HORIZON KINETICS

A Different Way to Think About Diversification

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The current industry sector diversification system used frequently by individuals, professional money managers, and risk managers is based on Securities Industry Classifications (SIC codes), which have very obvious deficiencies. Though it is not limited to a single SIC code, the S&P Financial Select Sector SPDR ETF ("XLF") may be used to illustrate some of those deficiencies. Included in XLF are companies like Berkshire Hathaway Inc., American Tower Corp., Weyerhaeuser Co., Plum Creek Timber Co. Inc., Leucadia National Corp., and Moody's Corp.

One could argue whether or not these firms should be considered financial companies. However, even if one were to dismiss that argument, there would still be a classification problem with XLF, because companies that are arguably correctly classified can be very dissimilar. For example, Federated Investors Inc. ("Federated"), the largest operator of money funds in the U.S., has very different profitability characteristics than T. Rowe Price Group Inc. ("T. Rowe Price"), even though both companies are in the mutual fund business. If interest rates were to rise, T. Rowe Price might not fare especially well, but Federated might experience a positive result. Another holding of XLF, Simon Properties, which operates malls, clearly differs from both T. Rowe Price and Federated; yet all three are included in XLF.

Let's now turn our attention to the iShares S&P Global Technology Sector Index ETF ("IXN"). This ETF not only includes Apple Inc., but also MasterCard Inc. There is a vast difference between these two companies.

Using SIC codes assigned to securities as a means of assessing diversification in a portfolio has limitations. We will advance the proposition that a better measure of diversity is the Herfindahl Index—also known as the Herfindahl-Hirschman Index—which measures diversity for the purposes of studying monopolies and oligopolies. In biology, it's known as the Simpson Diversity Index, and in linguistics it's called the Greenberg Linguistic Diversity Index. The formula looks like this:

$$H = \sum_{i=1}^{N} S_i^2$$

H = Herfindahl
S_i = Market share of any given firm
N = Number of firms

H, for Herfindahl, is equal to the sum of the squared S_i, or the market share of any given firm. If one adopts a classification system in which companies, their competitors, suppliers, and customers are grouped together in one class on the theory that they form one ecosystem, the symbol S_i for market share that is usually employed in the study of

monopolies would be the symbol for the ecosystem itself. Companies in the same ecosystem would have their weights summed and would count as one investment.

To illustrate, the following table lists the constituents and their weights in two seemingly distinct portfolios:

Portfolio A		Portfolio B	
Weight	Company	Weight	Company
20%	Apple Inc.	10%	Apple Inc.
20%	Google Inc.	10%	Intel Corp.
30%	Visa Inc.	10%	Microsoft Corp.
18%	eBAY Inc.	10%	Dell Inc.
12%	Automatic Data Processing Inc.	10%	Hewlett-Packard Co.
		10%	QUALCOMM Inc.
		10%	Visa Inc.
		10%	Mastercard Inc.
		10%	Applied Materials Inc.
		10%	Seagate Technology PLC.

Both portfolios are made up of technology companies. Portfolio A has a 20% weight in Apple, a 20% weight in Google, a 30% weight in Visa, an 18% weight in eBay, and a 12% weight in ADP. All five of those companies are included in IXN. Portfolio B consists of 10 companies, which are also included in IXN, with each given a 10% weight. They are Apple, Intel, Microsoft, Dell, Hewlett-Packard, Qualcomm, Visa, MasterCard, Applied Materials, and Seagate Technologies.

Which portfolio is more diversified, A or B? Portfolio B includes more names, and no position is greater than 10% of the portfolio. Portfolio A has only five names, and one position has a weight of as high as 30% of the portfolio. On that basis, one could argue with some justification that Portfolio B is more diversified than Portfolio A. Alternatively, since both are 100% invested in companies that appear in the IXN, it could be argued that both have 100% exposure to the same variable—technology companies—and therefore they have equal diversification levels.

However, in the case of Portfolio B, Apple, Intel, Microsoft, Dell, Hewlett-Packard, Qualcomm, Applied Materials, and Seagate Technologies are arguably all part of the same ecosystem. For the sale of its operating system, Microsoft relies, to a degree, upon the success of Dell and Hewlett-Packard, as does Intel for the sale of its hardware. Apple is clearly a competitor of Microsoft, and Qualcomm receives royalties on chips that are used in Apple iPhones. Applied Materials makes the wafer steppers that go into the manufacture of the semiconductors ultimately used in computers. Seagate Technologies makes disc drives that are used on the computers. Therefore, these companies are all part of the same ecosystem. However, MasterCard and Visa are part of a different ecosystem.

Viewed this way, an ecosystem is equal to competitors plus dependent suppliers plus dependent customers. Using this methodology, in Portfolio A, Apple is unrelated to Visa, eBay is unrelated to ADP, Google is unrelated to ADP, and so on.

Applying the Herfindahl formula to Portfolio B, one would have an 80% position[1] and a 20% position[2]. The result of the calculation shows that Portfolio B is 68% concentrated.

$$H_B = (1)(0.80)^2 + (1)(0.20)^2$$
$$H_B = 0.64 + 0.04$$
$$H_B = 0.68 \; or \; 68\%$$

Applying the Herfindahl formula to Portfolio A shows that it is 21.68% concentrated. Each of its elements is part of a different ecosystem.

$$H_A = (1)(0.20)^2 + (1)(0.20)^2 + (1)(0.30)^2 + (1)(0.18)^2 + (1)(0.12)^2$$
$$H_A = 0.04 + 0.04 + 0.09 + 0.03 + 0.01$$
$$H_A = 0.21 \; or \; 21\%$$

Thus, by examining portfolios on an ecosystem basis rather than on a position basis, one could make the case that the portfolio with the larger positions in fewer companies is much better diversified than the one with smaller positions in more companies. We would argue that the ecosystem approach provides a better measure of diversification.

We have always believed that investing is a social science and that quantitative information is generally not meaningful without qualitative context.

[1] Apple, Intel, Microsoft, Dell, Hewlett-Packard, Qualcomm, Applied Materials, and Seagate Technologies.
[2] Visa and MasterCard,