Portfolio Theory Final Project Report

Business Economics 365: Final Project

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1 Portfolio Composition and Strategy

Over the course of these 13 weeks, I built and managed a portfolio that aimed to balance stability, growth potential, and diversification across industries and market capitalizations. My decisions were guided by the need to adapt to changing market conditions while maintaining a clear focus on both short-term performance and long-term opportunities. I use the terms ”short-term” and ”long-term” with the understanding that this project spans a semester. In this context, ”long-term” refers to a span of 12 to 13 weeks, while ”short-term” refers to a period of about a week. The tables I will present from here on will showcase the strategy I used in selecting stocks to add to my portfolio, starting with the first table, which lists the stocks I bought over the course of these 13 weeks and the industries in which they are in.

Table 1: Stock Information with Categories

Ticker	**Company Name**	**Industry**	**Category**
ABBV	AbbVie Inc.	Pharmaceuticals	Large Cap
ADBE	Adobe Inc.	Software	Large Cap
JPM	JPMorgan Chase & Co.	Banking	Large Cap
RCL	Royal Caribbean Cruises Ltd.	Cruise Lines	Large Cap
CAVA	CAVA Group, Inc.	Restaurants	Large Cap
AMZN	Amazon.com, Inc.	E-commerce and Cloud Computing	Large Cap
RKLB	Rocket Lab USA, Inc.	Aerospace and Defense	Large Cap
DKNG	DraftKings Inc.	Online Gambling and Fantasy Sports	Large Cap
AOS	A. O. Smith Corporation	Manufacturing (Water Heaters and Boilers)	Mid Cap
DUOL	Duolingo, Inc.	Educational Technology	Large Cap
AMG	Affiliated Managers Group, Inc.	Asset Management	Mid Cap
FYBR	Frontier Communications Parent, Inc.	Telecommunications	Mid Cap
LNW	Light & Wonder, Inc.	Gaming Technology	Mid Cap
HR	Healthcare Realty Trust Incorporated	Real Estate Investment Trust (Healthcare)	Mid Cap
OLED	Universal Display Corporation	Technology (OLED Technology)	Mid Cap
COHR	Coherent Corp.	Photonics and Laser Technology	Large Cap
HRMY	Harmony Biosciences Holdings, Inc.	Biotechnology	Small Cap
DNUT	Krispy Kreme, Inc.	Food and Beverage	Small Cap
SOUN	SoundHound AI, Inc.	Artificial Intelligence	Mid Cap
CGEM	Cullinan Therapeutics, Inc.	Biotechnology	Small Cap
CING	Cingulate Inc.	Biotechnology	Small Cap
NOVA	Sunnova Energy International Inc.	Renewable Energy	Small Cap
SAFE	Safehold Inc.	Real Estate Investment Trust	Small Cap
SEZL	Sezzle Inc.	Financial Technology (Buy Now, Pay Later)	Small Cap

My portfolio features a broad range of industries and market capitalizations, as evidenced by the variety of companies included in Table 1. From well-established corporations such as AbbVie Inc. (ABBV) and JPMorgan Chase & Co. (JPM) to emerging players like Rocket Lab USA, Inc. (RKLB) and SoundHound AI, Inc. (SOUN), table 1 reflects my strategic inclusion of both stability-oriented(Low risk) and growth-focused stocks(High risk). This diverse selection shows my goal of creating a balanced portfolio that capitalizes on opportunities across multiple sectors while managing risk through diversification.

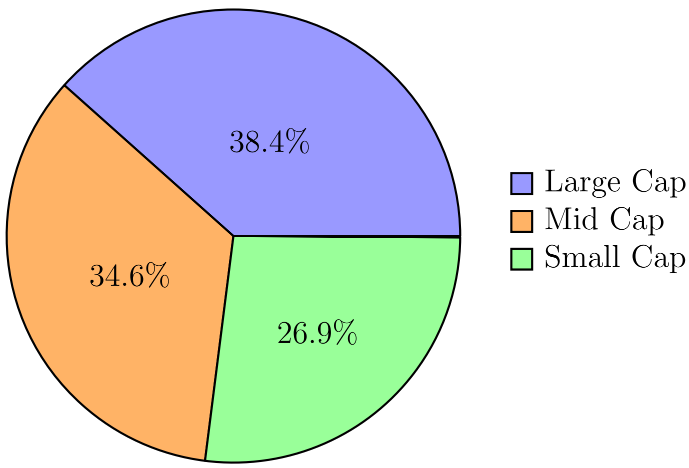


Figure 1: Market Capitalization Breakdown of Stocks in Portfolio

The pie chart in Figure 1 illustrates the market capitalization breakdown of all the stocks I purchased during the 13 -week period. It shows that 38.4% of my purchases were in Large Cap stocks, 34.6% in Mid Cap stocks, and 26.9% in Small Cap stocks. This breakdown reflects my initial exploratory approach, where I sought opportunities across a variety of market capitalizations to balance risk and reward.

Over time, however, my portfolio composition evolved, with Large Cap stocks making up an average of 56.63% of my holdings week to week, compared to 18.77% for Mid Cap stocks and 9.68% for Small Cap stocks. This shift wasn't planned but occurred as I observed the performance of these stocks. I found that Large Cap stocks provided more consistent and stable returns compared to Mid and Small Cap stocks. This stability encouraged me to allocate more capital to them, gradually increasing their weight in my portfolio and finally came to be what it is on week 13. The Current Portfolio Composition table below illustrates the result of these adjustments.

Table 2: Current Portfolio Composition

Security Name	Ticker	Exchange	Shares Held
CAVA Group, Inc.	CAVA	NYSE	1,700
Duolingo, Inc.	DUOL	NASDAQ	2,200
Amazon.com, Inc.	AMZN	NASDAQ	100
Harmony Biosciences Holdings, Inc.	HRMY	NASDAQ	100
Affiliated Managers Group, Inc.	AMG	NYSE	100
Light & Wonder, Inc.	LNW	NASDAQ	100
Joby Aviation, Inc.	JOBY	NYSE	100
Krispy Kreme, Inc.	DNUT	NASDAQ	100
SoundHound AI, Inc.	SOUN	NASDAQ	100
Sunnova Energy International Inc.	NOVA	NYSE	100

This learning process was key to shaping my portfolio management strategy. Initially, I was eager to explore the potential of Mid and Small Cap stocks, expecting higher returns in shorter time-frames. However, I quickly realized that their performance was often volatile and unpredictable. In contrast, Large Cap stocks not only delivered steady returns but also anchored the portfolio during periods of market fluctuation. As a result, I adjusted my capital allocation accordingly, building on what worked while scaling back on less consistent performers.

