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FINANCE & FINANCIAL TECHNOLOGIES

Final Project Work

LVMH Moët Hennessy Louis Vuitton
Salvatore Ferragamo S.p.A.

GROUP 6

Eleonora Di Mario, Giulia Formiconi
Giulia Macis, Martina Serandrei

1. INTRODUCTION

LVMH Moët Hennessy Louis Vuitton (LVMH) and Salvatore Ferragamo S.p.A. are leading players in the luxury goods industry, each with distinctive strategies and market positions that underscore their contributions to the sector.

LVMH, under the leadership of Chairman and CEO Bernard Arnault, stands as a powerhouse in the luxury market. The company's diverse portfolio, which includes fashion and leather goods, perfumes and cosmetics, watches, jewelry, and wines and spirits, plays a critical role in its resilience and success. This diversification allows LVMH to meet a wide array of consumer preferences and needs.

The conglomerate's broad shareholder base supports its strategic acquisitions and expansive growth strategies, providing the financial stability and flexibility needed to thrive in a competitive market. Recently, LVMH's performance has been particularly impressive, with a 10% surge in sales in the last quarter of 2023, exceeding analyst forecasts and boosting its shares significantly on the Euronext Paris Eurolist.

Ferragamo, a major Italian luxury goods company, designs, produces, and sells high-end items for men and women across multiple regions, including Europe, North America, and Asia-Pacific. Predominantly owned by the Ferragamo family, the company remains deeply committed to its founding values of quality and luxury. This family-led governance model sets it apart in a sector often dominated by external investors and corporate conglomerates.

Currently, Ferragamo is undergoing a significant rebranding and restructuring, as evidenced by the appointment of a new CEO Marco Gobbetti in January 2022. Mr. Gobbetti, who brings experience from Burberry and LVMH, is steering the company toward revitalization, aiming to double revenues by 2026 despite facing challenges such as the economic downturn and COVID-19 restrictions in China. With a focus on digital expansion and engaging a younger demographic, Ferragamo is poised for a strategic pivot toward growth and market adaptation. Ferragamo is publicly traded on the Borsa Italiana. It closed 2023 with revenues down by 7.6%, totaling €1.1 billion, which reflects the impact of a sluggish global economy.

While LVMH and Ferragamo both strive for excellence, quality, and luxury appeal, LVMH's diversified structure enables it to operate across various luxury segments. On the other hand, Salvatore Ferragamo focuses on Italian heritage and craftsmanship, catering to a market segment that values tradition and artisanal quality.

2. VALUATION OF STOCKS AND BONDS

The purpose of stock and bond valuation is to give investors an estimation of the fair market value of a company's securities; to perform well-informed investment choices.

We utilize several methodologies for valuing stock prices, including the Discounted Dividend Method (DDM), the Free Cash Flow Method (FCF), and the Peer Comparable Method. For a detailed walkthrough of our valuation techniques, refer to the Annexes section, where our calculations are thoroughly documented.

2.1. CAPITAL ASSET PRICING MODEL CALCULATION (see Appendix 7.1)

To apply the previously mentioned methods, we must determine the cost of equity, which is the appropriate discount rate at which we will discount our data to find the fair price, and then compare it with the current stock price on the market. To achieve this, we apply the CAPM model, defined as the sum of a risk-free rate and a portion of the equity risk-premium, adjusted to the beta value.

First, we select the 10-year German government bond yield ($r_f = 2.29\%$) as our risk-free rate, given Germany's strong economic stability. This choice aligns with the long-term nature of equity investments and provides a reliable benchmark for valuing a company's stock.

Secondly, we found the market risk premium, which represents the expected return of holding a risky market portfolio rather than a risk-free asset. We sourced this value from Aswath Damodaran's 'Country Default Spreads and Risk Premiums' section respectively regarding France and Italy, where for LVMH is listed as 5.32% and for Ferragamo as 7.8%.

Thirdly, we decided to take the value of the beta[1], which represents the measure of systematic risk of a security compared to the market. Finally, we found everything necessary to calculate the cost of equity, defined by the CAPM formula as $\boldsymbol{r = r_f + \beta \times (r_m - r_f)}$.

For LVMH's the value of r is 7.57%. This value seems to be fair, as it is very close to the 30-year historical average return of the stock market ($= 7.2\%$). We can consider our estimation accurate. For Ferragamo, traded on the Italian Market, using also the CAPM model we found out that r is equal to 12%, which compared to the historical average return ($= 4.5\%$) is significant higher. This could be derived from the higher risk carried in investing in the company.

2.2 GROWTH CALCULATION (see Appendix 7.1)

In the next phase of the stock valuation, we need to estimate the growth rate (g) for a perpetuity. To achieve this, we apply the Fisher Equation know as $(1 + i) = (1 + r) \times (1 + \pi)$, which correlates the nominal (i) and real (r) interest rates under the influence of inflation (π). In this way we are predicting the expected growth in nominal dividends. For the real growth rate, we consider two scenarios: an optimistic one 3%, reflecting LVMH's strong growth potential, and a more conservative one 2%, which accounts for current market challenges the company might face. Whereas the inflation rate is around 2%, value targeted by the bank as future aim. This approach allows us to project a total growth rate between 4% and 5%. We will evaluate the stock price at both ends of this range to determine the most accurate valuation for LVMH.

Whereas, for Ferragamo we combine the expected inflation rate of 2% with a conservative real growth rate. Given Ferragamo's recent challenges and its current phase of restructuring, we have chosen a cautious real growth rate of 1%. This yields a total estimated growth rate of 3%, which is prudent and reflective of the company's current market conditions and outlook.

2.3 DIVIDEND DISCOUNT MODEL CALCULATION (see Appendix 7.2)

The Discounted Dividend Model estimates a stock's fair value by adding up future dividends that investors expect to get and adjusting them to their present value using a discount rate. For LVMH, which pays dividends twice a year, the annual dividend is the total of these two payments. They are enough to employ the DDM using the previously calculated cost of equity and growth rates. Due to the non-payment of the second dividend of 2024 year, we decided to use the annual dividend value forecasted by Bloomberg, instead of calculating it manually.

So, we apply the growing perpetuity formula $P_0 = {}^{DIV_1}\!/_{(r-g)}$.

However, using this model we are assuming that dividends will grow indefinitely at a constant rate, and this is a strong assumption may result in a less accurate valuation. An alternative approach could be to use a **multi-stage DDM**. This method involves discounting future dividend estimates to their present value and assumes that the dividend for 2027[2] will continue to grow at a constant rate indefinitely.

