Future value

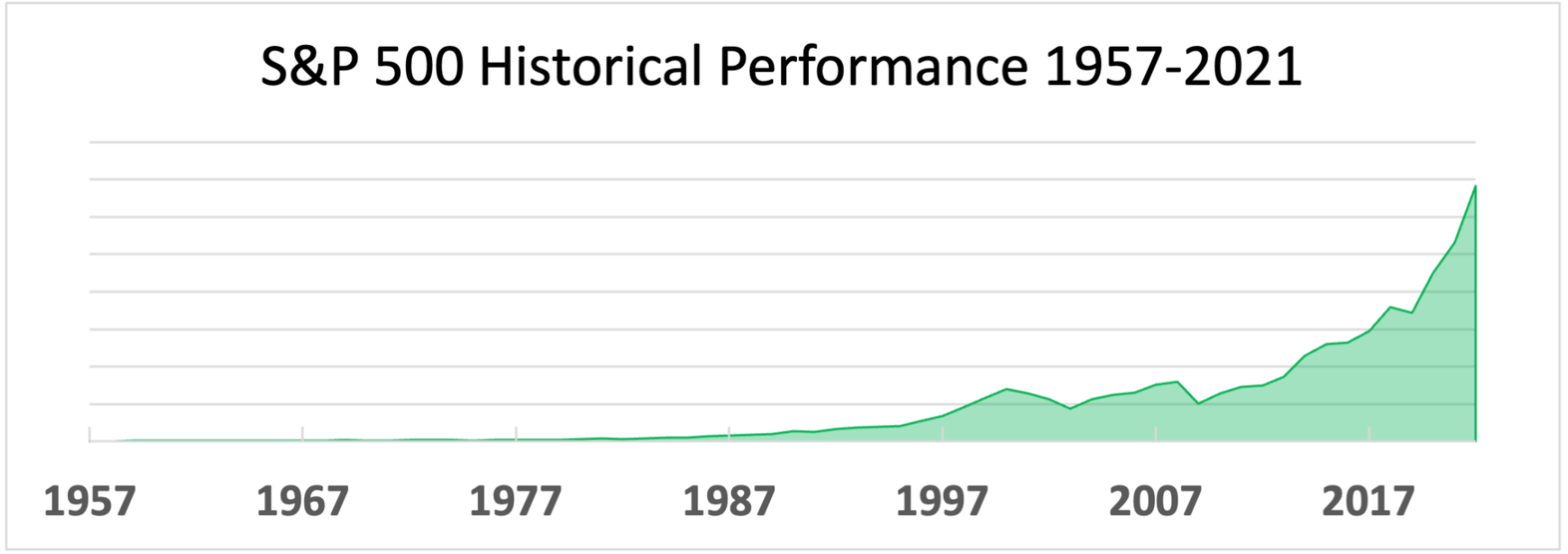
FINANCIAL ANALYSIS IN POWER BI

Nick Edwards
Capital Markets Analyst

What is time value of money?

Time value of money (TVM) is the concept that money is worth more now than in the future due to its earnings potential.

If you had invested $100 into the S&P 500 in 1957, it would be worth over $200,000 today!



[1] https://www.investopedia.com/terms/t/timevalueofmoney.asp

Future value (FV)

- What your investment will be worth in the future based on a rate of return and length of time

$$FV = PV(1+i)^y$$

where:
FV = future value of money
PV = present value of money
i = interest rate
y = years

Example: Find the value of $1,000 three years from now at a 5% interest rate.

```
FV = PV x (1+i)^n
```

```
FV = $1,000.00 x (1+0.05)^3
```

```
FV = $1,000.00 X (1.05)^3
```

```
FV = $1,000.00 X 1.15763
```

```
FV = $1,157.63
```

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Example: Find the value of $1,000 three years from now at a 5% interest rate.

