixed-income securities such as bonds.* Regulators, however, do want you to be familiar with two main concepts related to serial payments, internal rate of return and net present value.

Internal Rate of Return (IRR)

One of the biggest mistakes made both by investors and by the companies they invest in is not comparing what they'll earn against what it costs them to earn it. This is especially true when you reflect on the idea of **opportunity cost**, which is the realization that using money one place means that you are not using it elsewhere. **Internal rate of return** is a method of calculating the average annualized yield of a series of cash flows. By calculating this rate, an investor or company can then compare this rate against other choices of how to use her money over the same period and decide whether she wants to make this investment or not.

A simple example might be a company that wants to build a new plant now, which will cost \$10,000,000 to build and is expected to yield \$3,000,000 in new revenue each year for the next five years.

When plugged into an internal rate of return calculator, the building of this factory represents a 15.24% internal rate of return on the company's investment. Not too bad. But if the company thinks it can earn 20% by investing its money in more advertising for its existing products or it is going to cost more than 15.24% to borrow the money needed to build the factory, then it may want to reconsider this investment. Note that the exam will not ask you to calculate the IRR, because you won't be able to do it on the simple calculator that they will provide you with. Instead, understand its general meaning.

The IRR is often used to value investments that have known future payments (also called cash flows), such as bonds or annuities. The IRR is rarely used to value stocks, because the future cash flows are not known and there is no fixed maturity date for a stock.

 **Note:** To justify making an investment, an investment's internal rate of return

needs to be higher than the internal rate of return on competing investments or the cost of borrowing money.

Net Present Value (NPV)

Another time value of money concept that has to do with serial payments is **net present value**, or **NPV**. This calculation is a more complex version of the basic present value calculation mentioned earlier. Under a net present value calculation, the present value of each future cash inflow and outflow is figured. Then the results are added to determine whether, in the present, the project has a positive value or negative value for a company or investor.

For example, if a company was going to invest \$10,000 today, receive \$4,000 each of the next three years, and then have to pay an additional \$1,000 to exit the investment, an investor or company would want to know if they're losing money when the time value of money is considered.

Assuming an 8% annual interest rate, the calculation may look something like this, with the present values of money flowing out represented by negative numbers and money flowing in represented by positive numbers:

	Cash Flows	Present Value
Initial Investment	– \$10,000	– \$10,000
Year #1 Payment	+ \$4,000	+ \$3,704
Year #2 Payment	+ \$4,000	+ \$3,429
Year #3 Payment	+ \$4,000	+ \$3,175
Final Investment	– \$1,000	– \$794
Net Cash Flows	+ \$1,000	
Net Present Value (NPV)		–\$486

Though it appears the investment ultimately will make \$1,000 in profit, when these amounts are adjusted for the fact that they will not be received until some point in the future and thus are worth less today than they will be when received, the project actually has a negative net present value. That would mean that this company might be better off avoiding this investment.

The IRR of a project is the rate at which the project has a NPV of zero.

- 📌 **Note:** If an adviser is asked to evaluate an investment or a company's project in terms of NPV, projects with the highest NPV should be chosen. If only one project or investment is being evaluated, it should only be taken on if the NPV is greater than zero.

RISK

No one single subject occupies the minds of most investors like the potential to gain or