AM14 Assignment 1

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Q2. How do dividends affect the results of monthly returns for MSFT and GE?

Including dividends makes a significant difference in the return of the stocks. Dividends appear to have a positive effect on monthly returns: in fact, the total return with dividend is higher than the total return without dividend for the analyzed period for both stocks.

Microsoft introduced its first dividend in 2003, and it experienced an abnormal increase in returns after that for both return with dividend and without. Microsoft has managed to increase its dividend payout by leaps and bounds ever since 2005, increasing the investor's faith in the company's management and business. Despite the negative impact of the financial crisis of 2008-09, the stock was able to recover: while the dividends soared since 2010, the total return of Microsoft grew dramatically, to a total return of the period of 115.05% with dividend and 73.60% without.

For General Electric, we observe from the plot that the dividend gain was growing gradually and steadily from 1980 to 2008. As the financial crisis hit the markets, the dividend payout dropped too.
Moreover, the company faced backlashes in 2009 after the Securities and Exchange Commission investigated the company on fraud accusations and inflated revenue. The company decided to settle for a fine of $50 Million (Forbes, Aug 4, 2009), as their yearly dividends slashed from $1.24 to $0.82.
Dividends fell even further in 2010. The total return of GE recovered since 2010 and the dividend recovered too in 2010-2014. The total return of GE grew 9.92 % with dividends and 4.89% without dividends.

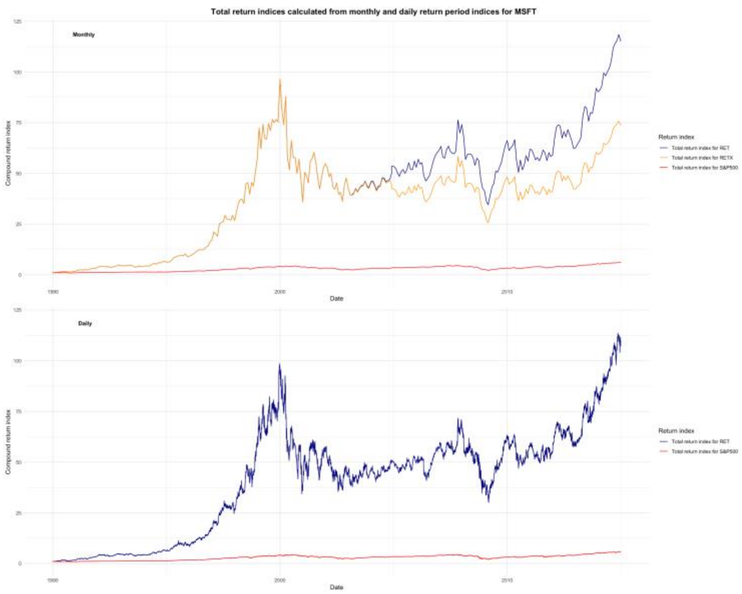
The results seem to be aligning with the Dividend signaling theory, which assumes that dividend change announcements trigger share returns because they convey information about management's assessment on firms' future prospects (Elisabete Vieira & Clara Raposo, 2007).
The announcement of dividend increases makes abnormal positive returns, as can be observed in the case of MSFT in 2006 (Microsoft, 2006) and announcement of dividend decreases generate abnormal negative returns, as can be observed in the case of GE in 2009 (Forbes, 2009) (Suwanna, 2012). AFrom our brief analysis it seems that the hypothesis of dividend signaling holds true, as the GE stock sharply decreased in price after the announcement of alleged financial investigations and as MSFG stock increased in value after news on increasing dividends.

Q3. Mean, variance, skewness, and kurtosis of the normal and the log returns.

Normal return and log return of MSFT:
The metrics about the distribution of the simple return and log return of MSFT allow us to conclude that the mean, variance, and kurtosis of the returns are very similar while the skewness is very different for the normal and log return. For the *simple return*, the skewness is 0.44, indicating a moderately right-skewness (positively skewed). For the log return, the skewness is -0.1, indicating a slightly left-skewed skewness closer to a normal distribution compared to simple return.

The business implications are the following: contrary to *log returns*, for *simple returns*, the distribution indicates that investors might experience frequent small losses and a few large gains from the investment (Corporate Finance Institute, 2022). Kurtosis of the distribution of returns is over 5 (very high) for both variables. This indicates that the distribution of monthly return (either simple or log) of MSFT is more peaked than normal distribution and possesses thick tails.

