In this Assignment I choose to analyse the following three stocks: Johnson and Johnson DC (JNJ), Hewlett Packard CO (HPQ) and American Express INC (AXP). The data I use is based on the monthly average stock for 30 consecutive months from 31/12/2003 to 31/05/2006.

Q1 This Assignment shall first begin with an individual statistical description of each series.

Johnson and Johnson DC

The graph below show the share price fluctuation during that period:
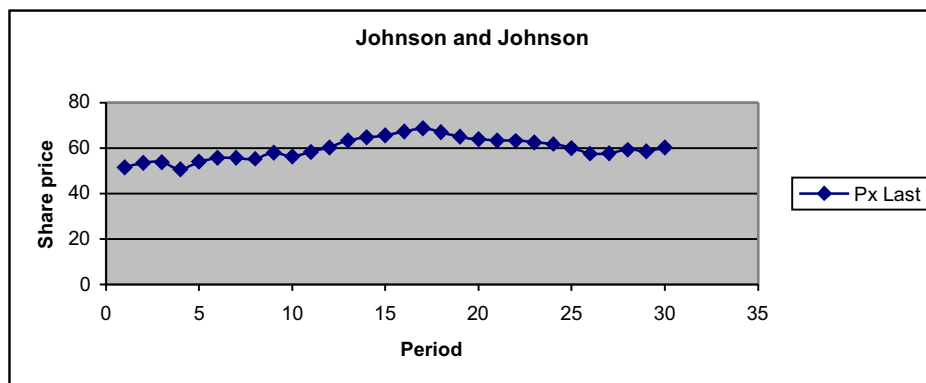
From the graph above it demonstrates that Johnson and Johnson's share price average highest on 29/04/2005, and lowest on 31/03/2004. After the share peak on 29/04/2005, the share started to drop and fluctuate a bit. However, it seems that the share price of Johnson and Johnson began to pick up on the 31/01/2006, and its share price 60.22 is higher than the beginning of the sample (51.66).

Johnson and Johnson	
Mean	59.78333333
Standard Error	0.882586759
Median	59.66
Mode	#N/A
Standard Deviation	4.834126768
Sample Variance	23.36878161
Kurtosis	-0.890698478
Skewness	-0.015033442
Range	17.91
Minimum	50.72
Maximum	68.63
Sum	1793.5
Count	30

The table above is a descriptive statistic of the Johnson and Johnson's stock during the period using Microsoft Excel. In here, because the mean (59.78333333) is very close to the median (59.66), the points on the distribution appear approximately symmetrical. We can assume that the distribution is very close to a normal distribution. The standard deviation describes how the share prices cluster around the mean. In here, the standard deviation is relatively small which indicates that the share price is stable during this period. Kurtosis is "a measure of whether the data are peaked or flat relative to a normal distribution"[1] and "is based on the differences around the mean raised to the fourth power."[2] Because a normal distribution would have a kurtosis of zero, a negative kurtosis here indicates flatness of the distribution[3].

[1] *Engineering Statistics Handbook* [on-line]; available from http://www.itl.nist.gov/div898/handbook/eda/section3/eda35b.htm; Internet; accessed 19April 2007.
[2] Mark L. Berenson, et al., *Basic Business Statistics* (New Jersey: Pearson Prentice Hall, 2004), 89.
[3] Engineering Statistics Handbook, http://www.itl.nist.gov/div898/handbook/eda/section3/eda35b.htm.

Hewlett Packard CO

Below diagrams shows how Hewlett Packard Co fluctuate over that period:
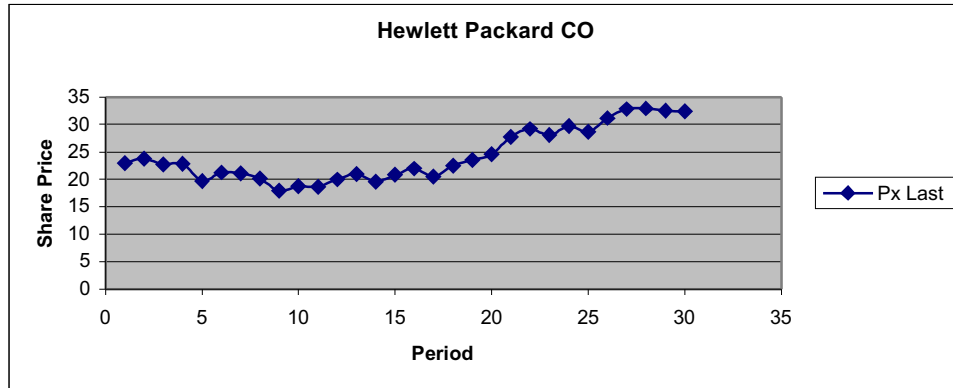
Hewlett Packard Co fluctuates more vigorously than Johnson & Johnson. From the period 31/12/2003 the share price seems to continuously fluctuate until 31/05/2005. The latest trend for the share is that it turns upward after experiencing continuous fluctuation between 31/12/2003 to 31/05/2005. Near the end of the sample period, the highest mark 32.9 appears on the month of 31/03/2006.

