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Project Work: Analysis of two listed companies

Group 10:

Tommaso Agudio

Eduardo Mosca

Alessandro Vittorio Natoli

Matteo Spadaccia

Part 1: Firms' summary

VAIL RESORTS

NYSE: MTN - Broomfield, Colorado, USA

Vail Resorts Inc. is one of the American main players in the mountain tourism industry, operating through a wide portfolio of centers with a data-analytics-empowered commitment to innovation and socio-environmental responsibilities. Despite the main business segment has developed in US – where Vail, Beaver Creek, Breckenridge, and Keystone destinations stand out, the corporation also owns the renowned Whistler Blackcomb resort in Canada, three centers in Australia and one in Switzerland.

FACTSHEET In F.Y. 2023:

Total number of resorts	Renewable electricity in US	Contributions to nonprofits	Gross Profit	EBITDA	Diluted EPS
41	100% (since 2022)	$28M+ (417 partners)	$1.2B ▲ 4%	$834.8M -	$6.74 ▼ 21%

ORGANIZATION Board:

Kirsten A. Lynch	Julie DeCecco	Angela Korch	Robert A. Katz	D. Bruce Sewell
CEO, Director	Executive VP, General Counsel	Executive VP, CFO	Chair of Board	Lead Independent Director

NEWS

November 2023: Vail Resorts announces the acquisition of Crans-Montana Resort, the second in Switzerland.
March 2024: Vail Resorts announces the AI-powered My Epic Assistant in-app delivery by next winter season.

Fast Company's 7th Most Innovative Travel Company 2024 for its revolutionary ski gear membership program

BOOKING HOLDINGS

NASDAQ: BKNG - Norwalk, Connecticut, USA

Booking Holdings Inc. is the world's leading provider of online travel and related services through five primary brands (Booking.com, Priceline, Agoda, KAYAK, OpenTable) and a network of subsidiary ones. The corporation's mission is to make experiencing the world easier for everyone, using technology to connect millions of travelers to a variety of experiences (e.g., 1.2K+ cities with tours), transportation options, and accommodations types (i.e., hotels, homes, apartments). As a worldwide marketplace, the business generates value for both consumers and local partners, widening small enterprises' audience.

FACTSHEET In F.Y. 2023:

Countries	Listed accommodations	Room nights booked	Gross Profit	EBITDA	Diluted EPS
220+	28M+	1B+	$21.4B ▲ 25%	$6.3B ▲ 14%	$117.40 ▲ 54%

ORGANIZATION Board: (4/11 Directors are women)

Glenn D. Fogel	Peter J. Millones, Jr.	David I. Goulden	Robert J. Mylod Jr.	Charles H. Noski
CEO, Director, Booking.com CEO	Executive VP, General Counsel	Executive VP, CFO	Chair of Board	Lead Independent Director

NEWS

June 2023: Booking.com announced tests of Trip Planner, a ChatGPT-based travel-planner AI.
August 2023: BKNG sued by Texas for allegedly engaging in deceptive practices for hotel rooms sale.
November 2023: Booking.com announced Cruises' launch, a new WTH-partnership-based trip option.
February 2024: the Spanish antitrust regulator (CNMC) imposed a $530M fine to Booking.com.

Fortune's 3rd in-sector World's Most Admired Company 2024; Forbes' 72nd Most Cybersecure Company 2023

Part 2: Financial insights on Vail Resorts

Estimated Return On Equity		0.20
Estimated Plowback Ratio		0.30
Estimated Dividend Growth Rate		8.43%
Cost of Equity	Dividends-estimated	9.49%
	CAPM-estimated	11.70%
	GuruFocus	9.42%

Cost of Equity

To develop a financial analysis of MTN [Atch. 1], we started from historical data downloaded from Yahoo Finance and estimated the Cost of Equity with two different methods: as the sum of Dividend Growth-Rate and Yield, and by CAPM.

P/E and P/B

To determine the Price's fairness, we computed the Price-to-Earnings and Price-to-Book Ratios, aggregating data from the company's IPO. This operation may explain the slight difference of our results with respect to MSN Money's end-January and Yahoo Finance's 12-month trailing ones.

Comparative Analysis of Ratios

P/E Ratio	Estimated	38.889
	Yahoo Finance	33.154
	MSN Money	37.06
P/B Ratio	Estimated	7.807
	Yahoo Finance	9.282
	MSN Money	10.18
Stock Price	Future-CFs-estimated	253.35$
	DCF-Perp.-estimated	226.08$
	14/04/24 Actual	226.97$

It is difficult to draw direct comparisons between companies operating in a niche sector. Nevertheless, considering the competitors identified by MSN Money, MTN presented quite positive indicators for F.Y. 2023: it had the second highest P/E – of 34.92, compared to NCLH's record one of 51.54 – and a high P/B too – of 9.33 (NCLH: 28.47).

Stock Price

Basing on future Free CFs, we firstly estimated a Stock Price slightly higher than expected: this method highly relies on an utterly precise Revenue Growth assessment.

However, the value computed via the DCF Perpetuity model – using the dividends-estimated Cost of Equity and our Dividend Growth result – is very similar to the market one, indicating a fair Stock Price.

Recent Price drop

As of April 2024 end, MTN's Price had a significant decrease (-10.6% in 5 days), reaching around 200$; suggested causes might be the slowing Rates of Return and Morgan Stanley's price target cut.

Bonds analysis

We detected a single active Vail bond.

Bond ID	Coupon		Issue date	April 2024		
	Rate	Freq.		Price($)	YTM	PV($)
MTN 15/25	6.25%	1/y	5/2015	100.7	5.4%	1005.064

Beta

The firm has a slightly lower Volatility compared to the overall market, thus a risk profile somewhat below market average: the Price is expected to follow market's oscillations with a smaller amplitude.

Beta	Estimated	0.939
	Yahoo Finance	1.108
Cost of Debt	Estimated	5.06%
	GuruFocus	5.24%
WACC	Estimated	9.77%
	GuruFocus	7.86%

Cost of Capital

We computed the after-tax WACC calculating the Cost of Debt and using the CAPM-estimated Cost of Equity. GuruFocus also implemented the CAPM formula, obtaining results somehow similar to

ours; discrepancies are mainly due to their estimated Tax Rate being different from US Corporate one.

Capital structure

In the F.Y. 2024 first-quarter report, the company declared a Total Stockholder's Equity of 829,904M$, along with a Total Debt amounting to 2,790B$ and a Debt-to-Equity Ratio of 3.36.

Dividend policy

Vail Resorts – declaring that no stock splits have ever happened – started paying quarterly dividends in June 2011; their amounts have only increased since then, except for a slight dip in frequency and amount in 2021, likely due to tourism shutdown caused by the covid-19 pandemic.

With first appearance briefly after the first dividend payment, repurchases did not follow trends and concerned values in the tens of M$ up until 2022. In 2023, the firm bought back 550M$ of its own shares instead, with a record payout of 400M$ in April. This hits a payout-policy change towards preference for repurchases, as the effective Tax Rate was only increasing towards end 2022 end. However, dividends continued and increased again in 2024: the current quarterly DPS is of 2.22$.

Part 3: Financial insights on Booking Holdings

Cost of Equity

To develop a financial analysis of BKNG [Atch. 2], we started from historical data downloaded from Yahoo Finance and estimated the Cost of Equity with two different methods: as the sum of Dividend Growth Rate and Yield, and by CAPM.

Estimated Return On Equity		-1.56
Estimated Plowback Ratio		1.49
Estimated Dividend Growth Rate		0.00%
Cost of Equity	Dividends-estimated	0.97%
	CAPM-estimated	13.39%
	GuruFocus	12.30%

P/E and P/B

To determine the Price's fairness, we computed the Price-to-Earnings and Price-to-Book Ratios, aggregating data from the company's IPO. This operation may explain the slight difference of our results with respect to MSN Money's end-January and Yahoo Finance's 12-month trailing ones.

Comparative Analysis of Ratios

Among the competitors identified by MSN Money, BKNG presented quite controversial indicators for F.Y. 2023: it had the second highest P/E – of 30.21, compared to AMZN's record one of 52.40 – but the only negative P/B too - of -47.22. We may also consider Airbnb as market rival; the latter firm has totally different ratios (i.e., P/E: 18.81, P/B: 11.04) indicating a balanced situation with positive Equity.