The *Table 1* outlines various methods used to assess LVMH's stock price, clearly showing that these models tend to underestimate the stock value, which stands around €800. The one-stage model poorly performs respect to the multi-stage, due to its rigid assumptions regarding dividend growth. Despite utilizing the DDM, we already expected that its effectiveness in valuing LVMH's stock was limited due to the company's relatively small dividend payouts, failing to capture the true worth of LVMH shares.

When applying the DDM to Ferragamo, it appears that the calculated stock prices significantly undervalue the company compared to its current market price, as we expected, since Ferragamo not only pays very low annual dividend, but it also didn't pay any in 2020 and 2021. This low dividend rate is directly influencing the outcomes of the DDM, leading to a substantial discrepancy between the model's valuation (=€1.06) and the stock's actual market price (=€11.1). Even when employing a more sophisticated approach, like the multi-staged DDM, the valuation only modestly increases to about €2.45. Consequently, a valuation approach based on comparable might be more appropriate for our analysis since it involves market values.

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[1] Retrieved from Yahoo finance.

[2] The last year for which dividends are forecasted on Bloomberg.

2.4 DIVIDEND FREE CASH-FLOW METHOD (see Appendix 7.3)

The Discounted Free Cash Flow (DCF) is a common method used to calculate a company's equity value, specifically aiming to calculate the fair price per share (PPS) based on future free cash-flows. It consists in estimating future free cash flows of the firm and discounting them to their present value using an appropriate rate. We maintained consistent growth assumptions across both the DDM and DCF methods, anticipating convergence over the long term. On Bloomberg we retrieved the estimated future free cash flows *(Table 2 and Table 3*), from 2024 to 2027. These projected cash flows are then discounted using a consistent growth assumption and the same cost of equity as used in prior models to ensure comparability. With the discount factors and our perpetual growth rate, we found the PV of Estimation Horizon FCF over the three years also adding the terminal value, calculated as a perpetuity. In this way we calculated what is called the Enterprise value. To obtain the value of the equity, we then subtracted the Net Debt. Finally, by dividing the equity by the number of shares outstanding we got the final price per share.

For LVHM, the Price is 1,568€, significantly above the current price of its shares, which is around 800€, meaning that the method significantly overestimates the price, and therefore it is not suitable for our evaluation. While for Ferragamo (Table 3), this approach is more suitable than the DDM given its sporadic dividend payments over the past five years, with no dividends paid during the two years affected by COVID-19. The DCF model gives a fair price of €4.55 for Ferragamo, still a little low compared to the real stock price.

2.5 PEERS COMPARISION (See Appendix 7.4)

When financial analysts need to value a business, they often start by identifying a sample of similar firms as potential comparable/multiples/peers, that operate within the same industry as our target one. They see what the business would be worth if it traded at the comparable' price–earnings or price-to-book value or dividend yield ratios. This valuation approach is called valuation by comparable.

In our analysis, it should be the most accurate since it takes in considerations market values.

For LVMH *(Table 4)* we chose Kering SA, Hermès International Société en commandite par actions, Compagnie Financière Richemont SA, Christian Dior SE, and Burberry Group plc.

For Ferragamo *(Table 5)*, we considered Brunello Cuccinelli S.p.A, Prada S.p.A, Tod's S.p.A and Capri Holdings Limited.

Our findings suggest that for both firms, the method involving the P/E yields the most suitable stock price, probably because of the low dispersion of the multiples' P/E values.

On the other hand, the P/B method tends to overestimate the stock price, as the P/B values of the peers are more disperse, since it's a value that also depends on the country of operation.

For LVMH this observation can be attributed to Burberry's Price to Book (P/B) ratio, which is considerably higher than that of its peers. This discrepancy may skew the average P/B ratio, potentially distorting the final stock price estimation. To address this, we replicated the analysis excluding Burberry to ensure a more accurate valuation, in fact the price is fairer at €863.

For the same reason, for Ferragamo, we removed Brunello Cuccinelli from our comparison, which had a high P/B ratio, and the adjusted valuation improved to €11.77.

2.6 BETA CALCULATION (see Appendix 7.5)

Further in our analysis, we computed manually the monthly β over a 5-year period (2019-2024) by dividing the covariance between the stock returns and the market return[3] by the variance of the latter. We found that LVMH's β is 1.033, very close to the one sourced from Yahoo Finance (=0.99). Our result suggests that its stock price moves in line with the market, carrying a similar risk. Investors can expect a volatility that is slightly less the one on the market, which is usually considered a moderate risk. The company's stock might not offer a very high return, but it also won't drop as much during a market downturn.

On the other hand, based on our analysis Ferragamo has a β of 0.42. This latter is much lower respect to the one reported by Yahoo Finance with a value of 1.25. This huge discrepancy can be derived from

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[3] LVMH's relevant market is the French stock market and the CAC 40 (Cotation Assistée en Continu) is benchmark index which reflects the overall performance of the French stock market.

the market index[4] used as a benchmark in our calculation. To discuss the risk reported by beta we decided to consider the one from Yahoo Finance, because it uses a methodology that it is standard across the industry. Ferragamo's beta is more volatile respect to the market, meaning that is subjected to greater fluctuations. This high volatility represents an opportunity for higher return during positive economic conditions but carries increased risk (meaning a greater loss) in the negative one. However, if we had to consider the first one calculated manually, we would have that it is a lower risk security with respect to LVMH but, at the same time, offers lower potential returns.

2.7 BOND VALUATION (see Appendix 7.6)

FOR LVMH: For this section we have chosen one of the bonds issued by LVMH, and we have calculated its price to see if it's fair. The bond chosen was issued in September 2023, and reaches maturity in 2033. We started by evaluating the appropriate yield to maturity (the overall interest rate earned by an investor who buys a bond at the market price and holds it until maturity), by summing the 10-year German Bund rate (2.29%) to the credit spread relative to the bond rating, AA- in our case, (0.82%), resulting in a YTM of 3.1%.

Then the bond price was calculated by discounting each of the bond's future cash flows, which include annual coupon payments of 3.5 and the principal amount (103.5) at the residual maturity (9 years). The estimated price came out to approximately €103.09, which is slightly above the Bloomberg reported price of €102.7. Overall, the estimation closely aligns with market values, indicating that the bond is priced fairly in relation to its risk and return characteristics. This type of valuation could be fundamental for investors looking to assess potential investments and for companies like LVMH to understand how their financial instruments are perceived in the market.

FOR FERRAGAMO: Since the company does not have any active bonds, in our financial analysis project, we have conducted a valuation of a hypothetical bond issued by Salvatore Ferragamo, with 10-year maturity and a 3.5% coupon rate, theoretically issued in 2023 (residual maturity of 9 years). We estimated the yield to maturity (YTM) from the firm's cost of debt, calculated by dividing the interest expenses by the total debt. This approach yielded a YTM of approximately 2.66%.