2 Trading Activity

My trading activity over the 13-week period shows a ever changing approach shaped by both performance outcomes and my evolving risk tolerance. My decisions to buy or sell stocks were often influenced by how much a stock was helping or hurting my portfolio. When I faced losses, I tended to become more risk-averse, favoring safer options. Conversely, when my portfolio's value increased, I felt more confident taking risks. I experimented briefly with day trading but found it didn't suit my style, as I preferred a less time-intensive approach. Without a fixed strategy, I often chose stocks based on trends I observed on platforms like Yahoo Finance, focusing on what seemed like "safe bets" at the time. The following tables highlight these trading patterns, showing how my portfolio evolved through these decisions over the course of the project.

To better understand how my trading decisions evolved week by week, the following table provides a detailed overview of the stocks I bought, held, or sold during the 13-week period. It captures the nature of my portfolio management, highlighting key trading actions and the adjustments I made in response to performance trends, market conditions, and my shifting risk tolerance. This table serves as a visual representation of the strategic—and at times experimental—choices that shaped my portfolio. From stocks like CAVA Group, Inc. (CAVA) and Duolingo, Inc. (DUOL), which became consistent anchors, to positions like AbbVie Inc. (ABBV) and Rocket Lab USA, Inc. (RKLB), which were sold quickly, the table offers insights into how I managed my portfolio throughout the project.

Table 3: Weekly Stock Positions with Buy and Sell Actions

Stock	**W1**	**W2**	**W3**	**W4**	**W5**	**W6**	**W7**	**W8**	**W9**	**W10**	**W11**	**W12**	**W13**
ABBV	Buy	Held	Sell										
ADBE	Buy	Sell											
JPM	Buy	Held	Sell										
CAVA			Buy	Held	Held	Held	Held	Held	Held	Held	Held	Held	Held
AMZN				Buy	Held	Held	Held	Held	Held	Held	Held	Held	Held
RKLB	Buy	Sell											
DKNG	Buy	Sell											
AOS	Buy	Held	Sell										
DUOL				Buy	Held	Held	Held	Held	Held	Held	Held	Held	Held
AMG		Buy	Held	Held	Held	Held	Held	Held	Held	Held	Held	Held	Held
LNW			Buy	Held	Held	Held	Held	Held	Held	Held	Held	Held	Held
CGEM	Buy	Held	Held	Held	Held	Held	Held	Held	Held	Sell			
CING	Buy	Held	Held	Held	Held	Held	Held	Held	Sell				
SAFE	Buy	Held	Held	Held	Held	Held	Held	Held	Held	Sell			
NOVA									Buy	Held	Held	Held	Held
DNUT									Buy	Held	Held	Held	Held
HRMY										Buy	Held	Held	Held
JOBY										Buy	Held	Held	Held

The table of weekly stock positions captures the trading activity and decision-making process, but the weighted returns analysis (available in the appendix) offers a clearer perspective on how each stock influenced the portfolio over the 13 weeks. This analysis of the table highlights both successful long-term choices and quick adjustments to manage risks. Some stocks emerged as core holdings, consistently driving portfolio growth. For example, CAVA Group, Inc. (CAVA), added in Week 3, delivered steady performance with standout weeks like +10.11% in Week 4 and +15.44% in Week 9, cementing its role as a key driver of returns. Duolingo, Inc. (DUOL) became the portfolio's standout performer, particularly in Week 9, where it achieved an extraordinary +699.32% return.

This exceptional result was a direct outcome of a significant re-balancing decision made between Week 8 and Week 9. Using a covariance matrix analysis on the adjusted closing prices of the portfolio's Week 8 holdings, I identified an optimal weight distribution that indicated the need to allocate as much capital as possible to DUOL while maintaining the required minimum of 100 units in each stock. This strategic shift not only drastically improved returns but also adjusted the portfolio's risk profile, showcasing the value of data-driven decision-making. Similarly, Amazon.com, Inc. (AMZN) provided stability and resilience throughout the semester, with highlights like +54.90% in Week 4, reinforcing its role as a reliable anchor in the portfolio.

In contrast, some stocks underperformed early in the semester and were removed to mitigate losses and reallocate capital to better opportunities. AbbVie Inc. (ABBV), for instance, delivered a weighted return of -1.85% in Week 1 and continued to decline, leading to its early sale. Adobe Inc. (ADBE) also struggled, with a -3.36% return in Week 2, prompting a swift reallocation of funds. Similarly, JPMorgan Chase & Co. (JPM) showed mixed performance, with a slight recovery in Week 3 but was ultimately sold as it didn't perform as well as intended. These decisions highlighted my willingness to cut losses early and focus on stocks with greater potential to contribute positively to the portfolio's performance.

While risk-free stocks might have offered stability, they didn't align with my portfolio's high-growth objectives, however managing volatile stocks presented its own challenges, as some securities showed potential but failed to deliver consistent returns. For example, SoundHound AI, Inc. (SOUN) had a strong +7.39% return in Week 7 but struggled with frequent fluctuations, leading to its eventual sale. Similarly, Cullinan Therapeutics, Inc. (CGEM) demonstrated early promise but ultimately failed to contribute meaningfully to the portfolio's growth, highlighting the difficulties of balancing risk and reward in highly volatile investments.

Later in the semester, new stocks were added to the portfolio to diversify holdings and capitalize on emerging opportunities. Sunnova Energy International Inc. (NOVA), introduced in Week 5, delivered consistent returns, including +4.30% in its first week, and became a stable addition. Krispy Kreme, Inc. (DNUT) provided modest yet steady contributions, adding variety to the portfolio by tapping into the food and beverage sector. Harmony Biosciences Holdings, Inc. (HRMY), added during the final weeks, offered small but positive returns, aligning with the portfolio's strategy of balancing growth-oriented and stable investments.

Over the course of these 13 weeks, I adopted a more concentrated strategy, focusing on stocks that aligned with my performance goals. During this period, I executed 68 trades, carefully refining my portfolio to maximize performance and manage risk. The table below outlines the stocks I traded during this time, specifying the weeks in which each transaction occurred.

