compound_interest

September 24, 2023

1 Compound interest

Suppose you decide to invest 1.000 euros in a bank account that offers an annual interest rate of 5%. However, the interest is compounded quarterly. How much money will you have after 3 years?

1.0.1 without function

[1]:
```
# variable_name = value
future_value_3_year = 1000*pow((1+0.05/4), 4*3)
# print() - shows/outputs text in the console.
print(f"After {3} years, the investment will be worth {future_value_3_year:.2f}␣
 ↪euros.")
```

```
After 3 years, the investment will be worth 1160.75 euros.
```

1.0.2 with function (only time argument)

[2]:
```
def specific_compound_interest(t):
    """
    Calculate the future value of an investment using the compound interest␣
 ↪formula when initial deposit is 1000,
    annual interest rate is 0.05, componding frequency 4 times.

    Parameters:
    - t (int or float): Time the money is invested for (in years).

    Returns:
    - A (float): Future value of the investment, including interest.
    """
    P = 1000
    r = 0.05
    n = 4
    A = P * (1 + r/n)**(n*t)
    return A

years = 3
fv_3_year_with_function = specific_compound_interest(years)
```

```
print(f"After {years} years, the investment will be worth␣
 ↪{fv_3_year_with_function:.2f} euros.")
```

```
After 3 years, the investment will be worth 1160.75 euros.
```

1.0.3 with function (everything are arguments)

[3]:
```
def compound_interest(P, r, n, t):
    """
    Calculate the future value of an investment using the compound interest␣
 ↪formula.

    Parameters:
    - P (float): Principal investment amount (initial deposit).
    - r (float): Annual interest rate (in decimal form, e.g., 5% is 0.05).
    - n (int): Number of times interest is applied per year (compounding␣
 ↪frequency).
    - t (int or float): Time the money is invested for (in years).

    Returns:
    - A (float): Future value of the investment, including interest.
    """
    A = P * (1 + r/n)**(n*t)
    return A

# Example usage:
P = 1000
r = 0.05
n = 4
t = 3
future_value = compound_interest(P, r, n, t)
print(f"After {t} years, the investment will be worth {future_value:.2f} euros.
 ↪")
```

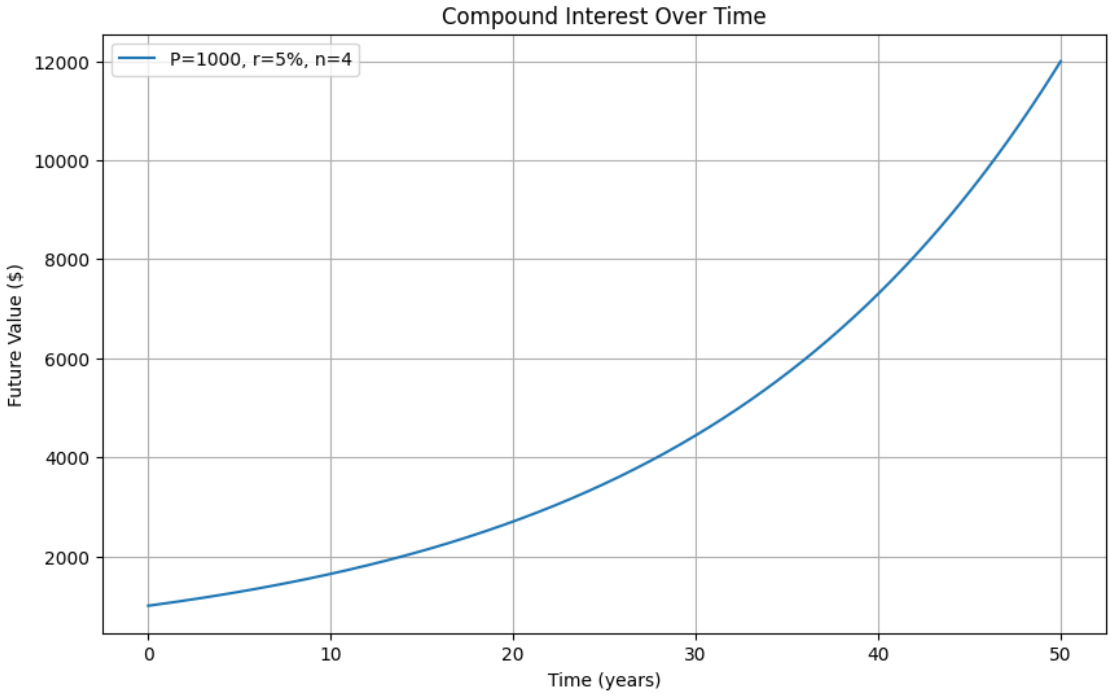
```
After 3 years, the investment will be worth 1160.75 euros.
```

1.0.4 Plotting graph from n1 to n2 years

[4]:
```
# Additional packages
import numpy as np
import matplotlib.pyplot as plt
```

[5]:
```
def plot_compound_interest(years):
    """Plot the compound interest graph over a range of time values."""

    # Generate an array of time values from 0 to years
    time_values = np.linspace(0, years, 10000)  # 500 points between n1 and n2
```

```
    future_values = specific_compound_interest(time_values)

    # Plotting
    plt.figure(figsize=(10, 6))
    plt.plot(time_values, future_values, label=f"P={1000}, r={5}%, n={4}")
    plt.title("Compound Interest Over Time")
    plt.xlabel("Time (years)")
    plt.ylabel("Future Value ($)")
    plt.legend()
    plt.grid(True)
    plt.show()

years = 50  # compounding time (e.g., 10 years)

plot_compound_interest(years)
```



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