

# CAPITALIST MANIFESTO: How Index Funds Work, Why Ordinary Investors Should Invest in Index Funds, and What to Expect from Index Fund Managers

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CAPITALIST MANIFESTO: How Index Funds  
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## Abstract

The proposition that a prudent investor should be diversified is widely accepted if not incontrovertible for ordinary investors – investors who have no reasonable expectation of influencing company management or business policy. Indeed, fiduciary duty requires that trustees and other investment managers assure that their clients be diversified. But the idea of diversification is not well articulated or understood even by sophisticated investors. This article fills that gap by laying out the logic (and mathematics) of diversification for ordinary investors who invest in common stock. As shown here, diversification can eliminate almost all of the company-specific risk that goes with investing in equities without any sacrifice of expected return. The only risk that remains is the risk that the market as a whole may do better or worse than expected. Thus, it is often said that diversification is the only free lunch in the market. It follows that diversified investors who assume less risk because they are diversified will pay more for the shares in which they invest and will thus dictate market prices. It further follows that undiversified stock-picking investors assume more risk than necessary and thus pay too much for the stocks in which they invest. In other words, the market has eaten their free lunch. The logic of diversification explains why investors have flocked to index funds – which offer maximum diversification for minimum fees – and why almost half of all stock in US companies is held by such funds. But the idea of diversification alone does not explain how much to invest in which companies. Fortunately, the market provides the answer to this question, and the answer turns out to be indexing. Generally speaking, we can depend on individual companies to maximize returns for their own stockholders by seeking out the most profitable opportunities in which to do business. Since market price is a function of expected return (divided by the required rate of return), it follows that ordinary investors should invest their funds in proportion to the aggregate market value of investee companies because by doing so investors are assured that their money is spread evenly across all lines of business in the economy in proportion to prospects for return. Thus, ordinary investors should invest in index funds that hold shares in proportion to the market capitalization of all possible portfolio stocks. It turns out that the 500 (or so) largest US stocks account for more than 80% of total market value. And as it happens, the value-weighted version of the S&P 500 (SPX) comprises exactly that portfolio. It follows that investing in an index fund that tracks SPX is a good way – possibly the best way – achieve maximum diversification at the lowest possible expense. Thus, it is mostly coincidence that investors favor index funds that track SPX as opposed to other indices. SPX was designed to measure the market and not as a normative strategy for investing. But it turns out that SPX provides the best guide for how to allocate investment funds within a portfolio of US common stocks. In other words, if SPX did not exist, it would be necessary to invent it. Moreover, by so allocating funds, the expenses of investment management can be kept to a minimum, because following an affirmative strategy of indexing precludes expending any fund assets on company-specific research. To engage in such research would be a literal waste of assets – and thus a breach of fiduciary duty – since there is nothing fund managers can do with the fruits thereof without violating an announced strategy of indexing. Similarly, indexing keeps the expenses of trading at the fund level to a minimum because the only trading that is necessary or appropriate is portfolio balance trading (PBT) to keep fund holdings proportional to the market capitalization of portfolio companies. Finally, it is wrong to characterize indexing as a passive investment strategy or one by which index investors free-ride on the efforts of traditional stock-picking investors who engage in company-specific fundamental research. To the contrary, indexing magnifies the disciplinary effects of market prices on portfolio company management. Moreover, indexing by some (or many) investors creates trading opportunities for other investors since index investors effectively cede first mover advantages to investors who engage in company-specific research. Thus, there is a symbiotic relationship between index investors and activist investors – and indeed among all investors of diverse interests – that arguably makes the market more efficient than it would otherwise be (in the absence of indexing).

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Keywords: prudent investor, trustee, investment manager, diversification, companyspecific risk, market risk, expected return, index fund, market capitalization, portfolio, value-weighted, S&P 500, fundamental research, fiduciary duty, portfolio balance trading, stock-picking, no-win transaction, waste, dead-weight loss, suitability rule, taxefficient, Sharpe Ratio, coefficient of variation, turnover, arithmetic average, geometric average, law of large numbers, standard deviation

JEL Classifications: G11, G23, G32, G53, K22, P17

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## CAPITALIST MANIFESTO

### *How Index Funds Work, Why Ordinary Investors Should Invest in Index Funds, and What to Expect from Index Fund Managers*

Richard A. Booth

#### ABSTRACT

The proposition that a prudent investor should be diversified is widely accepted if not incontrovertible for ordinary investors – investors who have no reasonable expectation of influencing company management or business policy. Indeed, fiduciary duty requires that trustees and other investment managers assure that their clients be diversified. But the idea of diversification is not well articulated or understood even by sophisticated investors. This article fills that gap by laying out the logic (and mathematics) of diversification for ordinary investors who invest in common stock. As shown here, diversification can eliminate almost all of the company-specific risk that goes with investing in equities without any sacrifice of expected return. The only risk that remains is the risk that the market as a whole may do better or worse than expected. Thus, it is often said that diversification is the only free lunch in the market. It follows that diversified investors who assume less risk because they are diversified will pay more for the shares in which they invest and will thus dictate market prices. It further follows that undiversified stock-picking investors assume more risk than necessary and thus pay too much for the stocks in which they invest. In other words, the market has eaten their free lunch.

The logic of diversification explains why investors have flocked to index funds – which offer maximum diversification for minimum fees – and why almost half of all stock in US companies is held by such funds. But the idea of diversification alone does not explain how much to invest in which companies. Fortunately, the market provides the answer to this question, and the answer turns out to be indexing. Generally speaking, we can depend on individual companies to maximize returns for their own stockholders by seeking out the most profitable opportunities in which to do business. Since market price is a function of expected return (divided by the required rate of return), it follows that ordinary investors should invest their funds in proportion to the aggregate market value of investee companies because by doing so investors are assured that their money is spread evenly across all lines of business in the economy in proportion to prospects for return. Thus, ordinary investors should invest in index funds that hold shares in proportion to the market capitalization of all possible portfolio stocks. It turns out that the 500 (or so) largest US stocks account for more than 80% of total market value. And as it happens, the value-weighted version of the S&P 500 (SPX) comprises exactly that portfolio. It follows that investing in an index fund that tracks SPX is a good way – possibly the best way – achieve maximum diversification at the lowest possible expense.

Thus, it is mostly coincidence that investors favor index funds that track SPX as opposed to other indices. SPX was designed to measure the market and not as a normative strategy for investing. But it turns out that SPX provides the best guide for how to allocate investment funds within a portfolio of US common stocks. In other words, if SPX did not exist, it would be necessary to invent it. Moreover, by so allocating funds, the expenses of investment management can be kept to a minimum, because following an affirmative strategy of indexing precludes expending any fund assets on company-specific research. To engage in such research would be a literal waste of assets – and thus a breach of fiduciary duty – since there is nothing fund managers can do with the fruits thereof without violating an announced strategy of indexing. Similarly, indexing keeps the expenses of trading at the fund level to a minimum because the only trading that is necessary or appropriate is portfolio balance trading (PBT) to keep fund holdings proportional to the market capitalization of portfolio companies.

Finally, it is wrong to characterize indexing as a passive investment strategy or one by which index investors free-ride on the efforts of traditional stock-picking investors who engage in company-specific fundamental research. To the contrary, indexing magnifies the disciplinary effects of market prices on portfolio company management. Moreover, indexing by some (or many) investors creates trading opportunities for other investors since index investors effectively cede first mover advantages to investors who engage in company-specific research. Thus, there is a symbiotic relationship between index investors and activist investors – and indeed among all investors of diverse interests – that arguably makes the market more efficient than it would otherwise be (in the absence of indexing).

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JEL CODES: G11, G23, G32, G53, K22, P17

## CAPITALIST MANIFESTO

### *How Index Funds Work, Why Ordinary Investors Should Invest in Index Funds, and What to Expect from Index Fund Managers*

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The iron law of investing is that if you take more risk, you must get more return. And if you want more return, you must take more risk. This is more than a bizspeak buzzphrase. It is actually the *law*. For example, it is almost impossible for management of an ordinary business corporation to be held liable for losses suffered by the corporation as a result of a bad business decision. The so-called business judgment rule recognizes that one must take risk to generate return. And to take a risk means that one will sometimes lose. So it would hardly be fair to hold management liable for losses. Stockholders should know when they invest that they may lose. That is the deal – literally.

On the other hand, there are exceptions to the business judgment rule. If management assumes extra risk without the prospect of extra return – if it makes a no-win bet for the company – management can be held liable for the loss suffered by the company.<sup>1</sup> Stockholders understand that companies will sometimes lose money. But they also expect that the losses they suffer will come from a good faith effort to make money. That is also the deal – literally.

Similarly, investment managers are duty-bound to avoid unnecessary risk for their clients. If my investment manager can get me a 10% return with one unit of risk by investing in ABC Company but instead steers me to XYZ Company where the prospect of the same 10% return entails two units of risk, I would have a claim for breach of fiduciary duty (BFD) if I suffer a loss because I was led to invest in XYZ. But what really do we mean by risk? How do we measure risk? And how does it relate to return? If my investment advisor can get me a 10% return with one unit of risk by investing in ABC Company or a 20% return with two units of risk by investing in XYZ Company, how do I compare the alternatives? The question whether ABC or XYZ is the better investment also requires that we quantify the co-relationship between risk and return. In the original example, both ABC and XYZ offered the same 10% return. So it is enough to know that XYZ entails more risk to conclude that ABC is the better investment. But we do not know how much more return would be required from XYZ to make it an equally attractive investment. Would 12% be enough? Or might we require a 20% return or even more to make up for the additional risk? There are many ways to define and measure risk. So the courts are understandably reluctant to get involved. As Cardozo once said, "Such a calculus of probabilities is beyond the science of the chancery."<sup>2</sup>

<sup>1</sup> See, e.g., *Joy v. North*, 692 F.2d 880 (2d Cir. 1982); *Litwin v. Allen*, 25 N.Y.S.2d 667 (Sup. Ct. 1940).

<sup>2</sup> *Meinhard v. Salmon*, 249 NY 458, 465 (1928).

One might think that it is quite unusual to find cases in which two investments offer the same return at different levels of risk. But one would be wrong. The situation arises surprisingly often – whenever an investment manager fails to diversify the investment portfolio of a client since by investing in a diversified portfolio of stocks an investor can achieve the same return as would be expected from a single stock but at a fraction of the risk. For example, by investing in a well-diversified portfolio of thirty stocks (such as the Dow Jones Industrial Average (DJIA)), one can eliminate more than 80% of the risk that goes with a single-stock portfolio without any sacrifice of expected return. Thus, it has been said that diversification is the only free lunch in the market.