Q5. Comparing daily to monthly returns for MSFT and GE.



The difference identified is that the monthly data is smoother while daily data has more volatility, as can be seen in the graph on the left. Departures from normality are much more severe for higher frequencies (daily) as they contain more noise compared to low frequencies (longer periods).

Q6. Log daily and monthly returns. Compare and discuss your results with the results from monthly frequency.

TICKER	mean	variance	skewness	kurtosis
MSFT daily log r	**0.0007416798**	**0.0004311239**	**0.01351621**	**8.571720**
MSFT daily simple r	**0.0009577292**	**0.0004327714**	**0.25041363**	**8.797435**
MSFT monthly log r	**0.0156613852**	**0.0082815803**	**-0.10188160**	**5.260510**
MSFT monthly simple r	**0.0199789340**	**0.0086590323**	**0.44420637**	**5.040721**

Based on the table above, if we only compare the simple and log returns daily, we can see the mean and variance are still very similar. Using log return instead of simple return can reduce the skewness and kurtosis, which means the distribution of returns is closer to normal distribution.

To better compare daily and monthly risks we have to annualize the volatility.

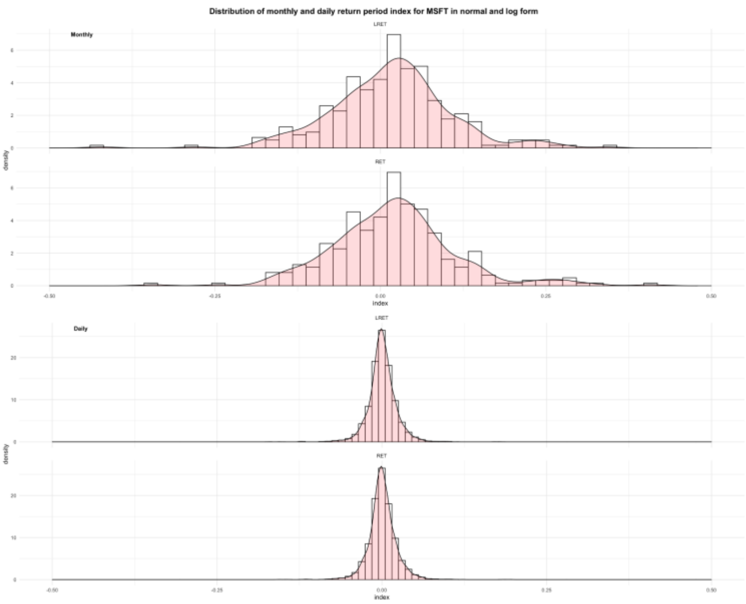
Further, if we compare the results with monthly frequency, we can observe that daily return has lower variance in comparison to monthly returns (both annualized):

$$daily: 0.0004311239 * \sqrt{360} = \ 0.00818000086 \ vs$$

$$monthly: 0.0082815803 * \sqrt{360} = 0.02868823569,$$

but higher annual returns. In terms of skewness, daily return is less skewed than monthly, and the daily log return is almost perfectly symmetrical. In terms of kurtosis, daily return has an extremely high kurtosis of 8, this indicates that for investors, they will experience occasional extreme returns (either positive or negative), more extreme than the usual + or - three standard deviations from the mean that is predicted by the normal distribution of returns. This phenomenon is known as kurtosis risk.

Q7. Compare the statistical properties of the log holding period return time series both for monthly and daily returns. How do they compare to normal distribution?



Daily simple and log returns tend to follow a normal distribution more than the monthly simple and log returns, as is illustrated in the graph below (put in Appendix). Monthly returns especially seem to have fatter tails, meaning that we could expect more outliers than for normal distributions. They are slightly right skewed but are peak more with a heavy tail since they have a very high kurtosis. And at higher frequency(daily), the likelihood of departures from normality is much higher.

Q8&9. Calculate the covariance matrix for the log return series, using both the returns and returns squared. Discuss your results briefly.

We choose the following stocks at random: JPM, XOM, INTC, and after calculating the returns (normal and log) as well as total return indices we investigated potential correlations.