The valuation process involved discounting the bond's future cash flows of 3.5 annual coupons and the final principal payment of 103.5, using this YTM. The calculated bond price of approximately €106.615 suggests that, if issued, this bond would trade at a premium over its par value.

3. CAPITAL STRUCTURE AND WACC (see Appendix 7.7)

The capital structure of a firm involves financing its assets through a combination of equity, debt, and hybrid securities. Understanding the capital structure is fundamental for any firm because it gives some insight into the risk and return of the company's operations.

By analyzing market values for debt and equity – reflecting the market's valuation of the companies – we calculate the **market capitalization** by multiplying the current market price per share by the total number of shares outstanding. The obtained values align with those reported by Bloomberg to represent market value of equity.

Summing the market cap and the net debt we get the enterprise value (V).

From this, we determined the capital structure ratios, specifically D/V (net debt to value) and E/V (equity to value), revealing that LVMH is predominantly equity-financed with a 93.6% E/V ratio *(Figure 1)*, whereas Ferragamo's ratio stands at 75.4% *(Figure 2)*. We also calculated the Weighted Average Cost of Capital (WACC), which is the combined average rate of return demanded by shareholders and debt holders, adjusted for their respective shares in the financing mix.

Using the following formula: $\boldsymbol{WACC = \left(\frac{E}{V}\right) \times R_e + \left(\frac{D}{V}\right) \times R_d \times (1 - T_c)}$, where Re is the cost of equity calculated previously, Rd is the cost of debt, the YTM of the bonds calculated previously and Tc is the corporate or marginal tax rate relative to the market the companies operate into.

LVMH shows a WACC of 7.088%, and Ferragamo at 9.617%, indicating both firms effectively utilize their capital to generate returns above their respective costs of capital. In both cases the WACC is higher

[4] To calculate the beta of Salvatore Ferragamo S.p.A. listed on the Milan Stock Exchange (Borsa Italiana), we consider the market returns of a broad market index that for Italy is the FTSE MIB Index.

than the cost of capital and lower of the cost of equity, as we expected because the cost of equity is higher than the cost of debt (since equity is riskier) and they are included into the WACC calculation, therefore the overall WACC typically ends up being in between the two. We also noted that Ferragamo shows a higher WACC than LVMH, even if Ferragamo has a higher percentage of debt (that should decrease the WACC), but it is probably because Ferragamo is considered riskier.

4. PORTFOLIO MANAGEMENT and RISK-RETURN ANALYSIS (see Appendix 7.8)

In this section we will look at portfolio optimization, which remains crucial even when considering just two companies, as it helps manage risk and enhance the overall risk-return relation of an investment.
In our analysis of LVMH and Ferragamo given that they both are luxury brands, we expected a higher degree of correlation compared to pairing a luxury brand with a company from a completely different sector. In fact, analyzing this latter we found a correlation of 0.59 *(Figure 3)* which is considered strong; however, diversification can still be worthwhile if the correlation isn't perfect, therefore, we proceeded to build our portfolio. First, we calculated the returns over the analyzed period, and we annualized them. From the results we observed that Ferragamo has an average negative return of -0.04780, highlighting underperformance in comparison to LVMH. Both companies, however, have positive covariance, meaning that in the market they move together. This relationship might suggest a reduced potential for diversification between these two stocks. Additionally, the variance, and hence the volatility, of Ferragamo's returns is higher than that of LVMH, which marks Ferragamo as the riskier investment.
Given these insights, we defined functions to calculate portfolio performance and using simulations of random portfolio weights to identify an optimal portfolio configuration, understanding further the interplay between risk and return for these stocks.
To identify an optimal portfolio configuration, we tried 1000 different combinations of weights and arranged them in a data frame. This gave us two optimal portfolios *(Figure 4)*, the one with the highest return, 27%, and the higher volatility of 29%, is 100% LVMH allocated, excluding Ferragamo.
While if we take into consideration the minimum variance portfolio with a volatility of the 28% and a return of 18%, the allocation is different with 74% invested in LVMH and 26% in Ferragamo. As a matter of fact, our analysis revealed that the optimal Maximum Sharpe Ratio portfolio consists entirely of LVMH shares. Introducing Ferragamo, as seen in the Minimum Volatility Portfolio, slightly reduces volatility but significantly decreases returns. To better visualize the risk-return relation we plotted the efficient frontier and got some interesting results, in fact figure *(Figure 5)* is upside down due to the fact that Ferragamo's returns are significantly volatile, often showing negative values which suggest losses. To further explore these findings, we constructed an equally balanced portfolio between LVMH and Ferragamo. This approach will help us assess the effects of a balanced allocation on the overall risk and return dynamics of the portfolio.
Our analysis of the 50/50 portfolio *(Figure 6)* revealed an expected annual return of 10.88%, which is lower than LVMH's historical performance but higher than Ferragamo's. This blended return moderates the high returns of LVMH (26.53%) with the lower and negative performance of Ferragamo (-4.78%). The portfolio's annual volatility stands at 29.03%, aligning closely with LVMH's volatility (29.16%) and is lower than Ferragamo's (35.78%), indicating that while LVMH introduces some risk mitigation, the inclusion of Ferragamo does not substantially reduce volatility. All these insights can be simply verified on the plotted risk-return graph *(Figure 7)* which shows that the risk-return trade-off of this combined portfolio results in a much lower return compared to investing solely in LVMH, with a similar risk level. Given these findings, an investor might prefer allocating entirely to LVMH, considering it offers a higher return for a comparable risk. Moving on, since Ferragamo presented mostly negative returns for the last five years, we have considered the returns estimated previously through the CAPM. So, the cost of equity respectively for LVMH and Ferragamo stocks are 7.57% and 12%. Then, we conduct an analysis of the new portfolio *(Figure 8),* observing a completely different situation. We can see that returns of both portfolios decreased importantly, however the volatility remained similar to the old one. The Sharpe ratio of both the Maximum Sharpe Ratio (MSR) and Minimum Volatility (MinVol) portfolios, decreased significantly. Also, the risk-adjusted returns of the portfolios declined after incorporating

CAPM-adjusted expected returns. We can say that the risk taken on by the portfolios may not be adequately compensated by the expected returns estimated using CAPM.

5. DIVIDEND POLICY

The Dividend Policy of a firm has a huge impact on a company's stock price and how investors view the company.

