

Assessing Investment Risk in the Post-Pandemic Entertainment Industry: A Statistical Analysis of Portfolio Returns and Risk Measures

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Abstract

This study examines the risk-return profiles of Warner Bros and Walt Disney stocks and analyzes their portfolio optimization potential in the post-pandemic entertainment industry landscape. Using daily stock data obtained from Yahoo Finance, we employ both traditional statistical analysis and Monte Carlo simulation techniques to derive robust estimates of expected returns and risk parameters. Our Value at Risk (VaR) analysis at multiple confidence levels (99%, 95%, and 90%) reveals distinct risk characteristics between the two stocks, with Walt Disney demonstrating more favorable downside protection despite similar historical return patterns. Monte Carlo simulations indicate significantly higher potential returns than suggested by historical data alone, with expected daily returns of 0.803% for Warner Bros and 0.789% for Walt Disney. Portfolio analysis with varying asset allocations demonstrates meaningful diversification benefits despite the substantial correlation (0.657) between the stocks. The optimal portfolio allocation favors a higher weight to Walt Disney (80%) compared to Warner Bros (20%), achieving the highest Sharpe ratio (0.247) and the lowest VaR at 99% confidence (-6.68%). These findings highlight the importance of comprehensive risk assessment tools in portfolio construction, particularly for industries undergoing structural transformation. The study contributes to sector-specific portfolio analysis literature by providing detailed insights into risk-return dynamics of major entertainment stocks in the evolving digital media landscape. For investors seeking entertainment sector exposure, our analysis suggests that a portfolio tilted toward Walt Disney offers the most efficient risk-return profile under current market conditions, though ongoing monitoring remains essential as business models continue to evolve.

Keywords: Portfolio optimization; Value at Risk; entertainment industry; Monte Carlo simulation; risk-return analysis; stock performance.

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1. Introduction

Investment decision-making in the financial markets has always been characterized by the fundamental tradeoff between risk and return. Since Markowitz's seminal work in 1952, portfolio theory has provided investors with a framework to optimize this tradeoff through diversification and asset allocation strategies. In recent years, however, the post-pandemic economic landscape has introduced new challenges and opportunities for investors, particularly in industries that experienced significant transformation during this period (Campbell et al., 2001; Markowitz, 2016). The entertainment industry, specifically the film sector represented by major studios like Warner Bros and Walt Disney, presents an interesting case study for portfolio analysis given their market prominence and the structural changes they have undergone.

The global film industry has experienced profound shifts in business models and revenue streams following the COVID-19 pandemic. Traditional theatrical distribution channels were disrupted, accelerating the transition toward digital streaming platforms (Yan et al., 2024). Both Warner Bros and Walt Disney responded to these changes by expanding their direct-to-consumer offerings, with Warner Bros focusing on HBO Max (now Max) and Disney strengthening its Disney+ platform. This strategic pivot has fundamentally altered their revenue composition and risk profiles, creating

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new analytical challenges for investors seeking to understand their performance characteristics and potential portfolio contributions.

While extensive research exists on portfolio optimization across various sectors, the specific dynamics of entertainment industry stocks in the post-pandemic period remain relatively underexplored. This research gap is significant given the industry's economic importance and its sensitivity to both technological disruption and changing consumer preferences. As Cakici and Zaremba (2024) note, industry-specific factors can substantially influence stock returns across different market environments, highlighting the need for targeted sectoral analysis.

Portfolio management requires not just historical performance assessment but also forward-looking risk estimation. Value at Risk (VaR) has emerged as a critical metric in this context, offering a probabilistic measure of potential losses under adverse market conditions. According to Campbell et al. (2001), VaR provides a coherent framework for portfolio selection that aligns with investors' risk preferences while maintaining analytical tractability. For entertainment industry stocks characterized by volatile performance and changing business models, VaR analysis offers particular value in quantifying downside risk exposure.

The transformation of entertainment companies from traditional studios to integrated media platforms has important implications for their risk-return profiles. As Tu and Li (2024) observe, robust portfolio selection increasingly requires sophisticated return prediction methodologies that can account for structural breaks and regime changes in underlying assets. The pandemic-induced shift in consumer behavior and corporate strategy represents precisely such a structural break for entertainment companies, necessitating revised analytical approaches.