The point is that it is a BFD for an investment manager to fail to diversify a client account (all else equal) because to fail to diversify is to assume more risk than is necessary to achieve the expected return.<sup>3</sup> Indeed, the law of trusts – not to mention the Talmud – includes a duty to diversify.<sup>4</sup>

<sup>3</sup> Needless to say, this assertion assumes that the investment manager (or adviser) in question is a fiduciary. That is not always true. Indeed, the question whether someone who provides financial advice should always be deemed to be a fiduciary has been debated and litigated at great length recently. The answer is that it depends on the person and the applicable legal regime. For example, a broker-dealer may or may not be a fiduciary depending on how much trust a customer reposes in them. See *Miley v. Oppenheimer & Co.*, 637 F.2d 318 (5th Cir. 1981). On the other hand, investment advisers registered with the SEC under the Investment Advisers Act of 1940 are presumed (at least) to be fiduciaries, and there is no doubt that the investment advisers who manage mutual funds and other such investment vehicles are fiduciaries as to the funds they manage. See, e.g., *Jones v. Harris Associates, LP*, 559 U.S. 335 (2010). And administrators of retirement plans (as governed by ERISA) are always fiduciaries. See, e.g., *Jander v. Retirement Plans Committee of IBM*, 910 F.3d 620 (2018), *vacated and remanded*, 140 S. Ct. 592, *reinstated*, 962 F.3d 85 (2d Cir. 2020). See generally Arthur B. Laby, *Reforming the Regulation of Broker-Dealers and Investment Advisers*, 65 Business Lawyer (2010). See also Brian Menickella, *How Elizabeth Warren's Vow to Bring Back Fiduciary Rule Affects You*, *Forbes*, Nov 6, 2019.

To be clear, the argument for diversification made here does not depend on whether the investor or decision-maker is a fiduciary, although it does imply that a fiduciary is duty-bound to assure that clients are diversified (all else equal) and irrespective of any conflict of interest. The argument also implies a reasonable investor would diversify and thus should inform the law with regard to any question that turns on the interests of reasonable investors. See *infra* note xxx.

<sup>4</sup> See Restatement (Third) of Trusts § 229(d) (1992); *Roberson v. Central Jersey Bank & Trust, Co.*, 47 F.3d 1268, 1273-74 (3d Cir. 1995) ("Prudence implies a duty to diversify," citing *Commercial Trust Co. of N.J. v. Barnard*, 27 N.J. 332, 142 A.2d 865, 871 (N.J. 1958). And see Ran Duchin & Haim Levy, *Markowitz Versus the Talmudic Portfolio Diversification Strategies*, 35 J. Portfolio Management, Winter, No. 2, at 71 (2009); Russell Investments Blog, *The Long March of Diversification — 1500 BCE to Today* (January 23, 2019). And also see Ecclesiastes 11:2 (935 BC); William Shakespeare, *The Merchant of Venice*, Act I: Scene 1 (Antonio).

But wait. There's more.

If the duty to diversify is based on the idea that one should avoid unnecessary risk, then it follows that one should take as little risk as possible. And while one can eliminate 80% of company-specific risk with a thirty-stock portfolio, it is possible to eliminate 95% of such risk by investing in 500 stocks as are comprised by the Standard & Poor's 500 (S&P 500) (ticker SPX).<sup>5</sup> In other words, one can avoid even more risk by investing in an SPX index fund. Indeed, such funds arguably offer the most diversification possible. Moreover, such funds charge the lowest possible management fees because fund managers have nothing to do but to mimic the index – which entails very little trading. So aside from minimizing risk, index funds also minimize the expenses of investment management. Thus, even if index funds merely offered equivalent risk-return combinations, they would be preferable because of lower expenses.

Presumably, a fiduciary is duty-bound to pay as little as possible for a given product or service – since to pay more than necessary is a literal waste of assets.<sup>6</sup> So it follows that a fiduciary is duty bound to opt for the lowest cost strategy all else equal. To be sure, I am free to invest my own money however I see fit. I cannot breach a fiduciary duty to myself. Then again, most investors want the most return they can get at the least risk and expense. So it follows that most investors who choose to invest in equities (common stocks) should invest in an index fund.<sup>7</sup>

Moreover, the law depends in many situations on preferences – the wants and needs – of reasonable investors to the extent they can be determined.<sup>8</sup> If a reasonable investor

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<sup>5</sup> SPX is the ticker for the price-only float-weighted version of the index, which is the one most widely followed and used for purposes of valuation. There are several other versions of the index.

<sup>6</sup> Although this proposition follows from well-settled legal doctrine (see *supra* note 1), it has found application elsewhere in the law of securities regulation, such as with regard to rules relating to obtaining soft-dollar services in exchange for directed brokerage.

<sup>7</sup> In addition, index funds offer a way to lock in a fiduciary relationship. Whereas the manager of an actively managed fund can change investment strategy almost with impunity, an index fund manager is duty-bound to follow the logic of indexing. Thus, an index fund offers another subtle way to minimize risk – namely the risk that the fund manager may change horses in midstream – may opt for a strategy disfavored by investors.

<sup>8</sup> See *TSC Indus., Inc. v. Northway, Inc.*, 426 U.S. 438 (1976); *Basic Inc. v. Levinson*, 485 U.S. 224 (1988); *Matrixx Initiatives, Inc. v. Siracusano*, 563 U.S. 27 (2011); *Amgen Inc. v. Conn. Ret. Plans & Trust Funds*, 568 U.S. 455 (2012); *Omnicare, Inc. v. Laborers Dist. Council Constr. Indus. Pension Fund*, 575 U.S. 175 (2015); *Halliburton Co. v. Erica P. John Fund, Inc.*, 573 U.S. 258 (2014) (*Halliburton II*); *Goldman Sachs Grp., Inc. v. Ark. Teacher Ret. Sys.*, 141 S. Ct. 1951 (2021).

should be diversified, then the law should be tailored to that preference.<sup>9</sup> So the question is what exactly do we mean when we say that an investor is diversified? Do we mean that the investor is somewhat diversified? Or do we mean that the investor is reasonably diversified or as diversified as possible?

Needless to say, the answer is particularly relevant in situations in which the law affirmatively *requires* diversification. In such situations, one must determine whether a trustee or other fiduciary has complied with the standard of care and if not what the remedy should be. So we need to know the extent to which the principal was harmed. Thus, we must compare how much was lost with how much would have been lost if the plaintiff-investor had been properly diversified.<sup>10</sup> But we cannot do that calculation unless we know how diversification works.

The answer also matters where the question relates to the standard of care applicable to a fiduciary or indeed anyone else who provides investment advice. Although a broker-dealer is not a fiduciary simply because they may make investment recommendations in the course of doing what they do, a broker-dealer is nonetheless bound by the FINRA suitability rule or the know-your-customer rules promulgated by exchanges.<sup>11</sup>

It is the purpose of this article to explain why ordinary investors have chosen to invest in index funds and indeed to explain why indexing is the superior strategy for such investors. Thus, it is also the goal here to provide a definition for the idea of a reasonable investor for purposes of interpreting the law of corporations as well as securities regulation and other bodies of law where the idea may be relevant.

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<sup>9</sup> It is often said that the measure of fiduciary duty is to act as would prudent persons in the conduct of their own affairs. If it is so clearly wrong to assume unnecessary risk that an investment manager can be held liable for doing so, there must be some pretty powerful logic behind the idea – a pretty good reason to act accordingly even if one is not legally required to do so.

<sup>10</sup> See, e.g., *Davis v. Merrill Lynch, Pierce, Fenner & Smith, Inc.*, 906 F.2d 1206 (8th Cir. 1990); *Nesbit v. McNeil*, 896 F.2d 380 (9th Cir. 1990). One issue that arises in many such cases is whether an investor should be compensated for their entire loss or only for the difference between what they would have lost if they had not been led to assume too much risk and what they would have lost but for the extra risk. The general rule for purposes of federal securities regulation is (sensibly) to compensate investors for their actual loss if suffered – even though it entails a windfall of sorts – but not to compensate investors for any non-loss simply because of the assumption of an excess risk that did not come home to roost (so to speak). See Richard A. Booth, *OOPs! The Inherent Ambiguity of Out-of-Pocket Damages in Securities Fraud Class Actions*, 46 J. Corp. L. 319 (2021). The rule is similar for purposes of mismanagement cases as a matter of state corporation law.

<sup>11</sup> FINRA Manual Rules 2111, 2090.

This article proceeds as follows:

Part I explains how diversification works in general. As will be seen, investors can eliminate company-specific risk – the risk that goes with investing in individual stocks – without any reduction in expected return.<sup>12</sup> The only risk that remains is the risk that the market as a whole will rise or fall – that equities in the aggregate will generate more or less return depending on general economic conditions.

Part II ventures into the weeds of how to construct a diversified portfolio of stocks and how we can know if we are as diversified as possible. As will be seen, the argument for holding a portfolio of about 500 stocks weighted in proportion to market capitalization is almost conclusive. Thus, the fact that the biggest and most successful index funds mimic the SPX is no accident.

Part III discusses the salient details of portfolio management in connection with a SPX index fund. In general, such a fund should minimize the expenses of investment management and fund operation.<sup>13</sup> Because an index fund is fully diversified and has eliminated company-specific risk, there is no reason to spend anything on company-specific research. Indeed, to do so constitutes waste (in the strict legal sense) because there is no use to which any such research may be applied: A SPX fund is committed to holding stocks in proportion to market capitalization. It cannot also buy and sell stocks based on company-specific research. So to spend anything on such research is a dead-weight loss that does nothing but reduce net return to investors. Accordingly, it is a breach of fiduciary duty for a SPX fund manager to devote any fund resources to company-specific research.

On the other hand, because a SPX index fund is committed to holding stocks in proportion to their market capitalization, such a fund must engage in some trading to keep fund holdings balanced – trading which is dictated by the logic of portfolio construction. As it turns out, such portfolio balance trading (PBT) results in minimal turnover – about 4% per year compared to about 63% per year (on average) for actively

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<sup>12</sup> The discussion here uses the word company – rather than the word corporation or firm – to refer to the businesses in which investors and investment companies invest (1) because investee businesses need not be corporations, and (2) because the word firm – which tends to be favored by economists – tends to connote a theoretical construct that captures all sorts of cooperative ventures. In short, the word company is probably more familiar to more readers as connoting a business separate from its owners in which one might invest.

<sup>13</sup> The word fund is used herein to refer generally to investment companies such as mutual funds and index funds and not to the cash invested therein. Note also that many index funds are organized as mutual funds. But many such funds are organized as exchange traded funds (ETFs) which are similar to closed-end funds. Although these distinctions can be quite important to the details of how a fund operates, they do not matter much for present purposes except to the extent they affect management fees and other operating expenses.

managed mutual funds.<sup>14</sup> Thus, SPX index fund investors benefit from both minimal advisory expenses and minimal trading expenses while locking in a market rate of return and avoiding company-specific risk. Incidentally, low turnover minimizes the effects of taxes on return. In broker lingo, index investing is tax-efficient.