Considering our companies, LVMH and Ferragamo, the dividend policy corresponds to a strategy where reinvestment in the company over high dividend payouts is prioritized. For this reason, they are classified as growth firms, which typically capitalize on opportunities to expand and innovate. Dividends issued by these kinds of firms are usually smaller or less frequent compared to more mature, income-oriented companies. LVMH's dividend policy, as reflected in its recent financial history, shows a tendency to adjust payouts based on prevailing economic conditions and internal cash flow management. LVMH's dividend was reduced during the economic downturn caused by the COVID-19 pandemic in 2020, followed by a constant increase in the next years as the market conditions improved. Dividends are prospected to slowly grow even after 2024, allowing LVMH to retain more capital for growth initiatives, maintain financial flexibility, and signal financial health and confidence to the market. Alongside an increase in dividends paid, starting from 2021 LVMH is enacting a strong stock repurchase, an approach that is increasing the share price significantly.

Ferragamo's dividend policy reflects a growth-oriented strategy and aware capital management as well. The company has adjusted its dividend payments over time to maintain financial flexibility and fund strategic growth initiatives. After the pandemic, as the majority of firms, Ferragamo faced some financial struggles and didn't manage to pay dividends in 2020 and 2021. However, since 2022 the company sent its first signal of growth, by paying a dividend of 0.34, value that has decreased over the years but that it is prospected to grow in the future (from 2024), even if at a slow pace, signaling a gradual return to financial stability and confidence in its long-term growth prospects.

In terms of stock buyback, Ferragamo has repurchased shares during periods of financial strength, as seen with substantial buybacks in 2021 and a peak activity in 2022, years in which the stock price reached 20€.

The absence of repurchases in 2020 and 2023 aligns with more cautious capital management during less favorable financial periods, while buybacks in 2022, have helped stabilize EPS Ferragamo's approach to managing its debt conservatively, without significant increases even during extensive repurchase activities, reflects a commitment to financial stability and strategic flexibility. This approach clearly signals that Ferragamo is undergoing a rebuilding phase, aiming to support long-term growth and shareholder value in a volatile market environment.

6. ANNEXES

6.1 TABLES

	perpetuity	multi-staged
price with g=4%	397.427847	516.191153
price with g=5%	552.223226	701.412742

Table 1

	Free Cash Flow
2020	58521000.0
2021	331642000.0
2022	211209000.0
2023	45762000.0

Table 2 (Ferragamo)

	Free Cash Flow
2020-12-31	8433000000.0
2021-12-31	15392000000.0
2022-12-31	12753000000.0
2023-12-31	10596000000.0

Table 3 (LVMH)

	P/B	DivYield	EPS	P/E	StockPrice
MC.PA	6.522967	0.0163	30.35	26.253706	NaN
KER.PA	2.790536	0.0413	24.38	14.204266	346.299988
RMS.PA	15.915230	0.0065	41.06	56.259132	2310.000000
CFR.SW	3.834791	0.0196	6.67	19.070463	127.199997
CDI.PA	6.243610	0.0175	34.90	21.346704	745.000000
BRBY.L	383.405100	0.0555	1.20	9.645833	1157.500000

Table 4

	P/B	DivYield	EPS	P/E	StockPrice
SFER.MI	2.073675	0.0110	0.23	39.282608	NaN
BC.MI	14.760658	0.0094	2.17	44.193546	95.900002
PRP.F	4.500664	0.0202	NaN	NaN	6.778000
TOD.MI	1.307198	NaN	NaN	NaN	43.080002
CPRI	2.281936	NaN	4.37	8.686499	37.959999