P/E Ratio	Estimated	54.175
	Yahoo Finance	29.945
	MSN Money	30.07
P/B Ratio	Estimated	-84.679
	MSN Money	-45.51
Stock Price	Future-CFs-estimated	3210.61$
	DCF-Perp.-estimated	3596.44$
	01/04/24 Yahoo Finance	3568.87$

Negative Equity

It is important to notice that BKNG has a negative Total Equity (i.e., of -2,744M$) reported for 2023. Coherently with the American approach of encouragement for entrepreneurship and growth, the above

situation is allowed in US financial system: by regulation, negative Equity does not necessarily imply bankruptcy, since the firm is entrusted to meet its obligations if demonstrating sufficient Cash Flows. In Italy, instead, the Corporate Law – traditionally emphasizing creditor protection – requires LLCs to maintain a minimum amount of Equity, avoiding financial distress situation as BKNG's one. Non-complying companies might undergo specific financial measures (e.g., capital injection) or liquidation.

Stock Price

Basing on future Free CFs and relying on a sharp Revenue Growth assessment, we firstly estimated a Stock Price lower than expected; being this method very sensible, the error may be due to many factors.

However, the value computed via the DCF Perpetuity model – using the dividends-estimated Cost of Equity and no Dividend Growth – is very similar to Yahoo Finance's one, indicating a fair Stock Price.

Bonds analysis

Booking Holdings mostly offers 10-year bonds, but currently also has 4- and 12-year bonds active.

Bond ID	Coupon		Issue			April 2024		
	Rate	Freq.	Date	Price($)	Implied YTM	Price($)	YTM	PV($)
BKNG 15/25	3.650%	2/y	3/2015	99.74	3.682%	98.410	5.50%	982.24
BKNG 14/24	2.375%	1/y	9/2014	99.06	2.482%	99.645	3.95%	984.85
BKNG 21/25	0.100%	1/y	3/2025	99.98	0.105%	97.15	3.71%	967.15
BKNG 16/26	3.600%	2/y	5/2016	99.81	3.623%	96.894	5.28%	968.51
BKNG 15/27	1.800%	1/y	3/2015	99.97	1.803%	96.01	3.33%	959.61
BKNG 20/30	4.625%	2/y	4/2020	99.83	4.647%	96.854	5.43%	962.29

Beta

The firm has a slightly higher Volatility compared to the overall market, thus a risk profile somewhat above market average: the Price is expected to follow market's oscillations in a slightly amplified way.

Beta	Estimated	1.165
	Yahoo Finance	1.402
Cost of Debt	Estimated	6.07%
	GuruFocus	6.46%
WACC	Estimated	13.18%
	GuruFocus	11.55%

Cost of Capital

We computed the after-tax WACC calculating the Cost of Debt and using the CAPM-estimated Cost of Equity. GuruFocus implemented the CAPM formula too, obtaining results somehow similar to ours.

Capital structure

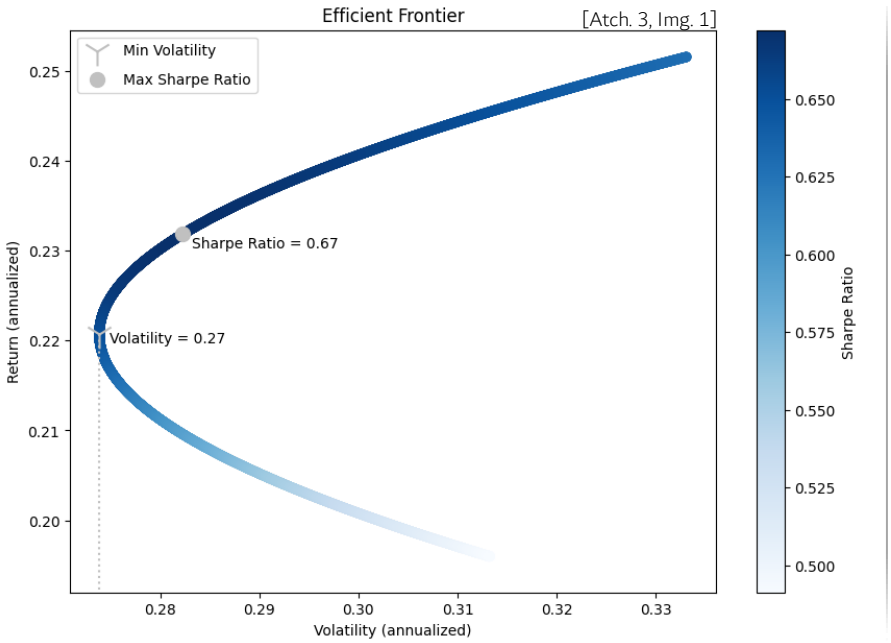
At 2023-end, the firm had a Total Debt of 14,252M$ and a Debt-to-Equity ratio of -5.19 – below zero due to the negative Equity, recording a Debt-to-Capital of 1.24 and a Debt-to-Assets of 0.59.

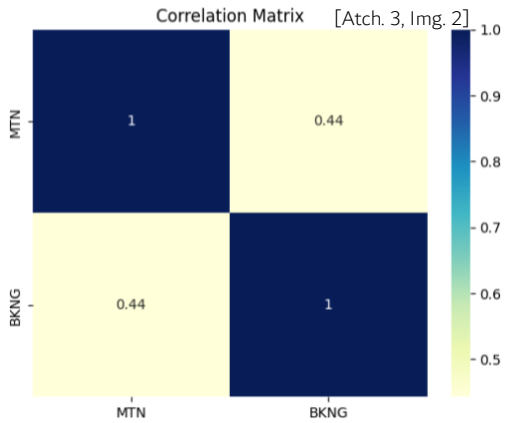
Dividend policy

Even if not paying dividends up until 2024 – when the intention towards stable quarterly payouts starting from 8.75$ per share has been declared, the firm has been very active in terms of repurchases, steadily spending millions each quarter ever since 2011. Repurchases' magnitude increased in June 2018 (718M$ in Q2; 1,187M$ in Q3), leading to a 5-years average quarterly repurchase of 1.257B$.

Part 4: Portfolio analysis

Basing on Yahoo Finance data (2010 to 2024-Q1), we analyzed [Atch. 3] the expected performance of all the possible portfolios containing the relevant two stocks only. We obtained the following results:





Portfolio:	Min Volatility	Max Sharpe
Return	22.1%	23.2%
Volatility	**27.4%**	28.2%
Sharpe	65.2%	**67.2%**
MTN	55.5%	35.5%
BKNG	44.5%	64.5%

Stocks-portfolios comparison

Annual:	Return	Volatility
MTN	19.6%	31.3%
BKNG	25.2%	33.3%

The stocks' performances are (as expectable) quite correlated, nevertheless the benefits of diversification are well visible: the portfolios' Volatility is lower than both individual stocks' ones. Obviously, this effect comes at the cost of a reduced Return compared to BKNG, which has a higher annual Return with respect to MTN and thus to all the mixed portfolios, clearly counterbalanced by a much higher Volatility, indicating a riskier investment. Therefore, the most appetible risk-adjusted Returns are most probably the max-Sharpe portfolio's ones, but adding other less correlated stocks would definitely help in reaching a more complete diversification, able to satisfy risk-averse traders.

Appendix

Part 1: Firms' summary

Travel industry

After more than two years of consistent year-over-year gains, leisure travel may have tapped all its pent-up demand from the peak pandemic years. The corporate comeback continues, but gains decelerate. While trips to build client relationships and support team collaboration remain key to business success, costs are a significant concern. Amid these efforts at prudent budgeting, US corporate travel spend is still likely to finally pass the pre-pandemic line within the next year.

One of the most lasting effects of the pandemic has been a shift in how white-collar work gets done. Remote and hybrid arrangements appear to be here to stay, and the share of travelers who plan to work on their longest leisure trips has surged. In addition to adding and extending trips, this laptop lugger behavior also has an impact on travelers' in-destination needs and preferences.

As travel demand has returned and shown continued resilience to economic anxiety, the industry's marketing spend has trended up, and travel providers have ridden a wave of pent-up demand. But as travel growth slows, there will be a greater need for more targeted marketing and for travel providers to build new strategies for a changing landscape.

Gen AI is already influencing travel, with call center efficiencies the most widely reported benefit. In the coming year, expect it to influence the industry in major ways. More visible applications (new options for discovery, shopping, booking) will garner much of the attention, but less visible applications might actually be more influential. Promising use cases for travel providers include advertising strategy, marketing content, and personalization.