Taken together, the foregoing features of index funds explain why index funds have become so popular with investors – why an estimated 40% (by value) of all the shares of US companies is held in index funds.<sup>15</sup> In short, they offer maximum return at minimum risk. Indeed, one can argue that ordinary investors are effectively compelled to invest in index funds: Because indexing eliminates all of the risk that can be eliminated, index fund investors are willing to pay top-dollar for stocks. Thus index fund investors drive market prices. As a result, undiversified stock-picking investors pay too much for the stocks they buy. In other words, the market has eaten their (free) lunch.

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<sup>14</sup> Stephan A. Abraham, Turnover Ratios and Fund Quality, Investopedia, January 20, 2021 (data according to Michael Lake of Morningstar).

<sup>15</sup> Buttonwood: *How to Think About the Unstoppable Rise of Index Funds*, The Economist, October 16, 2021.

## I. The Logic of Diversification

Index funds are popular with investors because they provide an inexpensive way to hold a diversified portfolio of stocks.<sup>16</sup> And diversification is attractive because it permits investors to eliminate much of the risk that attends investing in individual stocks without any sacrifice of return.

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<sup>16</sup> The term *index fund* as used herein refers to a broad-market index fund such as one based on the SPX. There are many types of index funds. Some are based on indices related to a specific industry. And some are based on bespoke indices that track idiosyncratic – and often questionable – investment strategies. See Jenna McCarthy, *Benchmarking the World: A Proposal for Regulatory Oversight of Index Providers*, 51 Vanderbilt J. Transnational L. xxx (2018). While it is tempting to say that the discussion here focuses on real index funds, the word *index* can refer to any measure of any factor. But as used herein the term *index fund* applies only to broad-market index funds.

Moreover, much of the discussion here is based on the premise that SPX is an optimum – and perhaps the optimum – index for purposes of achieving maximum diversification. Needless to say, it is one thing to assert that investors should diversify (for reasons to be discussed below), but it is quite another to say that holding a SPX index fund is the best possible way to do so. As will be seen, the argument for holding a SPX index funds is powerful but not quite air-tight. Subtle tweaks are possible. But they do not detract from the central argument here that ordinary investors should diversify. Nevertheless, indexing as discussed herein is more or less synonymous with investing in SPX. On the other hand, the possibility that reasonable investors may differ as to the best way to diversify does suggest a way to decide how much diversification is enough. Specifically, it should suffice to diversify up to the point that one cannot clearly get rid of any more risk.

Relatedly, the phrase *ordinary investor* means an investor who has no reasonable expectation of influencing the management of investee companies. In contrast, an *activist investor* is one who takes a relatively large position in one or more investee companies in the hope of generating profits in excess of the market rate of return by challenging or otherwise cajoling management to effect a change in strategy. Think hedge fund or private equity fund. One might think of an *ordinary investor* as a passive investor in this sense. But that does not necessarily imply that an *ordinary investor* is a price-taker in the same sense as an *index investor* since many *ordinary investors* persist in efforts to identify mispriced stocks.

Finally, references herein to *diversified investors* should be assumed to mean fully diversified investors in common stocks – investors who are invested solely in common stocks either through an index fund or who follow indexing practices on their own. As discussed further below, diversification works differently (and better) with regard to common stock than it does with regard to other securities (such as bonds). See *infra* text at note xxx. Moreover, the argument(s) herein depend on a fully fledged diversification strategy and not merely the practice of holding ten or even twenty stocks without attention to the distribution of invested funds. To be sure, investors in common stock run the gamut from stock-pickers who hold a single stock to investors who hold an index fund and nothing else. For investors who fall somewhere in the middle, their interests will be more or less aligned with those of index investors.

It almost goes without saying that investors dislike risk. Again, the iron law of investing is that if you assume more risk you must demand more return. It may suffice to say that this iron law holds because other investors follow it: You cannot sell a riskier investment to another investor for as much as a less risky investment (all else equal). So you cannot afford to pay as much in the first place.<sup>17</sup>

A better explanation for why investors tend to be risk-averse is that all else equal one would prefer to receive expected return *consistently* than to receive the same return merely on average with significant variations from one year to the next. If a particular stock can be expected to generate returns of 10% half of the time and zero half of the time, one would expect a 5% return on average. But it is still possible to book zero return for two or five or ten years in a row. Thus, as between two investments that offer the same return, the less volatile of the two is preferable even if one is risk neutral.<sup>18</sup>

The proof of this pudding can be found in the bond market. Bonds are safer than stocks. Investors accept lower returns on bonds in exchange for lower risk. Thus, investors actually pay for consistency.<sup>19</sup> So if one can shed risk without any reduction in return, it is like free money. By holding a diversified portfolio of stocks, investors can have their cake and eat it too. They can shuck most of the risk without any sacrifice of return. Thus, it has been said that diversification is the only free lunch in the market.<sup>20</sup>

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<sup>17</sup> To be sure, this truth assumes risk aversion, which appears to be an almost universal trait, except for some individuals who have suffered particular forms of brain damage (and appear to be genuinely risk neutral) and those who are addicted to risk (like members of gamblers anonymous). Cf. PARENTHOOD (the movie) (where the grandmother advocates for the excitement of the roller coaster over the routine of the carousel). On the other hand, risk-neutral individuals have been found to do better at opting for risky investments that offer superior returns. As discussed further below, investors can achieve superior returns over the long term through diversification – which amounts to an affirmative argument for risk-aversion. See *infra* Table II and accompanying discussion. But since diversification neutralizes risk, diversified investors have made themselves risk-neutral and will make risky but superior investments. So they too can do better. In contrast, there is no clear gain from risk risk-preference.

<sup>18</sup> See *infra* text at note xxx (discussing definition of risk as dispersion of returns or volatility).

<sup>19</sup> Further proof (if necessary) can be seen in the very existence of hedging -- such as with options, futures, and other derivatives and strategies – by which investors pay real money to avoid risk. See *infra* note xxx (discussing zero-sum nature of hedging).

<sup>20</sup> See Harry Markowitz, *Portfolio Selection*, 7 J. Fin. 77 (1952). Although Markowitz (Nobel 1990) made this comment in 1952, it was not nearly as true then as now. High sales charges (front-end loads) for mutual funds, high fixed commission rates (that were even higher for odd lots), and high bid-ask spreads had the combined effect of making diversification quite expensive in practice. See Richard A. Booth, *Five Decades of Corporation Law – From Conglomeration to Equity Compensation*, 53 Villanova L. Rev. 459 (2008).



To be specific, by holding a diversified portfolio of stocks, an investor can expect the same return as with one well-chosen stock (or a few such stocks) but without the risk that individual stocks may perform poorly. And index funds based on a broad market index such as SPX offer maximum diversification at the lowest price – with management fees that are much lower than the fees charged by actively managed (stock-picking funds) – all of which explains the phenomenal growth of such funds in recent years.<sup>21</sup>

Before discussing exactly how such an index fund works, it is important to be more precise about how diversification works.

The following chart depicts diversification at its very best.<sup>22</sup> Assume a world of just two stocks. GUNCO is a defense contractor. BUTTERCO makes consumer products. Expected return for GUNCO is 20% in times of war and 0% in times of peace. Expected return for BUTTERCO is 0% in times of war and 20% in times of peace. Assume also that war and peace are equally likely. The average expected return for both companies is the average of possible outcomes weighted by the probability of the outcome. In other words, an investor who invests \$1000 in one company or the other can expect a return of 10% but that return will fluctuate between 0% and 20%. In other words, in some years return will be 200 but in others it will be 0 for an average of 100 over the long haul. But an investor who invests \$500 in each company will enjoy a return of \$100 per year whether there is war or peace. No matter what happens, one or the other company will pay a 20% return on a \$500 investment -- \$100. The 50/50 portfolio is clearly preferable since one enjoys the same expected return without any of the risk.

	PEACE (50%)	WAR (50%)	EXPECTED RETURN	RISK (SD)
GUNCO	0	20	10	10
BUTTERCO	20	0	10	10
50/50 PORTFOLIO	10	10	10	0

The GUNCO / BUTTERCO example is unrealistic because in the real world most stocks rise and fall together. There may be a few counterexamples. For example, gold stocks often move against the broader market. But price changes for the vast majority of stocks

<sup>21</sup> Indeed, Fidelity offers several funds with a ZERO percent management fee: FNILX (large cap index fund), FZROX (total market index fund), FZIPX (extended market index fund), FZILX (international index fund). It is not clear why Fidelity offers such products. There must be some benefit derived from doing so. See Richard A. Booth, *The Proper Role of Index Funds in Corporate Governance* (forthcoming).

<sup>22</sup> The following material is derived from a similar discussion in VICTOR BRUDNEY & MARVIN A. CHIRELSTEIN, CASES AND MATERIALS ON CORPORATE FINANCE (Foundation 1972). A similar example appears in BURTON G. MALKIEL, A RANDOM WALK DOWN WALL STREET xxx (12E 2019), which was first published in 1973.

are correlated – they go up and down together – more or less.<sup>23</sup> As a result it is impossible to get rid of all risk as the above example suggests. Nevertheless, it is possible to get rid of almost all of the risk that goes with investing in a single stock even in a world in which price changes are largely correlated.

To see how this works, consider an investment in a single stock – Acme Blasting Cap Company (ABC). There is a 50% chance that ABC will generate a 5% return and a 50% chance that it will generate a 15% return. Thus, our best guess is that ABC will pay a 10% return even though the actual result will be 5% higher or lower.<sup>24</sup>

If we invest all of our money in ABC, we must assume the risk that our returns will vary from year to year. But if we invest our money in a portfolio of (say) 500 or 1000 different stocks with the same prospects, our return will almost certainly be 10% because we can be quite sure that about half of all our portfolio stocks will pay a 15% return while half will pay a 5% return. To be sure, the market as a whole may rise or fall with economic conditions. But that is a risk we must assume whether or not we diversify.<sup>25</sup>

The ABC example is essentially a variation on a simple flip of a coin. If we flip a coin one time, the chances are fifty-fifty that it will land HEADS. There is a really good chance we will lose such a bet. But if we flip the coin 1000 times, then it is almost certain to land HEADS about 500 times because of the law of large numbers. There is very little chance that we will lose much. But neither will we gain much.