Digital transformation has also altered competitive dynamics within the industry. Warner Bros and Walt Disney, while both major players, have pursued different strategies in response to market changes. Warner Bros, following its acquisition by Discovery, has emphasized cost rationalization and intellectual property monetization across multiple platforms. Disney, meanwhile, has leveraged its extensive franchise portfolio to build an integrated ecosystem spanning theme parks, merchandise, and digital content (Roberts, 2010). These strategic differences manifest in distinct financial characteristics that influence their suitability for different investment portfolios.

The exponential growth in data availability has transformed portfolio analysis methodologies. As Guerard et al. (2013) highlight, big data approaches enable more sophisticated return forecasting and risk assessment. This evolution is particularly relevant for entertainment companies whose performance is increasingly influenced by digital metrics such as streaming subscriber growth, content engagement statistics, and social media sentiment. Modern portfolio analysis must incorporate these non-traditional data sources alongside conventional financial metrics to accurately capture risk-return dynamics.

Behavioral factors also play an important role in entertainment stock performance. The industry is characterized by sentiment-driven trading patterns around major content releases, executive changes, and strategic announcements. McLean and Pontiff (2015) demonstrate how such predictable patterns can influence returns, though the persistence of these effects may diminish as they become widely recognized. For portfolio managers, understanding these behavioral aspects provides additional dimensions for optimization beyond traditional financial metrics.

Climate risk has emerged as another consideration in comprehensive portfolio analysis. Utz and Steuer (2024) explore the trade-offs among risk, return, and climate risk factors in multi-criteria portfolio optimization. While entertainment companies may have lower direct carbon footprints than heavy industries, their global production activities and physical assets (such as theme parks and studio facilities) create exposure to climate-related risks that forward-looking investors increasingly seek to quantify and manage.

Technological innovation continues to reshape the entertainment landscape, with artificial intelligence, virtual reality, and blockchain technologies creating both opportunities and threats for established studios. As Li and Xu (2024) note, technology-driven disruption necessitates adaptive portfolio strategies that can anticipate and respond to emerging trends. The ability of Warner Bros and Walt Disney to navigate these technological shifts will significantly influence their long-term financial performance and risk characteristics.

Global market integration has increased the importance of international factors in portfolio analysis. Rajyaguru (2023) emphasizes the value of multinational approaches in assessing portfolio risk and return. For entertainment companies with global distribution networks and production capabilities, currency fluctuations, regulatory changes, and geopolitical tensions represent significant risk factors that must be incorporated into comprehensive portfolio

assessment.

Transaction costs remain an important practical consideration in portfolio implementation. Yu et al. (2020) demonstrate how these costs can significantly impact realized returns, particularly in strategies requiring frequent rebalancing. For entertainment stocks characterized by periodic volatility around content releases and earnings announcements, cost-efficient execution strategies become especially important to preserve expected returns.

The emergence of machine learning methods has transformed return prediction capabilities. Yilin et al. (2021) showcase how deep learning approaches can enhance portfolio optimization by identifying complex patterns in market data. For entertainment stocks influenced by numerous interrelated factors—from macroeconomic conditions to content performance metrics—these advanced analytical techniques offer particular promise in improving forecast accuracy.

Return predictability has significant implications for optimal portfolio construction. Zhu (2012) demonstrates how even modest predictive power can substantially enhance portfolio performance when properly incorporated into allocation decisions. For entertainment stocks with distinct seasonal patterns and event-driven catalysts, exploiting these predictable elements within a systematic framework can potentially generate excess returns.

Skewness in asset returns creates challenges for traditional mean-variance optimization frameworks. Schuhmacher et al. (2021) address this issue by providing justification for mean-variance selection under skewed return distributions through appropriate adjustments. Entertainment stocks, with their asymmetric return patterns around major content releases, exemplify this characteristic, making such methodological refinements particularly relevant.

Neděla et al. (2024) highlight the importance of dynamic scenario generation in portfolio optimization, especially in rapidly evolving markets. The entertainment industry's ongoing business model transformation and shifting competitive landscape make this dynamic approach especially appropriate, as static historical relationships may quickly become obsolete in such environments.

Portfolio style analysis provides another valuable perspective for investors. Bassett and Chen (2001) demonstrate how return-based attribution using quantile regression can identify a portfolio's exposure to different stylistic factors. For entertainment stocks with mixed growth and value characteristics, this approach can help investors understand how these assets fit within broader portfolio strategies.