Table 5

6.2 FIGURES

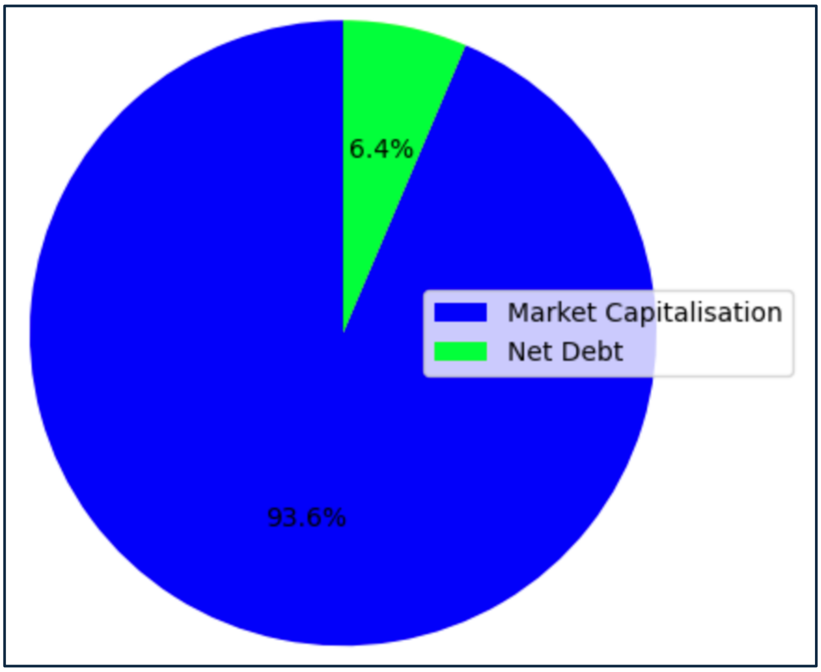

Figure 1

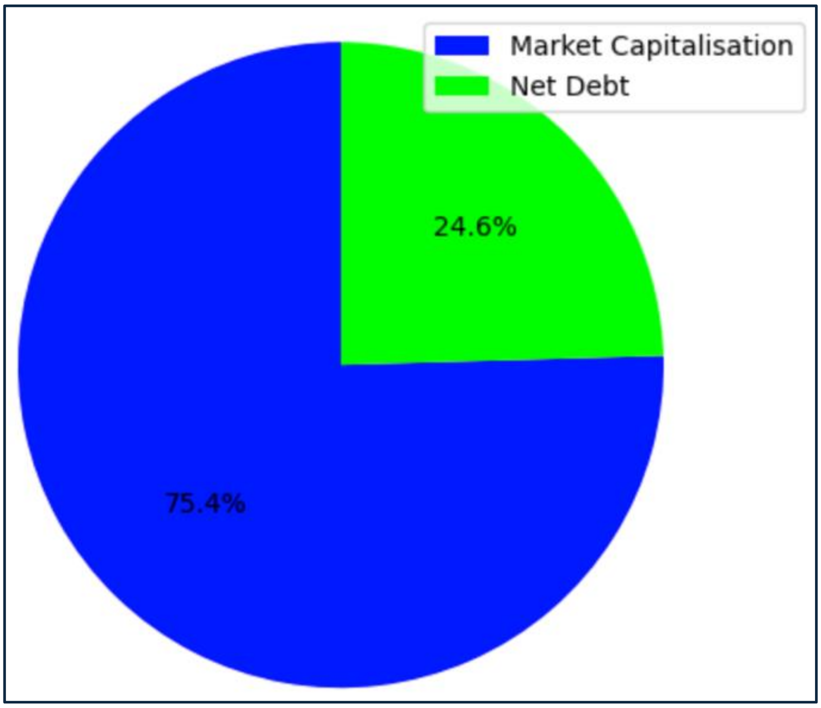

Figure 2

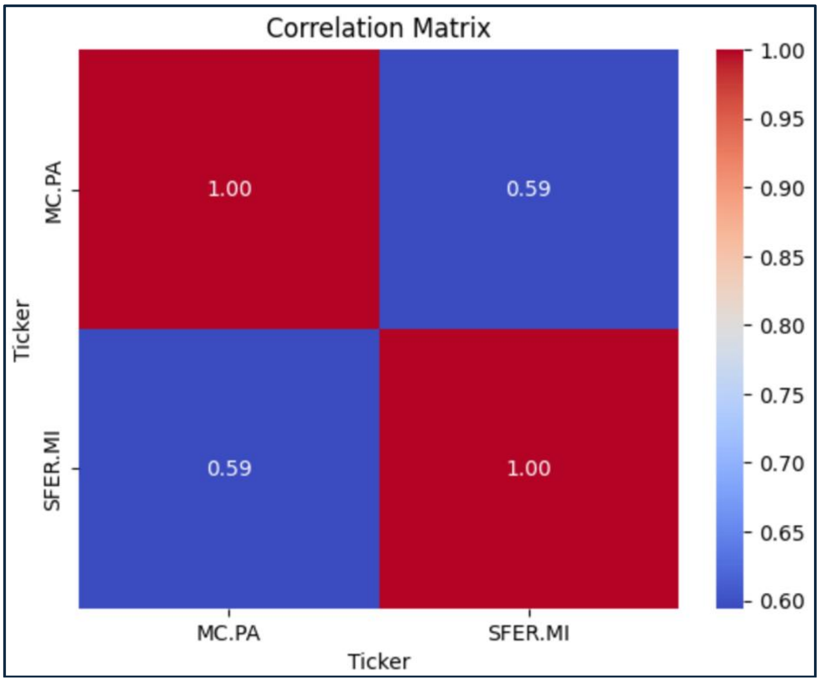

Figure 3

```
Maximum Sharpe Ratio Portfolio Allocation

Sharpe Ratio: 0.831383975110182
Annualized Return: 0.27
Annualized Volatility: 0.29


         allocation
Ticker
MC.PA         100.0
SFER.MI         0.0
--------------------------------------------
Minimum Volatility Portfolio Allocation

Sharpe Ratio: 0.5744572816895821
Annualized Return: 0.18
Annualized Volatility: 0.28


         allocation
Ticker
MC.PA         74.17
SFER.MI       25.83
```

Figure 4

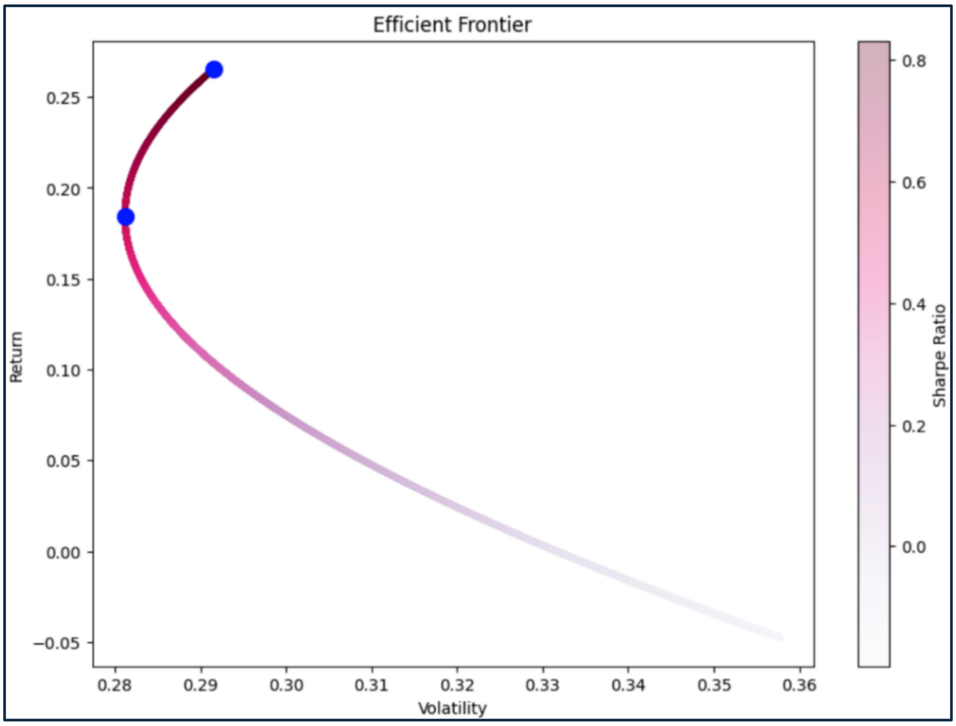

Figure 5

```
Expected annual return of the 50/50 portfolio: 0.1088
Annual volatility of the 50/50 portfolio: 0.2903
         Annual Return  Volatility
Ticker
MC.PA         0.265303    0.291561
SFER.MI      -0.047801    0.357832
```