Vail Resorts Inc.

Vail Resorts was founded as Vail Associates Ltd. by Pete Seibert and Earl Eaton in the early 1960s. Eaton, a lifelong resident, led Siebert (a former WWII 10th Mountain Division ski trooper) to the area in March 1957. They both became ski patrol guides at Aspen, Colorado, when they shared their dream of finding the "next great ski mountain." Siebert set off to secure financing and Eaton engineered the early lifts. Their Vail ski resort opened in 1962. George N. Gillett Jr. purchased Vail Associates in 1985. Vail Associates changed its name to Vail Resorts and went public in 1997 after Gillett Holdings went bankrupt. Apollo Management, headed by Leon Black, bought the company out of bankruptcy and took Vail Resorts public, controlling Vail Resorts until 2003, when Apollo divested itself of controlling interest. The skating rink at Beaver Creek, Colorado, was named the Black Family Skating Rink after Leon Black. Rob Katz, a former executive at Apollo, ran Vail Resorts as CEO until November 2021, when he was appointed executive chairperson of the board. Kirsten Lynch, the company's former chief marketing officer, then took over as CEO.

Booking Holdings Inc.

In 1996 (Stamford, Connecticut), Jay S. Walker founded Priceline.com, an online travel site that used a Name Your Own Price bidding model; in 1999, the firm's IPO made him a multi-billionaire.

Founded in 1996 in Amsterdam, Booking.com has grown from a small Dutch start-up to the leading hotel booking website in Europe, it was acquired by Priceline for $133 million in 2005. Together with many other acquisitions and mergers in the sector, Priceline Group was composed and became Booking Holdings in 2018. The integrations of Booking.com and Active Hotels helped the parent company to improve its financial position (from a loss of $19M in 2002 to $1.1B of profit in 2011). The acquisition of Booking.com was praised by some social media as "the best acquisition in Internet history" since no other acquisition in the digital travel market had been shown to be as profitable.

Darren Huston served as president and CEO of Booking Holdings until 2016, when his extramarital affair with an employee was revealed. Therefore, Jeffery H. Boyd - previous CEO (2002-2013) - was named interim CEO; then (effective Jan. 1, 2017) Glenn D. Fogel was appointed CEO and president.

In 2020, the Supreme Court of the United States decided within the Patent and Trademark Office v. Booking.com B. V. case that the term "Booking.com", via the suffix ".com" had created an identity that could be differentiated from the generic verb and hence could be trademarked.

In 2021, Booking Holdings announced its intention to acquire Etraveli Group AB, the operator of the website GoToGate, and hotel distributor Getaroom, for €1.63B; the Government of the United Kingdom's Competition and Markets Authority has launched an enquiry into the acquisition.

In 2022, the company's mobile app was the most downloaded mobile app in the travel agency category.

In November 2022, Salt Labs discovered flaws dangerous for guest accounts in the login process of Booking.com; Booking.com resolved the vulnerability promptly.

In 2022, Booking Holdings was the 340th Fortune's Largest United States Corporations by revenue.

In November 2023, Booking.com agreed to pay roughly €94M to settle a VAT dispute in Italy.

In October 2023, EU antitrust regulators stopped Booking Holdings' Etraveli Group's acquisition.

Part 2: Financial insights on Vail Resorts

Attachment 1: Python notebook containing all the main computations and full-length comments.

Bonds analysis

(Face values of 1000$)

Bond ID	Coupon		Issue Date	April 2024		
	Rate	Frequency		Price($)	YTM*	PV($)**
MTN 15/25	6.25%	1/year	5/2015	100.7	5.4%	**1005.064**[1] 1008.07

* Computed via Moneychimp (link)

** First value manually computed, second one via Buyupsite (link); best estimation in bold.

[1] Computed with DCFs' sum and denominator's exponents in twelfths (starting from 4/2024)

Dividend policy

Outlook from Vail's 2024-Q1 financial report, Return of Capital section:

"Our balance sheet remains strong, and the business continues to generate robust cash flow. Our total cash and revolver availability as of October 31, 2023 was approximately $1.4 billion, with $729 million of cash on hand [...]. During the quarter [10/23 to 1/24], the Company repurchased approximately

0.2 million shares of common stock at an average price of approximately $211 for a total of $50.0 million. We remain committed to returning capital to shareholders and intend to maintain an opportunistic approach to future share repurchases. We will continue to be disciplined stewards of our capital and remain committed to prioritizing investments in our guest and employee experience, high-return capital projects, strategic acquisition opportunities, and returning capital to our shareholders through our quarterly dividend and share repurchase program."

This very clearly serves to classify Vail, especially in recent times, as a steady and growing income stock, both in terms of increasing quarterly dividends and a firm approach to stock repurchases in high volume. The company highlighted commitment to paying back investors twice in a single report section.

Manager's side, 3 questions are fundamental to deciding whether to distribute profits:

- Will there be enough cash to cushion unexpected setbacks and pursue unforeseen opportunities?

  Vail Resorts might be safe, thanks to the possession of 729M$ cash and 9.4% of the mkt cap.

- Are the positive cashflows likely to continue in the future?

  Vail resorts' initiative to keep increasing dividends suggests an expected CFs' continuity.

- Do we have a prudent debt ratio? (Refer to 'Capital Structure' section)

Part 3: Financial insights on Booking Holdings

Attachment 2: Python notebook containing all the main computations and full-length comments.

Bonds analysis (Face values of 1000$)

Bond ID	Coupon		Issue			April 2024		
	Rate	Frequency	Date	Price($)	Implied YTM*	Price($)	YTM	PV($)**
BKNG 15/25	3.650%	2/year	3/2015	99.74	3.682%	98.410	5.50%	1011.28 **982.24**
BKNG 14/24	2.375%	1/year	9/2014	99.06	2.482%	99.645	3.95%	1007.35 **984.85**(*1y*)
BKNG 21/25	0.100%	1/year	3/2025	99.98	0.105%	97.15	3.71%	**967.15** 965.19
BKNG 16/26	3.600%	2/year	5/2016	99.81	3.623%	96.894	5.28%	1034.67 **968.51**
BKNG 15/27	1.800%	1/year	3/2015	99.97	1.803%	96.01	3.33%	**959.61**[1] 956.99
BKNG 20/30	4.625%	2/year	4/2020	99.83	4.647%	96.854	5.43%	**962.29**[2] 959.24

***** Computed via Moneychimp (link)

****** First value manually computed, second one via Buyupsite (link); best estimation in bold.

[1] Computed with DCFs' sum and denominator's exponents in twelfths (starting from 4/2024)

[2] Computed through Annuity formula and discounted Face Value repayment.

Dividend policy

On February 22, 2024, Booking Holdings announced that its Board of Directors declared a quarterly cash dividend of $8.75 per share, payable on March 28, 2024, to stockholders of record as of the close of business on March 8, 2024. Booking Holdings expects to pay a cash dividend on a quarterly basis

going forward, subject to Booking Holdings' Board's consideration of, among other things, market conditions and Booking Holdings' financial performance and cash flows.

When comparing to Vail, knowing that BKNG's current stock price(around 3000) is many times that of MTN(around 200), in relative terms Vail repurchased 2.2million shares to Booking's 800.000; but in terms of repurchase frequency the latter is higher up.

Booking has been very concerned with recent US tax policy developments, the company itself stated in its 2023 securities report how much of a concern and which financial risks these policies might bring to their operations. The amounting taxes on the company could be one of the main reasons behind higher repurchase volumes.

From BKNG's 2023 US securities and exchange commission report, Tax risks section:

"The United States's Tax Cuts and Jobs Act (the "Tax Act") introduced a tax on 50% of global intangible low-taxed income ("GILTI"), which is income determined to be in excess of a specified routine rate of return on qualifying business assets. The Tax Act further introduced a base erosion and anti-abuse tax ("BEAT") aimed at preventing the erosion of the U.S. tax base and a new tax deduction with respect to certain foreign-derived intangible income. If we are unable to operate our business so that BEAT does not impact us, our effective tax rate, results of operations and cash flows would be adversely affected. The interpretation and implementation of the Tax Act have had and could have a negative impact on our results of operations and cash flows. In addition, the United States's recently enacted Inflation Reduction Act includes a 15% corporate minimum tax on book income and a 1% excise tax on stock repurchases. The interpretation and implementation of these provisions could have a negative impact on our results of operations and cash flows. Increases in the U.S. corporate income tax rate, increasing the percentage of GILTI subject to tax in the United States, or other changes to U.S. federal tax laws could have a negative impact on our results of operations and cash flows."