While this result may seem intuitive, we can see how it works by considering the effect of gradually increasing the number of flips. Assume that we ante up one dollar for each flip. If the result is HEADS (H), we win another dollar and end up with two dollars. If the result is TAILS (T), we lose the ante and end up with zero dollars. Note that the

<sup>23</sup> The measure of the tendency of stocks to move up and down together – or more precisely for prices of individual stocks to change in proportion to SPX – is known as the beta coefficient for the stock or more simply its beta. A stock with a beta of 0.5 tends to move half as much as SPX (in terms of percentage change) and a stock with a beta of 2.0 tends to move twice as much as SPX. One would expect this correlation to increase as investors become more diversified and to be stronger with larger capitalization stocks because of market weighting.

<sup>24</sup> Note that even though our best guess is that ABC will generate a 10% return, it will never actually do so. In other words, expected return need not be one of the possible results.

<sup>25</sup> In other words, in a bad year for business, returns may fall in the 0% to 10% range for a 5% average. And in a good year for business, returns may fall in the 10% to 20% range for a 15% average. Either way, a diversified investor can expect results close to the average, while an investor who holds a single stock will suffer swings between the high-side and low-side year to year. See Table I below and following chart showing risk-reduction relative to increasing portfolio size.

*expected* return is always one dollar per flip because the chances are fifty-fifty that HEADS will be the result of any one flip.<sup>26</sup>

The margin of error (so to speak) is one dollar either way from the average. But as the number of flips increases, the margin of error becomes smaller and smaller relative to the aggregate return -- a smaller and smaller percentage of total return.

We can see this by iterating the results. With two flips, there are four possible results:

HH or HT or TH or TT

With three flips, there are eight possible results:

HHH or HHT or HTH or HTT or THH or THT or TTH or TTT

With four flips, there are 16 possible results. With five flips there are 32 possible results. And so forth.

Each of these outcomes is equally likely.

In the two-flip scenario, there is a 2/4 chance (50%) that the outcome will in fact be a return of \$2. But perhaps more important, there is only a 25% chance that we will lose as compared to a 50% chance of loss with a single flip.

In the three-flip scenario, there is a 3/8 (37.5%) chance that the outcome will be a return of \$4 and the same chance that the outcome will be a return of \$2. So there is a 6/8 (75%) chance that the return will be middling (\$4 or \$2). There is only a 12.5% chance that we will lose every bet as compared to a 50% chance of loss with a single flip.

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<sup>26</sup> While the expected return for an individual flip is always one dollar, we know that the actual return from one flip will be either two dollars or zero dollars. In other words, the expected return for each next flip remains one dollar, but the actual return will never be the expected (average) return of one dollar. To be clear, we treat the ante as a dead-weight loss, and we focus on the pay-off because the value of the latter dictates the amount of a break-even bet. In other words, the risk-adjusted value of the return should equal the amount at risk. The amount of the wager is not really important.

Although it is typical to bet one dollar on a coin flip, one could bet (say) 90 cents on the opportunity to get paid one dollar. Indeed, this is close to the bet that one makes in the stock market, where the average historical return is about 11% per year (arithmetic) -- with the difference that one does not forgo the amount wagered but rather is left with a lesser amount to wager next time around. Thus, the foregoing example assumes we have enough money (capital) to withstand a run of a few losses -- just as in the real world.

Needless to say, the math gets complicated very quickly. But it is relatively easy to calculate the standard deviation (STD) for various numbers of coin flips. And STD will tell us how often we can expect the outcome to fall in a middling range of possibilities.<sup>27</sup>

To be precise, one STD is equal to the range of outcomes that will obtain about 68% of the time (assuming a normal distribution and a sufficiently large sample). In other words, about 34% of outcomes will fall within one STD *above* the average and about 34% of outcomes will fall within one STD *below* the average. In effect, STD tells us the margin of error depending on the number of flips.

Table I illustrates the effects of increasing numbers of flips. Again, the assumption is that HEADS pays \$2 while TAILS pays zero -- as where we bet one dollar per flip. The table shows such data including STD for various numbers of flips from one coin flip to 5000 coin flips.

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<sup>27</sup> In essence, STD is the width of the middling range as shown on a bell curve. The STD of a population (collection) of outcomes is the square root of the variance. The variance is the sum of the squares of the difference between each outcome and average outcome divided by the number of outcomes. Thus, the effect of more extreme outcomes is amplified but offset by larger numbers of middling outcomes. For the record, the above calculation based on an iteration of outcomes (such as HHH, HHT, etc.) is known as a Monte Carlo simulation.

TABLE I

FLIPS	A EXPCTD RTRN (MEAN)	B VARIANCE	C STD DEV (STD)	A/C SHARPE	C/A BOOTH (COV)
1	1.00	1.00	1.00	1.00	1.0000
2	2.00	2.00	1.41	1.41	0.7071
3	3.00	3.00	1.73	1.73	0.5774
5	5.00	5.00	2.24	2.24	0.4472
10	10.00	10.00	3.16	3.16	0.3162
20	20.00	20.00	4.47	4.47	0.2236
30	30.00	30.00	5.48	5.48	0.1826
40	40.00	40.00	6.32	6.32	0.1581
50	50.00	50.00	7.07	7.07	0.1414
100	100.00	100.00	10.00	10.00	0.1000
200	200.00	200.00	14.14	14.14	0.0707
500	500.00	500.00	22.36	22.36	0.0447
1000	1000.00	1000.00	31.62	31.62	0.0316
2000	2000.00	2000.00	44.72	44.72	0.0224
3000	3000.00	3000.00	54.77	54.77	0.0183
4000	4000.00	4000.00	63.25	63.25	0.0158
5000	5000.00	5000.00	70.71	70.71	0.0141

As shown, the STD for the result HEADS in 1000 flips of a coin is 31.62 – which means that about 68% of the time the number of HEADS will be within about 32 of the expected outcome. That is, in 1000 flips we can expect HEADS between 468 and 532 about 68% of the time. And about 96% of the time we can expect results within two STDs of the mean. That is, there is only about a 4% chance that the number of HEADS will be more than 564 or fewer than 436 if we flip the coin 1000 times. So if we have \$1000 to wager, and we risk it all on one flip, there is a 50% chance we will lose all of our money, whereas if we risk our money one dollar at a time on 1000 flips, there is very little chance we will lose more than \$64.<sup>28</sup>

<sup>28</sup> Incidentally, this is essentially the logic behind the idea of value-at-risk (VAR), a tool used (primarily) by financial institutions to determine capital adequacy. In other words (literally), VAR is a form of stress test that seeks to determine how much financial cushion is necessary to survive an economic downturn within a range of possible scenarios likely to obtain (say) 95% of the time. The implication is that the business may need to be bailed out in more extreme cases. Note also that capital adequacy takes on a special meaning in the context of a financial institution such as a commercial bank. Whereas the primary question for a non-financial business is how much capital is necessary to function under normal

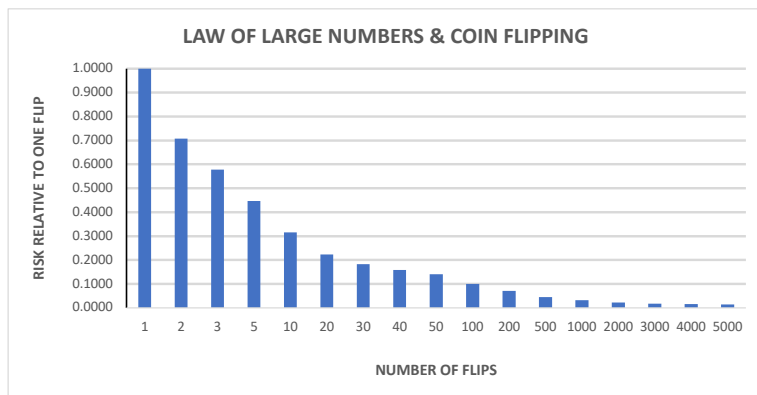
Although STD is a common way to quantify risk, it is not really intuitive for most of us not steeped in the study of statistics. Part of the problem is that STD is a dimensionless number – it is stated in the same terms as the mean. So to say that the average outcome for 1000 flips is \$1000 dollars with a STD of \$31.62 does not immediately conjure (for most of us) an image of a bell curve with a particular shape – and the implications thereof.

Moreover and more problematic, STD cannot be compared from one game of chance – or investment – to another unless it so happens that the average expected return is the same for both. So we cannot necessarily compare STD for a flip of a coin to STD for a roll of a die unless it happens that the payoff for the latter also averages one dollar.

One easy way to fix this problem is to use the ratio of STD to expected return (as shown in the chart column headed C/A on the far right-hand side), which tells us the amount of risk per dollar of return. As noted (parenthetically) this ratio is called the coefficient of variation (COV).

In effect, COV tells us the amount of risk that remains in a many-flip bet as a percentage of the risk we take in a one-flip bet. In other words, if we assume that one coin flip entails one full unit of risk (1.00 or 100%), the COV column tells us the percentage of risk entailed by various many-flip bets. For example, a twenty-flip bet entails just 22.36% of the risk that goes with a one-flip bet. And a 500-flip bet entails just 4.47% of the risk that goes with a one-flip bet. The decrease in risk from increasing numbers of flips is shown graphically in the chart below.

circumstances, the question for a financial institution is how much is necessary to survive a crisis. In other words, how much capital one needs depends on how diversified one is. See *supra* note xxx (discussing need for capital). And see Richard A. Booth, *Everything I Know About the Bond Market* (forthcoming) (discussing banking regulations that require diversification over borrowers and implicit connection to capitalization). The focus on possible loss (rather than the equally possible gain) is consistent with risk aversion. See *supra* note xxx (discussing risk aversion).



The beauty of COV in this setting is that it tells us at a glance how much risk we can shed by increasing the number of coin-flips even though it is difficult to articulate what we mean by a unit of risk. In other words, it is easy to grasp the idea that 500 small bets entail less than 5% of the risk entailed by one big bet.<sup>29</sup>

<sup>29</sup> Curiously, it has become common in finance literature to use the reciprocal ratio (A/C) as first suggested by William Sharpe (Nobel 1990). See William F. Sharpe, *Mutual Fund Performance*, 39 J. Bus. 119 (1966). In effect, the Sharpe Ratio tells us (dollar) return per unit of risk. But that seems rather like a statement of gallons per mile for a particular vehicle. While such a statistic might seem normal if it had been introduced first, it does not seem nearly as useful as the familiar miles per gallon (MPG). But (admittedly) it is standard practice with major appliances to state the cost of electricity (or other fuel) per year of operation.

In any event, Table I shows both ratios for specified numbers of coin flips. The table itself makes the argument for using COV. For example, we see that with 200 flips we can expect return of \$14.14 per unit of risk, while with 500 flips we can expect \$22.36 per unit of risk. Clearly, the latter seems preferable. But it begs the question as to what constitutes a unit of risk. In contrast, COV tells us that 200 flips has about 7% of the risk that goes with a single flip while 500 flips has about 4% of the risk that goes with a single flip. In other words, we can eliminate almost half of the risk we take with 200 flips by increasing to 500 flips.