	JPM_LRET	XOM_LRET	INTC_LRET	SPRTRN_LRET
JPM_LRET	1.0000000	0.3350649	0.3833730	0.6956786
XOM_LRET	0.3350649	1.0000000	0.2753722	0.6104161
INTC_LRET	0.3833730	0.2753722	1.0000000	0.6053025
SPRTRN_LRET	0.6956786	0.6104161	0.6053025	1.0000000

For log returns we observe nothing but positive correlations, but no significantly high values

	JPM_LRET	XOM_LRET	INTC_LRET	SPRTRN_LRET
JPM_LRET	1.0000000	0.2381203	0.1659690	0.5374612
XOM_LRET	0.2381203	1.0000000	0.1689921	0.7178163
INTC_LRET	0.1659690	0.1689921	1.0000000	0.3014405
SPRTRN_LRET	0.5374612	0.7178163	0.3014405	1.0000000

For log returns squared we observe that the correlation falls sharply between the stocks, but rises for their relationship with S&P

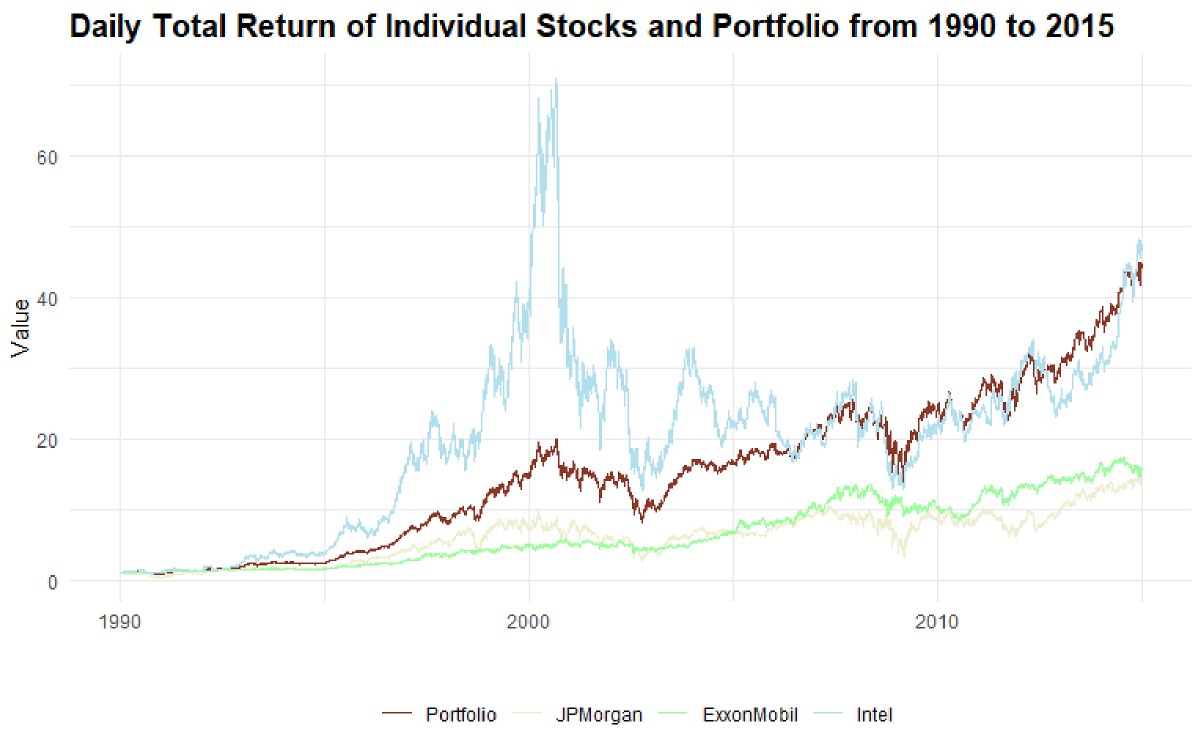
Q10. Plot the ACF (autocorrelation function) for returns, returns squared, and absolute returns. Discuss the results! (See appendix for graphs)

The graphs for JPM, XOM, INTC, and S&P500 can be found in the Appendix. The ACF graph tells us about the coefficient of correlation between two values in a time series. It helps in understanding the degree of similarity between a given time series and a lagged version of itself over successive time interval, measures the relationship between a variable's current value and its past values. The horizontal line represent threshold, the vertical lines exceeding the horizontal line are significant. The spikes at Lag 0 are ignored. The ACF model for JPM, XOM, INTC and SPRTRN have no major lags in the log return graph, whereas there are positive lags in squared lag graph and absolute log return graph.

Q11. Use the three assets and make up a portfolio by assigning arbitrary portfolio weights. What does it imply if you keep the weights fixed over time?