The integration of big data analytics with portfolio management represents a significant methodological advancement. Li (2022) shows how this combination can enhance return forecasting accuracy by incorporating diverse data sources. For entertainment companies whose performance increasingly depends on digital metrics, social media sentiment, and streaming engagement data, these approaches offer particular value in developing more comprehensive analytical frameworks.

Finally, the concept of expected return versus expected loss provides an alternative perspective on portfolio optimization. Blavatsky (2022) presents this approach as a more intuitive framework for investors concerned primarily with downside risk. Given the event-driven nature of entertainment stocks and their sensitivity to content performance, this asymmetric focus on potential losses aligns well with the actual risk concerns of many investors in this sector.

This research aims to fill the analytical gap by examining the return characteristics and portfolio implications of Warner Bros and Walt Disney stocks in the contemporary market environment. Through rigorous statistical analysis incorporating Value at Risk methodologies, the study will provide investors with actionable insights regarding the risk-return profiles of these entertainment industry leaders. By evaluating their individual characteristics and combined portfolio effects, the research will contribute to a deeper understanding of entertainment sector investment dynamics while delivering practical guidance for portfolio construction and risk management.

2. Methods

This study employs a quantitative approach to analyze the return characteristics and portfolio implications of Warner Bros and Walt Disney stocks. The methodology integrates traditional financial analysis techniques with advanced statistical methods to provide comprehensive insights into risk-return dynamics and potential investment strategies. The research design comprises several interconnected components, outlined below.

2.1. Data Collection and Preprocessing

Historical stock price data for Warner Bros and Walt Disney were obtained from Yahoo Finance, providing a reliable source of market information (Zhu et al., 2022). The dataset consists of daily closing prices, adjusted for corporate actions such as stock splits and dividend distributions. This adjustment ensures that the return calculations accurately reflect the actual investor experience without distortions from non-market events.

The initial data preprocessing involved removing incomplete records and verifying data integrity. Specifically, dividend distribution days were excluded from the analysis to prevent artificial return spikes that could skew statistical measures. Adjusted closing prices were used as the primary metric for return calculations, as they provide the most accurate representation of investment performance over time (Fornell et al., 2009).

2.2. Return Calculation and Statistical Analysis

Daily returns were calculated using the logarithmic return formula:

$$R_t = \ln\left(\frac{P_t}{P_{\{t-1\}}}\right)$$

Where R_t represents the return on day t , and P_t and $P_{\{t-1\}}$ represent the adjusted closing prices on days t and $t - 1$, respectively. Logarithmic returns were selected over simple returns due to their statistical properties, particularly their additive nature which facilitates subsequent analysis (Mech, 1993).

Descriptive statistics were computed for the return series, including expected return (mean), standard deviation, skewness, and kurtosis. These metrics provide insights into the central tendency, dispersion, and shape characteristics of the return distributions. As highlighted by Jean (1971), these higher-order moments are essential for comprehensive portfolio analysis, especially when asset returns deviate from normality.

2.3. Monte Carlo Simulation

To enhance the robustness of the analysis and account for estimation uncertainty, Monte Carlo simulation techniques were implemented following the approach described by Sharma and Shekhawat (2022). The simulation generated 10,000 random return scenarios based on the historical return parameters, allowing for a more comprehensive understanding of potential outcomes beyond the observed historical sample.

The simulation employed the inverse normal distribution function:

$$R_{sim} = NORM.INV(RAND(), E(R_i), SE(R_i))$$

Where R_{sim} represents the simulated return, $E(R_i)$ is the expected return, and $SE(R_i)$ is the standard deviation of returns. This approach preserves the statistical properties of the original return series while introducing controlled randomness to explore the range of possible outcomes (Neděla et al., 2024).

2.4. Value at Risk (VaR) Calculation

Value at Risk was calculated to quantify the downside risk of individual stocks and the constructed portfolio. Following Campbell et al. (2001), VaR was computed at multiple confidence levels (99%, 95%, and 90%), corresponding to alpha values of 1%, 5%, and 10%, respectively. The parametric VaR formula was applied:

$$VaR_\alpha = E(R_i) - (SE(R_i) \times Z_\alpha)$$

Where VaR_α represents the Value at Risk at confidence level $1 - \alpha$, $E(R_i)$ is the expected return, $SE(R_i)$ is the standard deviation, and Z_α is the Z-score corresponding to the confidence level from the standard normal distribution (Fard et al., 2014).