Table 4: Summary of Weekly Stock Trades Over 13 Weeks

Security Name	**Ticker**	**Shares Sold**	**Date Sold (Week)**
AbbVie Inc.	ABBV	300	Week 2
Adobe Inc.	ADBE	100	Week 1
JPMorgan Chase & Co.	JPM	250	Week 3
Royal Caribbean Cruises Ltd.	RCL	100	Week 1
Rocket Lab USA, Inc.	RKLB	10,000	Week 1
DraftKings Inc.	DKNG	20,000	Week 1
A. O. Smith Corporation	AOS	600	Week 4
Frontier Communications Parent, Inc.	FYBR	100	Week 11
Healthcare Realty Trust Incorporated	HR	100	Week 12
Universal Display Corporation	OLED	2,000	Week 1
Coherent Corp.	COHR	100	Week 4
Cullinan Therapeutics, Inc.	CGEM	2,000	Week 9
Cingulate Inc.	CING	5,000	Week 9
Theriva Biologics, Inc.	TOVX	15,000	Week 1
Safehold Inc.	SAFE	2,000	Week 9
Sezzle Inc.	SEZL	100	Week 1

Overall, the trading activity throughout the semester reflects my actively changing approach to portfolio management. Core holdings like DUOL, CAVA, and AMZN reinforced the importance of consistency and stability in driving performance, while early exits like ABBV and ADBE demonstrated the value of decisively cutting losses. The rebalancing decision between Week 8 and Week 9 marked a pivotal moment, showcasing how strategic adjustments informed by quantitative analysis can significantly enhance portfolio returns. Meanwhile, the addition of late-stage stocks like NOVA and DNUT demonstrated the benefits of staying flexible and adapting to new opportunities. These experiences stressed the importance of aligning trades with my portfolio goals, maintaining a data-driven approach, and balancing risk and reward effectively.

3 Performance Analysis

Investing is as much about managing risks as it is about capturing rewards, and my portfolio demonstrated this duality over the course of 13 weeks. Table 5 captures the week-to-week percentage change in net worth for both my portfolio and the market index.

Table 5: Percentage Change In Net Worth for Portfolio and Market Index

Week	**Portfolio (%)**	**Market Index (%)**
Week 1	-4.51	-2.05
Week 2	-3.22	-0.68
Week 3	-2.72	0.12
Week 4	-4.84	0.34
Week 5	-5.25	0.42
Week 6	-3.84	0.90
Week 7	-3.10	1.78
Week 8	-3.94	0.68
Week 9	-6.89	0.13
Week 10	3.21	4.09
Week 11	-2.26	2.56
Week 12	8.21	4.83
Week 13	6.83	5.30
Average	**-1.72**	**1.42**

On average, the portfolio returned -1.72% weekly, falling short of the market index's 1.42% average. However, while the portfolio underperformed on average, there were standout weeks—particularly in Weeks 10 through 13, where the portfolio's returns significantly outpaced the market. For instance, in Week 12, the portfolio delivered an 8.21% return compared to the market's 4.83%. These periods of strong performance helped mitigate earlier challenges and kept the portfolio competitive. Assuming an exit at the end of Week 13, my portfolio delivered a total yield of 6.83%, surpassing the market's yield of 5.3% leaving me to be a very happy man.

The earlier weeks told a more turbulent story. From Weeks 1 through 9, the portfolio underperformed in eight out of nine weeks, with Week 9 marking the sharpest decline of -6.89% compared to the market's modest 0.13% gain. This drop aligned with significant portfolio restructuring during Week 8, where large allocations were shifted into DUOL and CAVA stocks. Although the immediate impact was negative, these changes laid the groundwork for the portfolio's later recovery, as reflected in subsequent weeks' higher returns

This journey of ups and downs revealed how critical it is to understand my portfolio's composition, how it responds to market conditions, and how its performance compares to broader market trends. To delve deeper, Table 6 provides a comprehensive summary of the portfolio's performance metrics compared to the market index, highlighting both strengths and areas for improvement.

Table 6: Portfolio and Market Index Performance Metrics

Measure	**Portfolio**	**Market Index**
Mean Weekly Return (%)	0.66	1.06
Standard Deviation (%)	16.14	1.81
Beta	1.23	1.00
Alpha (%)	0.61	0.51
Tracking Error (%)	15.20	—
Sharpe Ratio (%)	61.35	23.48
Treynor Ratio (%)	8.03	0.42
Jensen's Alpha (%)	9.38	0
Information Ratio (%)	4.02	0
Covariance	0.000680051	
Correlation Coefficient	0.2329506	

One of the first things that stands out is the portfolio's standard deviation of 16.14%, which is significantly higher than the market index's 1.81%. This reflects the portfolio's higher level of volatility, with returns fluctuating more widely from week to week. While this might sound alarming, it was a calculated trade-off. I knew going in that my focus on mid-cap and small-cap stocks, as well as active reallocation, would lead to greater risks. However, this also created opportunities for out-sized returns in strong weeks, like Weeks 12 and 13, where I achieved gains of 8.21% and 6.83%, respectively. The downside of this strategy became evident during challenging weeks, such as Week 9, where the portfolio dipped by -6.89%. This extreme volatility underscored the importance of balancing riskier bets with more stable holdings.

The portfolio's beta of 1.23 further illustrates its higher sensitivity to market movements compared to the benchmark, which has a beta of 1. This means that my portfolio was 23%

more reactive to market changes than the index. While this exposed me to higher risks during downturns, it also positioned the portfolio to take advantage of bullish trends. For example, during Weeks 10 through 13, the portfolio benefitted from market momentum, outperforming the index in three of those weeks. This heightened sensitivity was largely driven by my allocation to growth-focused stocks like DUOL and CAVA, as well as other smaller, high-beta holdings.

In terms of risk-adjusted returns, the portfolio's Sharpe ratio of 61.35% was particularly rewarding to see. The Sharpe ratio measures how effectively returns were generated relative to the amount of risk taken, and my portfolio significantly outperformed the market index's 23.48% on this metric. This suggests that despite the higher volatility, my portfolio made good use of the risks I took. Similarly, the Treynor ratio of 8.03% (compared to the market's 0.42%) confirmed that I achieved higher returns per unit of market risk (as measured by beta). These metrics validate my strategy of actively managing the portfolio to maximize performance, even in a volatile environment.

