

The Truth About Diversification by the Numbers

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Ninety-five percent of the benefits of diversification are captured with a 30-stock portfolio. This is a common belief held by virtually all investment professionals. It's based on research conducted by Fisher and Lorie (F&L) [1970] on NYSE-traded stocks during 1926-1965. In this article we clarify F&L's work, offer some alternative approaches, and update the analysis to incorporate January 1, 1986, through June 30, 1999.

F&L measure the percent of all *possible* reduction in *dispersion* achieved by portfolios of various sizes on *average*. The reductions are measured relative to the dispersion of a one-stock portfolio. In this context, "all possible reduction" is the denominator of the ratio and is the difference between the dispersion of a one-stock portfolio and the dispersion of a portfolio comprising all NYSE stocks. The numerator of the ratio is the difference in dispersion between a one-stock portfolio and that of an N-stock portfolio where N is the number of stocks. Their results are summarized in Exhibit 1.

Hence it is commonly said that 90% of diversification is achieved with a 16-stock portfolio, and 95% is achieved with a 32-stock portfolio. We believe this is a misinterpretation of the F&L results for several reasons.

F&L measure the reduction in *total* volatility, which includes both diversifiable, or specific, and nondiversifiable, or market, risk. Modern portfolio theory (MPT) postu-

lates that only market risk is rewarded in the aggregate, so specific risk is to be avoided.

The reduction in specific risk is the benefit of diversification, and the basis for measures of diversification such as R-squared and tracking error. R-squared measures the percent of variance that is explained by the market, and is hence undiversifiable risk. Tracking error measures specific, or diversifiable, risk as the standard deviation of returns away from the market.

R-squared and tracking error are the measures that should be used to determine improvement in diversification since they are measures of diversification. Improvement in overall risk is interesting, but does not support statements about diversification. Some real examples will illustrate the point.

We have repeated the F&L analysis using portfolio opportunity distributions (PODs) for January 1986 - June 1999 (see Surz [1993, 1996, 1998]). PODs create all possible portfolios of a given size that could be held from stocks in the Compustat database, so the market in this analysis is broader than just the NYSE and includes NASD-traded securities. Exhibit 2 shows an F&L dispersion measure (standard deviation) and the two diversification measures. Exhibit 3 shows the percent of possible reduction derived from Exhibit 2.

As can be seen from Exhibit 3, we get results that are very similar to F&L for reductions in dispersion, or standard deviation, but the results for improvements in diversification

EXHIBIT 1

Reduction in Dispersion by Number of Stocks in Portfolio (%)

	Number of Stocks						Entire Market
	1	2	8	16	32	128	
	0	41	82	90	95	99	100

EXHIBIT 2

Risk and Diversification Measures for Portfolios of Various Sizes—January 1986-June 1999

	Number of Stocks				Entire Market
	1	15	30	60	
Standard Deviation	45%	16.5%	15.4%	15.2%	14.5%
R ²	0	0.76	0.86	0.88	1.0
Tracking Error	45	8.1	6.2	5.3	0

EXHIBIT 3

Percent of Possible Reduction

	Number of Stocks				Entire Market
	1	15	30	60	
Standard Deviation	0%	93%	97%	98%	100%
R ²	0	76	86	88	100
Tracking Error	0	82	86	88	100

EXHIBIT 4

Ranges of Dispersion and Diversification

	Standard Deviation			Entire Market
	15 Stocks	30 Stocks	60 Stocks	
5	19.2	17.5	17.2	
25	17.5	16.1	16.0	
50	16.5	15.4	15.2	14.5
75	15.5	14.7	14.5	
95	14.3	13.9	13.6	
R-Squared				
5	0.86	0.91	0.94	
25	0.84	0.89	0.91	
50	0.76	0.86	0.88	1.0
75	0.71	0.84	0.86	
95	0.63	0.76	0.79	

EXHIBIT 5

Reducing Tracking Error

	Tracking Error		
	15 Stocks	30 Stocks	60 Stocks
Random	8.1	6.2	5.3
Largest	7.5	5.2	4.1
Optimized	5.4	4.2	3.5

are much weaker than previously thought. We now see that a 15-stock portfolio gets 76% of available diversification versus the F&L 93%; this improves somewhat to 82% if tracking error is used as the diversification measure, but note that the tracking error is still a formidable 8.1% per year. Even at 60 stocks we still have less than 90% of the available diversification, while F&L would suggest virtually full diversification at this level.

Besides correcting the misunderstandings about the F&L work, we want to extend our analysis beyond the average fund to encompass the full range of results. Exhibit 4 shows the ranges of dispersion and diversification for various size portfolios. Note in Exhibit 4 that some 15-stock portfolios have *less* dispersion than the market, but none comes close to the diversification of the market. When we look at it this way, it seems so obvious that reductions in dispersion do not equate to improvements in diversification, yet the old interpretation of the F&L work will probably live on.

We also want to acknowledge that most managers attempt to diversify beyond a randomly chosen portfolio. Exhibit 5 shows how tracking error can be reduced through two different techniques—optimization, and holding the largest names. As can be seen, computer optimization can significantly reduce diversifiable risk, but the less sophisticated approach of simply holding the largest names can go a long way toward controlling tracking error.

SUMMARY

We have clarified the relationship between the number of stocks held in a portfolio and diversification. Fifteen-stock portfolios, on average, achieve only 75%–80% of available diversification, not the 90%–plus typically believed. Even 60-stock portfolios achieve less than 90% of full diversification.

Conscious efforts to diversify can improve these figures, but even optimizations won't achieve the diver-

sification levels that were once believed possible with simple random portfolios.

The implications of these findings for both the portfolio manager and the investor are significant. The portfolio manager can no longer rely on a simple rule of thumb to decide on the number of stocks to include in the portfolio. Diversification is more complex than the “30-stock” saw suggests. Similarly, investors should be less sanguine in the achievement of their diversification objectives if their confidence comes from a count of the names they hold in their portfolios.

REFERENCES

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