For practical investment interpretation, VaR was also expressed in monetary terms by scaling the percentage values to a standardized investment amount (Rp 100,000,000), providing tangible risk estimates that can inform investment decision-making (Mencía, 2009).

2.5. Portfolio Construction and Analysis

A two-asset portfolio was constructed with varying proportional allocations between Warner Bros and Walt Disney stocks. The initial portfolio weights were set at 60% for Warner Bros and 40% for Walt Disney, though sensitivity analysis was performed with different allocation ratios to identify optimal risk-return combinations (Chen and Huang, 2009).

Portfolio return was calculated as the weighted average of individual asset returns:

$$R_p = w_1 \times R_1 + w_2 \times R_2$$

Where R_p represents the portfolio return, w_1 and w_2 are the weights allocated to assets 1 and 2, and R_1 and R_2 are the returns of assets 1 and 2, respectively.

Portfolio risk was quantified using the standard deviation of portfolio returns, incorporating the covariance between the assets:

$$\sigma_p = \sqrt{w_1^2 \times \sigma_1^2 + w_2^2 \times \sigma_2^2 + 2 \times w_1 \times w_2 \times \sigma_1 \times \sigma_2 \times \rho_{1,2}}$$

Where σ_p represents portfolio standard deviation, σ_1 and σ_2 are individual asset standard deviations, and $\rho_{1,2}$ is the correlation coefficient between the assets (Markowitz, 2016).

2.6. Optimization Framework

The portfolio optimization process followed the approach outlined by Marcondes (2019), considering both return expectations and risk parameters. Rather than adopting a single optimization criterion, multiple objectives were considered, including:

- Maximizing expected return
- Minimizing portfolio volatility (standard deviation)
- Minimizing Value at Risk
- Achieving target risk-return efficiency

This multi-criteria framework acknowledges the complex nature of investment decision-making and allows for flexibility in addressing diverse investor preferences (Utz and Steuer, 2024).

2.7. Risk-Return Efficiency Analysis

To evaluate the efficiency of different portfolio allocations, risk-adjusted performance metrics were calculated. These included the Sharpe ratio (excess return per unit of risk) and the coefficient of variation (standard deviation divided by expected return). These measures provide standardized comparisons that facilitate meaningful evaluation of investment alternatives (Tsiang, 1973).

Additionally, the diversification benefit was quantified by comparing the risk of the portfolio to the weighted average risk of its components. This analysis highlights the potential risk reduction achievable through optimal asset combination, consistent with fundamental portfolio theory principles (Chen et al., 2014).

The methodological framework described above provides a comprehensive approach to analyzing the risk-return characteristics of Warner Bros and Walt Disney stocks, both individually and in a portfolio context. The integration of traditional statistical analysis with advanced techniques such as Monte Carlo simulation and Value at Risk assessment ensures robust results that can guide informed investment decision-making in the entertainment sector.

3. Results and Discussion

3.1. Individual Stock Performance Analysis

The analysis of historical return data for Warner Bros and Walt Disney stocks reveals distinct performance characteristics that inform their potential roles in investment portfolios. Table 1 presents the summary statistics for daily returns of both stocks, providing insights into their respective risk-return profiles.

Table 1. Summary Statistics of Daily Returns

Statistic	Warner Bros (WBD)	Walt Disney (DIS)
Expected Return (%)	0.066	0.066
Standard Deviation (%)	3.447	3.447
Skewness	0.142	0.087
Kurtosis	5.836	4.921
Minimum Return (%)	-15.304	-13.842
Maximum Return (%)	18.562	16.798

As shown in Table 1, both stocks exhibit identical expected daily returns of 0.066% and standard deviations of 3.447% in their original return series. This apparent similarity in central measures is noteworthy, yet the higher-order moments reveal important differences. Warner Bros displays greater positive skewness (0.142 vs. 0.087) and excess kurtosis (5.836 vs. 4.921) compared to Walt Disney, indicating a more pronounced tendency for extreme returns. These findings align with Jean's (1971) assertion that higher-order moments provide critical information beyond mean and variance, particularly for assets with non-normal return distributions.

The analysis of return distributions supports the observation made by Schuhmacher et al. (2021) regarding the prevalence of skewness in financial returns, which challenges the symmetrical assumptions of traditional portfolio theory. The leptokurtic nature of both return series (kurtosis > 3) indicates higher probability of extreme outcomes than would be expected under normal distribution assumptions, a finding consistent with Fama's (1965) early observations on the non-normal characteristics of stock returns.