Year 1: `$1,000.00 * 5% = $1,050.00`

Year 2: `$1,050.00 * 5% = $1,102.50`

Year 3: `$1,102.50 * 5% = $1,157.63`

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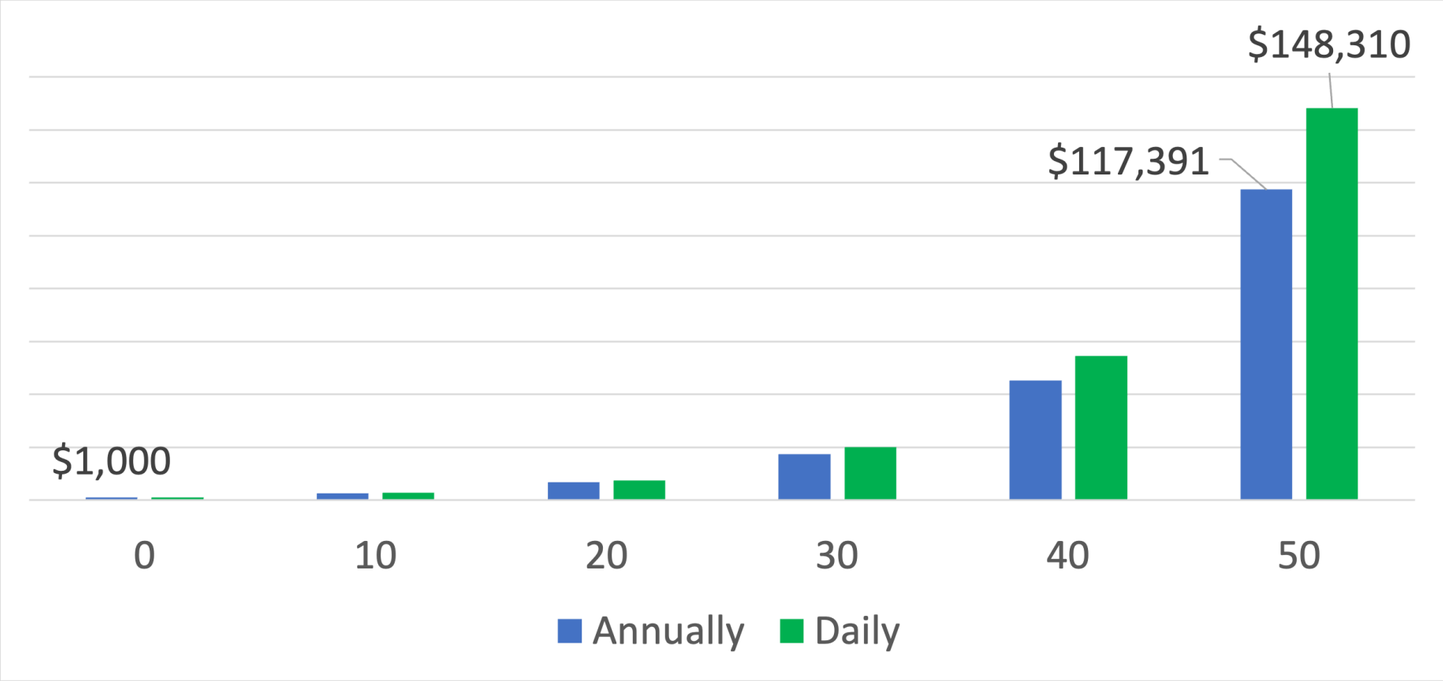
The power of compounding

- Compounding is the process in which an asset's earnings are reinvested to generate additional earnings over time.
- **Example:** Compare $1,000 compounding annually vs. daily over 50 years at a 10% rate.



[1] https://www.investopedia.com/terms/c/compounding.asp

Calculate with compounding interest

- **Step 1:** Divide i by n
- **Step 2:** Multiple y by n

$$FV = PV(1 + \frac{i}{n})^{(y \times n)}$$

where:
FV = future value of money
PV = present value of money
i = interest rate
n = number of compounding periods
y = years

Example: Find the value of $1,000 two years from now at a 5% interest rate compounding monthly.

```
FV = PV x (1+i/n)^(y*n)
```

```
FV = $1,000 x (1+0.0041)^(12*2)
```

