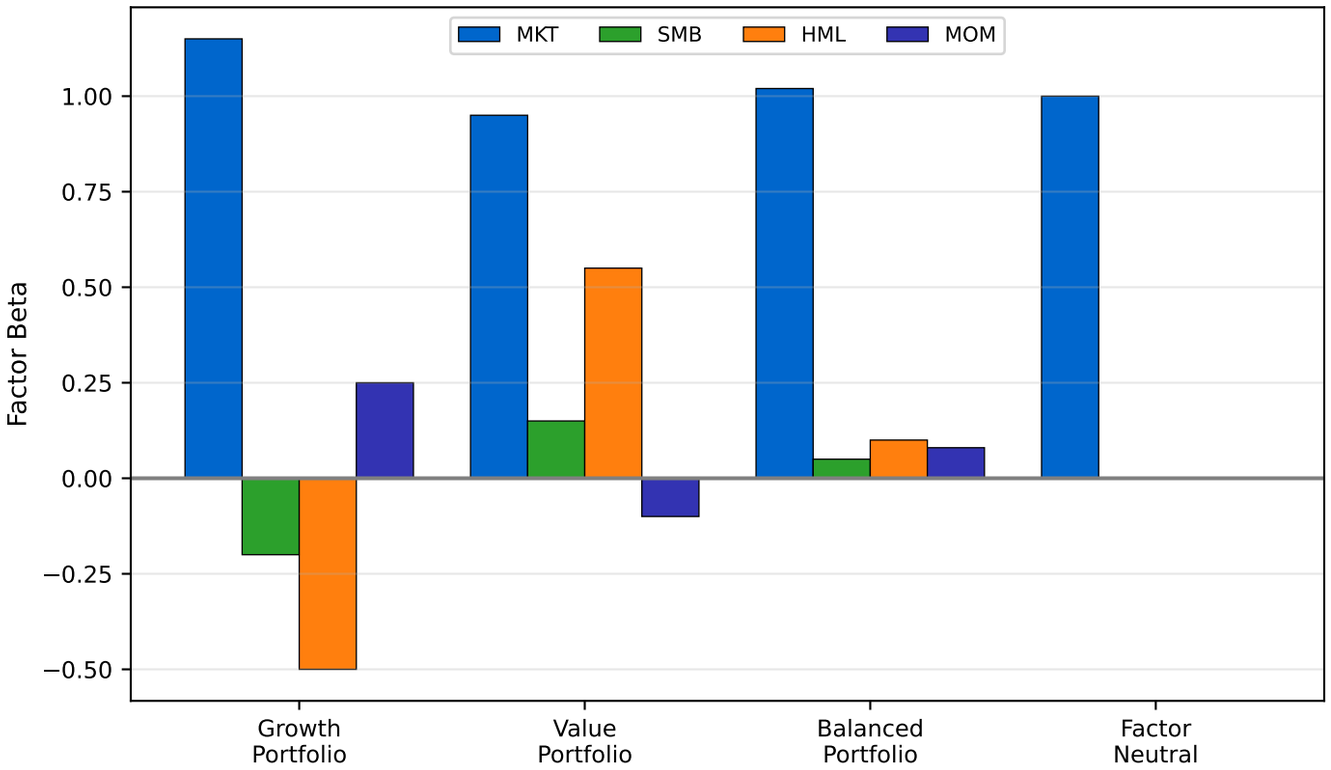
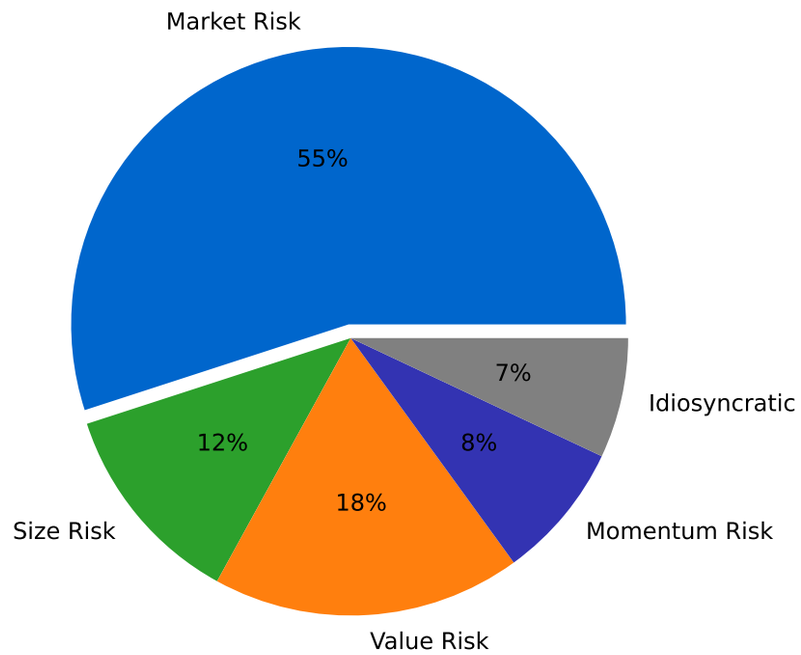
Portfolio Factor Analysis: Real-World Application