Hewlett Packard	
Mean	24.30833333
Standard Error	0.883995512
Median	22.775
Mode	#N/A
Standard Deviation	4.841842826
Sample Variance	23.44344195
Kurtosis	-1.047122995
Skewness	0.614645824
Range	15.01
Minimum	17.89
Maximum	32.9
Sum	729.25
Count	30

The mean of the share prices is higher than its median, which indicates right-skewness. It means that most of the values are in the lower portion of the distribution. This distortion is caused by some extremely large values in the sample. The maximum of the

sample is 32.9 and the minimum is 17.89 (see table above.) The positive skewness means that the distribution is right-skewed and that most values cluster around the lower portion with the exception of some large values. These large values pull the mean upward so that the mean is greater than the median. The negative kurtosis means that the distribution is "flat." The standard deviation is similar compared to Johnson and Johnson's shares in this report, but Hewlett Packard's share price has been fluctuated a little bit. General speaking, Hewlett Packard's share price has been relatively stable during the period with a hint of future increases.

American Express
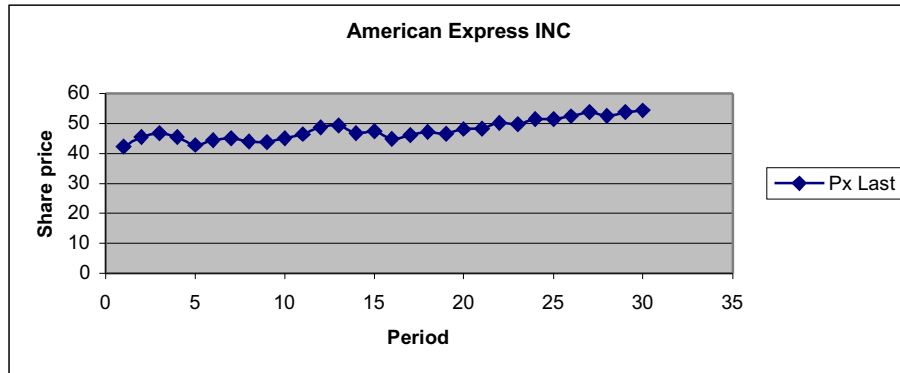
Compared to Hewlett Packard, American Express doesn't fluctuate as much as Hewlett Packard. Again it fluctuates a little bit from the period 31/12/2003 until a quite low point 44.9666 on 31/03/2005. Then the share price begins to peak up and continuously grow until the highest mark 54.36 during the month of 31/05/2006.

American Express	
Mean	47.82454
Standard Error	0.627728882
Median	46.9493
Mode	#N/A
Standard Deviation	3.438212689
Sample Variance	11.8213065
Kurtosis	-0.813769015
Skewness	0.42645752
Range	12.142
Minimum	42.218
Maximum	54.36
Sum	1434.7362
Count	30

The negative kurtosis again indicates flatness of the distribution, which means that no recurring values or clustering around the mean. The standard deviation is small compared to other shares in this report, which indicates that American Express share price has been relatively stable during the period. This can be enforced by the Range (12.142) which is the lowest compared to other shares.

Q2 Compute all the linear correlation coefficients between the series

Since there are three shares data, there will be three sets of correlation coefficients: one between Johnson & Johnson and Hewlett Packard, between Johnson & Johnson and American Express, and between Hewlett Packard and American express. We will look at each correlation separately, and then we will compare the three shares together.
The coefficient of correlation measures the relative strength of a linear relationship between two numerical variables.