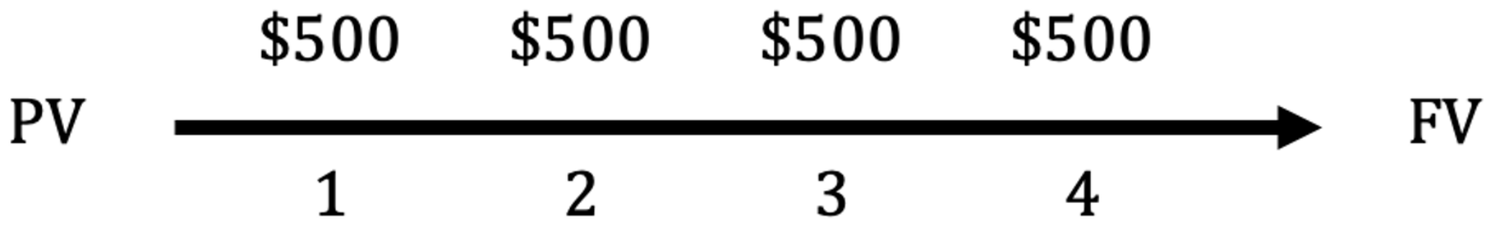
```
FV = $1,000 X (1.0041)^24
```

```
FV = $1,000 X 1.10494
```

```
FV = $1,104.94
```

Annuities

- **Annuities** are a cash flow structure where fixed payments are made at regular intervals



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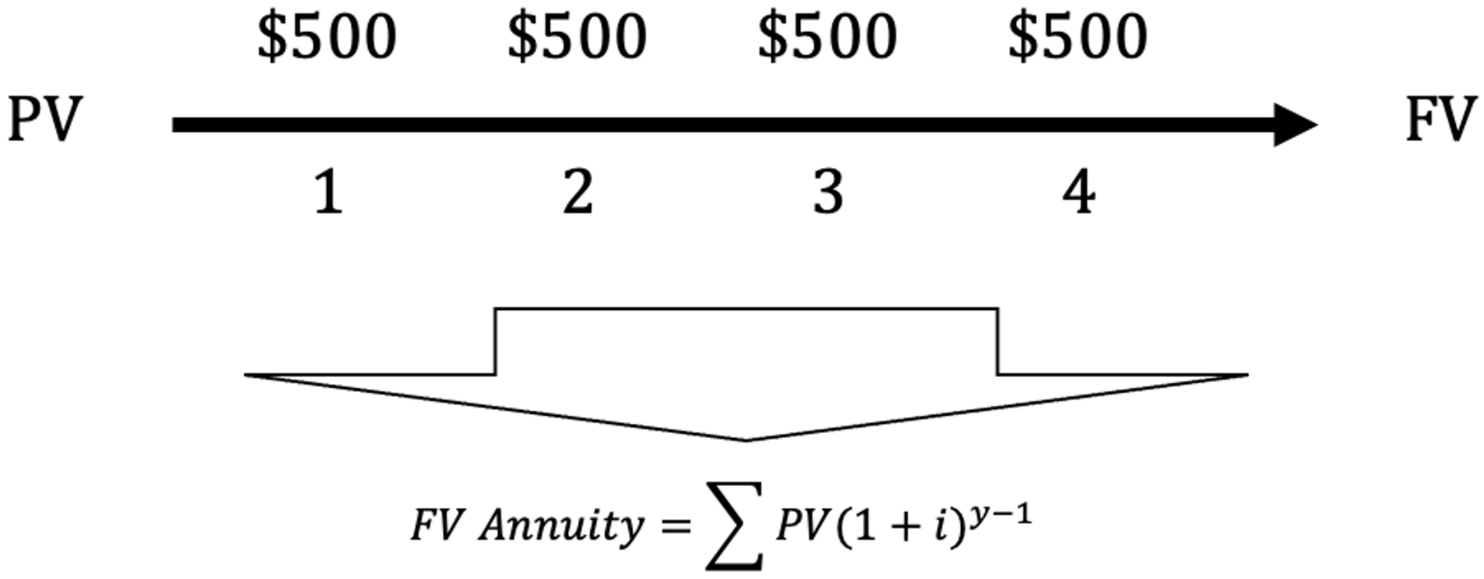