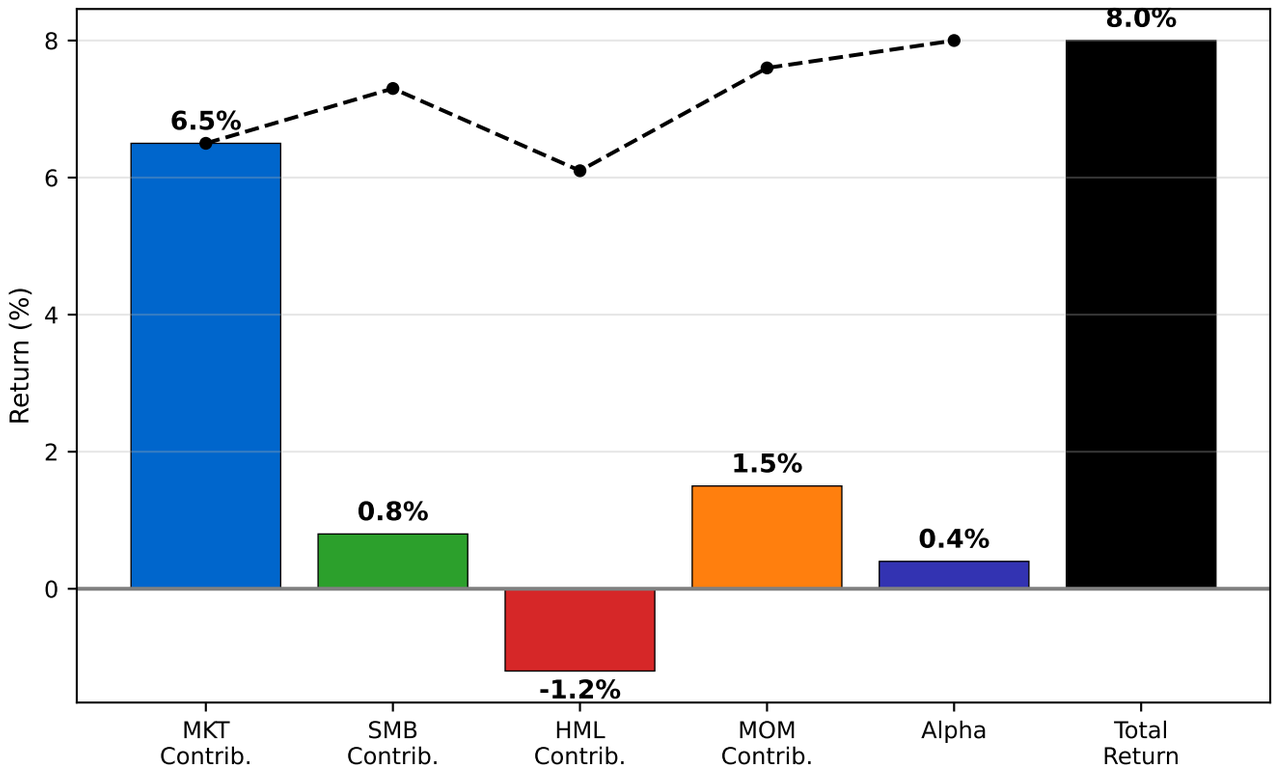
Portfolio Factor Exposures



Risk Decomposition (Variance Attribution)



Return Attribution (Growth Portfolio, Annual)



Factor Analysis Workflow

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COMPLETE FACTOR ANALYSIS WORKFLOW

1. LOAD PORTFOLIO HOLDINGS
   holdings = pd.read_csv('portfolio.csv')
   # ticker, weight

2. CALCULATE PORTFOLIO RETURNS
   portfolio_ret = (holdings['weight'] *
                    stock_returns).sum(axis=1)

3. REGRESS ON FACTORS
   from sklearn.linear_model import LinearRegression

   X = ff_factors[['Mkt-RF', 'SMB', 'HML', 'MOM']]
   y = portfolio_ret - ff_factors['RF']

   model = LinearRegression()
   model.fit(X, y)

4. ANALYZE RESULTS
   print("Factor Exposures:")
   print(f"  MKT: {model.coef_[0]:.3f}")
   print(f"  SMB: {model.coef_[1]:.3f}")
   print(f"  HML: {model.coef_[2]:.3f}")
   print(f"  MOM: {model.coef_[3]:.3f}")
   print(f"  Alpha: {model.intercept_:.3f}")

5. CALCULATE ATTRIBUTIONS
   factor_returns = X.mean()
   contributions = model.coef_ * factor_returns

6. REPORT TO STAKEHOLDERS
   - Which factors drove performance?
   - Is alpha statistically significant?
   - Are factor exposures intentional?
```