Another highlight was the portfolio's alpha of 0.61%, which slightly edged out the market index's alpha of 0.51%. Alpha represents the ability to outperform the market after accounting for risk (beta). Achieving a positive alpha was encouraging, as it showed that my active management decisions—such as reallocating capital to higher-performing stocks—added value. However, I recognize that the alpha could have been even stronger had I mitigated early losses in the first half of the period.

The tracking error of 15.20% revealed just how much my portfolio's returns diverged from the market index. This was expected, given my active management approach and the distinct composition of my holdings. At the same time, the information ratio of 4.02 demonstrated that I was able to convert this active risk into substantial excess returns. This ratio is a key measure of how efficiently I managed the portfolio's deviation from the benchmark, and achieving a value well above 1 is a clear positive.

The portfolio's relatively low correlation coefficient of 0.2329506 with the market index reflected its unique composition and behavior. By including mid-cap and small-cap stocks, which often follow different trends than the overall market, I was able to reduce the portfolio's dependence on broad market movements. This differentiation, while increasing risk, provided opportunities to capitalize on specific growth stories within individual sectors.

Reflecting on these metrics, it's clear that my portfolio was a double-edged sword: while it carried higher risk and volatility, it also delivered commendable results during strong weeks, thanks to strategic stock selection and active management. Balancing these factors required careful attention to performance trends and a willingness to adapt my strategy as needed. The data captured in Table 6 serves as a valuable benchmark for evaluating the portfolio's strengths and areas for improvement moving forward.

Building on the my earlier broad overview of my portfolio's performance, it's important to now take a closer look at how the different asset classes within the portfolio—large-cap, mid-cap, and small-cap stocks—contributed to its overall trajectory. By analyzing the weekly returns for these categories and comparing them to the respective market indices, I can better understand where my strategy worked and where it fell short. Tables 7 and 8 will guide this discussion, providing key insights into the interplay between the portfolio's asset classes and the benchmarks.

Table 7: Weekly Portfolio Returns by Asset Class

Week	**Portfolio Stocks Yield (%)**	**Large Cap Yield (%)**	**Mid Cap Yield (%)**	**Small Cap Yield (%)**
Week 1	-4.26	-2.36	-3.68	-12.48
Week 2	2.78	-37.28	52.38	-48.47
Week 3	1.24	8.07	-0.60	-0.15
Week 4	24.14	44.67	45.98	-40.18
Week 5	-0.41	0.67	-0.46	-4.04
Week 6	1.51	2.87	0.89	0.97
Week 7	29.89	49.98	1.90	-0.45
Week 8	-0.83	-0.08	-0.27	-5.55
Week 9	49.90	56.03	-87.18	-96.61
Week 10	10.77	11.32	0.18	-47.69
Week 11	-5.30	-5.40	-3.32	-3.54
Week 12	2.21	11.09	-1.57	15.71
Week 13	-1.27	-1.35	0.31	6.46
Mean Return	**8.49**	**10.63**	**0.35**	**-18.15**

To begin, Table 7 highlights the portfolio's performance broken down by asset class. Large-cap stocks were a critical component, delivering a mean return of 10.63%. Their contribution was evident in weeks like Week 4 (44.67%) and Week 7 (49.98%), where key holdings such as DUOL and CAVA excelled. These returns provided a stabilizing force, countering some of the volatility seen in other segments. This out performance relative to the portfolio's mid-cap and small-cap stocks stressing the importance of large-cap stability in managing overall portfolio risk.

In contrast, mid-cap stocks displayed more erratic behavior, with a mean return of just 0.35%. Although Week 2 saw an impressive surge of 52.38%, subsequent weeks failed to sustain this momentum. For example, Weeks 9 (-87.18%) and 11 (-3.32%) demonstrated the challenges of relying on mid-cap stocks for consistent returns. This volatility reflects the dual nature of mid-cap investments—they can be powerful drivers of growth during favorable conditions but also significant sources of risk.

Small-cap stocks, meanwhile, presented the greatest challenge, with a mean return of -18.15%. Their performance was highly volatile, as evidenced by the dramatic -96.61% decline in Week 9. This stark under-performance, compared to the Small Cap ETF's (VB) mean return of 0.87%, highlights the difficulty of timing and managing small-cap exposure. While small caps are often included for their growth potential, their substantial downside risk became a liability in this portfolio, particularly during weeks of market uncertainty.

Table 8: Weekly Market Index by Asset Class

Week	**Total Market Index Yield (%)**	**VV (Large Cap ETF) (%)**	**VO (Mid Cap ETF) (%)**	**VB (Small Cap ETF) (%)**
Week 1	-2.05	-4.24	-3.55	-4.79
Week 2	1.40	3.57	3.25	3.82
Week 3	0.81	1.89	1.75	2.37
Week 4	0.22	0.26	0.58	0.38
Week 5	0.08	0.34	0.25	-0.19
Week 6	0.48	0.57	1.08	1.01
Week 7	0.87	1.05	1.38	1.41
Week 8	-1.08	-0.55	-1.93	-2.44
Week 9	-0.55	-1.32	-0.93	-0.10
Week 10	3.95	4.84	5.35	7.15
Week 11	-1.46	-2.02	-1.58	-2.70
Week 12	10.65	1.79	3.50	4.64
Week 13	0.45	0.49	0.73	0.77
Mean Return	**1.06**	**0.51**	**0.76**	**0.87**

Shifting focus to Table 8, we see how the broader market indices for each asset class behaved over the same period. Large-cap stocks, as represented by the Large Cap ETF (VV), maintained steady growth, averaging a return of 0.51%. Even in weeks where the portfolio's large-cap stocks stumbled, such as Week 2 (-37.28%), VV's return of 3.57% demonstrates the stability inherent in a diversified large-cap benchmark. This comparison reveals the trade-off between the portfolio's concentrated positions and the index's broader exposure—while the portfolio captured out-sized gains in strong weeks, it also bore the brunt of individual stock volatility.

The mid-cap and small-cap indices, represented by VO and VB, respectively, exhibited more balanced returns compared to the portfolio's mid-cap and small-cap stocks. For instance, VO recorded steady returns across most weeks, with a mean of 0.76%, while the portfolio's mid-caps struggled to achieve consistent performance. Similarly, VB's resilience in weeks like Week 9 (-0.10%) stands in sharp contrast to the portfolio's small-cap free-fall. These differences showcase the advantages of diversified indices in mitigating the risks associated with individual stock selection.