$$FV\ Annuity = \sum PV(1+i)^{y-1}$$

Annuities

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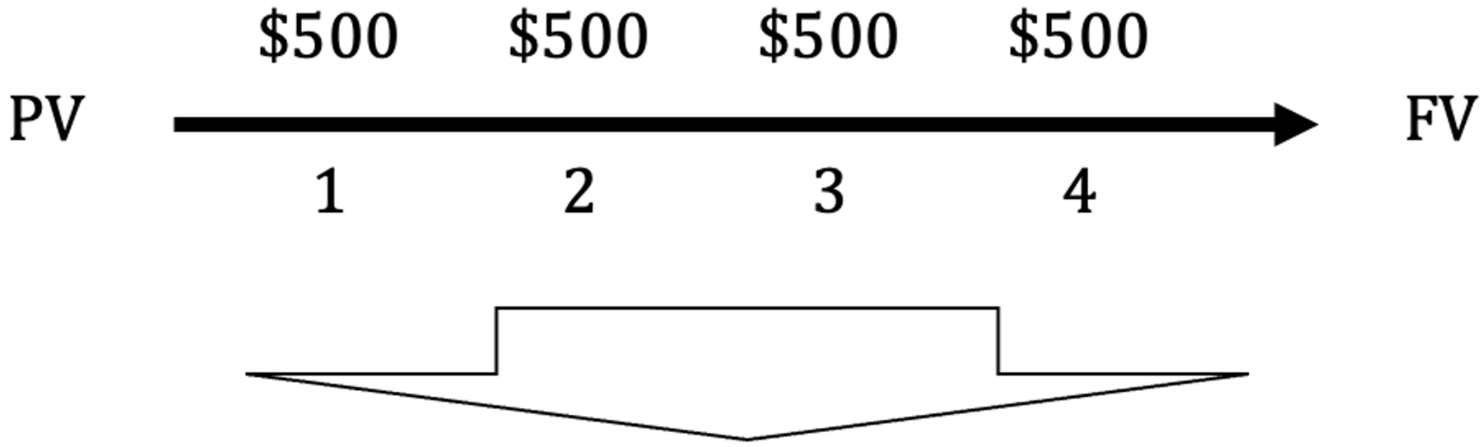

$$FV\ Annuity = \sum PV(1+i)^{y-1}$$

$$\$500(1+5\%)^{1-1} + \$500(1+5\%)^{2-1} + \$500(1+5\%)^{3-1} + \$500(1+5\%)^{4-1}$$

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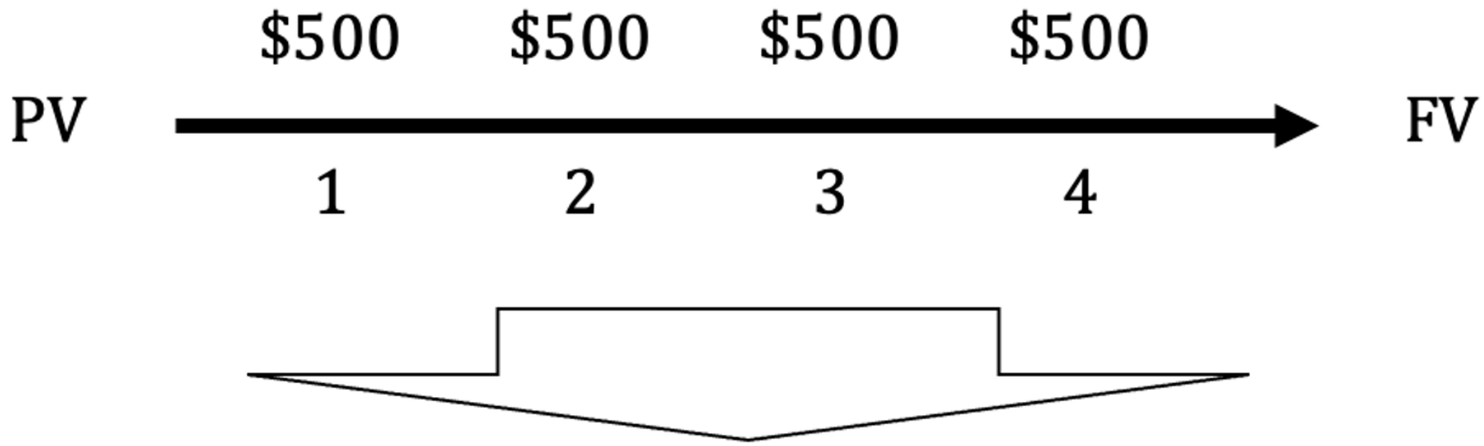