Figure 6

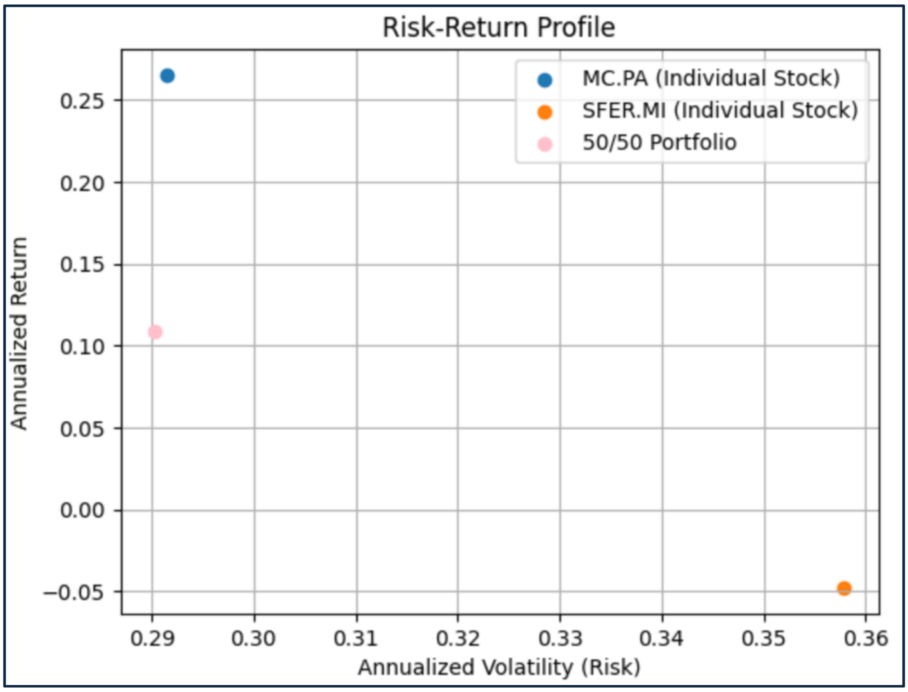

Figure 7

```
-------------------------------------------
Maximum Sharpe Ratio Portfolio Allocation

Sharpe Ratio: 0.273421276452589
Annualized Return: 0.11
Annualized Volatility: 0.34


         allocation
Ticker
MC.PA         12.45
SFER.MI       87.55
-------------------------------------------
Minimum Volatility Portfolio Allocation

Sharpe Ratio: 0.22873986869748278
Annualized Return: 0.09
Annualized Volatility: 0.28


         allocation
Ticker
MC.PA         74.17
SFER.MI       25.83
```

Figure 8

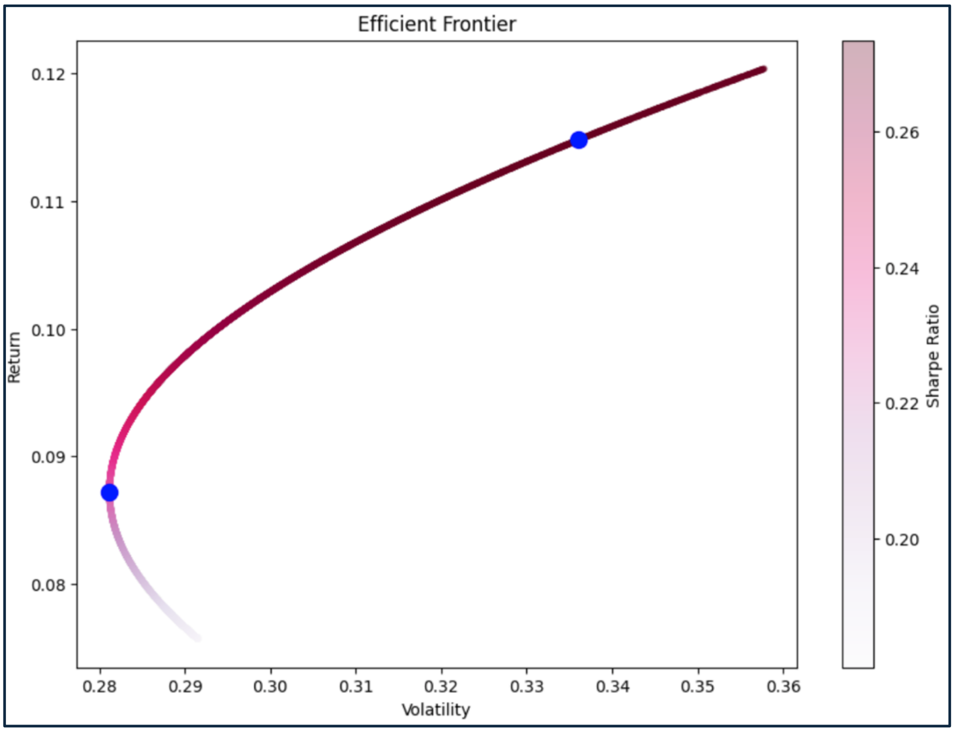

Figure 9

7. APPENDIX

7.1 CAPM AND GROWTH

LVMH

We calculated the cost of equity both with the CAPM and the historical returns and the results are almost identical, so we took the first one.

```
[ ] r=0.0229+lvmh.info['beta']*0.0532
    r
```

```
0.0756744
```

The cost of equity is 7.5%.

```
[ ] r2 = ((120489 / 14629) ** (1 / 30)) - 1
    r2
```

```
0.07281398271245987
```

Using the historical return, we found the cost of equity is 7.3%.

Ferragamo

We repeated both computations but here the results were very different probably due to the fact that Ferragamo has mostly negative returns, so we considered the CAPM cost of equity.

```
[ ] #EVALUATION COST OF EQUITY FERRAGAMO (CAPM)
    r_ferr=0.0229+ferragamo.info['beta']*0.0781 #with italian gov bonds
    g_ferr=0.02+0.01
    r_ferr
```

```
0.12036880000000001
```

```
[ ] r_f= ((29975/10000) ** (1 / 26)) - 1
    r_f
```

```
0.04312629213725061
```

7.2 DDM

DDM: Growth and Multi-staged Model

First, we calculated the estimated price stock utilizing the Growth DD Model. The results seem to be less accurate, due to the strong assumption of perpetual growth.

To achieve a more reliable value, we decide to approach another type of DD Model: the Multi-staged one. This model performed a more accurate value, but still far away from the current market price.

LVMH

```
[ ] P1=14.178/(r-0.04)
    P2=14.178/(r-0.05)
```

```
[ ] P3 =( 14.178/ (1 + r)) + (15.861/ (1 + r)**2) + (17.123/ (1 + r)**3) + (21.115/ (1 + r)**4) + ((21.115* (1 + 0.04)/ (r -
    P4 = ( 14.178/ (1 + r)) + (15.861/ (1 + r)**2) + (17.123/ (1 + r)**3) + (21.115/ (1 + r)**4) + ((21.115* (1 + 0.05)/ (r
```

```
stock_prices= pd.DataFrame({
    "perpetuity": [P1, P2],
    "multi-staged": [P3, P4]
}, index=["price with g=4%", "price with g=5%"])

stock_prices
```

	perpetuity	multi-staged
price with g=4%	397.427847	516.191153
price with g=5%	552.223226	701.412742

Ferragamo

```
[ ] #Growth DDM
    P1_f = 0.096/(r_ferr - g_ferr)
    P1_f
```

```
1.0623135418418745
```

```
[ ] #Multi-staged DDM
    P2_f =( 0.096/ (1 + r_ferr)) + (0.177/ (1 + r_ferr)**2) + (0.25/ (1 + r_ferr)**3) + (0.26/ (1 + r_ferr)**4) + ((0.26*
    P2_f
```

```
2.4503065999062716
```

7.3 FREE CASH-FLOW

LVMH

```
[ ] cf_lvmh=lvmh.cash_flow
    FCF_lvmh = cf_lvmh.loc['Free Cash Flow']
    FCF_lvmh = pd.DataFrame (FCF_lvmh)
    #FCF_lvmh.index = [2022,2021,2020]
    FCF_lvmh = FCF_lvmh.sort_index()
    FCF_lvmh
```