When examining the interplay between Tables 7 and 8, a clear narrative emerges. The portfolio's heavy reliance on high-volatility small caps and sporadic mid-cap performance often detracted from its overall returns, particularly during downturns. At the same time, its large-cap stocks outpaced the index during favorable periods, providing a critical buffer against losses. This duality reflects the challenges of active management—while it allows for the potential to outperform through strategic stock selection, it also introduces heightened risk and variability.

The correlation matrix in Table 9 builds on the narrative of the portfolio's duality by providing a more granular look at the relationships between individual stocks. While large-cap stocks served as a stabilizing force in the portfolio, the matrix highlights how high positive correlations, such as between CAVA and DUOL (93.51%) or AMZN and DUOL (88.26%), amplified the impact of shared market trends. These relationships underscore the concentrated nature of the portfolio's high-growth holdings, which, while delivering out-sized returns during favorable periods, also increased vulnerability to sector-specific risks.

Conversely, negative correlations, like those between CAVA and NOVA (-88.83%) or AMG and NOVA (-78.97%), highlight diversification opportunities that helped buffer the portfolio during downturns.

Table 9: Correlation Matrix of Portfolio Stocks

Stock	**AMG**	**AMZN**	**CAVA**	**HRMY**	**DUOL**	**JOBY**	**DNUT**	**LNW**	**SOUN**	**NOVA**
AMG	100.00%	54.18%	70.13%	-59.78%	68.64%	33.36%	-19.94%	-69.57%	31.32%	-78.97%
AMZN	54.18%	100.00%	87.52%	-37.12%	88.26%	72.27%	-53.14%	-27.43%	87.33%	-69.62%
CAVA	70.13%	87.52%	100.00%	-49.24%	93.51%	61.85%	-39.82%	-44.77%	72.63%	-88.83%
HRMY	-59.78%	-37.12%	-49.24%	100.00%	-48.10%	-35.07%	45.43%	60.10%	-37.17%	75.43%
DUOL	68.64%	88.26%	93.51%	-48.10%	100.00%	75.13%	-54.42%	-53.40%	76.67%	-80.79%
JOBY	33.36%	72.27%	61.85%	-35.07%	75.13%	100.00%	-63.90%	-26.39%	86.54%	-42.10%
DNUT	-19.94%	-53.14%	-39.82%	45.43%	-54.42%	-63.90%	100.00%	51.04%	-65.15%	39.37%
LNW	-69.57%	-27.43%	-44.77%	60.10%	-53.40%	-26.39%	51.04%	100.00%	-15.67%	64.83%
SOUN	31.32%	87.33%	72.63%	-37.17%	76.67%	86.54%	-65.15%	-15.67%	100.00%	-51.30%
NOVA	-78.97%	-69.62%	-88.83%	75.43%	-80.79%	-42.10%	39.37%	64.83%	-51.30%	100.00%

The table further illustrates how stocks with weaker correlations, such as LNW and SOUN (-15.67%), contribute to reducing portfolio volatility by behaving more independently of broader trends. These findings reinforce the importance of balancing high-volatility, high-growth stocks with less correlated or negatively correlated assets to enhance diversification. Incorporating this analysis alongside the earlier review of asset class performance adds depth to the understanding of the portfolio's construction and emphasizes the need for a more strategic approach to managing correlation risks while capitalizing on diversification benefits.

Looking back at my asset-class performance, it's clear that the portfolio's composition heavily influenced its overall results. While I am proud of the out-performance in large-cap stocks, the volatility in mid-caps and the steep losses in small caps are areas that require further refinement. This analysis reinforces the need for a more balanced and diversified approach in future portfolio strategies, especially when managing risk across varying market conditions.

4 Reflection and Lessons Learned

Reflecting on my portfolio's performance throughout this 13-week journey has been an enlightening experience, filled with valuable lessons that extend beyond just the numbers. While the process was challenging, it offered critical insights into the nuances of managing a portfolio, the importance of strategy, and the need for a disciplined approach to investing.

One of the most significant takeaways was the importance of conducting thorough research before selecting stocks. Early on, I realized that while large-cap companies are less likely to plummet drastically, they are also not guaranteed to grow significantly unless you catch them on the upswing after a rough patch or hold onto them for the long haul. My investments in DUOL and CAVA highlighted this, as these stocks outperformed during specific weeks, but they required timing and patience. The stability of large-cap stocks was a double-edged sword—they brought a sense of security but also demanded a longer-term horizon to unlock meaningful returns.

In contrast, mid-cap and small-cap stocks presented a different challenge altogether. Their volatility was undeniable, and while they could deliver outsized gains when picked correctly, they were just as likely to drag down performance if mishandled. My mid-cap holdings, for example, occasionally matched or exceeded market benchmarks, but their inconsistency often made them unreliable. Small caps, on the other hand, were particularly punishing, with extreme dips that reflected their high-risk nature. The key lesson here is that while these segments can be rewarding, they require a deep understanding of the market, strong conviction in the stocks selected, and a willingness to weather their ups and downs.

Another critical reflection is the challenge of achieving diversification. It's easy to gravitate toward stocks you like or companies you're familiar with, but this approach inherently limits the breadth of a portfolio. Effective diversification requires thinking beyond personal preferences and considering factors like future growth potential, market trends, and external influences. My concentrated investments in a few high-conviction stocks left me overexposed to specific risks, which hurt during market downturns. True diversification is not just about spreading investments across asset classes but also about balancing growth opportunities with stability.

As I managed my portfolio, I also realized the importance of understanding broader market trends and seasonal fluctuations. Stock performance is often influenced by cyclical factors or external events that can be anticipated with adequate research. Recognizing dips and peaks, understanding industry-specific cycles, and following macroeconomic indicators could have better informed my decisions. This level of awareness is essential for timing investments and avoiding reactionary moves during volatile periods.

Additionally, this experience reaffirmed that day trading is not for me. The constant need to monitor the market and make quick decisions felt unsustainable and ultimately detracted from my ability to make thoughtful, long-term investments. While some may thrive in this environment, I found that my strengths lie in a more deliberate approach, focusing on strategic allocation and long-term growth rather than chasing short-term gains.

