Statistical Analysis Report

This report analyses the assets of companies in four different manufacturing sectors. Sectors are compared based on performance, asset fluctuation and risk of investment.
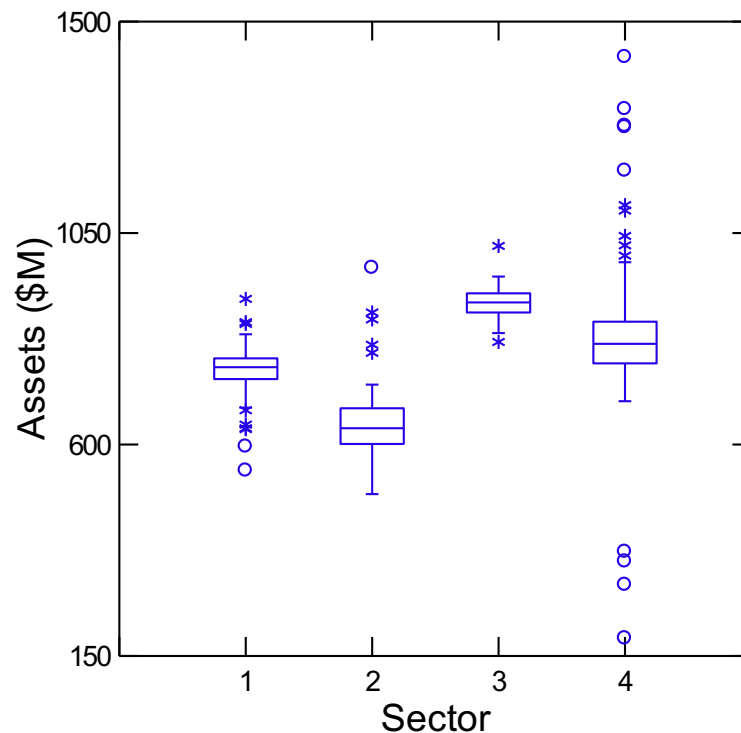

Figure 1: Boxplot Comparison of Sector Assets.
(An outlier of $3004 million has been excluded from Sector 3. See Figure 3 in Appendix for unaltered Boxplot.)
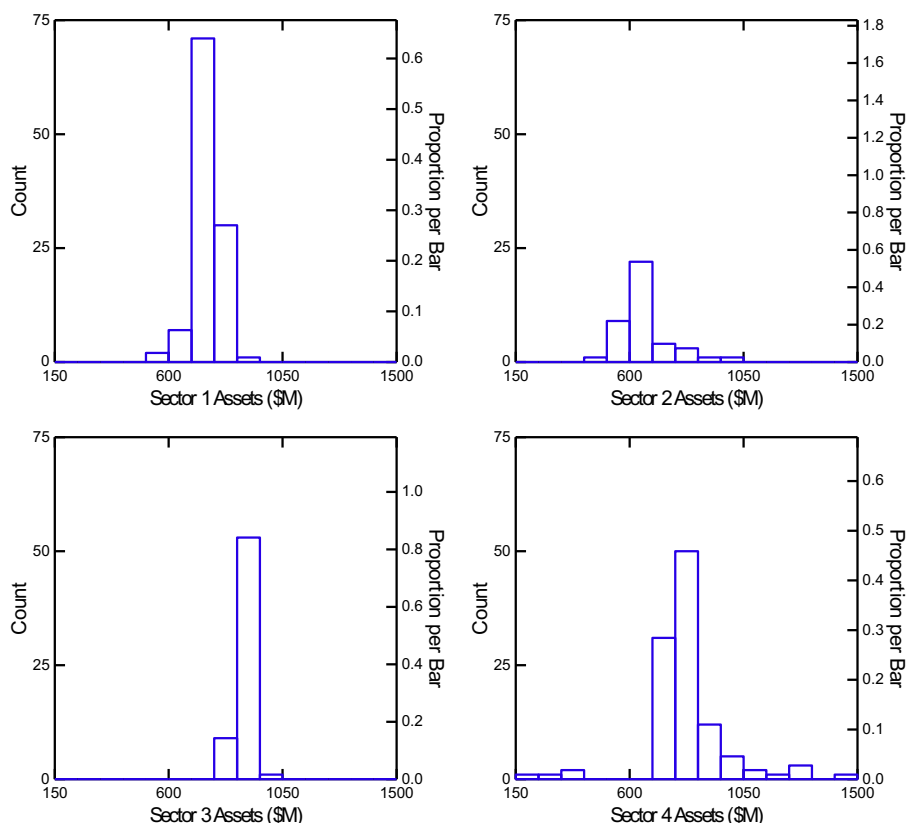
Sector 1

Sector 1 is the 3rd highest performing sector. This is demonstrated in Figure 1. It can be seen that Sector 1's inter-quartile range of company assets sits higher than Sector 2's, yet lower than Sectors 3 & 4. Sector 1's companies have an average (median) net asset base of $764.36 million.