Given that we are most concerned here with the risk inherent in coin flips (and stock portfolios), it seems more useful to know risk per dollar of return. Moreover, if we do not really know what constitutes a unit of risk, it seems more useful to have it in the numerator. In other words, if we do not intuitively understand risk – on a gut level (so to speak) – it seems useless to talk in terms of return per unit of risk. Rather, if we are less comfortable with risk as a commodity, it seems more useful to know how much of it we assume per dollar of return (a known commodity). It also seems more useful to use a statistic that

To be sure, it might be argued that the foregoing discussion of coin-flipping is both too simplistic and (frankly) too long. But coin-flipping is a much better analog for investing than it might seem to be. Indeed, it is a remarkably good fit. There is good reason to think that at any given time the chances are fifty-fifty that stock price will increase or decrease.<sup>30</sup> In other words, stock price is a weighted average of upside and downside potential. Thus, one of the leading methods for calculating the value of an option – the binomial option pricing model – depends precisely on such an estimate of upside and downside outcomes. Another reason for dwelling on the coin-flipping analogy is that it permits us to compare the risk inherent in portfolios of various sizes (as shown in the previous graph).<sup>31</sup>

The implication of the foregoing exercise for investment purposes should be obvious: Investors can eliminate most of the risk that goes with investing in a single stock by holding many stocks.<sup>32</sup>

This is not to say that (as with flipping a coin) one can expect only to break even in the stock market. To the contrary, stocks make money on average. In contrast to a casino where the odds always favor the house (to some extent), the odds in the stock market favor investors. In the years since 1930, US stocks have generated a return of about 10% per year on average. In the years since 2000, the average has been a little over a

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approaches zero rather than one that climbs ever higher with no upper limit. But that may be a matter of personal preference.

<sup>30</sup> Indeed, this proposition was established rigorously by Paul Samuelson (Nobel 1970). See Paul Samuelson, *Proof that Properly Anticipated Prices Fluctuate Randomly*, 6 Industrial Management Review 41 (1965).

<sup>31</sup> One early work on this subject, which is often cited even today is E. J. Elton & M. J. Gruber, *Risk Reduction and Portfolio Size: An Analytic Solution*, 50 Journal of Business 415 (1977), wherein the authors constructed portfolios of various sizes (from one stock to 1000 stocks) and calculated the standard deviation of each such portfolio from actual price returns. But they did so (apparently) for stocks picked at random and held in equal dollar amounts. I wanted initially to use their work to make the instant point here. But I found that the logic of their method difficult to determine (if not wanting in light of current theory). Thus, I opted to make the same point here from scratch – which explains why I dwell on coin-flipping as much as I do even though many readers will likely find this material quite obvious (if not tedious). Nevertheless, I think it is important to understand the fundamentals of the law of large numbers in order to be truly convinced of the logic of indexing and (more important) to grasp the rate of change in remaining risk as the number of stocks increases.

<sup>32</sup> Note that with flipping a coin there is no serial correlation – assuming the coin is fair. That is not necessarily the case with stocks. See *supra* note xxx (discussing beta and how diversification may magnify correlation). But the logic of diversification applies only to the uncorrelated portion anyway. The correlated portion is market risk. What gets diversified away is the net difference in result – the alpha risk – which is much more significant as to any individual stock. Beta risk remains.

6% as measured by dividends and capital gains combined.<sup>33</sup> Thus, if we can imagine a coin flip where we ante up 90 or 95 cents to win a dollar, such a bet is quite similar to an investment in common stock.<sup>34</sup>

To return to the ABC example, if we invest ALL of our money in ABC, there is a 50% chance we will realize a 5% return all else equal.<sup>35</sup> But if we spread our money equally over 500 different companies, there is only about a 2% chance we will end up with a 5% return.<sup>36</sup> Either way what we truly expect is the same 10% return. This is not to deny

<sup>33</sup> On the other hand, one might characterize such returns as break- even in that these levels of return are presumably what the market requires in exchange for assuming the risk that goes with investing in stocks rather than bonds or something else. *Cf.* *Joy v. North*, 692 F.2d 880 (2d Cir. 1982); *Litwin v. Allen*, 25 N.Y.S.2d 667 (Sup. Ct. 1940) (both finding bankers that lent funds at too-low interest rate liable for waste). If one defines winning as in the stock market as beating the market rate of return, then the market is in fact quite similar to flipping a coin. As noted above, there is good reason to think that in an efficient market, the next change in price is equally likely to be up or down. *See supra* note xxx. Indeed, one method of calculating the value of an option – which is essentially a bet that the price of the subject stock (or other instrument) will increase or decrease – is to treat the problem just like a coin flip. Specifically, the binomial option pricing model (BOPM) is based on an estimate of the high and low price at which a stock is likely to close at the end of the option period. *See* RICHARD A. BOOTH, *FINANCING THE CORPORATION* 7:16 (2020-21).

This is not to suggest that a zero-sum bet cannot make economic sense even in the aggregate. For example, a futures contract is a zero-sum arrangement in which the gain to one party equals the loss to the other. But the trade may nevertheless be wealth increasing in that it reduces the risk of one party or the other or even both, thus increasing the value of underlying commodity (and possibly inducing additional investment). *See infra* note xxx (discussing economy as largely a zero-sum game).

A similar question arises about intraportfolio litigation. *See* Amanda M. Rose & Richard Squire, *Intraportfolio Litigation*, 105 Nw. U. L. Rev. 1679 (2015) (addressing question whether disputes between companies within the same portfolio are wasteful). *See also* Rock & Kahan, *supra* note xxx (arguing that it is unlikely that index fund managers would advocate for one portfolio company to defer to another); Richard A. Booth, *Stockholders, Stakeholders, and Bagholders (Or How Investor Diversification Affects Fiduciary Duty)*, 53 Bus. Law. 429 (1998) (arguing that investors expect managers to run their individual companies so as to maximize their individual value).

<sup>34</sup> To be more precise, investing in a stock such as ABC is equivalent to betting 90 cents or so to win a dollar at the risk of losing some and occasionally all of the amount wagered.

<sup>35</sup> The all-else-equal proviso is important. The assumption is that the market as a whole generates the expected 10% return. So to be more precise, the stated odds relate to the chances of enjoying a market rate of return – which may be higher or lower than 10% in any given year. In other words, 10% is an average of an average.

<sup>36</sup> To be precise, the chances are  $.5000 \times .0447$  or  $.0235$  (2.35%) that return will be 5% or less based on the calculations in the above chart for 500 flips. In other words, since the chances of a 5% return on a single stock (50%) are deemed to be one unit of risk, the chances of such an outcome for a 500-stock portfolio are 4.47% thereof.

that sometimes an investor who holds a single stock will enjoy a 15% return while a diversified investor will never do so. But even though one may dodge the down-side bullet for a year or two – or even ten – it is purely a matter of luck to do so unless one has access to inside information (which is mostly illegal to use).<sup>37</sup> In short, there is no good reason to take the risk of divergent returns because the upside is always offset by the downside. One can (truly) expect only an average return.

To be sure, if we could know for certain that ABC will return 5% this year but that XYZ will return 15% then we would buy XYZ and sell ABC. But it is costly to do the research it takes to predict the future. And we can never be sure that XYZ (rather than ABC) will be the one to defy the odds. To claim so is to deny the premise of the hypothetical we have posited for ourselves. If our best estimate is that the chances of a 15% return are fifty-fifty, it is nothing but double-think to predict that XYZ will be the winner. Of course, we could bet (literally) on XYZ. And we will win half the time. But we will also lose half the time. Moreover, if we have somehow figured out that XYZ is the better investment, it is likely that others will have done so as well. If so, the price of XYZ will rise, and the price of ABC will fall until the odds revert to fifty-fifty.<sup>38</sup>

It is tempting to think of risk in the stock market as risk of mispricing. We might say that if ABC returns 5% in the end, then it was overpriced when we bought it. Similarly, if XYZ returns 15% in the end, we might say that it was underpriced when we bought it. But suffering a loss on an investment does not mean that it was mispriced – or a bad investment. ABC is correctly priced at 10% even though we know the chances are fifty-fifty that it will generate a 5% return. And we cannot be too upset when it does so. It is always possible that one may suffer a loss if one takes a risk. Thus, to suffer a loss

<sup>37</sup> Mutual funds (and their managers) often tout themselves as having beat the so-called Lipper Average for similarly focused funds – for example for small-capitalization growth funds. But studies indicate that the number of funds that do so is about the number one would expect by chance. *See* BURTON G. MALKIEL, *A RANDOM WALK DOWN WALL STREET* xxx (12E 2019). To return to the coin-flip example, if we have 1000 different flippers flip a coin 1000 times each, 3% of them will do better than 53% heads. Indeed, it would not be surprising for a few to achieve 60% heads (so to speak). Note that there are about 10,000 publicly available mutual funds (even though there are only about 4000 individual stocks traded in the US market).

<sup>38</sup> As at the track with pari-mutuel betting, the market will see that traders are buying XYZ and selling ABC and will adjust accordingly. Indeed, stock-pickers depend on the market to see what they see – but to do so later. *Cf.* MALKIEL at xxx (likening market to English newspaper contests in which the goal is to guess the winner of a beauty pageant). Note that if the market bids up the price of XYZ (because more traders are betting that it will do better), its ROI will fall until it equals that of other similar stocks (all else equal). Thus, it is often said that stocks tend to revert to the mean. Although it may go without saying, the market works according to a form of Bayesian inference where probabilities are updated as more information becomes available.

does not imply that one paid too much. Rather, it is quite normal for results to vary from expectations. Indeed, it is almost certain that they will do so.<sup>39</sup>

On the other hand, there is no doubt that individual stocks are sometimes genuinely mispriced – whether because of fraud or manipulation or innocent collective mistake. Again, coin-flipping can illustrate the point. A chance to win one dollar on a coin flip is fairly priced at one dollar assuming the coin is fair. Either I will end up with two dollars or zero dollars. The chances are fifty-fifty. So the value of the bet is one dollar. The fact that I lose one bet or even two or five or ten does not mean the bet was mispriced – that the price was wrong. But if the coin has been weighted so that heads is more likely, the value of a tails bet will be a bit less than one dollar (overpriced at one dollar), and the value of a heads bet will be a bit more than one dollar (underpriced at one dollar). That is true mispricing.

Diversification can address both forms of mispricing. By holding a diversified portfolio of stocks, one can eliminate most of the risk of random fluctuations in return as well as the risk that individual stocks may be overpriced or underpriced. And the larger the number of stocks one holds, the more assured one can be that results experienced will converge on the expected result. The law of large numbers dictates it.