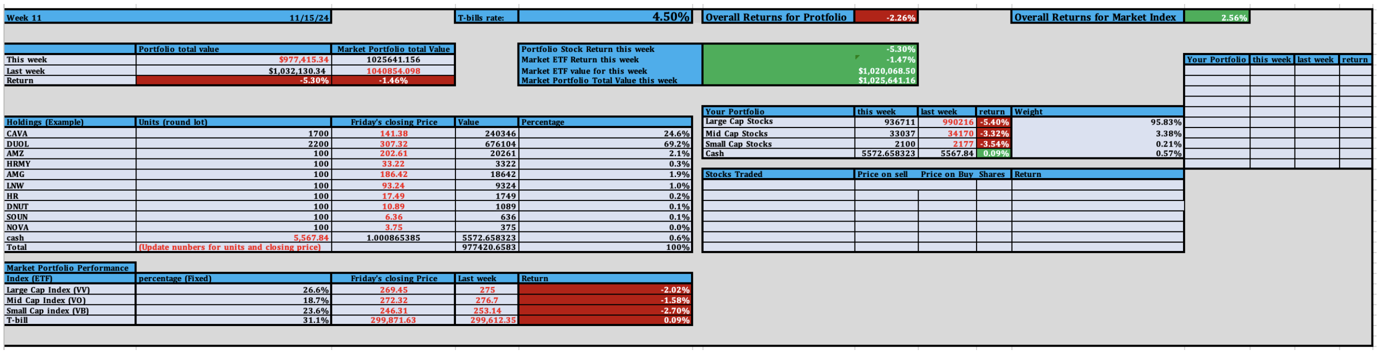
Looking forward, I plan to incorporate these lessons into my future investment strategies. I will prioritize research and due diligence, seek a better balance between high-risk and stable assets, and adopt a more structured approach to diversification. I also intend to pay closer attention to market trends, cycles, and broader economic factors to align my portfolio more closely with growth opportunities. Most importantly, I've learned to embrace the value of patience and discipline, recognizing that investing is a marathon, not a sprint.

This experience has been humbling but also deeply educational. By reflecting on my successes and missteps, I'm confident that I can build a more resilient and well-rounded portfolio in the future—one that reflects not just my goals but also the lessons learned from this journey.

5 Appendix

Table 10: Stock Names and Corresponding Betas

Stock Name	**Beta**
ABBV (AbbVie Inc.)	0.61
ADBE (Adobe Inc.)	1.30
JPM (JPMorgan Chase & Co.)	1.09
RCL (Royal Caribbean Cruises Ltd.)	2.60
CAVA (CAVA Group, Inc.)	1.76
AMZN (Amazon.com, Inc.)	1.15
RKLB (Rocket Lab USA, Inc.)	1.30
DKNG (DraftKings Inc.)	1.82
DUOL (Duolingo, Inc.)	1.17
COHR (Coherent Corp.)	1.65
AOS (A. O. Smith Corporation)	0.79
AMG (Affiliated Managers Group, Inc.)	1.19
FYBR (Frontier Communications Parent, Inc.)	1.11
LNW (Light & Wonder, Inc.)	1.75
HR (Healthcare Realty Trust Incorporated)	0.76
OLED (Universal Display Corporation)	1.43
SOUN (SoundHound AI, Inc.)	3.04
JOBY (Joby Aviation, Inc.)	1.97
HRMY (Harmony Biosciences Holdings, Inc.)	0.77
DNUT (Krispy Kreme, Inc.)	1.39
CGEM (Cullinan Therapeutics, Inc.)	-0.12
CING (Cingulate Inc.)	1.62
NOVA (Sunnova Energy International Inc.)	2.26
TOVX (Theriva Biologics, Inc.)	1.34
SAFE (Safehold Inc.)	0.90
SEZL (Sezzle Inc.)	2.78



Week 11	11/15/24	T-bills rate:	4.50%	Overall Returns for Protfolio	-2.26%	Overall Returns for Market Index	2.56%

	Portfolio total value	Market Portfolio total Value
This week	$977,415.34	1025641.156
Last week	$1,032,130.34	1040854.098
Return	-5.30%	-1.46%

Portfolio Stock Return this week	-5.30%
Market ETF Return this week	-1.47%
Market ETF value for this week	$1,020,068.50
Market Portfolio Total Value this week	$1,025,641.16

Holdings (Example)	Units (round lot)	Friday's closing Price	Value	Percentage
CAVA	1700	141.38	240346	24.6%
DUOL	2200	307.32	676104	69.2%
AMZ	100	202.61	20261	2.1%
HRMY	100	33.22	3322	0.3%
AMG	100	186.42	18642	1.9%
LNW	100	93.24	9324	1.0%
HR	100	17.49	1749	0.2%
DNUT	100	10.89	1089	0.1%
SOUN	100	6.36	636	0.1%
NOVA	100	3.75	375	0.0%
cash	5,567.84	1.000865385	5572.658323	0.6%
Total	(Update nunbers for units and closing price)		977420.6583	100%

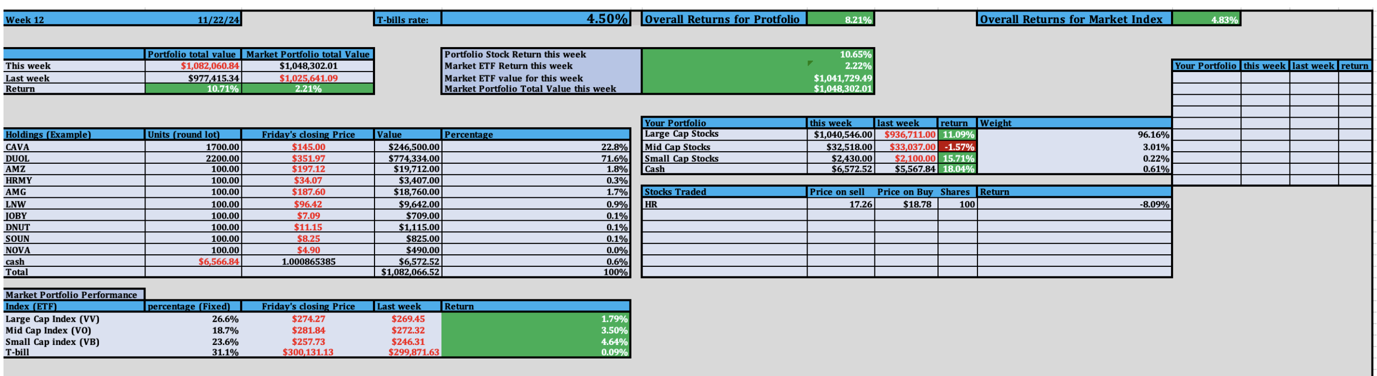
Your Portfolio	this week	last week	return	Weight
Large Cap Stocks	936711	990216	-5.40%	95.83%
Mid Cap Stocks	33037	34170	-3.32%	3.38%
Small Cap Stocks	2100	2177	-3.54%	0.21%
Cash	5572.658323	5567.84	0.09%	0.57%