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$$\$500.00 + \$525.00 + \$551.25 + \$578.81$$

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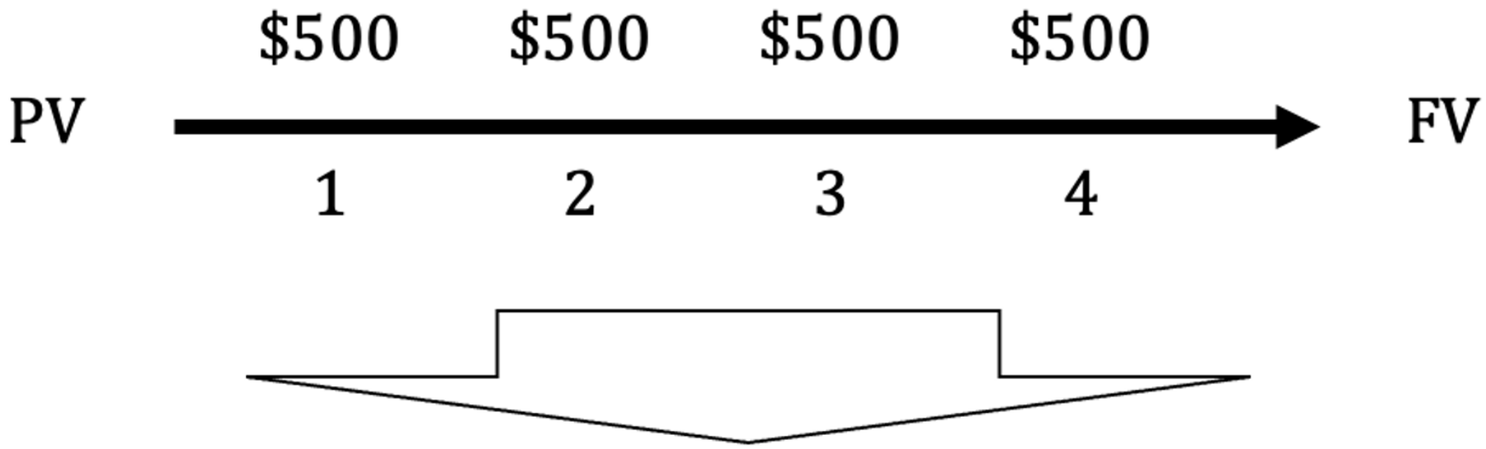

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$$\$500.00 + \$525.00 + \$551.25 + \$578.81$$

$$\$2{,}155.06$$

Let's practice!

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Present value

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Present value (PV)

Present value is the current value of money that will be received in the future.

- "How much do I need to invest today to have the equivalent of the future value by the end of the time period?"
- Referred to as "discounting"

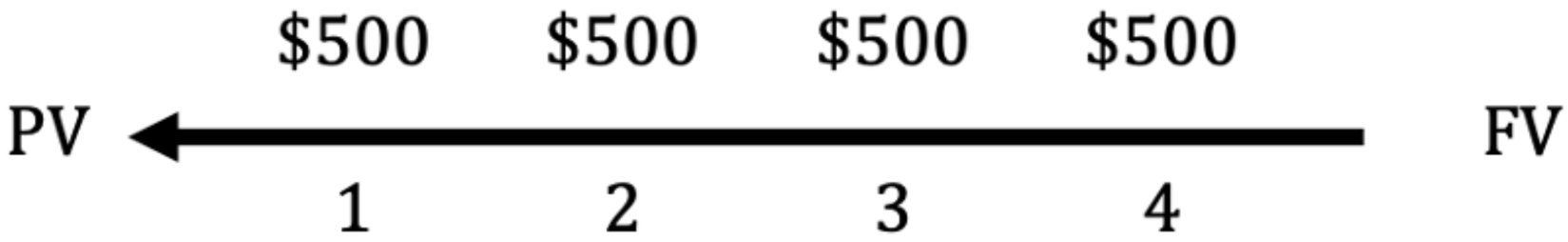
$$PV = \frac{FV}{(1 + \frac{i}{n})^{(y \times n)}}$$