In fact BKNG's effective tax rate for 2023 was 45.99%, when in 2022 it was just 14.94%. All of this leads us to think BKNG is an historically growth-stock, trying to make a shift very recently to a higher compensating payout policy through continuing repurchases and quarterly dividends.

Manager's side, 3 questions are fundamental to deciding whether to distribute profits:

- Will there be enough cash to cushion unexpected setbacks and pursue unforeseen opportunities?

  Booking Holdings might be safe, with 12,683M$ cash and 10.7% of the mkt cap.

- Are the positive cashflows likely to continue in the future?

  Booking Holdings' confidence in issuing dividends suggests an expected CFs' continuity.

- Do we have a prudent debt ratio? (Refer to 'Capital Structure' section)

Part 4: Portfolio analysis

Attachment 3: Python notebook containing all the computations and image-generation processes.

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- CSI Market's overview on Booking Holdings' effective tax rate
- YCharts' overview on Booking Holdings' stock buyback history
- Nasdaq's overview on Booking Holdings' dividend history
- Stock Analysis on Net's overview on Booking Holdings' solvency ratios

ATTACHMENT 1: Financial Analysis of Vail Resorts Inc. (MTN)

Preliminary Code

First of all, we import relevant libraries and extract the company's financial data useful for the subsequent analysis.

```
# Loading useful libraries
import yfinance as yf
import pandas as pd
import numpy as np

# Extracting historical stock prices thorugh Yahoo Finance
ticker = 'MTN' # Vail Resorts Inc.
stock_data = yf.download(ticker, start='1997-03-01', end='2024-04-01')
stock_5years = yf.download(ticker, start='2019-04-01', end='2024-04-01')

# Extracting the company's general financial data
company = yf.Ticker(ticker)
balance_sheet = company.balance_sheet
financials = company.financials
#tax_rate = financials['2023-12-31'].loc['Tax Rate For Calcs'] (We used this initially a
tax_rate = .21
cashflow = company.cashflow
dividends = company.dividends
market_cap = company.info['marketCap']
enterprise_value = company.info['enterpriseValue']
revenue = financials.loc['Total Revenue'].iloc[0]
operating_income = financials.loc['Operating Income'].iloc[0]
capex = cashflow.loc['Capital Expenditure Reported'].iloc[0]
nwc = balance_sheet.loc['Current Assets'] - balance_sheet.loc['Current Liabilities']

# Visualizing stock data format
print("\nStock data (last 5 rows):\n", stock_data.tail())
```

```
[**********100%%**********]  1 of 1 completed
[**********100%%**********]  1 of 1 completed

Stock data (last 5 rows):
                  Open        High         Low       Close   Adj Close  Volu
Date
2024-03-22  225.139999  225.139999  220.940002  221.500000  219.251785  2774(
2024-03-25  221.309998  221.309998  217.759995  218.770004  216.549500  4323(
2024-03-26  221.729996  221.729996  217.820007  218.720001  216.500000  4264(
2024-03-27  217.740005  220.270004  217.080002  220.179993  220.179993  3499(
2024-03-28  220.199997  224.119995  219.229996  222.830002  222.830002  3477(
```

Cost of Equity Estimation

We compute the Cost of Equity with two different methods: as the sum of Dividend Growth Rate and Dividend Yield and using the CAPM formula.

```
# Estimating the cost of equity based on the dividend growth and yield
div_growth = dividends.pct_change().mean()
div_yield = dividends.mean() / stock_data['Close'].mean()
cost_of_equity = div_growth + div_yield
print(f"\n\nEstimated Dividend Growth Rate = {div_growth:.2%}")
print(f"Dividends-estimated Cost of Equity = {cost_of_equity:.2%}")

# Extracting S&P 500 index's data
historical_data_SaP = yf.download('SPY', start='2014-03-01', end='2024-04-01')

# Estimating our own beta to be used in the CAPM
market_prices2 = yf.download('SPY', start='2019-04-01', end='2024-04-01')['Adj Close']

# Extracting the risk-free rate based on the 10-year Treasury Note
treasury = yf.Ticker("^TNX")
risk_free_rate = treasury.history(period="10y")['Close'].iloc[-1] / 100 # Converting ba
print(f"\nEstimated Risk-Free Rate = {risk_free_rate:.2%}")

# Getting historical returns for the S&P 500
historical_data = historical_data_SaP['Adj Close']
historical_data = historical_data.dropna()
market_return = np.log(historical_data/historical_data.shift(1))
market_return.dropna(inplace = True)
annual_return = market_return.mean()*252
print(f"Estimated Annual Market Return = {annual_return:.2%}")

# Extracting the daily returns
stock_returns2 = stock_5years['Adj Close'].pct_change().dropna()
market_returns2 = market_prices2.pct_change().dropna()

# Calculating beta as stock-market return covariance divided by market returns' varianc
covariance = np.cov(stock_returns2, market_returns2)[0][1]
market_variance = np.var(market_returns2)
beta2 = covariance / market_variance

# Estimating the cost of equity using the CAPM formula
cost_of_equity2 = risk_free_rate + beta2 * (annual_return - risk_free_rate)
print(f"CAPM-estimated Cost of Equity = {cost_of_equity2:.2%}")
```

```
[**********************100%%**********************]  1 of 1 completed
[**********************100%%**********************]  1 of 1 completed

Estimated Dividend Growth Rate = 8.43%
Dividends-estimated Cost of Equity = 9.49%

Estimated Risk-Free Rate = 4.71%
Estimated Annual Market Return = 12.16%
CAPM-estimated Cost of Equity = 11.70%
```

We obviously obtain two different values; the dividend-estimated Cost of Equity in particular will be used for the DCF Perpetuity analysis of the Stock Price.

P/E and P/B Calculation

We estimate the Price-to-Earnings and Price-to-Book Ratios considering data from the company's IPO, then we compare the results with the values extracted via Yahoo Finance and with the performance indicators of some MTN's market competitors; this analysis might be useful in determining the Stock Price's fairness.

```
# Computing the price-to-earnings ratio (per-share values considered)
net_income = financials.loc['Net Income'].iloc[0]
earning_per_share = net_income / balance_sheet.loc['Share Issued'].iloc[0]
price_per_share = stock_data['Close']
P_E_ratio = price_per_share / earning_per_share
print(f"Estimated P/E Ratio = {P_E_ratio.iloc[-1]:.3f}")

# Extracting the same ratio from Yahoo Finance for comparison
print(f"Yahoo-Finance P/E Ratio = {company.info['trailingPE']:.3f}")
```

```
# Computing the market-price to book-value ratio
book_value_ps = balance_sheet.loc['Total Equity Gross Minority Interest'].iloc[0] / bal
P_B_ratio = price_per_share / book_value_ps
print(f"\nEstimated P/B Ratio = {P_B_ratio.iloc[-1]:.3f}")

# Extracting the same ratio from Yahoo Finance for comparison
print(f"Yahoo-Finance P/B Ratio = {company.info['priceToBook']:.3f}")
```

```
Estimated P/E Ratio = 38.889
Yahoo-Finance P/E Ratio = 32.515

Estimated P/B Ratio = 7.807
Yahoo-Finance P/B Ratio = 9.103
```

Comparative Analysis of Ratios

MSN Money already did an analysis on Vail Resorts' Price-over-Earnings and Price-to-Book, reporting end-January results (P/E: 37.06, P/B: 10.18) not much different from ours. The small discrepancies must be due to the long-period data aggregation we operated; similarly, the difference between our estimations and Yahoo Finance's ratios is explainable by the fact that the latter are 12-month trailing values.

Moreover, compared to the competitors identified by MSN Money (i.e., CCL-Carnival Corp, LVS-Las Vegas Sand Corp and NCLH-Norwegian Cruise Line Holding Ltd), we notice that MTN presented quite positive indicators for F.Y. 2023: the focus firm had the second highest P/E score - of 34.92, compared to NCLH's record one of 51.54 - and a high P/B too - of 9.33, compared to NCLH's 28.47. It is also important to notice that the sector in which Vail Resorts operates is rather a niche one, thus it is impossible to draw an actually direct comparison with other companies.