From Table 1 it can be seen that Sector 1's companies have the lowest asset range ($365.210 million). (This indicates that the standard deviation and coefficient of variation should be relatively accurate as any outliers should only have a minimal effect on their calculation.) Table 1 also communicates that Sector 1's company assets sport the lowest standard deviation ($50.428 million) and the lowest coefficient of variation (6.7%). The small standard deviation indicates most values are huddled around the median and the small coefficient of variation means the Sector's assets vary only slightly in comparison to their magnitude. Thus, despite not being the best performer, Sector 1's assets are the most reliable as they have minimal fluctuation.

Figure 2 graphically depicts the performance of Sector 1's companies. The distribution is strongly peaked around its centre with little spread. This confers with the above analysis. The distribution is slightly negatively skewed.

Table 1: Key Statistics by Sector

	Sector 1	Sector 2	Sector 3	Sector 4
No. of Companies	111	41	64	109
Minimum ($M)	544.630	494.490	818.060	187.520
Maximum ($M)	909.840	975.960	3004.000	1424.650
Range ($M)	365.210	481.470	2185.940	1237.130
Median ($M)	764.360	634.510	902.445	814.070
Standard Deviation ($M)	50.428	98.671	265.069	163.024
Coefficient of Variation	6.7%	15.2%	28.4%	19.7%

Figure 2: Histogram Comparison of Sector Assets.
(An outlier of $3004 million has been excluded from Sector 3. See Figure 4 in Appendix for unaltered Boxplot.)

Sector 2

Sector 2 is the 4th highest performing sector. This is demonstrated in Figure 1. It can be seen that Sector 2's inter-quartile range of company assets sit beneath that of all other Sectors. Sector 2's companies have an average (median) net asset base of $634.51 million.

From Table 1 it can be seen that Sector 2's companies have a low asset range ($481.471 million). (Once again, this indicates the standard deviation and coefficient of variation should be relatively accurate as any outliers should only have a minimal effect.) Subsequently, Sector 2's moderate standard deviation ($98.671 million) implies that values will be focused primarily around the median, yet extending further away from the median than Sector 1's values did. Its moderate coefficient of variation (15.2%) means the Sector's assets vary moderately in comparison to their magnitude.

Figure 2 graphically depicts Sector 2's performance. As expected, the distribution is peaked around its centre, yet values extend further from the centre than in Sector 1's histogram. Sector 2's distribution is slightly positively skewed.

Sector 3

Sector 3 is the highest performing sector. This is demonstrated in Figure 1. It can be seen that Sector 3's inter-quartile range of company assets sit above that of all other Sectors. Sector 3's companies have an average (median) net asset base of $902.445 million.

From Table 1 it can be seen that Sector 3's companies have the largest asset range ($2185.940 million). This gigantic range implies that any outliers could have a substantial misleading effect on the standard deviation and coefficient of variation. Table 1 reports that Sector 3 has a massive standard deviation ($265.069 million) and a large coefficient of variation (28.8%). This suggests that Sector 3 company assets are spread well away from the median and the assets vary substantially in comparison to their magnitude.

However, upon inspection of the data it became apparent that Sector 3 contained a single extreme outlier. One company (out of 64) held assets of $3004 million. Thus, the standard deviation and coefficient of variation were not representative of the majority of values. To provide a more accurate idea of the distribution, I recalculated the statistics without the outlier. (See Table 2)

Table 2 shows that Sector 3's company assets now have the smallest range of all Sectors ($204.360 million). This implies that any additional outliers would have a minimal impact on the calculation of the standard deviation and coefficient of variation. The new standard deviation and coefficient of variation are both now the smallest of all Sectors ($33.770 million and 3.8% respectively). This suggests that most values will be closely clustered around the median with little extension. Furthermore, the Sector's assets vary only slightly in comparison to their magnitude. Thus, simply by excluding one extreme outlier, Sector 3 changed from having the most fluctuating assets to the company with the most stable assets.

