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## Tutorial 4: Building a DCF Model in VS Code

### □ What You'll Learn (120 minutes)

Build a professional Discounted Cash Flow (DCF) valuation model from scratch: - DCF theory and methodology - Step-by-step model construction - Using VS Code for financial modeling - GitHub Copilot to accelerate development - Sensitivity analysis and scenario testing - Real company valuation example - Professional output and reporting

Prerequisites: - Completed Tutorials 1-3 - Basic understanding of corporate finance - Python and Pandas knowledge

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### Part 1: DCF Theory Review (15 minutes)

What is DCF?

Core Concept: A company is worth the present value of all its future cash flows.

$$\text{Enterprise Value} = \sum_{t=1}^n \frac{FCF_t}{(1 + WACC)^t} + \frac{\text{Terminal Value}}{(1 + WACC)^n}$$

#### Key Components

##### 1. Free Cash Flow (FCF)

FCF = EBITDA

- Taxes
- CapEx
- Change in NWC
- + D&A

##### 2. Weighted Average Cost of Capital (WACC)

$$WACC = (E/V \times Re) + (D/V \times Rd \times (1 - \text{Tax Rate}))$$

Where:

E = Equity Value

D = Debt Value

V = Total Value (E + D)

Re = Cost of Equity (from CAPM)

Rd = Cost of Debt

### 3. Terminal Value

Method 1 - Perpetuity Growth:

$$TV = FCF(n+1) / (WACC - g)$$

Method 2 - Exit Multiple:

$$TV = EBITDA(\text{final}) \times \text{Exit Multiple}$$

### 4. Enterprise to Equity Value

$$\text{Enterprise Value} = PV(\text{Cash Flows}) + PV(\text{Terminal Value})$$

$$\text{Equity Value} = \text{Enterprise Value} + \text{Cash} - \text{Debt}$$

$$\text{Share Price} = \text{Equity Value} / \text{Shares Outstanding}$$

When to Use DCF

☐ Good for: - Mature, stable companies - Predictable cash flows - Long-term valuation - Investment banking / PE

☐ Challenging for: - Early-stage startups - Cyclical industries - Financial institutions - Negative FCF companies

## Part 2: Project Setup (10 minutes)

Create Project Structure

Open VS Code terminal:

```
# Create project folder
mkdir dcf-valuation-model
cd dcf-valuation-model
```

```
# Create virtual environment
python -m venv venv
venv\Scripts\activate
```

```
# Install packages
pip install pandas numpy matplotlib openpyxl jupyter plotly
```

```
# Open in VS Code
code .
```

Create Initial Files

File 1: README.md

```
# DCF Valuation Model

Professional discounted cash flow model built in Python.

## Features
- Complete DCF calculation
- WACC computation
- Terminal value (perpetuity & multiple)
- Sensitivity analysis
- Scenario testing

## Usage
```python
from dcf_model import DCFModel

model = DCFModel("Company Name")
# ... configure and run
```

## Author

[Your Name]

```
**File 2: `.gitignore`**

venv/ .pyc pycache/ .ipynb_checkpoints/ .xlsx !template.xlsx

### Initialize Git

```bash
git init
git add .
git commit -m "Initial commit: DCF project setup"
```

---

## Part 3: Build DCF Model Class (30 minutes)

Create Model File

File: dcf\_model.py

Let's build this step-by-step using GitHub Copilot!

Step 1: Basic Structure

Type this comment and let Copilot complete:

```
# DCF Valuation Model Class
# Calculates enterprise value using discounted cash flow methodology
#
# Features:
# - Free cash flow projection
# - WACC calculation using CAPM
# - Terminal value (perpetuity growth method)
# - Sensitivity analysis
# - Comprehensive valuation output
```

```
import pandas as pd
import numpy as np
from typing import Dict, List, Tuple
from dataclasses import dataclass
```

Copilot will suggest imports. Press Tab.

