INTRO TO FINANCIAL CONCEPTS IN PYTHON

Fundamental Financial Concepts

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Course Objectives

- The Time Value of Money
- Compound Interest
- Discounting and Projecting Cash Flows
- Making Rational Economic Decisions
- Mortgage Structures
- Interest and Equity
- The Cost of Capital
- Wealth Accumulation

Financial Decisions

Financial decisions always revolve around:

- Revenues
- Expenses
- Rate of Return (%)
- Economic Value (in Present Value Terms)
- Risk

Growth and Rate of Return

Two forms of growth:

- Percentage return
- Dollar value

Percentage Growth (For a 1-Day Horizon):

$$\frac{\text{Value Today} - \text{Value Yesterday}}{\text{Value Yesterday}}$$

Dollar Value Growth (For a 1-Day Horizon):

$$\text{Value Today} - \text{Value Yesterday}$$

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Let's practice!

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Present and Future Value

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The Non-Static Value of Money

Situation 1

- **Option A**: $100 in your pocket today
- **Option B**: $100 in your pocket tomorrow

Situation 2

- **Option A**: $10,000 dollars in your pocket today
- **Option B**: $10,500 dollars in your pocket one year from now

Time is Money

Your Options

- **A**: Take the $10,000 now, and do nothing
- **B**: Take the $10,000, stash it in the bank at 1% interest per year, risk free
- **C**: Invest the $10,000 in the stock market and earn an everage 8% per year
- **D**: Wait 1 year, take the $10,500 instead

Comparing Future Values

- **A**: 10,000 present dollars = 10,000 future dollars
- **B**: 10,000 * (1 + 0.01) = 10,100 future dollars
- **C**: 10,000 * (1 + 0.08) = 10,800 future dollars
- **D**: 10,500 future dollars

Present Value in Python

Calculate the present value of $100 received 3 years from now at a 1.0% inflation rate.

```
[In] 1: import numpy as np
[In] 2: np.pv(rate=0.01, nper=3, pmt=0, fv=100)
[Out] 2: -97.05
```

Future Value in Python

Calculate the future value of $100 invested for 3 years at a 5.0% average annual rate of return.

```
[In] 1: import numpy as np
[In] 2: np.fv(rate=0.05, nper=3, pmt=0, pv=-100)
[Out] 2: 115.76
```

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Net Present Value and Cash Flows

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Cash Flows

Project 1

- Year 0: -$100
- Year 1: +$100
- Year 2: +$125
- Year 3: +$150
- Year 4: +$175

Project 2

- Year 0: $100
- Year 1: $100
- Year 2: -$100
- Year 3: $200
- Year 4: $300

Discounting

Assume a 3% discount rate

Project 1

- Year 0: -$100 => pv(rate=0.03, nper=0, pmt=0, fv=-100) => -100
- Year 1: +$100 => pv(rate=0.03, nper=1, pmt=0, fv=100) => 97.09
- Year 2: +$125 => pv(rate=0.03, nper=2, pmt=0, fv=125) => 117.82
- Year 3: +$150 => pv(rate=0.03, nper=3, pmt=0, fv=150) => 137.27
- Year 4: +$175 => pv(rate=0.03, nper=4, pmt=0, fv=175) => 155.49

Sum of all present values = 407.67

Net Present Value

Project 1

```
[In] 1: import numpy as np
[In] 2: np.npv(rate=0.03, values=np.array([-100, 100, 125, 150, 175]))
[Out] 2: 407.67
```

Project 2

```
[In] 1: import numpy as np
[In] 2: np.npv(rate=0.03, values=np.array([100, 100, -100, 200, 300]))
[Out] 2: 552.40
```

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