where:
PV = present value of money
FV = future value of money
i = discount rate
n = number of compounding periods
y = years

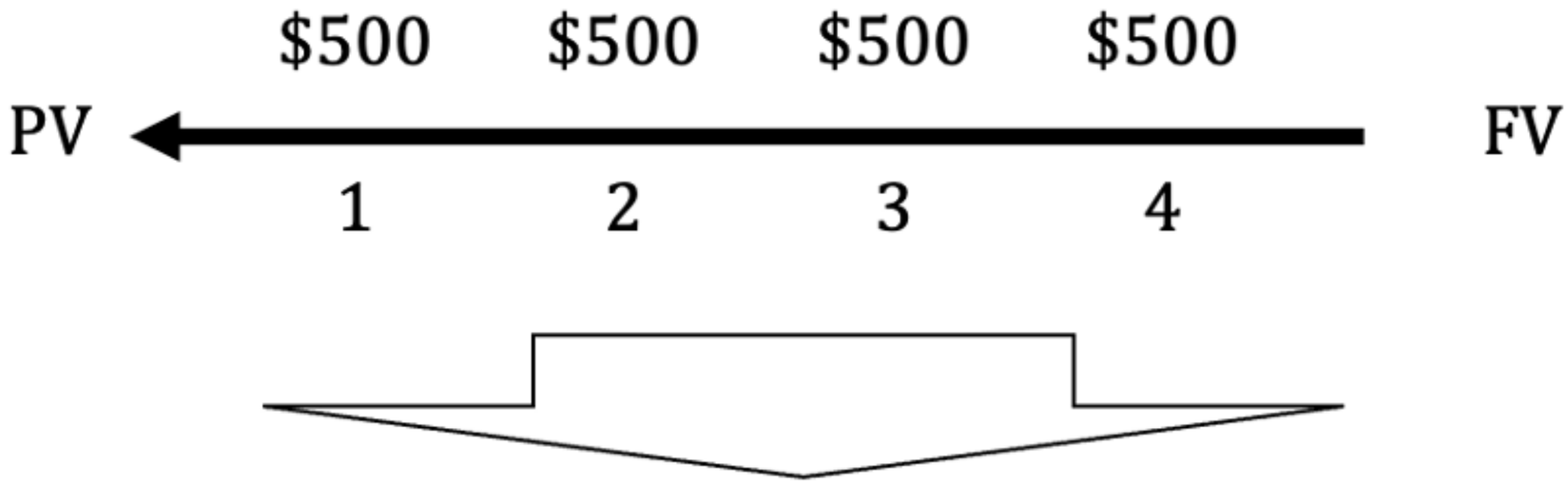
Example: Find the present value of $500,000 ten years from now at a 20% discount rate that compounds weekly.

1. `PV = FV/(1+i/n)^(y*n)`
2. `PV = $500,0000.00/(1+0.2/52)^(10*52)`
3. `PV = $500,0000.00/(1.00385)^520`
4. `PV = $500,0000.00/7.36`
5. `PV = $67,927.73`