## Step 2: Data Classes for Inputs

```
@dataclass
class CompanyAssumptions:
    """Store all company-specific assumptions"""
    # Let Copilot suggest fields
    company_name: str
    # Type more comments, Copilot fills in:
    # - Base year revenue
    # - Revenue growth rates (list)
    # - EBITDA margins (list)
    # - Tax rate
    # - CapEx as % of revenue
    # - NWC as % of revenue
    # - D&A as % of revenue
```

Ask Copilot Chat (Ctrl+Shift+I):

"Complete the CompanyAssumptions dataclass with all fields needed for DCF model including revenue, margins, capex, nwc, and tax assumptions"

Copy Copilot's response!

## Step 3: DCF Model Class

```
class DCFModel:
    """Complete DCF Valuation Model"""

    def __init__(self, company_name: str):
        """Initialize DCF model"""
        self.company_name = company_name
        self.projection_years = 5
        self.projections = None
        self.dcf_results = {}

    def set_assumptions(self,
                        revenue: float,
                        revenue_growth: List[float],
                        ebitda_margins: List[float],
                        tax_rate: float,
                        capex_pct_revenue: float,
                        nwc_pct_revenue: float,
                        da_pct_revenue: float):
        """Set operating assumptions"""
        # Let Copilot complete this method

    def set_wacc_assumptions(self,
                             risk_free_rate: float,
                             equity_risk_premium: float,
                             beta: float,
```

```

        debt_cost: float,
        market_value_equity: float,
        market_value_debt: float,
        tax_rate: float):
    """Set WACC calculation assumptions"""
    # Let Copilot complete

def calculate_wacc(self) -> float:
    """Calculate weighted average cost of capital using CAPM"""
    # Ask Copilot Chat to write this method
    # Formula: WACC = (E/V × Re) + (D/V × Rd × (1-T))
    # where Re = Rf + Beta × (Rm - Rf)

```

Use Copilot Chat:

"Write the calculate\_wacc method using CAPM formula.  
Include cost of equity = risk\_free\_rate + beta \* equity\_risk\_premium.  
Include after-tax cost of debt."

Step 4: Build Projections

```

def build_projections(self) -> pd.DataFrame:
    """Build 5-year financial projections"""
    # Let Copilot write this - it should create DataFrame with:
    # - Revenue
    # - EBITDA
    # - D&A
    # - EBIT
    # - Taxes
    # - NOPAT
    # - CapEx
    # - Change in NWC
    # - Free Cash Flow

```

Use Copilot Chat:

"Write build\_projections method that:  
1. Creates DataFrame with years 1-5  
2. Calculates Revenue using growth rates  
3. Calculates EBITDA using margins  
4. Calculates taxes on EBIT  
5. Calculates FCF = NOPAT + D&A - CapEx - ΔNWC  
Return DataFrame with all line items"

Step 5: Terminal Value

```

def calculate_terminal_value(self,
                             terminal_growth_rate: float) -> float:
    """Calculate terminal value using perpetuity growth"""
    # FCF(n+1) = FCF(n) × (1 + g)
    # TV = FCF(n+1) / (WACC - g)
    # Let Copilot complete

def calculate_terminal_value_multiple(self,
                                       exit_multiple: float) -> float:
    """Calculate terminal value using exit multiple method"""
    # TV = Final Year EBITDA × Exit Multiple
    # Let Copilot complete

```

## Step 6: DCF Valuation

```
def calculate_dcf(self,
                    terminal_growth_rate: float = 0.025,
                    use_multiple: bool = False,
                    exit_multiple: float = 10.0) -> Dict:
    """Calculate enterprise value using DCF"""
    # 1. Get projections
    # 2. Calculate WACC
    # 3. Discount FCFs to present value
    # 4. Calculate terminal value
    # 5. Discount terminal value
    # 6. Sum for enterprise value
    # 7. Bridge to equity value
    # Let Copilot write this!
```

## Use Copilot Chat:

```
"Write calculate_dcf method that:
1. Builds projections DataFrame
2. Calculates WACC
3. Discounts each year FCF using  $PV = FCF / (1+WACC)^{year}$ 
4. Calculates terminal value
5. Sums PV of FCFs + PV of terminal value = Enterprise Value
6. Returns dictionary with all results"
```

