

positive or negative.¹⁹ Second, central to the hypothesis that it is necessary to offer a positive premium to investors in order to attract adequate capital into a risky industry is the idea that risk may cause firms to incur losses as well as to enjoy abnormally high profit rewards. Hence, risky industries would be characterized by the presence of both firms with abnormally high profits and firms with abnormally low profits. It would be inconsistent with risk theory if nearly all firms in an industry made very high profits and few or none ever suffered losses.

The Conrad-Plotkin measure of risk misses this point. Risk is quantified by Conrad and Plotkin by measuring the variance of individual companies' rates of return about the industry average in a given year and computing a simple average of these values for the sixteen-year period 1950 to 1965.²⁰ This measure assumes that the greater the *variation* in the profit rates of firms about the industry average, the *riskier* the industry. The chief conceptual shortcoming of this measure is that it does not necessarily tell us anything about the probability of incurring losses. In truth, using this measure an industry may be defined as risky even though all firms in it earn excessively high profits; on the other hand, this measure may define an industry as having very low risk even though all firms are making little or no profit. An example will illustrate this point. By the Conrad-Plotkin measure, the drug industry is a high risk industry and the aluminum industry is a low risk industry. Conrad and Plotkin's estimates of the average rate of return, standard deviation, and variance for the two industries are as follows:

[In percent]			
	Average rate of return	Standard deviation ¹	Risk (profit variance) ²
Drugs.....	17.5	8.6	74.2
Aluminum.....	7.8	1.3	1.6

¹ The standard deviation is defined as the positive square root of the variance. In a normal distribution 68 percent of the observations fall within 1 standard deviation, plus or minus, of the average; 2 standard deviations about the average include 95 percent of the observations.

² Variance measures the dispersion of observations about an average. It is computed by taking a simple average of the squared deviations of the observations from the average.

The drug companies in their sample experienced an average rate of return of 17.5 percent over the period 1950-1965.²¹ The standard deviation in profits around this average was 8.6 percent. This means that the profit ratio of roughly two-thirds of the companies in the industry fell in the range, 8.9 percent to 26.1 percent.

On the other hand, the average rate of return of a group of aluminum companies was 7.8 percent, with a standard deviation of 1.3 percent. This means that two-thirds of the time aluminum company profits fell in the range, 6.5 percent to 9.1 percent.

Thus, according to Conrad and Plotkin, the drug industry is riskier than the aluminum industry because of the greater standard deviation in the profit rates of drug manufacturers.

Just what do these facts concerning the variation in profits tell an investor about the relative profit expectations in these two industries? They say, in effect, that there is a two to one chance that profit rates in the drug industry will fall in a range from 8.9 percent to 26.1 percent, whereas there is a two to one chance in the aluminum industry that profit rates will fall in a range from 6.5 percent to 9.1 percent. Can anyone seriously argue that investors would prefer to place new capital in the aluminum industry rather than in the drug industry? The only risk that the aluminum investor is saved from is the high probability that aluminum companies will earn less than 9 percent—there is only one chance in six of getting more than 9 percent. On the other

¹⁹ See, for example, Professor Bain's discussion of the effect of risk on average profit rates of an industry. He concludes that, "a weighted average profit rate for all firms in the economy or in the industry (all losers as well as all winners being included) should include a true net risk return of roughly zero—and there should be no obvious risk reward explanation of group-average excess profits." Joe S. Bain, *Industrial Organization*, 1959, p. 375.

²⁰ Gordon R. Conrad and Irving H. Plotkin, *Risk and Return in American Industry*, p. 12.

²¹ Conrad and Plotkin's computations of industry variance and profits in 59 industries have been reproduced in Appendix Table 1.