**MGEC72: Financial Economics**

**Assignment #3**

Aditi Lad: 999081087

Tingting Li: 999568775

Xiaoya Lin: 999568579

Isaac Aktam: 998986575

**Question 1**

1. The following alphas, betas, and standard deviations are obtaining from the regressing each stock’s excess return on market excess. Alpha measures stock’s systematic return if the market’s excess return is zero. Beta measures the systematic risk or the market risk, it is the day-to-day fluctuations of returns. A beta of less than 1 implies a lower variation of stock returns than the market returns. A beta that is greater than 1 implies a higher variation in stock returns that the market returns. This also means that there is a higher risk associated with higher beta. The estimates β do not correspond well with my belief that higher the risk higher the β. As we can see from the following table, for most of the values, the regressed beta decreases as standard deviation increases, apart for MSFT. I expected β to increase as standard deviation increases.

|  |  |  |  |
| --- | --- | --- | --- |
| **Stocks** | **Regressed Alpha** | **Regressed beta** | **Standard Deviation** |
| AMZN | 0.023709958 | 1.08516 | 1.1104% |
| APPL | 0.018851832 | 1.20884 | 0.953% |
| JPM | 0.003999389 | 1.30042 | 0.869% |
| MSFT | 0.005142396 | 1.03436 | 0.721% |

1. The following graph represents the historical risk premium and the risk premium predicted by the regression model for AMZN. The blue line is the historical risk premium (stock return – risk free rate), also known as the excess, and the red line is the risk premium predicted by the regression CAPM model, as seen in the graph the predicted model does not predict the actual risk premium well. The risk premium increases and decreases at a higher rate than the predicted. It is safe to conclude that the regression model under predicts the risk premium. Especially when the stock returns increase or decrease by a significant amount the regression model under predicts that shock.

The following graph below represents the historical risk premium and the predicted risk premium for Apple. Again the blue line represents the actual excess rate of return for the past 10 year and the red line is the predicted excess rate of return for the past 10 years. As we can see this stock’s behaviour is a lot like Amazon where the predicted regression does the predict the actual excess correctly. The actual excess of the stock is usually much higher or lower than the predicted excess. However, closer to the end of the year the regression model starts to better predict the risk premium.

In the time plot of the residual for Apple and Amazon, there is an unusual drop in 2007 and 2008 period. The actual returns decline dramatically in that year, while the predicted return is relatively stable, so the difference between two (residual) has a large decline. The reason behind the drop is primarily due to the financial crisis in 2008. Many firms including Apple suffered in that time. The individual firm-specific loss causes the actual return drops much more than the predicted one. Another thing to note is that residuals behave randomly implying that returns are normally distributed and that linear model should fit data properly.

1. For each of the companies, test the null hypothesis that α = 0 using a significance level of 95%. Would rejection of this null hypothesis imply that the CAPM has been invalidated?

|  |  |
| --- | --- |
| **Stocks** | **P-Value** |
| MSFT | 0.3239 |
| JPM | 0.5117 |
| AMAZON | 0.0119 |
| APPLE | 0.0113 |

For each company to test the null hypothesis of α = 0 at a significant level of 95%, the above table shows their P-values. For stocks MSFT and JPM the P-values are greater than 0.05 therefore we do not reject the null hypothesis. Therefore we can assume that α = 0. For AMZN and APPL the p-value are 0.0119 and 0.0113 respectively which is less then 0.05 meaning we reject the null hypothesis.

By rejecting the null hypothesis, we are disproving the CAPM model. Alpha represents the expected return when the risk free rate equals the expected market return. It would simply mean that the portfolio would be earning too little or too much relative to its risk. If alpha is less than zero indicates that the portfolio is earning too little and if alpha is greater than zero that the portfolio is earning relatively higher return to the risk.

1. The following table shows the market risk and the Idiosyncratic risk for all four stocks.

|  |  |  |
| --- | --- | --- |
| **Stocks** | **Market-Risk (R-squared)** | **Idiosyncratic Risk (1-(R-squared))** |
| MSFT | 0.3936 | 0.6063 |
| JPM | 0.4282 | 0.5718 |
| AMZN | 0.1827 | 0.8173 |
| APPL | 0.3080 | 0.6920 |

According to William Sharpe the percent of the market risk should be around 30% for all stocks in the portfolio. Unfortunately, this statement is not verified through the results because only the R-squares for APPL is close 30% the rest of the stock are either above or below 30%.

**Question 2)**

1. Alpha is the intercept coefficient and beta is the Market excess coefficient. Because of small p-value, alpha is significant which means that the portfolio has abnormal return of 0.01293 for the past 10 years. Beta of 1.157 is also significant and means that the portfolio moves 1.157% if market moves by 1%

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | ***Coefficients*** | ***Standard Error*** | ***t- Stat*** | ***P-value*** |
| Intercept | 0.0129 | 0.0036 | 3.5316 | 0.0005 |
| Market excess | 1.1571 | 0.0836 | 13.8303 | 2.25994E-26 |

The diversification benefit is 0.4412%, which is the difference between the portfolio variance (total risk) and the weighted average of variance of the 4 stocks. Portion of non – systematic (diversifiable) risk is lower in the portfolio. This coincides with the diversification benefits of combining the stocks.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Portfolio** | **Weighted Average of Individual stocks** | **Diversification (Portfolio – Weighted Average)** |
| **Total Risk** | 0.4129% | 0.8541% | 0.4412% |
| **Systematic Risk** | 0.2562% | 0.2583% | 0.0021% |
| **Unsystematic Risk** | 0.1567% | 0.5958% | 0.4391% |
| **Portion of systematic risk** | 62.0472% | 30.2407% |  |
| **Portion of non-systematic risk** | 37.9528% | 69.7593% |  |

1. The CAPM predictions are a lot closer to actuals compared to individual stocks (less pronounced residuals). The portfolio residuals have a smaller range (+/- 10%) compared to AMZN (-50% to 30%) and APPL (+/- 20%).
2. For the portfolio to test the null hypothesis that the null hypothesis is zero using the significant level of 95%, we need to examine the p-value. The p-value at 95% level of significance is 0.0005. This is significantly lower than 0.05 therefore we reject it. As mentioned earlier the rejection of this null hypothesis implies that the CAPM has been invalidated. Alpha represents the expected return when the risk free rate equals the expected market return. It would simply mean that the portfolio would be earning too little or too much relative to its risk. If alpha is less than zero indicates that the portfolio is earning too little and if alpha is greater than zero that the portfolio is earning relatively higher return to the risk.