THE EFFECT OF DIVERSIFICATION ON AUSTRALIAN PORTFOLIOS

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This note explores the diversification effect of increasing the size of a portfolio to decrease its risk which is measured by the standard deviation of the portfolio. No thorough market value weighted study exists in Australia at all and this note goes part of the way to providing actual numbers to measure the effect. It is based on Praetz and Wilson (1978) who studied the frequency distributions of share prices returns on the Australian stock market, monthly from 1958-1973, using the data base of the Australian Graduate School of Management, University of New South Wales which has returns adjusted for all capital changes and which includes dividends.

Table 1 below has used averages over all portfolios variance as their size increases so portfolios assume equal weighting for all stocks.

TABLE 1

Monthly Estimated and Actual Portfolio Standard Deviations and Amount of Achieved Diversification for Increasing Portfolio Sizes

(1)	(2)	(3)	(4)
Portfolio Size (n)	Estimated Portfolio Standard Deviation (%)	Portfolio Standard Deviation Sp (%)	Amount of Diversification Achieved (%)
1	9.17	9.17	0
5	6.71	6.58	42
10	5.04	5.24	63
20	4.07	4.14	81
40	3.57	3.59	90
100	3.25	3.20	96
578	3.04	2.96	100

Column (1) has the portfolio size (n), which equals 1, 5, 10, 20, 40, 100 and 578 (market).

The estimated portfolio standard deviations in column (2) are given by substituting n (portfolio size) in $Sp = 3.04 + 21.46\, n^{-1} - 15.33\, n^{-2}$, which was estimated by ordinary least squares and explained 99.7% of total Sp variation. The difference between the estimated and actual portfolio standard deviations in column (3) is very small.

The portfolio standard deviations decline dramatically from 9.17% if a single security is held to 2.96% for the market illustrating the advantages of diversification. For 20 securities, the value is 4.14% which has declined a lot towards that of the market standard deviation.

Column (4) has percentages of amounts of diversification achieved as portfolio sizes increase so 42% is achieved with five shares. With 20 shares, the amount is 81% and the market is completely diversified.

Figure 1 is a graph of the actual (·) and fitted (—) portfolio standard deviations of columns (3) and (2) in Table 1. Both decline rapidly at first and then much more slowly approaching the 3% level. The fitted graph (and formula) can be used for generating values of the portfolio standard deviation for sizes which are not in Table 1. For example, using 15 shares gives $Sp = 4.40\%$ from the formulae with $n = 15$ (or graph by reading the value of Sp off from the vertical axis).

All data is monthly, so yearly standard deviations follow by multiplying monthly values in Table 1 by $3.464 = \sqrt{12}$.

The conclusion is that most of the effective diversification is achieved by 20 to 30 share portfolios.

REFERENCE

Praetz, P. and Wilson, E. (1978), "The Distribution of Stock Market Returns", *Australian Journal of Management*, Vol. 3, pp 79-90.

FIGURE 1

Actual (·) and Fitted (–) Portfolio Standard Deviations