## Step 7: Sensitivity Analysis

```
def sensitivity_analysis(self,
                        wacc_range: List[float],
                        growth_range: List[float]) -> pd.DataFrame:
    """Create sensitivity table for enterprise value"""
    # Create 2-way table varying WACC and terminal growth
    # Let Copilot complete
```

## Step 8: Summary Output

```
def print_summary(self):
    """Print valuation summary"""
    # Print formatted output of key results
    # Let Copilot complete

def export_to_excel(self, filename: str):
    """Export model to Excel"""
    # Export projections and results to Excel
    # Let Copilot complete
```

---

## Part 4: Test the Model (15 minutes)

### Create Test File

File: test\_dcf.py

```
"""
Test DCF Model with Sample Company
"""
```

```

from dcf_model import DCFModel

# Create model instance
model = DCFModel("TechCorp Inc.")

# Set operating assumptions
model.set_assumptions(
    revenue=1000, # $1B base year
    revenue_growth=[0.15, 0.12, 0.10, 0.08, 0.06], # Declining growth
    ebitda_margins=[0.25, 0.26, 0.27, 0.28, 0.28], # Margin expansion
    tax_rate=0.25,
    capex_pct_revenue=0.05,
    nwc_pct_revenue=0.10,
    da_pct_revenue=0.03
)

# Set WACC assumptions
model.set_wacc_assumptions(
    risk_free_rate=0.04, # 4% risk-free
    equity_risk_premium=0.06, # 6% market premium
    beta=1.2, # Higher risk tech company
    debt_cost=0.05, # 5% cost of debt
    market_value_equity=5000, # $5B equity
    market_value_debt=1000, # $1B debt
    tax_rate=0.25
)

# Run DCF
results = model.calculate_dcf(
    terminal_growth_rate=0.025, # 2.5% perpetual growth
    use_multiple=False
)

# Print results
model.print_summary()

# Show projections
print("\n Financial Projections:")
print(model.projections.round(2))

# Sensitivity analysis
print("\n Sensitivity Analysis:")
wacc_range = [0.06, 0.07, 0.08, 0.09, 0.10]
growth_range = [0.015, 0.020, 0.025, 0.030, 0.035]
sensitivity = model.sensitivity_analysis(wacc_range, growth_range)
print(sensitivity.round(0))

# Export to Excel
model.export_to_excel('techcorp_dcf_valuation.xlsx')
print("\n Model exported to Excel!")

```

Run the Model

In terminal:

```
python test_dcf.py
```

Expected output:

```
=====
DCF VALUATION SUMMARY - TechCorp Inc.
=====
```

WACC Calculation:

```
Cost of Equity (CAPM): 11.20%
After-tax Cost of Debt: 3.75%
Weighted Average Cost of Capital: 9.83%
```

Valuation Results:

```
PV of Projected FCF (5 years): $XXX M
Terminal Value: $XXX M
PV of Terminal Value: $XXX M
```

```
Enterprise Value: $XXX M
+ Cash: $XX M
- Debt: $XXX M
= Equity Value: $XXX M
```

```
Shares Outstanding: XX M
Implied Share Price: $XX.XX
```

---

## Part 5: Build Interactive Notebook (20 minutes)

Create Jupyter Notebook

File: dcf\_interactive.ipynb

Cell 1: Setup

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import plotly.graph_objects as go
from dcf_model import DCFModel
```

```
print(" DCF Model Loaded!")
```

Cell 2: Company Inputs

```
# Company to value
COMPANY_NAME = "TechCorp Inc."
BASE_REVENUE = 1000 # millions
```

```
# Create model
model = DCFModel(COMPANY_NAME)
```

```
print(f" Building DCF for: {COMPANY_NAME}")
print(f"Base Year Revenue: ${BASE_REVENUE}M")
```

### Cell 3: Operating Assumptions