(Source: https://www.msn.com/en-us/money/stockdetails/fi-a1y3dm?id=a1y3dm&l3=L3_Analysis)

Stock Price Estimation

We estimate the Stock Price by two methods:

1) Projected Free Cash Flows system;

2) Discounted Cash Flow Perpetuity model.

```
# 1) Projected Free Cash Flows

# Calculating financial metrics
revenue = financials.loc['Total Revenue'].iloc[0]
operating_income = financials.loc['Operating Income'].iloc[0]
capex = cashflow.loc['Capital Expenditure'].iloc[0]
nwc = balance_sheet.loc['Current Assets'] - balance_sheet.loc['Current Liabilities']
operating_margin = (operating_income / revenue) * 100
capex_percentage_of_revenue = (capex / revenue) * 100
change_in_nwc_percentage_of_revenue = ((nwc.iloc[0] - nwc.iloc[-1]) / revenue) * 100
print("Operating Margin:", round(operating_margin, 2), "%")
print("Capex Percentage of Revenue:", round(capex_percentage_of_revenue, 2), "%")
print("Change in NWC Percentage of Revenue:", round(change_in_nwc_percentage_of_revenue

# Calculating the revenue growth and prediciting the future revenue (with gradual decrea
revenue_growth = financials.loc['Total Revenue'].iloc[::-1].pct_change()
revenue_growth.dropna(inplace=True)
last_known_growth = revenue_growth.iloc[-1]
future_years = 6  # Number of future years to predict
final_growth_rate = 0.06  # Target final growth rate

# Creating a linear interpolation between the last known growth and the final target gr
predicted_growth = np.linspace(last_known_growth, final_growth_rate, future_years)

# Projecting future revenues
current_revenue = financials.loc['Total Revenue'].iloc[0]  # Revenue current year
projected_revenues = [current_revenue * ((1 + predicted_growth) ** year) for year in ra

# Projecting future free cash flows
free_cash_flows = []
for revenue in projected_revenues:
    operating_income = revenue * operating_margin
    capex = revenue * capex_percentage_of_revenue
    change_in_nwc = revenue * change_in_nwc_percentage_of_revenue
    free_cash_flow = operating_income - capex - change_in_nwc
    free_cash_flows.append(free_cash_flow)

# Estimating the stock price
w_avg_cost_of_capital = 0.0989 # Obtained from future calculations for the WACC
debt = balance_sheet.loc['Long Term Debt'].iloc[0]
present_value_flows = sum(cf / ((1 + w_avg_cost_of_capital) ** (i+1)) for i, cf in enum
shares_outstanding = balance_sheet.loc['Share Issued'].iloc[0]  # Assuming outstanding
stock_price = (present_value_flows - debt) / shares_outstanding
stock_price = stock_price.mean()
print(f"Future-CFs-estimated Stock Price = {stock_price:.2f}$")
```

```
Operating Margin: 19.49 %
Capex Percentage of Revenue: -10.9 %
Change in NWC Percentage of Revenue: 0.55 %
Future-CFs-estimated Stock Price = 253.35$
```

Using the projected future Free Cash Flows system, we build a Stock Price estimation which highly relies on the future Revenue Growth assessment; we estimated this value through iterative tests and in order to potentially achieve a Stock Price coherent with the actual one. It is also important to notice that we assumed the WACC equal to the one we estimated (dedicated code section below).

The obtained Stock Price (253.35$) is a bit higher than the actual one; this discrepancy is possibly due to a predicted Revenue Growth imprecision.

```
# 2) Discounted Cash Flow Perpetuity

# Computing the present value of the perpetuity of stock using the DCF
div_future = dividends[46]*(1+div_growth)
pvperp = div_future / (cost_of_equity-div_growth)
print(f"DCF-Perpetuity-estimated Stock Price = {pvperp:.2f}$")
```

```
DCF-Perpetuity-estimated Stock Price = 226.08$
```

However, the Stock Price computed via the DCF perpetuity model - with Cost of Equity = 9.49% and Dividend Growth Rate = 8.43% - returns a value (226.08$) very similar to the market one as of 14/04/2024 (i.e., 226.97$), which indicates a rather fair Stock Price.

Recent Substantial Price Drop

As of the end of April 2024, MTN's Price had a significant decrease, reaching a value of around 200$. Recent analyses suggest that this drop (-10.6% in 5 days) might have been caused by the slowing Rates of Return and the recent price cut of Morgan Stanley from 242$ to 229$. It is inferable that our DCF-estimated Stock Price was slightly more accurate than the one calculated basing on Projected Free Cash Flows.

(Source: https://www.defenseworld.net/2024/04/23/vail-resorts-nysemtn-price-target-cut-to-229-00-by-analysts-at-morgan-stanley.html)

ROE and Plowback Estimation

```
# Computing the ROE and plowback
roe = net_income / balance_sheet.loc['Total Equity Gross Minority Interest'].iloc[0]
print(f"Estimated Return On Equity = {roe:.2f}")
retained_earnings = balance_sheet.loc['Retained Earnings'].iloc[0]
total_revenue = financials.loc['Total Revenue'].iloc[0]
plowback = retained_earnings / total_revenue
payout = 1 - plowback
print(f"Estimated Plowback Ratio = {plowback:.2f}")
```

```
Estimated Return On Equity = 0.20
Estimated Plowback Ratio = 0.30
```

Beta Computation

We compute the Beta manually and then extract it via Yahoo Finance; conscious that the latter value represents the monthly 5-year Beta.

```
# Extracting market's and stock's daily returns
stock_5years = yf.download(ticker, start='2019-04-01', end='2024-04-01')
market_prices = yf.download('SPY', start='2019-04-01', end='2024-04-01')['Adj Close']
stock_returns = stock_5years['Adj Close'].pct_change().dropna()
market_returns = market_prices.pct_change().dropna()

# Calculating beta as stock-market return covariance divided by market returns' variance
covariance = np.cov(stock_returns, market_returns)[0][1]
market_variance = np.var(market_returns)
beta = covariance / market_variance
print(f"\n\nEstimated Beta = {beta:.3f}")

# Extracting the beta from YFinance for comparison
beta_yahoo = company.info['beta']
print("Yahoo-Finance Beta =", beta_yahoo)
```

```
[**********************100%%**********************]  1 of 1 completed
[**********************100%%**********************]  1 of 1 completed

Estimated Beta = 0.939
Yahoo-Finance Beta = 1.108
```

The computed Beta (0.939) indicates that the company has a slightly lower Volatility compared to the overall market: if the market goes up or down, the Stock Price is expected to go up or down as well, but to a slightly lesser degree than the market itself. This suggests that the firm has a risk profile slightly below the market average, making it a somewhat less risky investment than the market as a whole.

Cost of Capital Assessment

We compute the after-tax Weighted Average Cost of Capital: firstly we calculate the Cost of Debt, then the WACC itself using the Cost of Debt and the CAPM-estimated Cost of Equity.

```
# Calculating the cost of debt
interest_expense = financials.loc['Interest Expense'].iloc[0]
total_debt = balance_sheet.loc['Total Debt'].iloc[0]
cost_of_debt = interest_expense / total_debt
print(f"Estimated Cost of Debt = {cost_of_debt:.2%}")

# Estimating the WACC after tax
total_debt = enterprise_value - market_cap
E_V = market_cap / enterprise_value
D_V = total_debt / enterprise_value
wacc = (E_V * cost_of_equity2) + (D_V * cost_of_debt * (1 - tax_rate))
print(f"Estimated WACC = {wacc:.2%}")
```

```
Estimated Cost of Debt = 5.06%
Estimated WACC = 9.73%
```

In order to assess their fairness, we compare our calculations to those of GuruFocus (updated to the end of April 2024). Firstly, our CAPM-estimated Cost of Equity (11.70%) is very similar to the aforementioned website's one (i.e., 9.42%), also computed via the CAPM formula. An even lower discrepancy is found comparing the Cost of Debt estimations, as Gurufocus' value is of 5.24% and ours of 5.06%. The key difference in this case is the Tax Rate: they calculated it to be 26.0%, while we used the US Corporate Tax Rate (i.e., 21%). This led the website's computations to a WACC of 7.86%, which is not very similar to ours (9.77%), possibly also due to the CAPM-estimated Cost of Equity.