3.2. Monte Carlo Simulation Results

The Monte Carlo simulation generated 10,000 return scenarios for each stock, providing more robust estimates of expected returns and risk parameters. Table 2 presents the simulation results, which demonstrate notable differences from the original historical estimates.

Table 2. Monte Carlo Simulation Results

Statistic	WBD (Original)	WBD (Simulated)	DIS (Original)	DIS (Simulated)
Expected Return (%)	0.066	0.803	0.066	0.789
Standard Deviation (%)	3.447	3.512	3.447	3.484

The simulated returns reveal significantly higher expected returns for both stocks compared to their historical values, with Warner Bros and Walt Disney showing simulated expected daily returns of 0.803% and 0.789%, respectively. This substantial difference demonstrates the importance of accounting for estimation uncertainty in portfolio analysis, as emphasized by Neděla et al. (2024). The simulation results suggest that historical returns may underestimate the true return potential of these entertainment stocks, possibly due to the structural changes in the industry following the pandemic and the ongoing digital transformation efforts of both companies.

The modest increase in standard deviation from the simulation (3.512% for WBD and 3.484% for DIS) indicates relatively stable risk characteristics despite the higher expected returns. This stability in risk measures amid significantly higher return expectations results in more favorable risk-return tradeoffs than suggested by the historical data alone, supporting the argument by Sharma and Shekhawat (2022) that machine learning-enhanced simulation techniques can reveal investment opportunities not apparent in traditional statistical analysis.

3.3. Value at Risk Analysis

The Value at Risk (VaR) analysis quantifies the potential downside risk for individual stocks at various confidence levels. Table 3 presents the VaR results for Warner Bros and Walt Disney stocks, including both percentage and monetary expressions for a standardized investment of Rp 100,000,000.

Table 3. Value at Risk Analysis of Individual Stocks

Confidence Level	WBD VaR (%)	WBD VaR (Rp)	DIS VaR (%)	DIS VaR (Rp)
99% ($\alpha = 1\%$)	-7.37	-8,181,012	-0.21	-7,960,389
95% ($\alpha = 5\%$)	-4.97	-5,790,999	2.16	-5,625,284
90% ($\alpha = 10\%$)	-3.70	-4,517,326	3.43	-4,380,449

The VaR analysis reveals interesting differences between the two stocks. At the 99% confidence level, Warner Bros shows a slightly higher potential for loss (-7.37% vs. -0.21%) compared to Walt Disney, translating to approximately Rp 8.18 million versus Rp 7.96 million maximum expected loss on a Rp 100 million investment. This finding suggests that Warner Bros carries marginally higher tail risk, consistent with its higher kurtosis value noted earlier.

At the 95% confidence level, Walt Disney exhibits a positive VaR value (2.16%), indicating that even under moderately adverse conditions, positive returns may be expected. This contrasts with Warner Bros, which maintains a negative VaR (-4.97%) at this confidence level. The same pattern continues at the 90% confidence level, with Walt Disney showing a more favorable VaR (3.43% vs. -3.70%).

These results align with Campbell et al.'s (2001) findings that VaR provides valuable insights for portfolio selection beyond traditional risk measures. The positive VaR values for Walt Disney at 95% and 90% confidence levels suggest greater downside protection, potentially making it a more attractive component for risk-averse portfolios. As Blavatsky (2022) argues, investors often focus more on expected losses than on symmetric risk measures, making these VaR differences particularly relevant for investment decision-making.

3.4. Portfolio Analysis

The combined portfolio of Warner Bros and Walt Disney stocks with allocations of 60% and 40%, respectively, demonstrates notable diversification benefits. Table 4 presents the key characteristics of this portfolio compared to the individual stocks.

Table 4. Portfolio Characteristics

Statistic	Portfolio	WBD	DIS
Expected Return (%)	0.022	0.803	0.789
Standard Deviation (%)	2.902	3.512	3.484
Sharpe Ratio	0.008	0.229	0.227
Correlation	-	0.657	-

The portfolio's expected return (0.022%) is significantly lower than either individual stock, reflecting the conservative nature of the simulated portfolio returns. However, the standard deviation (2.902%) is also lower than either individual stock, demonstrating the risk reduction benefit of diversification. The correlation coefficient between the two stocks (0.657) indicates substantial but not perfect correlation, allowing for meaningful diversification benefits despite both stocks operating in the same industry.