	Free Cash Flow
2020-12-31	8433000000.0
2021-12-31	15392000000.0
2022-12-31	12753000000.0
2023-12-31	10596000000.0

```
[ ] g= 0.05
    pv_fcf = (17681000000 / (1 + r)) + (20101000000 / (1 + r)**2) + (23080000000 / (1 + r)**3) + (( (23080000000* (1+g)) / (
    pv_fcf
    net_debt = 27181000000
    equity = pv_fcf - net_debt
    pps = equity / lvmh.info.get('sharesOutstanding')
    pps
```

```
1568.5215347326807
```

Ferragamo

```
[ ] cash_flow=ferragamo.cash_flow
    FCF = cash_flow.loc['Free Cash Flow']
    FCF = pd.DataFrame (FCF)
    FCF.index = [2022,2021,2020]
    FCF = FCF.sort_index()
    newdata = pd.DataFrame({'Free Cash Flow': 45762000.0}, index=[2023])
    FCF = pd.concat([FCF, newdata])
    FCF
```

	Free Cash Flow
2020	58521000.0
2021	331642000.0
2022	211209000.0
2023	45762000.0

```
[ ] pv_fcf = P2_f = (86501000 / (1 + r_ferr)) + (95102000 / (1 + r_ferr)**2) + (109892000 / (1 + r_ferr
    pv_fcf
    net_debt = 367125000
    equity_f = pv_fcf - net_debt
    pps = equity_f / ferragamo.info.get('sharesOutstanding')
    pps
```

4.558888993049038

7.4 COMPARABLES

LVMH

```
[14] comparables = df_financials.drop('MC.PA')
     #P/E method
     avg_pe = comparables['P/E'].mean()
     price_pe= df_financials['EPS'][0]*avg_pe
     price_pe
```

726.2069838599999

```
[15]
     #P/B method
     avg_pb = comparables['P/B'].mean()
     bv=lvmh.balance_sheet.loc['Total Assets'] - lvmh.balance_sheet.loc['Total Liabilities Net Minority Interest']
     bvps=bv[0]/lvmh.info.get('sharesOutstanding')
     price_pb=bvps*avg_pb
     price_pb
```

10453.795703986274

From the result above, the price is clearly overestimated and looking at the P/B ratios of the comparables, it makes sense since Burberry's P/B ratio is significantly higher than the others. This might compromise the P/B ratio mean and therefore the final price stock estimation. Thus, we replicate the estimation excluding Burberry.

```
[16] comparables1 = df_financials.drop('BRBY.L')

     #P/B method
     avg_pb = comparables1['P/B'].mean()
     bv=lvmh.balance_sheet.loc['Total Assets'] - lvmh.balance_sheet.loc['Total Liabilities Net Minority Interest']
     bvps=bv/lvmh.info.get('sharesOutstanding')

     price_pb1=lvmh.info.get('bookValue')*avg_pb

     price_pb1
```

854.58240998754

```
[17] #DDM comparables

     avg_dy = comparables['DivYield'].mean()

     #note that r-g = dividend yield

     price_dy=annual_dividends_sum_lvmh.iloc[5]/avg_dy

     price_dy
```

264.6436175630227

Ferragamo

```
[29] comparables_f = df_financials_F.drop('SFER.MI')
     #P/E method
     avg_pe_f = comparables_f['P/E'].mean()
     price_pe_f= df_financials_F['EPS'][0]*avg_pe_f

     price_pe_f
```

```
5.833771680000001
```

```
[30] #P/B method
     avg_pb_f = comparables_f['P/B'].mean()

     price_pb_f=ferragamo.info.get('bookValue')*avg_pb_f

     price_pb_f
```

```
25.096481535775002
```

let's remove brunello cucinelli

```
comp_f = comparables_f.drop('BC.MI')
avg_pb_f1 = comp_f['P/B'].mean()

price_pb_f1=ferragamo.info.get('bookValue')*avg_pb_f1
price_pb_f1
```

```
12.147527024033336
```

```
[32] #Dividend yield - rifare per ferragamo forse

     avg_dy = comparables['DivYield'].mean()

     #note that r-g = dividend yield

     price_dy=annual_dividends_sum_f.iloc[3]/avg_dy

     price_dy
```

```
3.387438304806691
```

7.5 BETA CALCULATION

LVMH

```
#LVMH's beta 5 year, monthly
from datetime import datetime
start_date = '2019-04-05'
end_date = '2024-04-05'
df = yf.download(['MC.PA' ,'^FCHI'],start=start_date, end=end_date,interval='1mo')['Adj Close']
df.columns = ['LVMH_price', 'market price']
# Calculate returns
df['stock_returns'] = df['LVMH_price'].pct_change()
df['benchmark_returns'] =df['market price'].pct_change()
df
```

```
[ ] # Calculate the covariance between stock returns and market returns
    covariance = df['stock_returns'].cov(df['benchmark_returns'])
    #Calculate variance of the returns on the market
    variance = df['benchmark_returns'].var()
    # Calculate beta
    beta = covariance / variance
    beta

    1.0338473907164205
```

Ferragamo

```
[ ] from datetime import datetime
    start_date = '2019-04-05'
    end_date = '2024-04-05'
    DF = yf.download(['SFER.MI', 'FTSEMIB.MI'],start=start_date, end=end_date,interval='1mo')['Adj
    DF.columns = ['ferragamo_price', 'market price']
    # Calculate returns
    DF['stock_returns'] = DF['ferragamo_price'].pct_change()
    DF['benchmark_returns'] =DF['market price'].pct_change()
```

```
[ ] # Calculate the covariance between stock returns and market returns
    covariance_ferragamo = DF['stock_returns'].cov(DF['benchmark_returns'])
    #calculate variance of the returns on the market
    variance_ferragamo = DF['benchmark_returns'].var()
    # Calculate beta
    beta_ferragamo = covariance_ferragamo / variance_ferragamo
    beta_ferragamo

    0.42540809718795974
```

7.6 BOND VALUATION

LVMH

```
[ ] YTM_lvmh=(0.0229+0.0081)
    YTM_lvmh

    0.031
```

```
discount_factor=1+YTM_lvmh
Bond_price=3.5/discount_factor + 3.5/(discount_factor)**2 + 3.5/(discount_factor)**3 + 3.5/(discoun
Bond_price

103.09997057192854
```

Ferragamo

```
[20] balance_sheet=ferragamo.balance_sheet
     imcome_statement=ferragamo.incomestmt
     Total_Debt_ = ferragamo.balance_sheet.loc['Total Debt'][0]
     Interest_Expense_ = ferragamo.incomestmt.loc['Interest Expense'][0]
     Rd_ferr = Interest_Expense_  / Total_Debt_
     Rd_ferr

     0.026636364989654094
```

```
[21] discount_factor=1+Rd_ferr
     Bond_price_f=3.5/discount_factor + 3.5/(discount_factor)**2 + 3.5/(discount_factor)**3 + 3.5/(discount_factor)**4 + 3.5/(discount_factor)**5 + 3.5/
     Bond_price_f

     106.61537223462548
```

€106.61 would be the fair price of a bond issued by ferragamo in 2023, with maturity 10 years.