Annuities

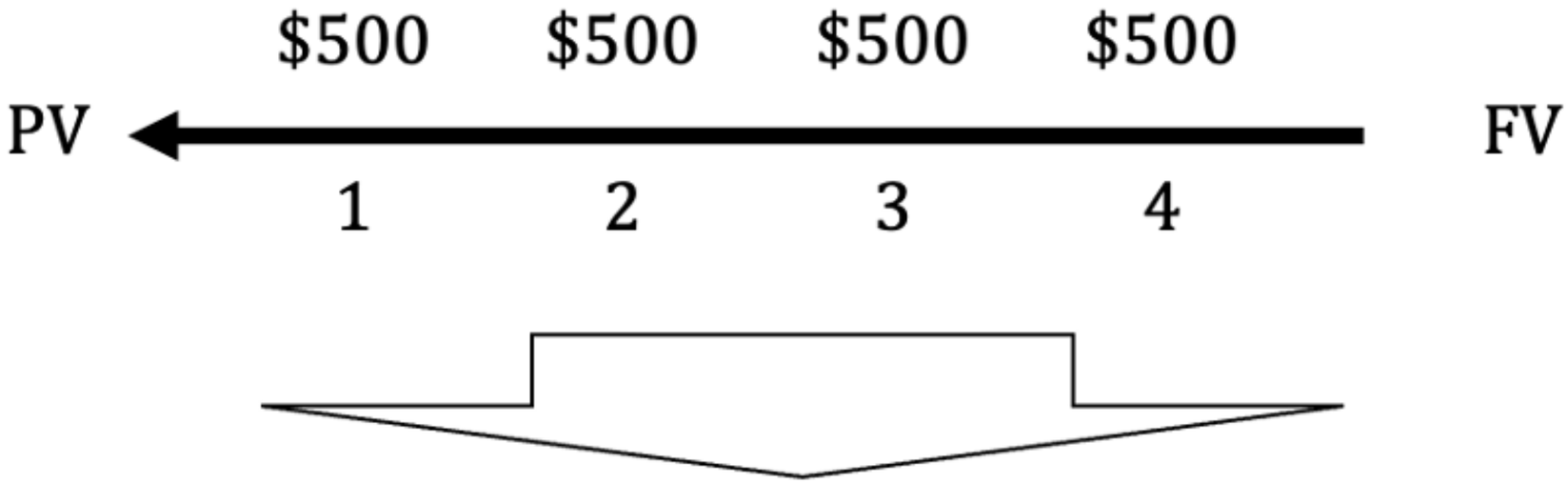


Annuities



$$PV\ Annuity = \sum PMT/(1+i)^{y}$$

Annuities



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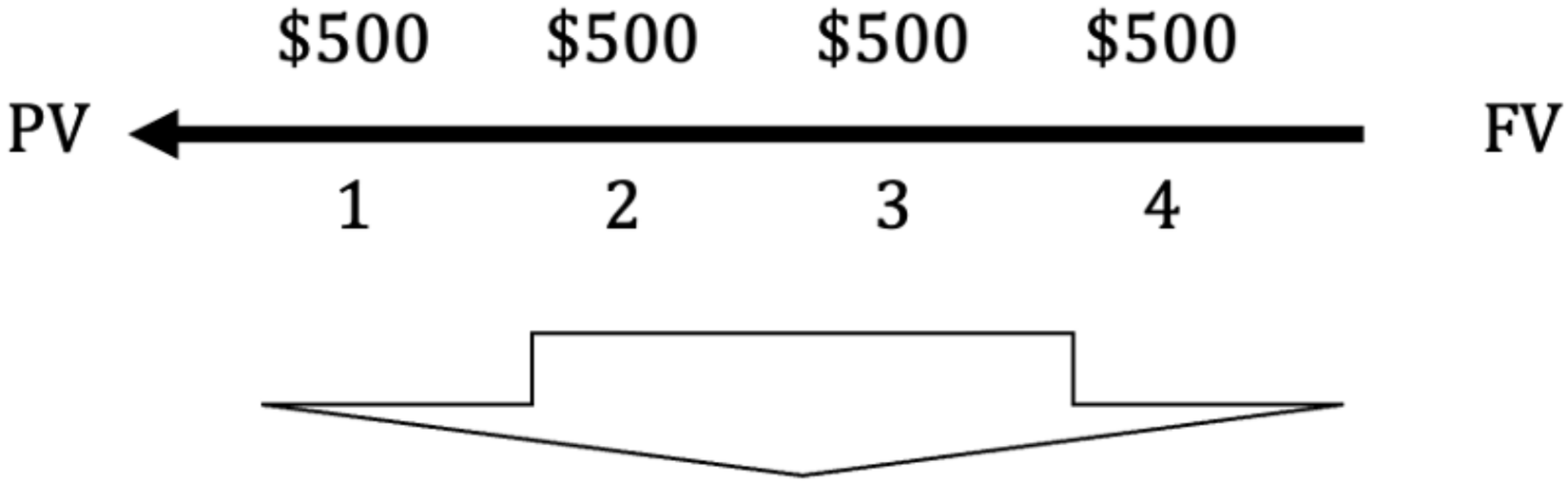
$$\$500/(1+5\%)^{1} + \$500/(1+5\%)^{2} + \$500/(1+5\%)^{3} + \$500/(1+5\%)^{4}$$