It is also important to note that the argument here for diversification works much better for stocks than it does for bonds and other debt securities. With stocks it is possible for actual return to exceed expected return. Indeed, the argument for diversification depends on the idea that an equal number of stocks will do better than expected as the number of stocks that do worse than expected. In contrast, a bond will never do better than expected. If a \$5000 bond carries a 5% coupon and is due in ten years, the most that an investor can expect is \$250 per year and \$5000 in ten years. The issuer will never pay anything more than what is owed. And if the issuer is a corporation, it would be a breach of fiduciary duty (BFD) to the stockholders to do so. To be sure, a bond may increase in value if interest rates decline generally. But such market-wide events will affect all bonds similarly. A rising tide lifts all ships. So it makes no difference in this regard if the bondholder-investor is diversified. The point for present purposes is that bonds entail only down-side risk. You can do worse than expected, but not better.<sup>40</sup>

<sup>39</sup> Thus, the logic of diversification does not depend on market efficiency. Indeed, diversification makes more sense if market is less efficient. See *infra* text at note xxx (further discussing this point). Still, the amount paid must be commensurate with the possibility of loss: The greater the possibility that return will vary from what is expected, the less one should pay for a stock (all else equal). It follows that risk IS the possibility that return will vary from what is expected. In other words, risk is a measure of the dispersion of possible returns – AKA volatility.

<sup>40</sup> Some commentators have noted that the diversification inherent in collateralized debt obligations (CDOs) did not protect investors from significant losses in the 2008 credit crisis and thus have argued that diversification does not protect investors in the stock market from the effects of misinformation – which in turn justifies a robust system of securities fraud litigation. See James Cameron Spindler, *We Have a Consensus on Fraud on the Market – And It's Wrong*, 7 Harv. Bus. L. Rev. 67 (2017). But this argument fails to consider

## II. The Logic of Diversification over Time

The foregoing argument should suffice to convince any ordinary investor of the need to diversify. There is no good reason to assume unnecessary risk because there is no reward for doing so. But this argument misses a further even more compelling argument for diversification that applies for long-term investors: Over the long haul, reducing risk produces *higher* returns all else equal. Not only is it possible to eliminate company-specific risk without any sacrifice of return but return itself is also effectively increased through diversification – literally a win-win proposition.

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the difference between the bond market (where there is no real possibility of better-than-expected returns other than from market forces) and the stock market (where half of all stocks do better than expected all else equal). See Richard A. Booth, *Sense and Nonsense About Securities Litigation*, 21 U. Penn. J. Bus. L. 1 (2018). This does not imply that bondholders gain nothing through diversification. By spreading the risk of default across numerous bonds, bondholders can minimize such risks. But they can also do so directly by relying on research as provided by credit rating agencies (CRAs). So bondholders face a trade-off that stockholders need not make: They can either spend a bit on research – which reduces returns – or diversify their portfolio – which also reduces returns because a few bonds will default without any windfall gains to make up the difference. To be sure, it is also possible for an obligor to become more credit-worthy – to have its credit rating upgraded – and thus for a bond to increase in value because of such company-specific developments. But it is also possible for a bond to suffer a down-grade – though possibly not equally so. Thus, bondholders can achieve some equity-like benefits from diversification: They can hedge away the risk of changes in credit ratings and do so for free. But they cannot hedge away the risk of default – which is probably much more significant. Moreover, although bond prices have become much more volatile over the last fifty years, trading in bonds remains less liquid and thus more expensive than trading in stocks. See ROGER IBBOTSON, *STOCKS, BONDS, BILLS, AND INFLATION xxx* (2014). So the benefits of diversification as to changes in default risk are not likely to be as significant as they are for stocks where price is determined wholly by the trading market.

The following chart illustrates the point. The expected return of both Portfolio ABC and Portfolio XYZ is 10% per year. But ABC is riskier in that return fluctuates between 5% and 15% per year. In contrast, XYZ is less risky in that return fluctuates between 8% and 12% per year. One might think that this difference would wash out over time.

Not so. As shown in the chart, an initial investment of \$100 in ABC is worth \$256.71 after ten years for a cumulative average growth rate (CAGR) of 9.89% per year, while the same \$100 initial investment in XYZ is worth \$258.95 after ten years for a CAGR of 9.98% per year, a difference of 11 BP in return.

TABLE II

YEAR	Portfolio ABC			Portfolio XYZ		
	PRIN	RET%	RET\$	PRIN	RET%	RET\$
0	100.00		-100.00	100.00		-100.00
1	105.00	0.05	5.00	108.00	0.08	8.00
2	120.75	0.15	15.75	120.96	0.12	12.96
3	126.79	0.05	6.04	130.64	0.08	9.68
4	145.81	0.15	19.02	146.31	0.12	15.68
5	153.10	0.05	7.29	158.02	0.08	11.71
6	176.06	0.15	22.96	176.98	0.12	18.96
7	184.86	0.05	8.80	191.14	0.08	14.16
8	212.59	0.15	27.73	214.08	0.12	22.94
9	223.22	0.05	10.63	231.20	0.08	17.13
10	256.71	0.15	133.48	258.95	0.12	127.74
AAVG		0.1000			0.1000	
STD		0.0527			0.0211	
GAVG		0.0866			0.0980	
IRR			13.76%			14.16%
CAGR	0.0989			0.0998		
SHARPE (\$R/σ)		1.8974			4.7434	
BOOTH (σ/\$R)		0.5270			0.2108	

What explains the discrepancy? The answer can be seen by comparing the returns for Year Two. Even though ABC generates a 15% return, that 15% return (15.75) is figured on a base of 105 from the previous year, resulting in a principal balance of 120.75 at the end of the year. On the other hand, XYZ begins the year with a base of 108 and generates a 12% return (12.96), resulting in a principal balance of 120.96 at the end of the year. In other words, one cannot simply add up the series 5 + 15 + 5 + 15... and compare it to 8 + 12 + 8 + 12....

Because we are dealing with percentage returns each next return must be applied to the previous principal balance to calculate the resulting principal balance. The latter series results in a higher balance over several periods because the lingering effects of lower returns operate to dilute the effects of higher returns.<sup>41</sup>

The practical implication is that long-term investors should be less attuned to the simple arithmetic average (AAVG) return on an investment – which reflects return that can be expected in any given year – and more attuned to the geometric average (GAVG) which incorporates the effects of fluctuation.<sup>42</sup> As illustrated by the example, the simple arithmetic average return for both ABC and XYZ is 10% per year. But the geometric average differs – 8.66% for ABC and 9.80% for XYZ – because returns for XYZ are less volatile. The difference translates into a higher return for XYZ over the long haul.<sup>43</sup> And if one reinvests returns (as is typical in the context of a retirement account such as a 401(k) or a pension plan), returns are dramatically higher because of compounding.<sup>44</sup> And about 40% of all of the equity in US public companies (or about \$10T) is held in retirement accounts and pension plans.<sup>45</sup>

<sup>41</sup> The effect is akin to climbing a sand dune where one step forward is followed by sliding a half step back with the result that it takes twice as many steps altogether to get to the top.

<sup>42</sup> To calculate the familiar arithmetic average, one adds up the results from each year and divides by the number of years. To calculate the geometric average, one squares the results of each individual year and finds the square root of the sum thereof. Where the return is the same every year, the two averages are equal. But if the return fluctuates, the geometric average will always be less than the arithmetic average. And the greater the fluctuation, the greater the difference.

<sup>43</sup> Compare the result to an investment in a bond that yields 10% per year every year. With such an investment, the geometric average return equals the arithmetic average return. On the other hand, bonds do not offer implicit automatic reinvestment of returns. This may explain in part why stock investors have become so comfortable with distributions by repurchase rather than by dividend. To be sure, it is the company that decides how to make distributions, but it is not unreasonable to say that if companies rely most on repurchase it must be because stockholders prefer it that way. See generally RAB, *How I Stopped Worrying and Learned to Love Buybacks* (forthcoming).

<sup>44</sup> Note that both the cumulative annual growth rate (CAGR) and the internal rate of return (IRR) are higher than GAVG (which does not reflect compounding). Note also that results differ slightly if higher returns come in earlier years – if the series begins with 15% rather than 5% or 12% rather than 8% respectively. Although the average returns are the same no matter the order in which they arrive, both CAGR and IRR are higher for both ABC and XYZ if the series starts out with 15% and 12% returns respectively. As between CAGR and IRR, it is probably better for diversified investors to focus on CAGR in evaluating portfolio performance. In effect, CAGR is equivalent to the coupon return on a bond whereas IRR reflects repayment of principal at maturity (in effect) – which assumes that the investor cashes out in the end.

<sup>45</sup> See Richard A. Booth, *Investment Companies and Investment Advice* (Chapter 16 in BBL5 SE) (Table I).

This is not to say that AAVG returns are irrelevant. The example itself illustrates that an investor needs a 10% simple AAVG to generate the long-term returns shown. Since it is difficult to predict the order in which returns will arrive – and ultimately unnecessary to do so – it follows that investors should focus on AAVG returns in choosing the stocks to build a diversified portfolio (if they do not follow a strategy of indexing as discussed in the next section). Indeed, it is not clear how one would go about using GAVG in building a portfolio. Rather, it is simply a fact that long term return will always be lower than average annual return if the investment entails any risk at all. So the best way to maximize long term results is to maximize short term results *consistently*.

Accordingly, investors (the market) tend to focus on AAVG for individual stocks. And even diversified investors must worry about AAVG returns while recognizing that GAVG is what matters in the end. In other words, it is because GAVG return is always less than AAVG return that one is able to generate higher long-term returns through diversification even though AAVG return is the same 10% for individual stocks.

Not so incidentally, the same logic that shows how reducing risk leads to higher long-term returns also explains why diversified investors focus so much on fund management fees (as discussed further below). Anything that eats into the principal balance at the end of the year has the effect of reducing the base to which returns are added in the following year and requiring fund managers to find ever more lucrative opportunities to make up for past shortfalls – a fool's errand if ever there was one.

Needless to say, the foregoing example is quite stylized in that return fluctuates quite predictably between the high and low extreme – which extremes are rather narrow at that. Note also that ABC and XYZ could be seen as individual companies rather than portfolios. But it is more realistic to think of portfolios because diversification has the effect of narrowing and focusing the extremes – which explains why investors should be concerned about finding the very best diversification strategy (as discussed at more length in the next section). Nevertheless, even with optimal diversification (as discussed further below) real-world portfolio returns are much more volatile than the examples shown here. But that *magnifies* the benefits of diversification. Intuitively, a third portfolio with returns that fluctuate between 0% and 20% per year would fare worse than either ABC or XYZ. So the greater the risk, the more dramatic the effect of reducing risk – the more important it is to diversify. Again, the ultimate point of the foregoing example is that *less risk means higher returns* – LRMHR.