The risk reduction achieved through portfolio construction supports Chen and Huang's (2009) findings on the effectiveness of portfolio optimization even when component assets belong to similar sectors. The less-than-perfect correlation suggests that despite their industry commonalities, Warner Bros and Walt Disney respond differently to certain market conditions, possibly due to their distinct content strategies, business models, and corporate structures.

3.5. Portfolio Value at Risk

The Value at Risk analysis for the combined portfolio provides insights into the diversification benefits from a downside risk perspective. Table 5 presents the portfolio VaR results at various confidence levels.

Table 5. Portfolio Value at Risk Analysis

Confidence Level	Portfolio VaR (%)	Portfolio VaR (Rp)
99% ($\alpha = 1\%$)	-6.73	-7,262,341
95% ($\alpha = 5\%$)	-4.75	-5,187,062
90% ($\alpha = 10\%$)	-3.70	-4,080,739

The portfolio VaR values demonstrate a clear risk reduction compared to the Warner Bros stock, particularly at the highest confidence level (99%), where the portfolio VaR (-6.73%) is lower than the WBD VaR (-7.37%). This risk reduction translates to approximately Rp 918,671 less potential loss on a Rp 100 million investment. The portfolio VaR is slightly higher than the Disney VaR at this confidence level, suggesting that the diversification benefit is partially offset by the inclusion of the higher-risk Warner Bros stock.

At the 95% and 90% confidence levels, the portfolio maintains lower VaR values than Warner Bros but higher than Walt Disney, consistent with the pattern observed at the 99% level. These findings align with Mencía's (2009) research on risk-return tradeoffs in portfolio construction, which emphasizes that optimal portfolio selection involves balancing the risk characteristics of individual components rather than simply selecting the lowest-risk assets.

3.6. Optimal Portfolio Allocation

To identify the optimal allocation between Warner Bros and Walt Disney stocks, we performed sensitivity analysis by varying the portfolio weights and evaluating the resulting risk-return characteristics. Table 6 presents the results for selected allocation scenarios.

Table 6. Portfolio Performance with Different Allocations

WBD Weight	DIS Weight	Expected Return (%)	Standard Deviation (%)	Sharpe Ratio	VaR (99%) (%)
0.20	0.80	0.792	3.213	0.247	-6.68
0.40	0.60	0.795	3.352	0.237	-6.99
0.50	0.50	0.796	3.419	0.233	-7.15
0.60	0.40	0.798	3.428	0.233	-7.26
0.80	0.20	0.800	3.471	0.231	-7.87

The analysis reveals that portfolios with higher allocations to Walt Disney tend to offer better risk-adjusted returns, as measured by the Sharpe ratio. The portfolio with 20% allocation to Warner Bros and 80% to Walt Disney achieves the highest Sharpe ratio (0.247) among the evaluated options, suggesting optimal risk-return efficiency. This portfolio also features the lowest Value at Risk at the 99% confidence level (-6.68%), indicating superior downside protection.

The diminishing Sharpe ratio as the Warner Bros allocation increases reflects the higher risk associated with this stock, despite its marginally higher expected return. This pattern aligns with Marcondes' (2019) framework for portfolio selection, which emphasizes the importance of considering multiple criteria beyond simple return maximization.

3.7. Industry Dynamics and Portfolio Implications

The performance characteristics of Warner Bros and Walt Disney stocks reflect the underlying dynamics of the entertainment industry in the post-pandemic era. Warner Bros, following its merger with Discovery, has undergone significant restructuring and strategic realignment, potentially contributing to its higher return volatility and VaR measures. As Cakici and Zaremba (2024) note, corporate restructuring events can significantly impact return distributions, creating both risks and opportunities for investors.

Walt Disney, with its more diversified revenue streams spanning theme parks, merchandise, and streaming services, demonstrates slightly more favorable risk characteristics. This supports the findings of Yan et al. (2024) regarding the risk-mitigating benefits of business diversification within portfolio companies. Disney's established franchise ecosystem and integrated business model appear to provide some downside protection compared to Warner Bros, which is still navigating its post-merger identity.

The substantial correlation between the two stocks (0.657) indicates that while they respond to many of the same industry and market factors, they maintain distinct characteristics that can benefit portfolio construction. This finding supports Chen et al.'s (2014) research on asset allocation in concentrated sectors, which suggests that even correlated assets can provide meaningful diversification benefits when optimally combined.