We create our portfolio using equal (1/3 for each) weights.
Keeping the weights fixed can lead us to being exposed to additional risk. It is vital that we rebalance the portfolio weight overtime, to account for differences in returns and their volatility in real time. That way we can control and minimize risk.

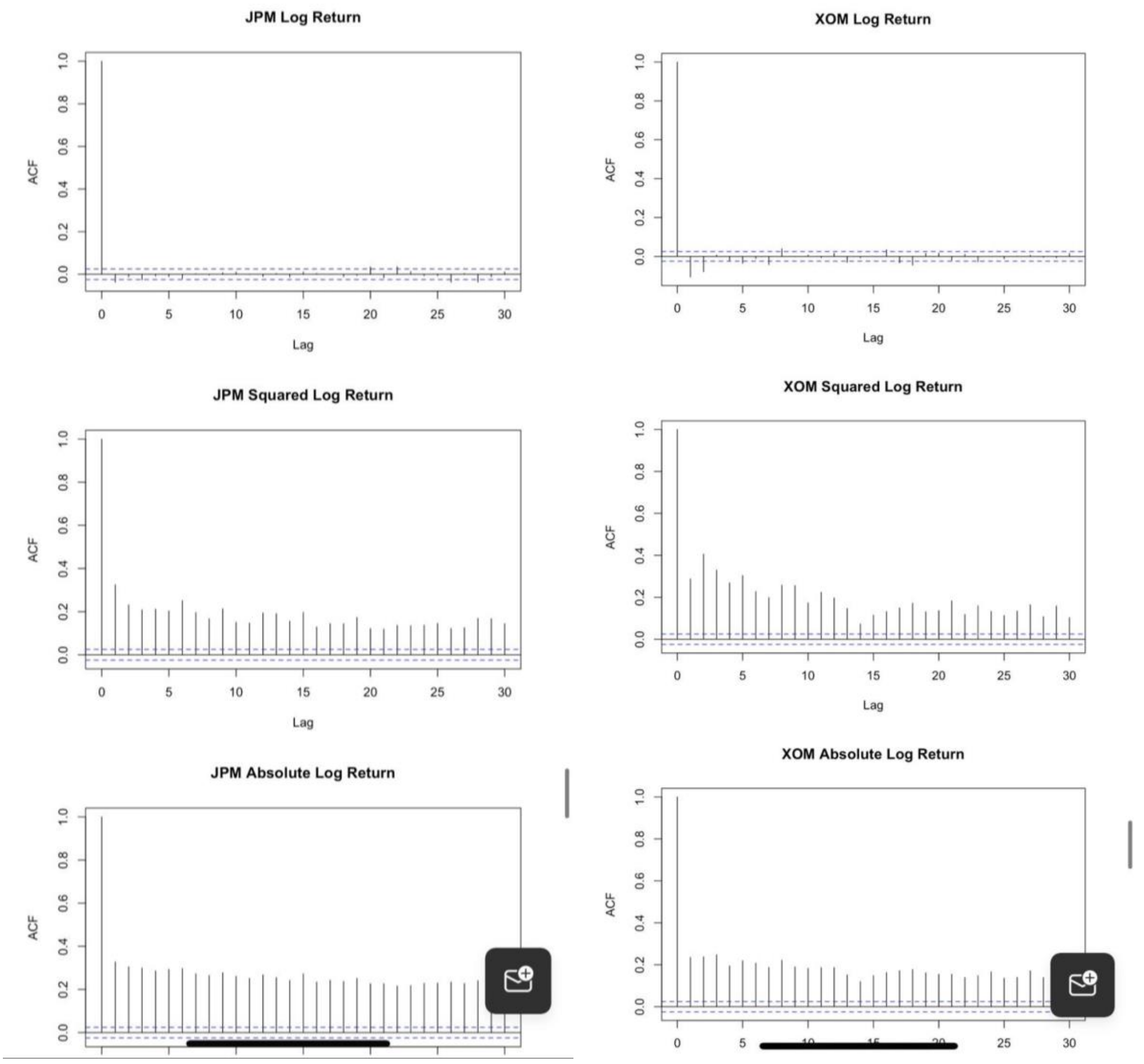
Q12. Using the portfolio weights and assets from above, calculate the corresponding portfolio returns. More-over, use the portfolio returns to calculate the evolution of a $ 1 investment in the portfolio over the sample period. Plot and discuss the result.