```
# Set assumptions (you can adjust these!)
model.set_assumptions(
    revenue=BASE_REVENUE,
    revenue_growth=[0.15, 0.12, 0.10, 0.08, 0.06],
    ebitda_margins=[0.25, 0.26, 0.27, 0.28, 0.28],
    tax_rate=0.25,
    capex_pct_revenue=0.05,
    nwc_pct_revenue=0.10,
    da_pct_revenue=0.03
)

# Show assumption table
assumptions_df = pd.DataFrame({
    'Year': ['1', '2', '3', '4', '5'],
    'Revenue Growth': ['15%', '12%', '10%', '8%', '6%'],
    'EBITDA Margin': ['25%', '26%', '27%', '28%', '28%']
})
```

assumptions\_df

### Cell 4: WACC Inputs

```
model.set_wacc_assumptions(
    risk_free_rate=0.04,
    equity_risk_premium=0.06,
    beta=1.2,
    debt_cost=0.05,
    market_value_equity=5000,
    market_value_debt=1000,
    tax_rate=0.25
)

wacc = model.calculate_wacc()
print(f" Calculated WACC: {wacc*100:.2f}%")
```

### Cell 5: Build Projections

```
# Build model
results = model.calculate_dcf(terminal_growth_rate=0.025)

# Show projections
model.projections.round(2)
```

### Cell 6: Visualize Projections

```
# Plot revenue and FCF
fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(14, 5))

# Revenue growth
years = model.projections.index
ax1.bar(years, model.projections['Revenue'], color='lightblue', alpha=0.8)
ax1.set_title('Revenue Projection', fontsize=14, fontweight='bold')
ax1.set_ylabel('Revenue ($M)')
ax1.set_xlabel('Year')
ax1.grid(True, alpha=0.3)
```

```

# Free Cash Flow
colors = ['green' if x > 0 else 'red' for x in model.projections['FCF']]
ax2.bar(years, model.projections['FCF'], color=colors, alpha=0.8)
ax2.set_title('Free Cash Flow', fontsize=14, fontweight='bold')
ax2.set_ylabel('FCF ($M)')
ax2.set_xlabel('Year')
ax2.grid(True, alpha=0.3)

plt.tight_layout()
plt.show()

```

#### Cell 7: Valuation Waterfall

```

# Create waterfall chart
waterfall_data = [
    ('PV of FCF', results['pv_fcf_total']),
    ('PV of TV', results['pv_terminal_value']),
    ('Enterprise Value', results['enterprise_value']),
    ('+ Cash', results.get('cash', 0)),
    ('- Debt', -results.get('debt', 1000)),
    ('Equity Value', results['equity_value'])
]

labels = [x[0] for x in waterfall_data]
values = [x[1] for x in waterfall_data]

# Plot
plt.figure(figsize=(12, 6))
plt.bar(labels, values, color=['blue', 'blue', 'green', 'lightgreen', 'red', 'darkgreen'])
plt.title('DCF Valuation Waterfall', fontsize=16, fontweight='bold')
plt.ylabel('Value ($M)')
plt.xticks(rotation=45, ha='right')
plt.grid(True, alpha=0.3, axis='y')
plt.tight_layout()
plt.show()

print(f"\n Implied Equity Value: ${results['equity_value']:,.0f}M")

```

#### Cell 8: Sensitivity Analysis

```

# 2-way sensitivity table
wacc_range = np.arange(0.07, 0.13, 0.01)
growth_range = np.arange(0.015, 0.036, 0.005)

sensitivity = model.sensitivity_analysis(
    wacc_range.tolist(),
    growth_range.tolist()
)

print(" Enterprise Value Sensitivity ($M)")
print("Rows = Terminal Growth Rate | Columns = WACC")
sensitivity.round(0)

```

#### Cell 9: Interactive Sensitivity Heatmap

```

# Create interactive heatmap

```

```
fig = go.Figure(data=go.Heatmap(
    z=sensitivity.values,
    x=[f"{x*100:.1f}%" for x in sensitivity.columns],
    y=[f"{y*100:.1f}%" for y in sensitivity.index],
    colorscale='RdYlGn',
    text=sensitivity.round(0).values,
    texttemplate='%{text}',
    textfont={"size": 10},
    colorbar=dict(title="EV ($M)")
))
```