To sum up the implications of diversification: The ultimate point is that an investor can avoid company-specific risk without any sacrifice of expected return by holding a diversified portfolio of stocks. In other words, one can avoid the risk of investing in the wrong stock by investing in a diversified portfolio of stocks. And one can do so at zero cost – without affecting expected return.<sup>46</sup> By holding a diversified portfolio of stocks an

<sup>46</sup> Although such a strategy entails some expense in the form of brokerage commissions, so too does stock-picking: It is equally costly to buy 10000 shares of ABC as it is to buy 100 shares of 100 different companies.

investor can eliminate the risk of mispricing without any reduction in expected return. In other words, a diversified investor need not worry about whether the price of a stock is too high or too low. An individual stock may be mispriced on any given day. But the chances are that for every stock that is overpriced another stock is underpriced.<sup>47</sup> Simply stated, if we knew for sure that a stock would pay a 10% return (for example) there would be no need to diversify. But by holding a diversified portfolio of stocks we can eliminate almost all of the risk that return will be other than the expected return.

### III. The Further Logic of Indexing

The foregoing argument for diversification remains incomplete. It is clear that costly research aimed at predicting the performance of individual companies is a waste of money for ordinary investors. But how does one select portfolio stocks in some rational way that has nothing to do with evaluating their individual prospects? The lurking issue is that it may be just as costly to determine which stocks make up an optimum portfolio as it is to pick winners – if not more so.

One possibility is to choose stocks at random. And indeed that idea has been taken quite seriously.<sup>48</sup> A better answer is to invest in the stocks comprised by a well-constructed index. But this answer merely kicks the can down the road. In other words, it begs the question: How does a well-constructed index determine the stocks to be included therein?

Clearly, the most important factor is the number of stocks to be included. Studies show that one can eliminate almost all company-specific risk with a portfolio of twenty stocks.<sup>49</sup> But a portfolio of twenty different technology stocks or twenty different energy

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<sup>47</sup> To be clear, the logic of diversification applies to the decision to hold a stock from day to day as well as the decision to buy or sell. It is an old adage on Wall Street that to HOLD is to BUY.

<sup>48</sup> For many years, the Wall Street Journal ran a regular column – the Investment Dartboard – for which it invited a professional investment manager to pick five stocks and then compared the result to five stocks chosen by throwing darts at the charts. See MALKIEL, *supra* note xxx.

<sup>49</sup> See *supra* text at note xxx (discussing Table I and accompanying chart). This should seem evident to anyone who follows the business news (even a little) since there is seldom much difference (percentage-wise) between the performance of the Dow Jones Industrial Average (DJIA) (30 stocks) and the S&P500 (SPX). Note that the AMEX Major Market Index (MMI) – which once sought to compete with DJIA – comprises just twenty stocks. Note also that the logic of holding at least twenty different stocks is reflected in the Investment Company Act (ICA) 5(b), which defines a diversified investment company as one holding no more than 5% of AUM in the stock of any one company. Technically, such a fund could hold as few as fifteen stocks since the ICA permits such a fund to hold 25% of AUM in assets other than securities and cash.



stocks would be over-exposed to industry-specific risk. A stockholder who holds a portfolio of twenty stocks in a single industry remains exposed to the risks peculiar to that industry and thus assumes some risk that can be avoided with more diversification.<sup>50</sup> So diversification depends on the number of different stocks *and* the distribution thereof over various industries – the amount invested in each. The question remains: How do we know which stocks to include – and in what proportions – in order to be as diversified as possible? In other words, how do we know we are fully diversified?

The market provides the answer. By holding (say) the 500 largest stocks in proportion to the market capitalization of each, an investor can be assured that invested funds are distributed according to an impartial assessment of business opportunities economy-wide. But to see how this works requires some explanation.

In effect, the market allocates capital to companies (and industries) through the pricing process. The value of a company – and thus the value of a share of its stock – is ultimately a function of the formula:

$$\text{VALUE} = \text{RETURN} / \text{DISCOUNT RATE}^{51}$$

For example, suppose that Acme Blasting Cap Company (ABC) is expected to generate a return of \$1000 annually for its common stockholders. And suppose that investors demand a return of 12% from ABC given the risk entailed in its business. If so, the value of ABC can be calculated as follows:

$$\text{VALUE} = 1000 / 0.12 = 8333$$

In other words, ABC is worth \$8333 in the aggregate, and the price of each ABC share should be \$8333 divided by the number of shares outstanding.

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<sup>50</sup> Thus, it is curious that the NASDAQ average – which is known to be heavy on technology stocks – is reported in the business news as if it is equally indicative of the market as SPX or DJIA. The NYSE average was also widely reported in the past as were the prices of so-called bellwether stocks such as IBM or GE. On the other hand, technology stocks do account for the biggest single sector of the market. So reporting NASDAQ may be seen as akin to reporting GE when GE accounted for as much as 10% of total market capitalization. But the idea that an investor might invest in the NASDAQ 100 (QQQs) as an alternative to SPX reflects a misunderstanding of how indexing works. On the other hand, such a strategy has worked well in the recent past. See Ryan Jackson, *An Illogical Approach Overshadows Excellent Performance*, Morningstar, May 14, 2021.

<sup>51</sup> Note that this formula presumes level returns. That is quite unrealistic for purposes of the valuation of an individual company. But it is good enough for present purposes since the goal of diversification is to eliminate as much company-specific risk as possible.

It follows that the aggregate value (market capitalization) of a company is proportional to the returns generated by the company. Thus, a capitalization-weighted index such as SPX holds ten times as much stock of a company worth \$100B as it holds of a company worth \$10B (constructively speaking). Note also that the 505 SPX stocks comprise about 80% of the value of the entire US market.<sup>52</sup> In other words, the other 3650 (or so) US publicly traded companies account only for about 20% the total value of all publicly held equity in US companies.<sup>53</sup> So by holding the 500 largest stocks in proportion to the market capitalization of each, an investor effectively allocates funds in proportion to the returns generated in the US economy as a whole.<sup>54</sup>

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<sup>52</sup> One might ask SPX holds 505 stocks rather than exactly 500 stocks. One justification for doing so might be that the very smallest stocks are close enough to each other in size that a more obvious breakpoint comes between the last stock and the next smallest. Another good reason to hold a few more than 500 stocks is that inclusion in the index affects the market price (positively). That is, when a stock gets added to the index its price increases a bit because demand for stock increases (because of index investors). So including just a few more stocks than 500 acts as a hedge against (constructively) paying more to add a stock to the index.

<sup>53</sup> See *infra* Table III (data for SPX and VTI (which tracks the entire market)). To be sure, there may be industries that are populated wholly by relatively small companies (or indeed private companies). For example, it seems unlikely that the index reflects the business of law or other professional practices. So it is possible that a portfolio based on all publicly traded stocks is somewhat under-diversified in some ideal sense. But it is not clear that there is anything to be done about it. In most US jurisdictions, it is illegal for anyone other than a member of the bar to own even a minority equity interest in a law firm. (DC is one notable exception.) On the other hand, one might gain some exposure to this market by investing in a company involved in the litigation finance business.

Moreover, the number of companies in each sector of the market may reveal that some sectors are more populated with smaller companies – which tend to carry higher capitalization rates and thus lower aggregate values all else equal – which might (in turn) suggest improvements in diversification.

<sup>54</sup> Some of the return generated by US companies comes from operations outside the US, and some returns from within the US are generated by non-US companies. The significance of this discrepancy (if any) is discussed below. See *infra* text at note xxx.

In the case of SPX, this means that about 29% of value comes from information technology, 13% from consumer discretionary, 13% from health care, 11% from financials, and so forth, as shown in the chart below.

TABLE III

	SPX	DJIA	NASDAQ	QQQ	CRSP	SPW	GBMI	G1200
	SPY	DIA	ONEQ		VTI	RSP	VT	
	12/31/21	12/31/21	11/30/21	9/30/21	6/30/21	12/31/21	12/31/21	12/31/21
(Information) Technology	29.2	22.4	43.3	48.4	26.0	15.5	22.3	23.9
Consumer Discretionary (Cyclical)	12.5	15.4	17.3	17.3	12.0	12.6	12.7	13.3
Health Care	13.3	17.7	8.6	6.6	13.0	12.0	11.3	11.9
Financials	10.7	15.6	5.0	0.0	12.0	13.2	13.9	13.3
Communication Services	10.2	3.8	15.7	19.3	10.0	4.1	8.1	9.0
Industrials	7.8	14.4	4.3	2.7	9.0	14.5	10.9	9.9
Consumer Staples (Defensive)	5.9	7.6	3.4	4.8	6.0	6.2	6.2	6.6
Energy	2.7	2.1	0.4	0.0	3.0	4.9	3.4	3.2
Real Estate	2.8	0.0	1.1	0.0	4.0	5.9	3.5	2.3
Materials	2.6	1.0	0.2	0.0	3.0	5.6	5.1	4.2
Utilities	2.5	0.0	0.7	0.9	2.0	5.3	2.6	2.5
TOTAL	100.2	100.0	100.0	100.0	100.0	99.8	100.0	100.1
NO. STOCKS	505	30	1009	101	4156	505	9230	1223
MKT CAP	42368	11846	19400	15000	48840	N/A	88576	64783
FOREIGN (\$%)	0.00000	0.00000	0.42300	0.02220	0.00800	0.00000	0.39990	0.34600
TOTAL RETURN (10Y through 2021)	16.55	14.21	20.85	22.38	13.66	15.60	12.35	13.12
STD TR (10Y per SPDR)	13.08	13.46	15.11	15.41	13.51	14.56	13.34	12.93
COV (BOTH)	0.79	0.95	0.72	0.69	0.99	0.93	1.08	0.99
BETA	1.00	0.99	1.08	1.07	1.03	1.08	1.01	N/A
BID	465.31	359.40	56.99	380.40	235.00	159.03	105.01	N/A
ASK	465.42	359.65	58.26	380.49	235.60	164.69	105.80	N/A
SPREAD (%BID)	0.0002364	0.0006956	0.0222846	0.0002366	0.0025532	0.0355908	0.0002366	N/A
EXPENSES	0.095	0.160	0.210	0.200	0.030	0.200	0.080	N/A
TURNOVER	0.02	N/A	0.19	0.09	0.08	0.24	0.06	N/A

The question remains why it matters that the 500 largest US companies generate their returns in these particular lines of business. Arguably, the statistical tail is wagging the portfolio-composition dog.<sup>55</sup> The answer is that investing is about finding opportunities to generate return. Presumably, companies invest where they find potential for return. It is almost implausible to think that the 500 largest US companies could have missed significant opportunities to generate returns. To be sure, this allocation is somewhat backward-looking in that it reflects how these companies have chosen to invest their

<sup>55</sup> Similarly, I once found it curious that the media were so fixated on indices such as the DJIA. It seemed as if statistics had become more important than the game itself – as one might say about baseball. I might also have pointed out that one must ultimately invest in particular stocks and not the market as a whole. But that is no longer true and has not been so since the advent of index funds if not stock index futures. And as this article itself attests, media fascination with averages turns out to have been prescient, although I doubt there are many business journalists who can explain why the averages matter more than the constituents.

assets in the past. But it is also forward-looking in that it is based on stock price – which reflects the collective opinion of thousands of investors as to the prospect of future returns. Because size (market capitalization) is directly proportional to returns, investing in an SPX index fund assures that funds are distributed as broadly and evenly as possible across the entire array of business opportunities. In other words, the logic of doing so is more than mimicry for its own sake.