Johnson & Johnson and Hewlett Packard
The linear relationship between Johnson & Johnson and Hewlett Packard is 0.041(corrected to three significant digits), which means that there is little linear relationship existed. If I draw a graph with Johnson & Johnson's share price against Hewlett Packard, it would look like that:

Johnson & Johnson and Hewlett Packard
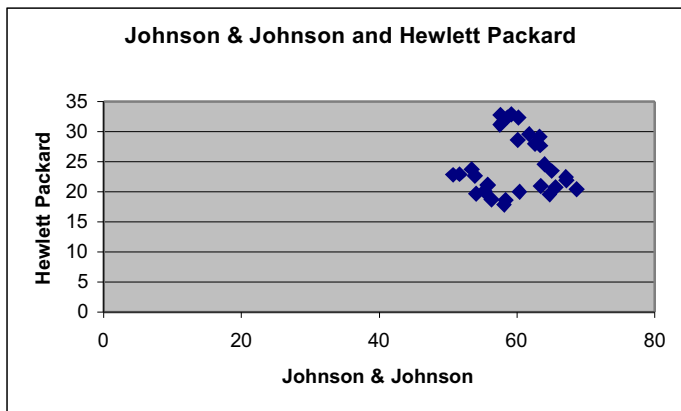
It should be noted that they are positively correlated. Those share prices with the highest price from Johnson & Johnson tend to be associated with the highest of Hewlett Packard's share price. However, this relationship is weak, as indicated by a coefficient of correlation of 0.041.

Johnson & Johnson and American Express

Johnson & Johnson and American Express
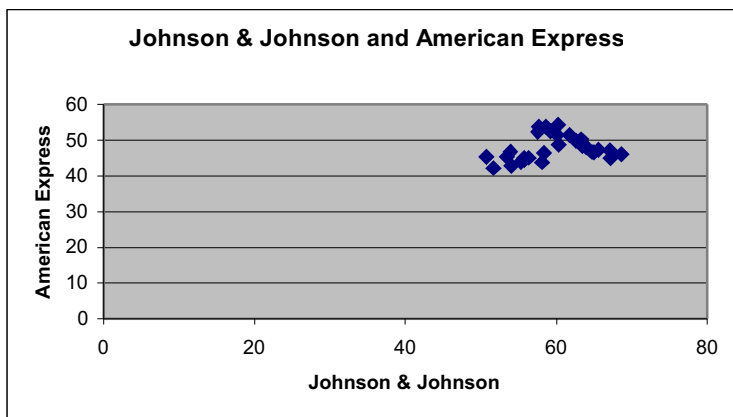
The correlation between Johnson & Johnson and American Express is 0.26. This means that the two shares are slightly correlated, but not overly so. In fact, if you plot Johnson & Johnson against American Express, you barely notice the correlation. .
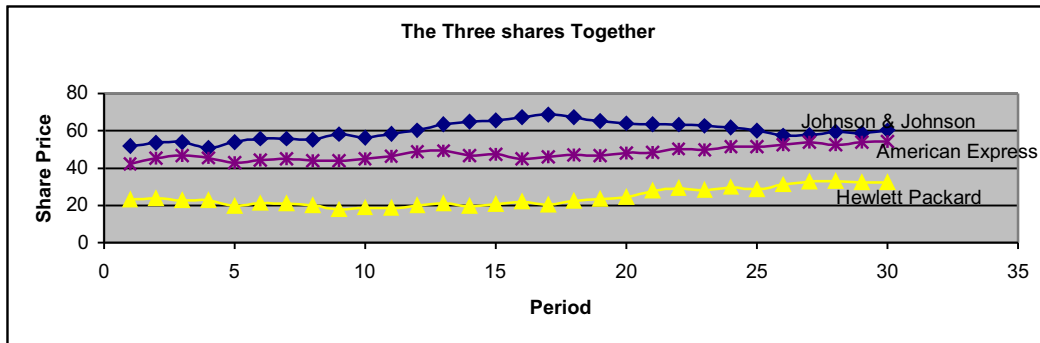
Hewlett Packard and American Express

The correlation between Hewlett Packard and American Express is 0.863, which means that they are highly positive correlated. Holding these two shares together as a portfolio will not diversify the risk. Instead you magnify the risks. It's like you put not only one, but two eggs in the same basket. (The idea of diversification is not put all the eggs in the same basket.) Below is the graph shows Hewlett Packard against American Express would look like.
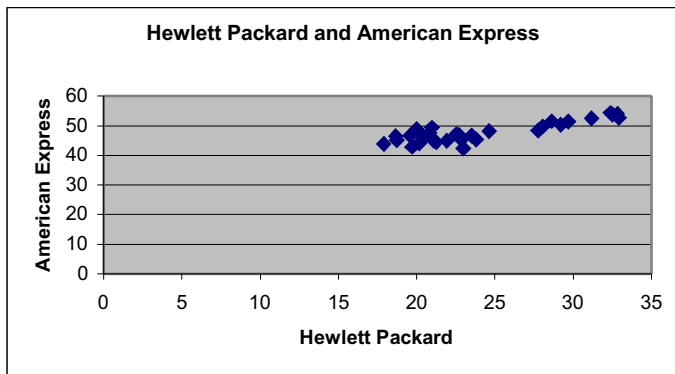
Therefore, even though Johnson & Johnson and Hewlett Packard are not exactly compatible portfolio wise (If so, the coefficient correlation should be negative), they still make a fairly okay portfolio.