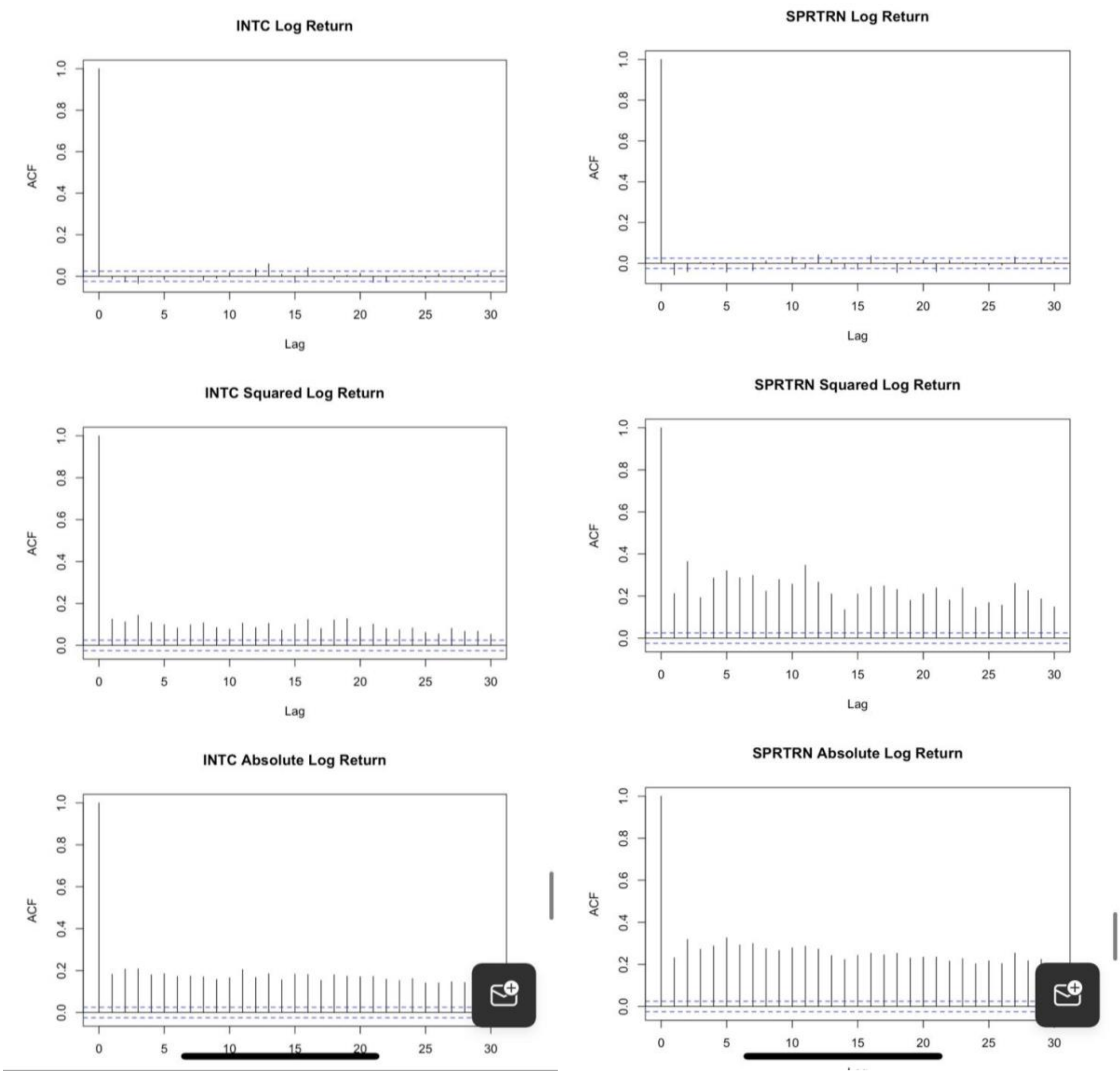


We get a plot for the three stocks: JP Morgan, ExxonMobil, and Intel. We see through this graph the return we could have obtained if we had invested $1 in the stock. The highest return overall is for Intel with a sharp peak in the early 2000'. However, it is worth noting that Intel has the most volatile behavior. ExxonMobil and JP Morgan follow with the former providing the less returns but being the most stable. It is also interesting to see how the 2008 recession influenced our portfolio will all stock returns falling sharply, only to regain momentum in the following years

Appendix

Q10 Graphs (ACF)





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