(Source: https://www.gurufocus.com/term/wacc/MTN#:~:text=cost%20of%20debt.-,As%20of%20Jan.,158.965%20%2F%203032.6538%20%3D%205.2418%25)

ATTACHMENT 2: Financial Analysis of Booking Holdings Inc. (BKNG)

Preliminary Code

First of all, we import relevant libraries and extract the company's financial data useful for the subsequent analysis.

```
# Loading useful libraries
import yfinance as yf
import pandas as pd
import numpy as np

# Extracting historical stock prices thorugh Yahoo Finance
ticker = 'BKNG' # Booking Holdings Inc.
stock_data = yf.download(ticker, start='1997-03-01', end='2024-04-01')
stock_5years = yf.download(ticker, start='2019-04-01', end='2024-04-01')

# Extracting the company's general financial data
company = yf.Ticker(ticker)
balance_sheet = company.balance_sheet
financials = company.financials
#tax_rate = financials['2023-12-31'].loc['Tax Rate For Calcs'] (We used this initially a
tax_rate = .21
cashflow = company.cashflow
dividends = company.dividends
dividend = 35 # Assuming a constant dividend of 35 USD per share: no dividend data found
market_cap = company.info['marketCap']
enterprise_value = company.info['enterpriseValue']
revenue = financials.loc['Total Revenue'].iloc[0]
operating_income = financials.loc['Operating Income'].iloc[0]
capex = cashflow.loc['Capital Expenditure'].iloc[0]
nwc = balance_sheet.loc['Current Assets'] - balance_sheet.loc['Current Liabilities']

# Visualizing stock data format
print("\nStock data (last 5 rows):\n", stock_data.tail())
```

```
[**********100%%**********]  1 of 1 completed
[**********100%%**********]  1 of 1 completed

Stock data (last 5 rows):
                  Open         High          Low        Close    Adj Close
Date
2024-03-22  3624.969971  3646.120117  3604.459961  3624.729980  3624.729980
2024-03-25  3608.439941  3629.830078  3569.500000  3626.939941  3626.939941
2024-03-26  3649.000000  3688.909912  3640.600098  3661.080078  3661.080078
2024-03-27  3677.939941  3711.429932  3656.139893  3673.500000  3673.500000
2024-03-28  3690.000000  3694.639893  3618.399902  3627.879883  3627.879883

             Volume
Date
2024-03-22  205400
2024-03-25  166600
```

```
2024-03-26  274900
2024-03-27  209200
2024-03-28  274100
```

Cost of Equity Estimation

We compute the Cost of Equity with two different methods: as the sum of Dividend Growth Rate and Dividend Yield and using the CAPM formula.

```
# Estimating the cost of equity based on the dividend growth and yield
div_growth = 0  # Since a single dividend payment exists
div_yield = dividends.mean() / stock_data['Close'].mean()
cost_of_equity = div_growth + div_yield # Note: in this case the cost of equity is equa
print(f"\n\nEstimated Dividend Growth Rate = {div_growth:.2%}")
print(f"Dividends-estimated Cost of Equity = {cost_of_equity:.2%}")

# Extracting S&P 500 index's data
historical_data_SaP = yf.download('SPY', start='2014-03-01', end='2024-04-01')

# Estimating our own beta to be used in the CAPM
market_prices2 = yf.download('SPY', start='2019-04-01', end='2024-04-01')['Adj Close']

# Extracting the risk-free rate based on the 10-year Treasury Note
treasury = yf.Ticker("^TNX")
risk_free_rate = treasury.history(period="5y")['Close'].iloc[-1] / 100  # Converting ba
print(f"\nEstimated Risk-Free Rate = {risk_free_rate:.2%}")

# Getting historical returns for the S&P 500
historical_data = historical_data_SaP['Adj Close']
historical_data = historical_data.dropna()
market_return = np.log(historical_data/historical_data.shift(1))
market_return.dropna(inplace = True)
annual_return = market_return.mean()*252
print(f"Estimated Annual Market Return = {annual_return:.2%}")

# Extracting the daily returns
stock_returns2 = stock_5years['Adj Close'].pct_change().dropna()
market_returns2 = market_prices2.pct_change().dropna()

# Calculating beta as stock-market return covariance divided by market returns' varianc
covariance = np.cov(stock_returns2, market_returns2)[0][1]
market_variance = np.var(market_returns2)
beta2 = covariance / market_variance

# Estimating the cost of equity using the CAPM formula
cost_of_equity2 = risk_free_rate + beta2 * (annual_return - risk_free_rate)
print(f"CAPM-estimated Cost of Equity = {cost_of_equity2:.2%}")
```

```
[**********************100%%**********************]  1 of 1 completed
[**********************100%%**********************]  1 of 1 completed

Estimated Dividend Growth Rate = 0.00%
Dividends-estimated Cost of Equity = 0.97%

Estimated Risk-Free Rate = 4.71%
Estimated Annual Market Return = 12.16%
CAPM-estimated Cost of Equity = 13.38%
```

We obviously obtain two different values; the dividend-estimated Cost of Equity in particular will be used for the DCF Perpetuity analysis of the Stock Price.

P/E and P/B Calculation

We estimate the Price-to-Earnings and Price-to-Book Ratios considering data from the company's IPO, then we compare the results with the values extracted - where possible - via Yahoo Finance and with the performance indicators of some BKNG's market competitors; this analysis might be useful in determining the Stock Price's fairness.

```
# Computing the price-to-earnings ratio (per-share values considered)
net_income = financials.loc['Net Income'].iloc[0]
earning_per_share = net_income / balance_sheet.loc['Share Issued'].iloc[0]
price_per_share = stock_data['Close']
P_E_ratio = price_per_share / earning_per_share
print(f"Estimated P/E Ratio = {P_E_ratio.iloc[-1]:.3f}")

# Extracting the same ratio from Yahoo Finance for comparison
print(f"Yahoo-Finance P/E Ratio = {company.info['trailingPE']:.3f}")

# Computing the market-price to book-value ratio
book_value_ps = balance_sheet.loc['Total Equity Gross Minority Interest'].iloc[0] / bala
P_B_ratio = price_per_share / book_value_ps
print(f"\nEstimated P/B Ratio = {P_B_ratio.iloc[-1]:.3f}")

# Extracting the same ratio from Yahoo Finance for comparison
# Note: would not work as 'priceToBook' is not found, since 'bookValue' is negative
```

```
Estimated P/E Ratio = 54.175
Yahoo-Finance P/E Ratio = 29.811

Estimated P/B Ratio = -84.679
```

Comparative Analysis of Ratios

MSN Money already did an analysis on Booking Holdings' Price-over-Earnings and Price-to-Book, reporting end-December results (P/E: 30.07, P/B: -45.51) somewhat dissimilar from ours. The discrepancy must be due to the long-period data aggregation we operated, evidently not intended to represent the up-to-date situation. Similarly, the difference between our P/E and Yahoo Finance's one is explainable by the fact that the latter is a 12-month trailing value.

Moreover, compared to the competitors identified by MSN Money (i.e., META, AAPL-Apple and AMZN-Amazon), we notice that BKNG presented quite controversial indicators for F.Y. 2023: the focus firm had the second highest P/E score - of 30.21, compared to AMZN's record one of 52.40 - but the only negative P/B too - of -47.22. We may also consider as a Booking's market rival ABNB-Airbnb; the latter firm has totally different ratios (i.e., P/E: 18.81, P/B: 11.04) indicating a more balanced situation and a positive Equity amount.

(Source: https://www.msn.com/en-us/money/stockdetails/fi-az6g8m?id=az6g8m)

Negative Equity Explaination

It is important to notice that BKNG has a negative Total Equity reported for 2023, precisely of -2,744B$. This situation is allowed in US financial system: by regulation a negative Equity does not necessarily imply bankruptcy, since the firm is still entrusted to meet its obligations if demonstrating sufficient Cash Flows. This provision is coherent with the American approach of encouragement towards entrepreneurship and growth, somehow limiting creditors' safety.

On the other hand, a situation similar to BKNG's one would not be verifiable in Italy, as the Corporate Law requires LLCs (i.e., S.r.l- and S.p.A-type firms) to maintain a minimum amount of Equity. Any company missing to satisfy this requirement might be restored through financial measures (e.g., capital injection) or potentially face liquidation proceedings. In fact, the Italian Civil Code - traditionally emphasizing creditor protection - aims to maintain financial stability even by forcing firms to take corrective actions rather than allowing financial distress indicated by negative Equity.