Figure 2 graphically depicts Sector 3's performance (excluding the outlier). As expected, the distribution is heavily clustered around its centre expanding only slightly on either side. The distribution is slightly positively skewed.

Table 2: Key Statistics by Sector
(An outlier of $3004 million has been excluded from Sector 3.)

	Sector 1	Sector 2	Sector 3	Sector 4
No. of Companies	111	41	63	109
Minimum ($M)	544.630	494.490	818.060	187.520
Maximum ($M)	909.840	975.960	1022.420	1424.650
Range ($M)	365.210	481.470	204.360	1237.130
Median ($M)	764.360	634.510	902.210	814.070
Standard Deviation ($M)	50.428	98.671	33.770	163.024
Coefficient of Variation	6.7%	15.2%	3.8%	19.7%

Sector 4

Sector 4 is the 2nd highest performing sector. This is demonstrated in Figure 1. It can be seen that Sector 4's inter-quartile range of company assets sit above that of Sectors 1 & 2, yet below that of Sector 3. Sector 4's companies have an average (median) net asset base of $814.070 million.

Table 1 shows that Sector 4's company assets have a very large range ($1237.130 million), a large standard deviation ($163.024 million) and a very large coefficient of variation (19.7%). This large range

indicates that any outliers could have a substantial effect on the calculation of the standard deviation and coefficient of variation. However, upon examination of the values, I determined there were no single extreme outliers. Thus, I opted not to exclude any values as removing 10% of data is not being representative.

The large standard deviation implies that values will be more spread out than in the other companies' asset distributions. The very large coefficient of variation means the Sector's assets fluctuate largely in comparison to their magnitude.

Figure 2 graphically depicts Sector 4's performance. As anticipated, the distribution spreads further from its centre than all other Sectors. However, the distribution appears to be ever so slightly bimodal. Bimodal in this capacity means "having two local maxima as opposed to two equal most common values" (Weisstein, E 2002). Bimodal distributions can produce "deceptive summary statistics such as the… standard deviation" (All Experts 2006). However, in the case of Sector 4, the distribution of company assets could just as easily be considered non-bimodal, instead with a clump of lower outliers. Thus, the standard deviation is still valid and representative. Overall the distribution is negatively skewed with a long upper tail.

Comparison Concerns

Table 2 shows that the number of companies in each Sector differ. Thus, no comparison between Sectors can be truly conclusive. Sector 1 has 111 companies. This enables a trend to become apparent and gives strong weight to that trend. However, Sector 2 has only 41 companies. Thus, a trend may be slightly harder to see and less weight can be placed on the findings. Sector 3 has 63 companies, implying that any conclusions are most likely valid. Sector 4 consists of 109 companies placing strong weight on its findings.

Risk Assessment

Variance is used in the world of finance to denote the level of risk in an investment. In all cases the underlying assumption is that a large variance corresponds to a higher level of risk. To compare variances from different distributions we use the coefficient of variance. The larger the coefficient of variance, the greater the risk. (Selvanathan, Selvanathan, Keller & Warrack 2007, p. 142, 148) From Table 2 it can be concluded that Sectors 1 and 3 pose minimal risk to investors as their coefficient of variation is low. This implies their respective industries are stable. However, Sectors 2 and 4 pose increased risk to investors as their coefficient of variation is high.

Sector 3 has the smallest coefficient of variation and 63 companies to give the statistic weight. Thus, it is the preferred investment option.

References

All Experts 2006, *'Bimodal distribution: Encyclopaedia'*, in All Experts Questions & Answers, accessed 15 April 2007, from <http://en.allexperts.com/e/b/bi/bimodal_distribution.htm>.

Selvanathan, A, Selvanathan, S, Keller, G & Warrack, B 2007, '*Australian Business Statistics 4th Edition (Abridged)'*, Thomson Learning Australia, Melbourne.