Stocks Traded	Price on sell	Price on Buy	Shares	Return

Your Portfolio	this week	last week	return

Market Portfolio Performance				
Index (ETF)	percentage (Fixed)	Friday's closing Price	Last week	Return
Large Cap Index (VV)	26.6%	269.45	275	-2.02%
Mid Cap Index (VO)	18.7%	272.32	276.7	-1.58%
Small Cap index (VB)	23.6%	246.31	253.14	-2.70%
T-bill	31.1%	299,871.63	299,612.35	0.09%

Figure 2: Week 11 Portfolio Overview



Week 12	11/22/24	T-bills rate:	4.50%	Overall Returns for Protfolio	8.21%	Overall Returns for Market Index	4.83%

	Portfolio total value	Market Portfolio total Value
This week	$1,082,060.84	$1,048,302.01
Last week	$977,415.34	$1,025,641.09
Return	10.71%	2.21%

Portfolio Stock Return this week	10.65%
Market ETF Return this week	2.22%
Market ETF value for this week	$1,041,729.49
Market Portfolio Total Value this week	$1,048,302.01

Holdings (Example)	Units (round lot)	Friday's closing Price	Value	Percentage
CAVA	1700.00	$145.00	$246,500.00	22.8%
DUOL	2200.00	$351.97	$774,334.00	71.6%
AMZ	100.00	$197.12	$19,712.00	1.8%
HRMY	100.00	$34.07	$3,407.00	0.3%
AMG	100.00	$187.60	$18,760.00	1.7%
LNW	100.00	$96.42	$9,642.00	0.9%
JOBY	100.00	$7.09	$709.00	0.1%
DNUT	100.00	$11.15	$1,115.00	0.1%
SOUN	100.00	$8.25	$825.00	0.1%
NOVA	100.00	$4.90	$490.00	0.0%
cash	$6,566.84	1.000865385	$6,572.52	0.6%
Total			$1,082,066.52	100%

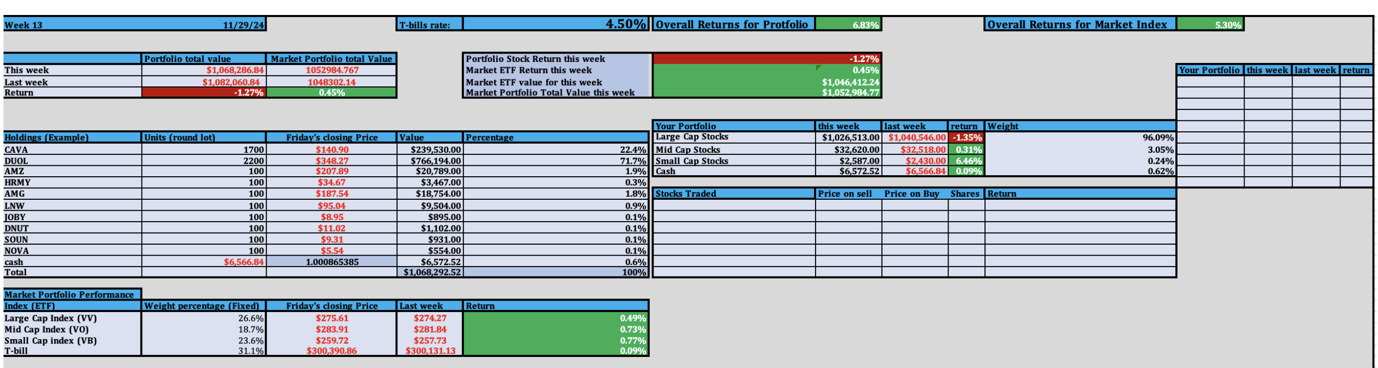
Your Portfolio	this week	last week	return	Weight
Large Cap Stocks	$1,040,546.00	$936,711.00	11.09%	96.16%
Mid Cap Stocks	$32,518.00	$33,037.00	-1.57%	3.01%
Small Cap Stocks	$2,430.00	$2,100.00	15.71%	0.22%
Cash	$6,572.52	$5,567.84	18.04%	0.61%

Stocks Traded	Price on sell	Price on Buy	Shares	Return
HR	17.26	$18.78	100	-8.09%

Your Portfolio	this week	last week	return

Market Portfolio Performance				
Index (ETF)	percentage (Fixed)	Friday's closing Price	Last week	Return
Large Cap Index (VV)	26.6%	$274.27	$269.45	1.79%
Mid Cap Index (VO)	18.7%	$281.84	$272.32	3.50%
Small Cap index (VB)	23.6%	$257.73	$246.31	4.64%
T-bill	31.1%	$300,131.13	$299,871.63	0.09%

Figure 3: Week 12 Portfolio Overview



Week 13	11/29/24	T-bills rate:	4.50%	Overall Returns for Protfolio	6.83%	Overall Returns for Market Index	5.30%

	Portfolio total value	Market Portfolio total Value
This week	$1,068,286.84	1052984.767
Last week	$1,082,060.84	1048302.14
Return	-1.27%	0.45%

Portfolio Stock Return this week	-1.27%
Market ETF Return this week	0.45%
Market ETF value for this week	$1,046,412.24
Market Portfolio Total Value this week	$1,052,984.77