Stock Price Estimation

We estimate the Stock Price by two methods:

1) Projected Free Cash Flows system;

2) Discounted Cash Flow Perpetuity model.

```
# 1) Projected Free Cash Flows

# Calculating financial metrics
revenue = financials.loc['Total Revenue'].iloc[0]
operating_income = financials.loc['Operating Income'].iloc[0]
capex = cashflow.loc['Capital Expenditure'].iloc[0]
nwc = balance_sheet.loc['Current Assets'] - balance_sheet.loc['Current Liabilities']
operating_margin = (operating_income / revenue) * 100
capex_percentage_of_revenue = (capex / revenue) * 100
change_in_nwc_percentage_of_revenue = ((nwc.iloc[0] - nwc.iloc[-1]) / revenue) * 100
print("Operating Margin:", round(operating_margin, 2), "%")
print("Capex Percentage of Revenue:", round(capex_percentage_of_revenue, 2), "%")
print("Change in NWC Percentage of Revenue:", round(change_in_nwc_percentage_of_revenue

# Calculating the revenue growth and prediciting the future revenue (with gradual decrea
revenue_growth = financials.loc['Total Revenue'].iloc[::-1].pct_change()
revenue_growth.dropna(inplace=True)
last_known_growth = revenue_growth.iloc[-1]
future_years = 6  # Number of future years to predict
final_growth_rate = 0.06  # Target final growth rate

# Creating a linear interpolation between the last known growth and the final target gr
predicted_growth = np.linspace(last_known_growth, final_growth_rate, future_years)

# Projecting future revenues
```

```
current_revenue = financials.loc['Total Revenue'].iloc[0]  # Revenue current year
projected_revenues = []
for i in range(0,6):
    future_revenue = current_revenue * ((1 + predicted_growth[i]) ** i)
    projected_revenues.append(future_revenue)

# Projecting future free cash flows
free_cash_flows = []
for revenue in projected_revenues:
    operating_income = revenue * operating_margin
    capex = revenue * capex_percentage_of_revenue
    change_in_nwc = revenue * change_in_nwc_percentage_of_revenue
    free_cash_flow = operating_income + capex + change_in_nwc
    free_cash_flows.append(free_cash_flow)

# Estimating the stock price
weighted_avg_cost_of_capital = 0.12 # Obtained from future calculations for the WACC
debt = balance_sheet.loc['Long Term Debt'].iloc[0]
present_value_flows = sum(cf / ((1 + weighted_avg_cost_of_capital) ** (i+1)) for i, cf
shares_outstanding = balance_sheet.loc['Share Issued'].iloc[0]  # Assuming outstanding
stock_price = (present_value_flows - debt) / shares_outstanding
stock_price = stock_price.mean()
print(f"Future-CFs-estimated Stock Price = {stock_price:.2f}$")
```

```
Operating Margin: 27.31 %
Capex Percentage of Revenue: -1.61 %
Change in NWC Percentage of Revenue: -23.76 %
Future-CFs-estimated Stock Price = 3210.61$
```

Using the projected future Free Cash Flows system, we build a Stock Price estimation which highly relies on the future Revenue Growth assessment. It is also important to notice that we assumed the WACC equal to the one we estimated (dedicated code section below).

The obtained Stock Price (3210.61$) is a bit lower than the actual one; this could be due to disparate factors, but the relative error is acceptably low.

```
# 2) Discounted Cash Flow Perpetuity

# Computing the present value of the perpetuity of stock using the DCF
pvperp = dividend / cost_of_equity
print(f"DCF-Perpetuity-estimated Stock Price = {pvperp:.2f}$")
```

```
DCF-Perpetuity-estimated Stock Price = 3596.44$
```

However, the Stock Price computed via the DCF perpetuity model - with Cost of Equity = 0.97% and no Dividend Growth Rate - returns a value (3596.44$) very similar to Yahoo Finance's one (i.e., 3568.87$) as of 01/04/2024 - end date of the data used in our analysis, which indicates a rather fair Stock Price.

ROE and Plowback Estimation

```
# Computing the ROE and plowback
roe = net_income / balance_sheet.loc['Total Equity Gross Minority Interest'].iloc[0]
```

```
print(f"Estimated Return On Equity = {roe:.2f}")
retained_earnings = balance_sheet.loc['Retained Earnings'].iloc[0]
total_revenue = financials.loc['Total Revenue'].iloc[0]
plowback = retained_earnings / total_revenue
payout = 1 - plowback
print(f"Estimated Plowback Ratio = {plowback:.2f}")
```

```
Estimated Return On Equity = -1.56
Estimated Plowback Ratio = 1.49
```

Beta Computation

We compute the Beta manually and then extract it via Yahoo Finance; conscious that the latter value represents the monthly 5-year Beta.

```
# Extracting market's and stock's daily returns
stock_5years = yf.download(ticker, start='2019-04-01', end='2024-04-01')
market_prices = yf.download('SPY', start='2019-04-01', end='2024-04-01')['Adj Close']
stock_returns = stock_5years['Adj Close'].pct_change().dropna()
market_returns = market_prices.pct_change().dropna()

# Calculating beta as stock-market return covariance divided by market returns' varianc
covariance = np.cov(stock_returns, market_returns)[0][1]
market_variance = np.var(market_returns)
beta = covariance / market_variance
print(f"\n\nEstimated Beta = {beta:.3f}")

# Extracting the beta from YFinance for comparison
beta_yahoo = company.info['beta']
print("Yahoo-Finance Beta =" ,beta_yahoo)
```

```
[**********************100%%**********************]  1 of 1 completed
[**********************100%%**********************]  1 of 1 completed

Estimated Beta = 1.165
Yahoo-Finance Beta = 1.402
```

The computed Beta (1.165) indicates that the company has a slightly higher Volatility compared to the overall market: if the market goes up or down, the Stock Price is expected to go up or down as well, but to a slightly higher degree than the market itself. This suggests that the firm has a risk profile slightly above the market average, making it a somewhat riskier investment than the market as a whole.

Cost of Capital Assessment

We compute the after-tax Weighted Average Cost of Capital: firstly we calculate the Cost of Debt, then the WACC itself using the Cost of Debt and the CAPM-estimated Cost of Equity.

```
# Calculating the cost of debt
interest_expense = financials.loc['Interest Expense'].iloc[0]
```

```
total_debt = balance_sheet.loc['Total Debt'].iloc[0]
cost_of_debt = interest_expense / total_debt
print(f"Estimated Cost of Debt = {cost_of_debt:.2%}")

# Estimating the WACC after tax
total_debt = enterprise_value - market_cap
E_V = market_cap / enterprise_value
D_V = total_debt / enterprise_value
wacc = (E_V * cost_of_equity2) + (D_V * cost_of_debt * (1 - tax_rate))
print(f"Estimated WACC = {wacc:.2%}")
```

```
Estimated Cost of Debt = 6.07%
Estimated WACC = 13.15%
```

In order to assess their fairness, we compare our calculations to those of GuruFocus (updated to the end of April 2024). Firstly, our CAPM-estimated Cost of Equity (13.39%) is very similar to the aforementioned website's one (i.e., 12.30%), also computed via the CAPM formula. An even lower discrepancy is found comparing the Cost of Debt estimations, as GuruFocus' value is of 6.46% and ours of 6.07%. This led the website's computations to a WACC of 11.55%, which is slightly lower than ours (13.18%), possibly also due to the CAPM-estimated Cost of Equity.