```
fig.update_layout(
    title='Enterprise Value Sensitivity Analysis',
    xaxis_title='WACC',
    yaxis_title='Terminal Growth Rate',
    height=500
)
```

```
fig.show()
```

#### Cell 10: Scenario Analysis

```
# Test different scenarios
scenarios = {
    'Base Case': {'growth': 0.025, 'wacc_adjust': 0.00},
    'Bull Case': {'growth': 0.035, 'wacc_adjust': -0.01},
    'Bear Case': {'growth': 0.015, 'wacc_adjust': 0.01}
}

scenario_results = []

for scenario_name, params in scenarios.items():
    # Recalculate with adjusted parameters
    temp_results = model.calculate_dcf(
        terminal_growth_rate=params['growth']
    )

    scenario_results.append({
        'Scenario': scenario_name,
        'Terminal Growth': f"{params['growth']*100:.1f}%",
        'Enterprise Value': temp_results['enterprise_value'],
        'Equity Value': temp_results['equity_value']
    })

scenario_df = pd.DataFrame(scenario_results)
scenario_df
```

#### Cell 11: Export Results

```
# Export comprehensive report
model.export_to_excel(f'{COMPANY_NAME.replace(" ", "_")}_DCF_Model.xlsx')
print(f" Complete model exported to Excel!")
```

---

## Part 6: Real Company Example - Apple Inc. (15 minutes)

### Get Real Financial Data

New notebook: apple\_dcf.ipynb

Cell 1:

```
import yfinance as yf
import pandas as pd
from dcf_model import DCFModel

# Get Apple data
aapl = yf.Ticker("AAPL")
info = aapl.info
financials = aapl.financials
balance_sheet = aapl.balance_sheet

print(" Apple Inc. - DCF Valuation")
print(f"Market Cap: ${info.get('marketCap')/1e9:.1f}B")
print(f"Current Price: ${info.get('currentPrice'):.2f}")
```

Cell 2:

```
# Extract key metrics
latest_revenue = financials.loc['Total Revenue'].iloc[0] / 1e9 # billions
latest_ebitda = financials.loc['EBITDA'].iloc[0] / 1e9 if 'EBITDA' in financials.index else None
total_debt = balance_sheet.loc['Total Debt'].iloc[0] / 1e9 if 'Total Debt' in balance_sheet.index else 0
cash = balance_sheet.loc['Cash'].iloc[0] / 1e9 if 'Cash' in balance_sheet.index else 0
shares = info.get('sharesOutstanding', 0) / 1e9

print(f"Latest Revenue: ${latest_revenue:.1f}B")
print(f"Total Debt: ${total_debt:.1f}B")
print(f"Cash: ${cash:.1f}B")
print(f"Shares Outstanding: {shares:.2f}B")
```

Cell 3:

```
# Build DCF for Apple
apple_model = DCFModel("Apple Inc.")

# Set assumptions (analyst estimates)
apple_model.set_assumptions(
    revenue=latest_revenue,
    revenue_growth=[0.08, 0.07, 0.06, 0.05, 0.04], # Mature growth
    ebitda_margins=[0.30, 0.30, 0.31, 0.31, 0.32], # Strong margins
    tax_rate=0.15, # Apple's effective tax rate
    capex_pct_revenue=0.03,
    nwc_pct_revenue=0.05,
    da_pct_revenue=0.025
)

# WACC assumptions
apple_model.set_wacc_assumptions(
    risk_free_rate=0.045,
    equity_risk_premium=0.055,
    beta=1.25,
    debt_cost=0.03,
```

```

        market_value_equity=info.get('marketCap') / 1e9,
        market_value_debt=total_debt,
        tax_rate=0.15
    )

    # Calculate
    apple_results = apple_model.calculate_dcf(
        terminal_growth_rate=0.025
    )

    apple_model.print_summary()

```

Cell 4:

```

    # Compare to market
    implied_price = apple_results['equity_value'] * 1000 / shares # Convert B to M, then per share
    current_price = info.get('currentPrice')

    print(f"\n VALUATION COMPARISON")
    print(f"{'='*50}")
    print(f"DCF Implied Price: ${implied_price:.2f}")
    print(f"Current Market Price: ${current_price:.2f}")
    print(f"Upside/(Downside): {((implied_price/current_price - 1) * 100):.1f}%")

    if implied_price > current_price:
        print(f"\n Stock appears UNDERVALUED by {((implied_price/current_price - 1) * 100):.1f}%")
    else:
        print(f"\n Stock appears OVERVALUED by {(1 - implied_price/current_price) * 100):.1f}%")

```

---

## Part 7: Best Practices & Tips (10 minutes)

### Code Organization

```

# Good: Modular structure
dcf-valuation-model/
    dcf_model.py          # Core model class
    utils.py              # Helper functions
    data_loader.py        # Data import functions
    test_dcf.py           # Unit tests
    examples/
        tech_company.ipynb
        apple_dcf.ipynb
        custom_valuation.ipynb
    outputs/              # Excel exports

```

### Error Handling

```

def calculate_wacc(self) -> float:
    """Calculate WACC with validation"""
    try:
        # Validation
        if self.market_value_equity <= 0:
            raise ValueError("Equity value must be positive")

```

```

    if not 0 <= self.tax_rate <= 1:
        raise ValueError("Tax rate must be between 0 and 1")

    # Calculation
    total_value = self.market_value_equity + self.market_value_debt
    # ...

except Exception as e:
    print(f" Error calculating WACC: {e}")
    return None

```

## Documentation

```

def calculate_dcf(self, terminal_growth_rate: float = 0.025) -> Dict:
    """
    Calculate enterprise value using DCF methodology.

    Parameters:
    -----
    terminal_growth_rate : float, default=0.025
        Perpetual growth rate for terminal value (e.g., 0.025 = 2.5%)
        Should be <= long-term GDP growth rate

    Returns:
    -----
    Dict containing:
        - enterprise_value : float
        - equity_value : float
        - pv_fcf_total : float
        - pv_terminal_value : float
        - wacc : float

    Example:
    -----
    >>> model = DCFModel("Company")
    >>> results = model.calculate_dcf(terminal_growth_rate=0.03)
    >>> print(f"EV: ${results['enterprise_value']:.0f}M")
    """

```

## Version Control

```

# Commit after each major milestone
git add dcf_model.py
git commit -m "Add terminal value calculation methods"

git add test_dcf.py
git commit -m "Create test case for DCF model"

git add apple_dcf.ipynb
git commit -m "Add Apple valuation example"

# Push to GitHub
git push origin main

```

---

## Part 8: Enhancements & Extensions (10 minutes)

### 1. Add Multiple Valuation Methods

```
class EnhancedDCFModel(DCFModel):
    """Extended DCF with additional methods"""

    def comparable_companies_check(self, comps_multiples: List[float]):
        """Compare DCF result to comps"""
        # Calculate implied EV/EBITDA from DCF
        # Compare to comparable companies
        pass

    def precedent_transactions_check(self, transaction_multiples: List[float]):
        """Compare to precedent transactions"""
        pass

    def football_field(self):
        """Create football field chart with all methods"""
        pass
```

### 2. Monte Carlo Simulation

```
def monte_carlo_valuation(self, iterations: int = 10000):
    """Run Monte Carlo simulation on key assumptions"""
    # Randomly vary: growth rates, margins, WACC
    # Run DCF 10,000 times
    # Show distribution of outcomes
    # Return probability of positive return
    pass
```

### 3. Historical Analysis

```
def backtest_model(self, historical_data: pd.DataFrame):
    """Test model accuracy using historical data"""
    # Use past financials
    # Calculate what DCF would have predicted
    # Compare to actual stock performance
    pass
```

### 4. API Integration