Holdings (Example)	Units (round lot)	Friday's closing Price	Value	Percentage
CAVA	1700	$140.90	$239,530.00	22.4%
DUOL	2200	$348.27	$766,194.00	71.7%
AMZ	100	$207.89	$20,789.00	1.9%
HRMY	100	$34.67	$3,467.00	0.3%
AMG	100	$187.54	$18,754.00	1.8%
LNW	100	$95.04	$9,504.00	0.9%
JOBY	100	$8.95	$895.00	0.1%
DNUT	100	$11.02	$1,102.00	0.1%
SOUN	100	$9.31	$931.00	0.1%
NOVA	100	$5.54	$554.00	0.1%
cash	$6,566.84	1.000865385	$6,572.52	0.6%
Total			$1,068,292.52	100%

Your Portfolio	this week	last week	return	Weight
Large Cap Stocks	$1,026,513.00	$1,040,546.00	-1.35%	96.09%
Mid Cap Stocks	$32,620.00	$32,518.00	0.31%	3.05%
Small Cap Stocks	$2,587.00	$2,430.00	6.46%	0.24%
Cash	$6,572.52	$6,566.84	0.09%	0.62%

Stocks Traded	Price on sell	Price on Buy	Shares	Return

Your Portfolio	this week	last week	return

Market Portfolio Performance				
Index (ETF)	Weight percentage (Fixed)	Friday's closing Price	Last week	Return
Large Cap Index (VV)	26.6%	$275.61	$274.27	0.49%
Mid Cap Index (VO)	18.7%	$283.91	$281.84	0.73%
Small Cap index (VB)	23.6%	$259.72	$257.73	0.77%
T-bill	31.1%	$300,390.86	$300,131.13	0.09%

Figure 4: Week 13 Portfolio Overview

Table 11: Covariance Matrix of Portfolio Stocks

Stock	AMG	AMZN	CAVA	HRMY	DUOL	JOBY	DNUT	LNW	SOUN	NOVA
AMG	0.10%	0.02%	-0.02%	-0.02%	0.03%	0.04%	0.03%	0.01%	-0.11%	0.15%
AMZN	0.02%	0.17%	0.08%	0.10%	0.10%	0.03%	-0.01%	0.16%	0.52%	-0.15%
CAVA	-0.02%	0.08%	0.20%	0.13%	0.17%	-0.04%	0.04%	0.21%	0.56%	-0.51%
HRMY	-0.02%	0.10%	0.13%	0.29%	0.19%	0.09%	0.06%	0.14%	0.44%	-0.03%
DUOL	0.03%	0.10%	0.17%	0.19%	0.44%	0.09%	0.05%	0.22%	0.64%	-0.03%
JOBY	0.04%	0.03%	-0.04%	0.09%	0.09%	1.17%	0.00%	0.10%	0.47%	0.80%
DNUT	0.03%	-0.01%	0.04%	0.06%	0.05%	0.00%	0.14%	0.13%	-0.12%	0.07%
LNW	0.01%	0.16%	0.21%	0.14%	0.22%	0.10%	0.13%	0.42%	0.72%	-0.29%
SOUN	-0.11%	0.52%	0.56%	0.44%	0.64%	0.47%	-0.12%	0.72%	4.06%	-1.01%
NOVA	0.15%	-0.15%	-0.51%	-0.03%	-0.03%	0.80%	0.07%	-0.29%	-1.01%	3.62%

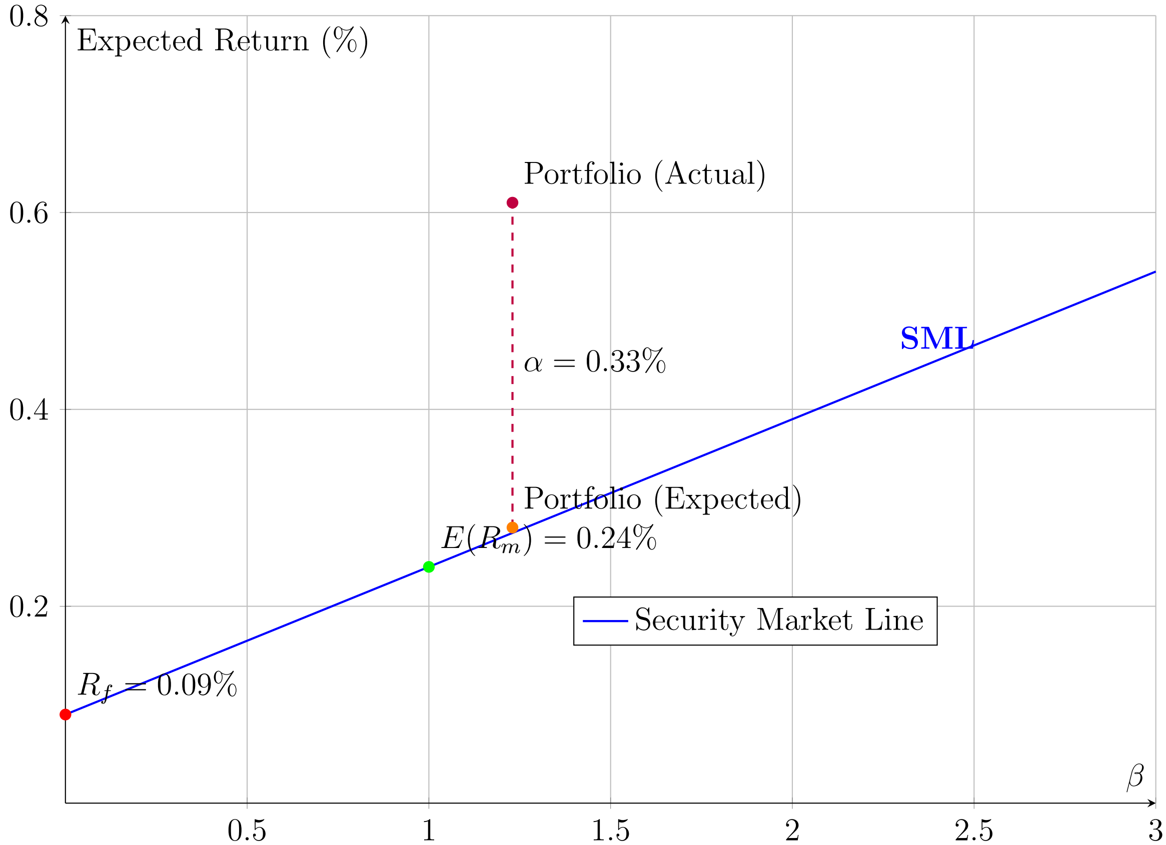


Figure 5: Security Market Line (SML) Showing Portfolio and Alpha