Annuities

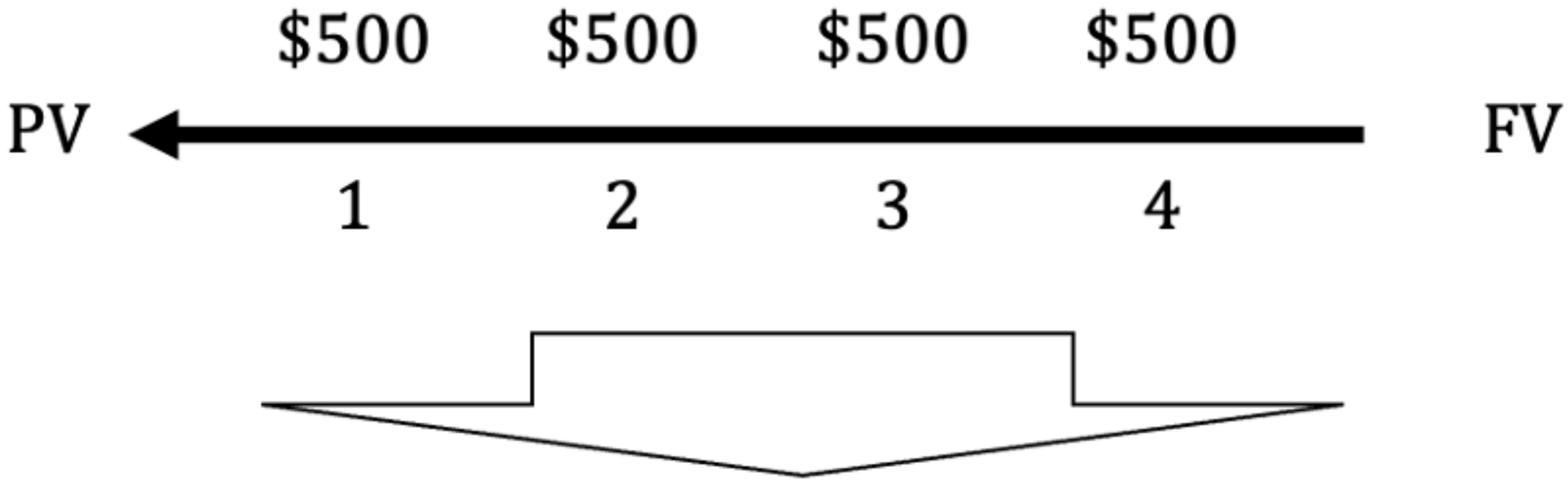


$$PV\ Annuity = \sum PMT/(1+i)^{y}$$

$$\$500/(1+5\%)^{1} + \$500/(1+5\%)^{2} + \$500/(1+5\%)^{3} + \$500/(1+5\%)^{4}$$

$$\$476.19 + \$453.51 + \$431.92 + \$411.35$$

Annuities



$$PV\ Annuity = \sum PMT/(1+i)^{y}$$

$\$500/(1+5\%)^{1} + \$500/(1+5\%)^{2} + \$500/(1+5\%)^{3} + \$500/(1+5\%)^{4}$

$\$476.19 + \$453.51 + \$431.92 + \$411.35$

$\$1,772.98$

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