The concepts of present value (PV) and future value (FV) are based on the time value of money. The time value of money is the idea that, quite simply, money received today is worth more than money to be received one year from today (or at any other future date), because it can be used to earn interest. If you invest $1,000 today at 10 percent, you will have $1,100 in one year. So $1,000 in one year is worth $100 less than $1,000 today because you lose the opportunity to earn the $100 in interest.

The value in 3 years time is called the Future Value (FV) as this is how much the money will be worth in the future.

What is the future value of $1000 in 6 years time at 6% pa?

**Step 1:** Write down everything that you know

- \( S_n = \text{Future value} = ? \)
- \( P = \text{Present Value} = $1000 \)
- \( i = \text{annual interest rate} = 6/100 = 0.06 \)
- \( n = \text{number of years} = 6 \text{ years} \)

**Step 2:** Write down the formula

\[ S_n = P(1 + i)^n \]

**Step 3:** Apply the formula

\[ S_n = $1000(1 + 0.06)^6 \]

**Step 4:** Work out the formula starting with brackets followed by exponents then multiplication (BODMAS)

\[ S_n = $1418.52 \]

**Step 5:** Answer to two decimal places

\[ P = $1000.00 \]

What about if we know the future amount and not the present value?

**Step 1:** Write down everything that you know

- \( S_n = \text{Future value} = 1418.52 \)
- \( P = \text{Present Value} = ? \)
- \( i = \text{annual interest rate} = 6/100 = 0.06 \)
- \( n = \text{number of years} = 6 \text{ years} \)

**Step 2:** Rearrange the formula

\[ P = \frac{S_n}{(1 + i)^n} \]

**Step 3 & 4:** Apply the formula and BODMAS

\[ P = \frac{1418.52}{(1.06)^6} \]

**Step 5:** Answer to two decimal places

\[ P = $1000.00 \]
Examples

From our original equation we must factor in time:

\[ P = \frac{S_n}{(1 + i)^n} \quad \text{becomes} \quad P = \frac{S_n}{(1 + \frac{i}{t})^{nt}} \]

\[ \text{and} \quad S_n = P(1 + i)^n \quad \text{becomes} \quad S_n = P(1 + \frac{i}{t})^n \]

**Example 1: FV Compounding Quarterly**

What is the future value of $10,000 in 10 years time at 7\%\text{ pa} compounded quarterly?

**Step 1:** Write down everything that you know
- \( S_n = \text{Future value} = ? \)
- \( P = \text{Present Value} = $10,000 \)
- \( i = \text{annual interest rate} = 7\%/100\% = 0.07 \)
- \( k = \text{number of years} = 10\text{years} \)
- \( t = 4 \text{ quarters in a year} \)
- \( n = k*t = 4*10 = 40 \text{ quarters in 10 years} \)

**Step 2:** Write down the formula
\[ S_n = P(1 + \frac{i}{t})^n \]
\[ = 10000(1 + \frac{0.07}{4})^{40} \]
Answer = $20,015.97

**Example 2: PV Compounding Weekly**

What is the present value of a payment of $100,000 in 5 years time at 6\%\text{ pa} compounded weekly?

**Step 1:** Write down everything that you know
- \( P = ? \)
- \( i = 0.06 \)
- \( S = 100,000 \)
- \( t = 52 \)
- \( k = 5 \text{ years} \)
- \( n = k*t = 5*52 = 260 \)

**Step 2:** Write down the formula
\[ P = \frac{S_n}{(1 + \frac{i}{t})^n} \]
\[ = \frac{100,000}{(1 + \frac{0.06}{52})^{260}} \]
Answer = $74,094.64