In summary, the coefficient of correlation indicates the linear relationship, or association, between two share prices. When the coefficient of correlation gets closer to +1 or -1, the linear relationship between the two share prices is stronger. When the coefficient of correlation is near 0, little or no linear relationship exists. The sign of the coefficient of correlation indicates whether the data are positively correlated or negatively correlated. The existence of a strong correlation does not imply a causation effect. It only indicates the tendencies present in the data.

Below I have put together all the three share prices during the period:

Compared to Johnson and Johnson, we can see that Hewlett Packard and American Express are more stabilized in terms of its fluctuation. Johnson's share price has increased during the middle period of the 30 months, and then there is downward trend. However, at the end of the 30 month, Johnson share price did pick up. We can see Hewlett Packard and American Express have an almost identical trace along the period, once again proving the very positive correlation. Johnson & Johnson's is less, but still positively, correlated to the two shares. The three shares peak approximately in the different period. While Johnson and Johnson at its highest mark, Hewlett Packard and American Express are in a decline trend.

Q3 Financial Advice on Hold, buy and sell.

Actual return on an investment may differ substantially from your expected return. If we say that risk as the variability of returns from those that are expected, therefore the greater the variability, the riskier the security is said to be.

A meaningful diversification is combine securities in a way that will reduce risk, for example the portfolio of Johnson & Johnson and Hewlett Packard. The relationship between Johnson& Johnson and Hewlett is weak, as indicated by a coefficient of correlation of 0.041. Therefore, even though Johnson & Johnson and Hewlett Packard are not exactly compatible portfolio wise (If so, the coefficient correlation should be negative), they still make a fairly okay portfolio.

The greater the standard deviation of returns, the greater the variability of returns, and the greater the risk of the investment. Apply this to the 3 stocks; both Johnson & Johnson and Hewlett Packard's standard deviation are bigger than the American Express share, meaning greater risk of investment compared to American Express. However, we can not only look at it's variability but also at its volatility and its fluctuation. (I have considered these two at below)

To conclude, I would suggest "hold" the Hewlett Packard's shares until end of 2006, as from the graph of Hewlett Packard the trend is going up steadily, therefore the last highest mark 32.9 may not be the highest mark. At the end of 2006, I would suggest sell the Hewlett Packard's shares because at this point the shares probably have reached it's highest point, and there after the shares are likely going down. So hold any longer may result in losing the value of the share.

I would suggest "buying" more shares of Johnson & Johnson, though it has just been to a decline, but the share price is just start to rise from 31/01/2006. Therefore buying the share at this time is relatively cheap and we can wait for increases in the future, where Johnson & Johnson's graph clearly indicates the increasing trend. In addition, Johnson and Johnson's share price has been pretty stable all along. We can also say that Johnson and Johnson's share as a fairly secure stock.

For American express I would suggest to "sell" the share because its share is now at its highest point (concluded from the American Express graph). So it's wise to sell it now. In addition, information from London exchange market indicates that American express's shares are decreasing from June 2006 to September 2006, a little increase from September to December 2006, afterward it towards decreasing direction. Generally in 2007, American express is the weakest stocks in the Dow Jones industrial.

Moreover, I would also like to consider the possibility of share portfolio. As I have indicated before Johnson & Johnson and Hewlett Packard make a fairly okay portfolio.

Bibliography

Books

- Mark L. Berenson, et al., *"Basic Business Statistics"* (New Jersey: Pearson Prentice Hall, 2004), 89.
- James C. Van Horne and John M. Wachowicz *"Fundamentals of Financial Management"* twelfth edition (Pearson Prentice Hall, 2003)

Websites

- *Engineering Statistics Handbook* [on-line]; available from http://www.itl.nist.gov/div898/handbook/eda/section3/eda35b.htm; Internet; accessed 17th of April 2007.
- *Engineering Statistics Handbook*, available from http://www.itl.nist.gov/div898/handbook/eda/section3/eda35b.htm; Internet; Accessed 18th of April 2007

http://www.ft.com/cms/s/0/57756d66-0021-11dd-825a-000077b07658.html