Weisstein, E 2002, '*Bimodal.*' in Wolfram Math World, accessed 15 April 2007, from <http://mathworld.wolfram.com/Bimodal.html>.
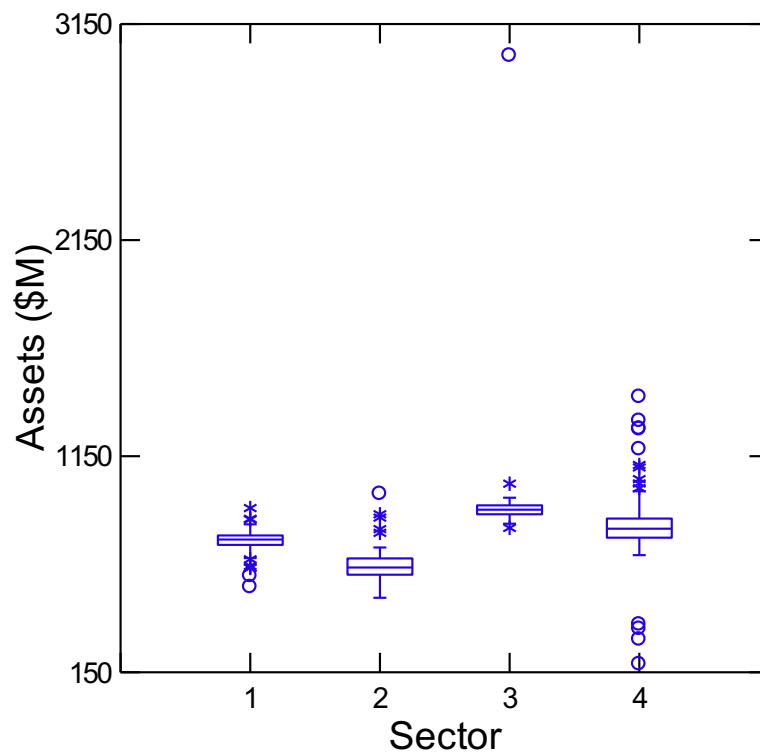
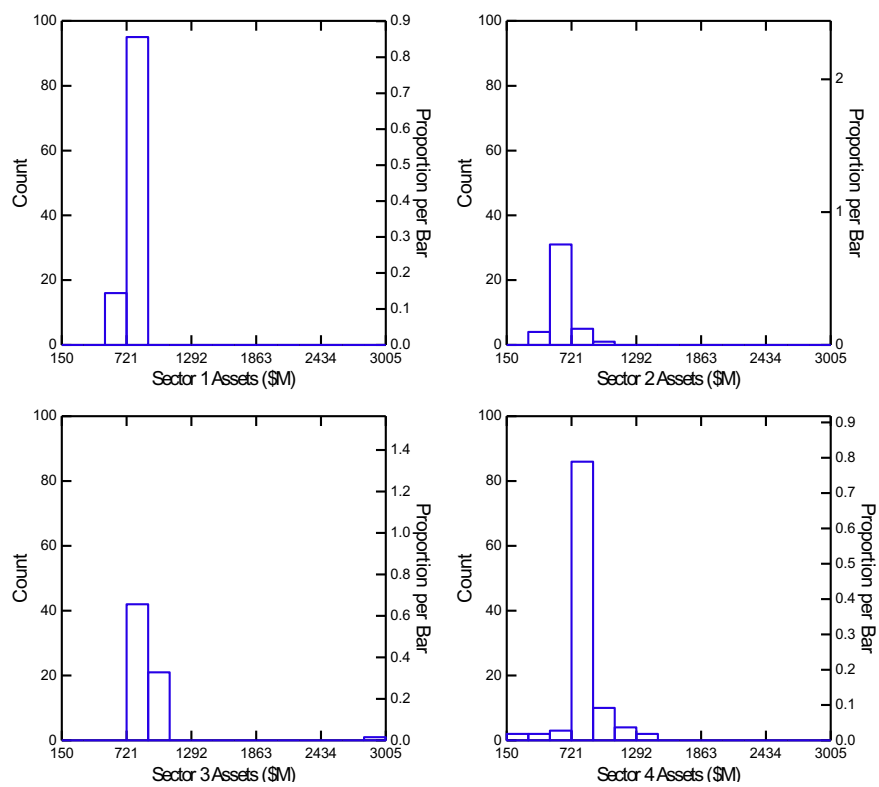# Appendix

Figure 3: Boxplot Comparison of Sector Assets.

Figure 4: Histogram Comparison of Sector Assets.