(Source: https://www.gurufocus.com/term/wacc/BKNG#:~:text=Booking%20Holdings%20(NAS%3ABKNG)%20WACC%20%25&text=As%20of%20today%20(2024-04,of%20capital%20is%2011.44%25%25))

ATTACHMENT 3: Portfolio Analysis (MTN+BKNG)

Preliminary Code

First of all, we import relevant libraries and extract the financial data related to both the stocks (i.e., Vail Resorts Inc. and Booking Holdings Inc.) useful for the subsequent analysis.

```
# Loading useful libraries
import numpy as np
import pandas as pd
from scipy.optimize import minimize
import matplotlib.pyplot as plt
import seaborn as sns
import yfinance as yf

# Extracting historical stocks' prices thorugh Yahoo Finance
vail = yf.download('MTN', start='2010-01-01', end='2024-04-01') # Vail Resorts Inc.
vail.index = pd.to_datetime(vail.index)
vail = vail['Adj Close']

booking = yf.download('BKNG', start='2010-01-01', end='2024-04-01') # Booking Holdings Inc.
booking.index = pd.to_datetime(booking.index)
booking = booking['Adj Close']

# Combining the stocks' data
prices = pd.concat([vail, booking], axis=1)
prices.columns = ['MTN', 'BKNG']

# Analyzing returns
returns = prices.pct_change().dropna()
mean_returns = returns.mean() * 252
cov_matrix = returns.cov() * 252

# Extracting the risk-free rate based on the 10-year Treasury Note
treasury = yf.Ticker("^TNX")
risk_free_rate = treasury.history(period="5y")['Close'].iloc[-1] / 100  # Converting basis points to decimal
```

```
[**********100%%**********]  1 of 1 completed
[**********100%%**********]  1 of 1 completed
```

Portfolio Optimization

We analyze all the possible portfolios' performances through specifically designed functions.

```
# Defining the functions for portfolio performance metrics
def portfolio_annualized_performance(weights, mean_returns, cov_matrix):
    returns = np.dot(weights, mean_returns)
    std = np.sqrt(np.dot(weights.T, np.dot(cov_matrix, weights)))
    return std, returns
def neg_sharpe_ratio(weights, mean_returns, cov_matrix, risk_free_rate):
    p_std, p_ret = portfolio_annualized_performance(weights, mean_returns, cov_matrix)
    return -(p_ret - risk_free_rate) / p_std

# Defining the constraints
constraints = ({'type': 'eq', 'fun': lambda x: np.sum(x) - 1})
bounds = tuple((0, 1) for asset in range(len(mean_returns)))

# Initial guess (equal distribution)
num_assets = len(mean_returns)
initial_guess = num_assets * [1. / num_assets,]

# Defining the optimization function
def max_sharpe_ratio(mean_returns, cov_matrix, risk_free_rate):
    args = (mean_returns, cov_matrix, risk_free_rate)
    opts = minimize(neg_sharpe_ratio, initial_guess, args=args, method='SLSQP', bounds=bounds, constraints=constraints)
    return opts

# Applying the functions
optimal_portfolio = max_sharpe_ratio(mean_returns, cov_matrix, risk_free_rate)
optimal_weights = optimal_portfolio.x
expected_return, expected_volatility = portfolio_annualized_performance(optimal_weights, mean_returns, cov_matrix)
```

Plotting

We plot the efficient frontier and related results.

```
# Defining the efficient-frontier plotting function
def plot_efficient_frontier(mean_returns, cov_matrix, num_portfolios=10000, risk_free_rate=0.0421):
    weights_arr = np.linspace(0, 1, num=num_portfolios)
    efficient_portfolios = pd.DataFrame(columns=['Return', 'Volatility', 'Sharpe', 'Vail_Weight'])

    for i, weight in enumerate(weights_arr):
        weights = np.array([weight, 1 - weight])
        volatility, return_ = portfolio_annualized_performance(weights, mean_returns, cov_matrix)
        sharpe_ratio = (return_ - risk_free_rate) / volatility
        efficient_portfolios.loc[i] = [return_, volatility, sharpe_ratio, weight]

    # Ensure that the dataframe contains valid numerical entries
    if not efficient_portfolios.empty and efficient_portfolios['Sharpe'].notna().all():
        max_sharpe = efficient_portfolios.loc[efficient_portfolios['Sharpe'].idxmax()]
        min_vol = efficient_portfolios.loc[efficient_portfolios['Volatility'].idxmin()]

        # Plotting efficient frontier
        plt.figure(figsize=(10, 7))
        plt.scatter(efficient_portfolios['Volatility'], efficient_portfolios['Return'], c=efficient_portfolios['Sharpe'], cmap='Blues')
        plt.title('Efficient Frontier')
        plt.xlabel('Volatility (annualized)')
        plt.ylabel('Return (annualized)')
        plt.colorbar(label='Sharpe Ratio')
        plt.scatter(min_vol['Volatility'], min_vol['Return'], color='silver', marker='1', s=400, label='Min Volatility')
        plt.plot([min_vol['Volatility'],min_vol['Volatility']], [min_vol['Return'],0.192], linestyle=':', color='silver')
        plt.gca().set_ylim([0.192, None])
        minVol = efficient_portfolios.loc[efficient_portfolios['Volatility'].idxmin()]['Volatility']
        plt.text(min_vol['Volatility']+0.001, min_vol['Return']-0.001, f'Volatility = {minVol:.2f}')
        plt.scatter(max_sharpe['Volatility'], max_sharpe['Return'], color='silver', marker='.', s=400, label='Max Sharpe Ratio')
        maxSharpe = efficient_portfolios.loc[efficient_portfolios['Sharpe'].idxmax()]['Sharpe']
        plt.text(max_sharpe['Volatility']+0.001, max_sharpe['Return']-0.0015, f'Sharpe Ratio = {maxSharpe:.2f}')
        plt.legend(labelspacing=1)
        plt.show()
    else:
        print("The efficient frontier could not be plotted due to invalid or missing data.")

    return efficient_portfolios

# Generating and plotting the efficient frontier
efficient_portfolios = plot_efficient_frontier(mean_returns, cov_matrix)

# Checking if portfolios were generated and displaying optimal ones
if not efficient_portfolios.empty:
    print(f"\nPortfolio with Maximum Sharpe Ratio:\n{efficient_portfolios.loc[efficient_portfolios['Sharpe'].idxmax()]}")
    print(f"\nPortfolio with Minimum Volatility:\n{efficient_portfolios.loc[efficient_portfolios['Volatility'].idxmin()]}")
else:
    print("No efficient portfolios were generated.")

# Computing and displaying the correlation between MNT and BKNG
plt.close()
correlation = returns.corr()
heatmap = sns.heatmap(correlation, annot=True, cmap='YlGnBu')
plt.title('\n\nCorrelation Matrix')
plt.savefig('correlation_matrix.png')
print(f"\nCorrelation Matrix:\n{correlation}")

# Analyzing the impact of diversification under perfect correlation
if correlation.iloc[0,1] == 1:
    print("\nDiversification is not useful when Correlation = 1, as both assets move identically.")
else:
    print("\nDiversification reduces idiosyncratic risk, especially when Correlation < 1.\n")
```

```
 IMAGE 1 GENERATED: Efficient Frontier

 Portfolio with Maximum Sharpe Ratio:
 Return         0.231800
 Volatility     0.282240
 Sharpe         0.672122
 Vail_Weight    0.355236
 Name: 3552, dtype: float64

 Portfolio with Minimum Volatility:
 Return         0.220710
 Volatility     0.273866
 Sharpe         0.652179
 Vail_Weight    0.554955
 Name: 5549, dtype: float64
```

```
Correlation Matrix:
           MTN      BKNG
MTN   1.000000  0.442565
BKNG  0.442565  1.000000

IMAGE 2 GENERATED: Correlation Matrix

Diversification reduces idiosyncratic risk, especially when Correlation < 1.
```

Individual Stock Analysis

Once computed the portfolio optimization, we look at each stock's Return and compare it to the portfolio's one.

```
# Downloading the historical data for both stocks
stocks = ['MTN', 'BKNG']
data = yf.download(stocks, start="2010-01-01", end="2024-04-01")['Adj Close']

# Calculating the daily and annual returns
daily_returns = data.pct_change().dropna()
annual_returns = daily_returns.mean() * 252

# Computing the annual volatility
annual_volatility = daily_returns.std() * np.sqrt(252)

rets = np.log(data/data.shift(1))
# Printing the results
print("\n\nAnnual Returns:")
print(annual_returns)
print("\nAnnual Volatility:")
print(annual_volatility)
```

```
[**********100%%**********]  2 of 2 completed

Annual Returns:
Ticker
BKNG    0.251525
MTN     0.195998
dtype: float64

Annual Volatility:
Ticker
BKNG    0.333095
MTN     0.313237
dtype: float64
```

Stocks-Portfolios Comparison

The stocks' performances are (as expectable) quite correlated, nevertheless the benefits of diversification are well visible: the portfolios' Volatility is lower than both individual stocks' ones. Obviously, this effect comes at the cost of a reduced Return compared to BKNG, which has a higher annual Return with respect to MTN and thus to all the mixed portfolios, clearly counterbalanced by a much higher Volatility, indicating a riskier investment. Therefore, the most appetible risk-adjusted Returns are most probably the max-Sharpe portfolio's ones, but adding other less correlated stocks would definitely help in reaching a more complete diversification, able to satisfy risk-averse traders.