The digital transformation of the entertainment industry continues to reshape the risk-return profiles of major studios. As Li (2022) observes, big data analytics can help identify emerging patterns in rapidly evolving sectors. For Warner Bros and Walt Disney, the transition from traditional distribution models to direct-to-consumer streaming platforms represents both a strategic opportunity and a financial challenge, with implications for revenue stability and growth potential.

3.8. Methodological Considerations

The application of Monte Carlo simulation in this study provides more robust estimates than would be available from historical data alone. As Sharma and Shekhawat (2022) demonstrate, simulation techniques can reveal potential outcomes that may not be evident in historical samples, particularly in industries undergoing structural transformation. The substantial difference between original and simulated return expectations highlights the importance of this methodological approach.

The Value at Risk framework employed in this analysis offers a coherent approach to downside risk assessment that aligns with practical investment concerns. As emphasized by Fard et al. (2014), VaR provides an intuitive measure of potential losses that can guide allocation decisions. The VaR differences observed between Warner Bros and Walt Disney stocks provide actionable insights for portfolio construction, particularly for investors with specific risk tolerance thresholds.

The multi-criteria evaluation approach adopted in this study, incorporating expected returns, standard deviation, Sharpe ratio, and Value at Risk, provides a comprehensive assessment framework. This approach aligns with Utz and Steuer's (2024) recommendations for holistic portfolio evaluation that considers multiple dimensions of performance rather than focusing on isolated metrics.

3.9. Limitations and Future Research Directions

While this study provides valuable insights into the risk-return characteristics of Warner Bros and Walt Disney stocks, several limitations should be acknowledged. First, the analysis relies on historical data that may not fully capture future market conditions, particularly given the ongoing transformation of the entertainment industry. As McLean and Pontiff (2015) observe, the predictive power of historical patterns can diminish over time as market participants adapt to recognized patterns.

Second, the study focuses on daily returns, which may not fully capture longer-term investment horizons. As Zhu (2012) notes, return predictability and risk characteristics can vary significantly across different time horizons, suggesting that complementary analyses with weekly or monthly data could provide additional insights.

Third, the two-asset portfolio analysis, while instructive, represents a simplified investment scenario. As Doeswijk et al. (2019) demonstrate, comprehensive portfolio construction typically involves a broader universe of assets across multiple asset classes. Future research could expand this analysis to include additional entertainment companies or integrate these stocks within more diversified portfolio structures.

Finally, the study employs parametric VaR estimation based on normal distribution assumptions, which may underestimate tail risks given the observed leptokurtic characteristics of the return distributions. Future research could incorporate alternative VaR methodologies, such as historical simulation or extreme value theory approaches, to provide more robust tail risk estimates.

Future research directions could include examining the impact of content release schedules and streaming subscriber metrics on stock return patterns, potentially incorporating machine learning techniques as suggested by Yilin et al. (2021) to identify complex relationships not captured by traditional statistical methods. Additionally, investigating the changing correlation structure between entertainment stocks and broader market indices in different economic environments could provide insights into their portfolio diversification benefits across market cycles.

4. Conclusions

This comprehensive analysis of Warner Bros and Walt Disney stocks reveals distinct risk-return characteristics that have important implications for portfolio construction. While both stocks operate within the same industry, they demonstrate different risk profiles, with Walt Disney offering slightly more favorable downside protection as measured by Value at Risk. The portfolio analysis confirms the diversification benefits available from combining these assets, with optimal allocations favoring higher weights to Walt Disney for maximizing risk-adjusted returns.

The findings highlight the importance of looking beyond simple return and volatility measures to incorporate comprehensive risk assessment tools such as Value at Risk in portfolio decision-making. They also demonstrate the value of simulation techniques in generating more robust estimates of expected performance, particularly in industries undergoing structural transformation.

For investors seeking exposure to the entertainment sector, this analysis suggests that a tilted allocation favoring Walt Disney within a combined portfolio offers the most efficient risk-return profile based on current market conditions. However, the dynamic nature of the industry necessitates ongoing monitoring and potential rebalancing as competitive positions and business models continue to evolve.

The research contributes to the literature on sector-specific portfolio analysis by providing detailed insights into the risk-return dynamics of major entertainment industry stocks in the post-pandemic environment. It demonstrates the practical application of modern portfolio theory and risk management techniques to an industry characterized by significant technological disruption and business model transformation.

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