7.7 CAPITAL STRUCTURE AND WACC

LVMH

```
[ ]  #data from 2023
    Total_Debt = lvmh.balance_sheet.loc['Total Debt'][0]
    Interest_Expense = lvmh.incomestmt.loc['Interest Expense'][0]
    Rd_lvmh = Interest_Expense  / Total_Debt
    Rd_lvmh
```

```
0.025028295092087663
```

```
[ ] current_price = lvmh.history(period="1d")['Close'].iloc[-1]
    market_capitalisation_2024=(current_price*lvmh.info['sharesOutstanding'])
    market_capitalisation_2024
```

```
392790661092.4629
```

```
[ ] net_debt=27181000000
    V=market_capitalisation_2024+net_debt
    WACC_lvmh=(market_capitalisation_2024/V)* r + (net_debt/V)*YTM_lvmh
    WACC_lvmh
```

```
0.07278302665532888
```

```
[ ] af_WACC_lvmh=(market_capitalisation_2024/V)* r+ (38445/V)*YTM_lvmh*(1-0.25)
    af_WACC_lvmh
```

```
0.07077667674123733
```

Ferragamo

```
[ ] current_price = ferragamo.history(period="1d")['Close'].iloc[-1]
    market_capitalisation_f=(current_price*ferragamo.info['sharesOutstanding'])
    market_capitalisation_f
```

```
1523694358.7311401
```

```
[ ] net_debt_f=486700000
    V=market_capitalisation_f+net_debt_f
    WACC_ferr=(market_capitalisation_f/V)* r_ferr+ (net_debt_f/V)*Rd_ferr
    WACC_ferr
```

```
0.0976769455778019
```

```
[ ] af_WACC_ferragamo=(market_capitalisation_f/V)* r_ferr+ (net_debt_f/V)*Rd_ferr*(1-0.26)
    af_WACC_ferragamo
```

```
0.09600034969805213
```

7.8 PORTFOLIO MANAGEMENT

Portfolio optimization

```
[ ] data = yf.download(['SFER.MI', 'MC.PA'], start='2019-01-01', end='2024-04-17')['Adj Close']
    import numpy as np
    import seaborn as sns
    import matplotlib.pyplot as plt
```

```
# Calculate daily returns
returns = data.pct_change()
mean_returns = returns.mean() *252
print(mean_returns)
covariance_matrix = returns.cov()*(252) #To annualize the daily standard deviation we multiply it w
print(covariance_matrix)

correlation_matrix = returns.corr()
correlation_matrix

sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm', fmt=".2f", cbar=True)
plt.title('Correlation Matrix')
plt.show()
```

Random portfolio

```
[ ] # Number of portfolios to simulate
num_portfolios = 10000
risk_free_rate = 0.0229

def portfolio_annual_performance(weights, mean_returns, covariance_matrix):
    returns = np.sum(mean_returns*weights )
    std = np.sqrt(np.dot(weights.T, np.dot(covariance_matrix, weights)))
    return std, returns

   # the function above is calculating the expected annual performance of a portfolio.

def random_portfolios(num_portfolios, mean_returns, covariance_matrix, risk_free_rate):

#Generates several random portfolios to simulate different weight distributions and calculates their performance.

    results = np.zeros((3, num_portfolios))
    weights_record = []
    for i in range(num_portfolios):
        weights = np.random.random(len(['SFER.MI', 'MC.PA']))
        weights /= np.sum(weights)
        weights_record.append(weights)
        portfolio_std_dev, portfolio_return = portfolio_annual_performance(weights, mean_returns, covariance_matrix)
        results[0,i] = portfolio_std_dev
        results[1,i] = portfolio_return
        results[2,i] = (portfolio_return - risk_free_rate) / portfolio_std_dev
    return results, weights_record

results, weights = random_portfolios(num_portfolios, mean_returns, covariance_matrix, risk_free_rate)
```

50 and 50 portfolio

```
[ ] weights = np.array([0.5, 0.5])

# Calculate expected portfolio performance
portfolio_return = np.sum(mean_returns * weights)
portfolio_std_dev = np.sqrt(np.dot(weights.T, np.dot(covariance_matrix, weights)))

print(f"Expected annual return of the 50/50 portfolio: {portfolio_return:.4f}")
print(f"Annual volatility of the 50/50 portfolio: {portfolio_std_dev:.4f}")

# Compare with individual stock performance
individual_perf = pd.DataFrame(index=data.columns)
individual_perf['Annual Return'] = mean_returns
individual_perf['Volatility'] = returns.std() * np.sqrt(252)

print(individual_perf)
```

```
Expected annual return of the 50/50 portfolio: 0.1088
Annual volatility of the 50/50 portfolio: 0.2903
             Annual Return  Volatility
Ticker
MC.PA             0.265303    0.291561
SFER.MI          -0.047801    0.357832
```

Replacing the expected returns of both firms with CAPM

```
[ ] new_ret = pd.Series([r,r_ferr])

    def portfolio_annual_performance(weights, new_ret, covariance_matrix):
        returns = np.sum(new_ret *weights )
        std = np.sqrt(np.dot(weights.T, np.dot(covariance_matrix, weights)))
        return std, returns

       # the function above is calculating the expected annual performance of a portfolio.

    def random_portfolios(num_portfolios, new_ret, covariance_matrix, risk_free_rate):

    #Generates several random portfolios to simulate different weight distributions and calculates their performance.

        results = np.zeros((3, num_portfolios))
        weights_record = []
        for i in range(num_portfolios):
            weights = np.random.random(len(['SFER.MI', 'MC.PA']))
            weights /= np.sum(weights)
            weights_record.append(weights)
            portfolio_std_dev, portfolio_return = portfolio_annual_performance(weights, new_ret, covariance_matrix)
            results[0,i] = portfolio_std_dev
            results[1,i] = portfolio_return
            results[2,i] = (portfolio_return - risk_free_rate) / portfolio_std_dev
        return results, weights_record

    results, weights = random_portfolios(num_portfolios, new_ret, covariance_matrix, risk_free_rate)
```