```
def auto_populate_from_api(self, ticker: str):
    """Automatically populate assumptions from financial APIs"""
    import yfinance as yf

    stock = yf.Ticker(ticker)
    # Extract all needed data
    # Populate model automatically
    # Return ready-to-run model
    pass
```

---

## ☐ Skills Checklist

After this tutorial, you can:

- ☐ Understand DCF methodology and theory
  - ☐ Build complete DCF model from scratch
  - ☐ Use GitHub Copilot for financial modeling
  - ☐ Calculate WACC using CAPM
  - ☐ Project free cash flows
  - ☐ Calculate terminal value
  - ☐ Create sensitivity analysis
  - ☐ Value real companies
  - ☐ Export models to Excel
  - ☐ Build interactive valuation notebooks
- 

## ☐ DCF Formula Quick Reference

*# Free Cash Flow*

$$FCF = NOPAT + D\&A - CapEx - \Delta NWC$$

*# NOPAT*

$$NOPAT = EBIT \times (1 - \text{Tax Rate})$$

*# WACC*

$$WACC = (E/V \times Re) + (D/V \times Rd \times (1 - \text{Tax Rate}))$$

*# Cost of Equity (CAPM)*

$$Re = Rf + \beta \times (Rm - Rf)$$

*# Terminal Value (Perpetuity)*

$$TV = FCF(n+1) / (WACC - g)$$

*# Terminal Value (Multiple)*

$$TV = EBITDA(n) \times \text{Exit Multiple}$$

*# Present Value*

$$PV = FV / (1 + r)^n$$

*# Enterprise Value*

$$EV = \sum PV(FCF) + PV(TV)$$

*# Equity Value*

$$\text{Equity Value} = EV + \text{Cash} - \text{Debt}$$

*# Share Price*

$$\text{Share Price} = \text{Equity Value} / \text{Shares Outstanding}$$

---

## ☐ Pro Tips

### 1. Sanity Check Your Results

- WACC typically 7-12% for mature companies

- Terminal growth  $\leq$  GDP growth (2-3%)
- FCF margins should be realistic
- Compare implied multiple to peers

## 2. Sensitivity is Critical

- Always show sensitivity tables
- Test multiple scenarios
- Document key assumptions
- Show range of outcomes

## 3. Use Real Data

- Start with yfinance for actuals
- Use analyst estimates for projections
- Research industry benchmarks
- Validate assumptions

## 4. Keep Learning

- Read equity research reports
- Study investment banking models
- Practice with different industries
- Build template library

## ☐ What's Next?

You now have: - ☐ Complete DCF model built in VS Code - ☐ Professional valuation framework - ☐ Interactive analysis capabilities - ☐ Real company valuation skills

Next steps:

1. ☐ Value 5 companies to practice
2. ☐ Build industry-specific templates
3. ☐ Continue to: `Tutorials/05_VS_Code_Power_User.md`
4. ☐ Start Module 4: DCF Modeling

## ☐ Bonus: Export to Investment Memo

```
def create_investment_memo(model, output_file='memo.md'):
    """Generate investment recommendation memo"""

    memo = f"""
# Investment Recommendation: {model.company_name}

## Executive Summary
Based on our DCF analysis, {model.company_name} has an implied equity value of
${model.dcf_results['equity_value']:.0f}M, suggesting the stock is
[OVERVALUED/UNDERVALUED] by XX%.

## Valuation Methodology
```

```

- Discounted Cash Flow (DCF)
- 5-year projection period
- WACC: {model.wacc*100:.2f}%
- Terminal growth: 2.5%

## Key Assumptions
- Revenue CAGR: X%
- EBITDA margins expanding to X%
- Modest CapEx requirements

## Investment Thesis
[Your thesis here]

## Risks
- [Risk 1]
- [Risk 2]

## Recommendation
[BUY/HOLD/SELL]

## Price Target
$XX.XX per share

---
*Analysis Date: {datetime.now().strftime('%Y-%m-%d')}*
    """

    with open(output_file, 'w') as f:
        f.write(memo)

```

---

☐ You're now a DCF modeling expert in VS Code!

Next: `Tutorials/05_VS_Code_Power_User.md` - Advanced VS Code techniques

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Estimated completion time: 120 minutes Difficulty: Intermediate-Advanced Next: Power User Techniques