The bottom line is that an investor who picks stocks to hold in a diversified portfolio other than in proportion to market capitalization is not truly diversified — or at least not as diversified as one might be. In other words, to be truly diversified one must invest in a value-weighted portfolio.

#### A. Why So Many Stocks – Why Not Even More?

Another question is: Why invest in so many stocks? There are several answers.

Recall that most of the benefits of diversification can be achieved by holding about 20 different stocks. That translates into investing no more than 5% in any one stock.<sup>56</sup> But stocks increase and decrease in value as they trade. So if one invests 5% in 20 different stocks, some stocks are bound to become worth more than 5% either because they rise in value or because other stocks fall in value (relative to each other). Thus, it would seem prudent to limit any one stock (say) to 4% of portfolio value.

As shown in the nearby chart as of EOY 2021, AAPL accounted for about 6.88% of the value of SPX (a record high percentage for any one company), while MSFT accounted for 5.96% and AMZN accounted for 3.99% thereof.<sup>57</sup> This is a somewhat unusual situation in that for most years since 1980, no one company exceeded 5% of the value of the entire index except for IBM (in 1982 to 1985) and AT&T (in 1981 and 1982).<sup>58</sup> In 35 out of 42 years since 1980 (through 2021) no one company exceeded 5% of the value of the entire index. During that same period, the largest company in the index accounted on average for 3.83% of index value.<sup>59</sup> It follows that one needs to invest in about 500 stocks BOTH to hold a size-weighted portfolio AND to invest no more than about 4% by value in the largest stock therein.

<sup>56</sup> See *supra* note xxx.

<sup>57</sup> See S&P Dow Jones Indices, Top Annual Percent of Index Issues (as of Dec. 31, 2021).

<sup>58</sup> See *id.* (percentages as of year-end).

<sup>59</sup> See *id.*

	COMPANY	TICKER	MKT CAP (\$B)
1	Apple Inc.	AAPL	2,913
2	Microsoft Corp.	MSFT	2,525
3	Amazon.com Inc.	AMZN	1,691
4	Tesla, Inc.	TSLA	1,061
5	Alphabet Inc. C	GOOG	919
6	Alphabet Inc. A	GOOGL	871
7	Meta Platforms, Inc. Class A	FB	796
8	Nvidia Corp.	NVDA	735
9	Berkshire Hathaway B	BRK-B	668
10	UnitedHealth Group Inc.	UH	473

Perhaps more worrisome, the ten largest SPX constituent companies accounted for almost 30% of index value as of EOY 2021.<sup>60</sup> On the one hand, that is roughly equivalent to the exposure one would get with a portfolio of about 33 stocks – which is coincidentally about the size of the DJIA – which suggests that Charles Dow had pretty good instincts. And again, the DJIA is only slightly more volatile than SPX. Still thirty or thirty-three stocks does not seem like many. Surely it is possible to be better diversified.

One might think that the solution is to invest in a still larger number of stocks. But even if one invests in the entire market (the Wilshire 5000), the largest constituent stock therein (AAPL) still accounted for 5.45% of index value as of June 2021.<sup>61</sup>

<sup>60</sup> See *id.* That is the highest such concentration of value since 1980 (which itself ranked as third highest with 25.54% of value in the top ten stocks). For the record, the lowest level of top ten concentration since 1980 was 17.51% as of EOY 2014, and the average was 20.75% for the entire period. See *id.*

Although the ten largest holdings account for a large percentage of the aggregate value of the index (and thus any index fund), the specific stocks therein vary considerably from year to year. For example, ExxonMobil (XOM) was one of the three largest holdings every year from 2000 to 2014 and was the single largest holding in six of those years (from 2006 to 2011). But as of EOY 2019 (and since) XOM has not even been in the top ten holdings.

Thus, XOM illustrates both the rationale for indexing and the need for periodic rebalancing, as well as the challenges thereof. One must wonder whether it really makes sense for energy stocks to account for as little as 2.7% of index value (as shown in the chart above). Indeed, it may be that the growth of index funds (and index investing generally) contributes to the demise (as it were) of stocks that fall out of favor by magnifying the effects of a price decrease. Then again, market capitalization is a function of return and not gross sales. So there may be some very big companies out there that do not make much money and thus do not show up in the index. Note also that only public float counts. So a company such as Wal-Mart whose stock is owned in large part by the founding family does not count for as much of index value as one might expect. See further discussion below. Did the market really fall as it did in March / April 2020 or was it how we measured or adjusted?

<sup>61</sup> See Wilshire 5000 Total Market Index Fact Sheet (as of June 30, 2021).

Another alternative might be to invest the equal-weight version of the S&P500 (SPW) with which one would effectively invest the same amount in the largest company therein (AAPL which is worth about \$2.9T) as in the smallest company therein (FTI which is worth about \$2.7B).<sup>62</sup> While holding an equal-weight portfolio would avoid placing almost 7% of one's money in AAPL (or about 30% in the ten largest index companies), it would also mean that most of one's money was invested in the smallest index companies. Although smaller companies tend to generate higher returns at lower than commensurate risk (as measured by beta), it is not clear what the rationale would be for an investor who seeks the higher returns of small-cap companies to allocate some of their funds to large-cap companies. Moreover, such a strategy is doubly unclear because the individual stocks that compose the S&P 500 are chosen according to size (by market float). What is the point of singling out the 500 largest stocks in order to invest equal amounts in each?

Moreover, investing in SPW merely shifts the locus of risk and may increase it in the process. Each company in the SPW accounts for 0.20% of index value. So if some tiny company fails completely, the value of the index will fall accordingly. The question is whether a few likely failures of small companies is more worrisome than the unlikely failure of a big company. In addition, investing in stocks smaller than SPX stocks may entail subtle costs that outweigh the benefits of any increase in diversification. Such stocks may be less liquid and thus more expensive to trade and less efficiently priced. And it is possible that equal weighting would entail more portfolio balance trading (PBT).

As it turns out these questions are easy to answer. As shown in Table III, SPX is a bit less volatile than SPW (as measured by standard deviation of total returns).<sup>63</sup> Admittedly, the risk inherent in SPX is only slightly less than the risk inherent in SPW – which suggests that the number of stocks held in a portfolio is much more important than their distribution – but the 10Y total return is also a bit lower. Moreover, turnover for SPW (the trading required to maintain balance – was a whopping 24% compared to 2% for SPX for the most recent year.

Thus, 500 appears to be the Goldilocks Portfolio. Not too small. Not too big. But just right. Still, getting getting the distribution just right could shave off a bit more risk.

<sup>62</sup> See PDR Services LLC, SPDR S&P 500 ETF Trust Prospectus (listing holdings).

<sup>63</sup> Note that standard deviation here is measured according to total returns (assuming reinvestment) and not solely by price return, but that beta is measured solely by price return (which presumably includes the effects of reinvestment).

Yet another version of the index reflects reinvestment of returns – presumably from an investment in the value-weighted version of the index. But this version of the index is useless for purposes of allocating funds going forward.

### B. Company-Specific Risk Revisited

The foregoing discussion of the rationale for value-weighting suggests an important qualification to the idea that one can eliminate company-specific risk by holding a fully diversified portfolio of stocks and that the only risk that remains is the risk that the market as a whole may rise or fall. To be specific, it is not really possible to eliminate company-specific risk entirely. The performance of any portfolio ultimately reflects an average of results for the individual companies therein. Every constituent company contributes to the average. And it is impossible to invest in a portfolio of stocks without selecting individual stocks in which to invest. So some firm-specific risk must remain. Indeed, in a market-weighted index fund based on SPX, the largest company therein (AAPL) accounts for more almost 7% of index value. If AAPL were to fail completely, the value of the index would suffer accordingly. Think Enron and WorldCom.

On the other hand, the argument for investing in a broad-market index fund depends only on the proposition that we have eliminated all of the risk we *can* eliminate. Thus, it may be more accurate to say that diversification can eliminate as much company-specific risk as *can* be eliminated. The fact that some firm-specific risk remains does not mean that one should try to eliminate it. If we know it is impossible to eliminate any more firm-specific risk, then it makes no sense to spend money trying to do so.<sup>64</sup>

The only risk that remains is the risk that the market as a whole will rise or fall. Admittedly, this is true *by definition* if one measures the market by SPX. If one invests in the stocks comprised by SPX, one will always match the performance of SPX. But that proves nothing unless SPX is known to be superior to every other measure of the market. So the real question is why SPX is the best measure of the market. There is good reason to think that SPX is in fact an optimal portfolio – that it is the least risky portfolio at its level of risk – which is good enough. Nevertheless, there lurks the worry that to measure market returns by the same index effectively assumes the conclusion that we cannot eliminate the risk that goes with investing so much in the very largest companies in the index.

<sup>64</sup> Similarly, there is no such thing as 200 proof alcohol. The last 5% (or so) of water cannot be distilled away. Still, it is not clear that the risk that remains should be characterized as company-specific risk. As noted above, one form of risk is the risk of mispricing. See *supra* text at note xxx. But the fact that a stock performs worse (or better) than expected does not necessarily mean that we paid the wrong price for it. And we can eliminate the risk of errors in portfolio selection by eschewing stock-picking – by declining to seek out stocks that are misvalued.

### III. The Implications of Diversification and Indexing

It may not be self-evident why indexing implies that research into the merits of individual stocks – beyond monitoring market capitalization – is a waste of money. Why does elimination of company-specific risk imply no further gain from research?

The simplest answer is that once we have decided to invest in SPX based on the logic of its construction, we have no use for further research. There is nothing we can do with the insights provided by such research because to do anything to adjust our portfolio would be inconsistent with the logic of value-weighted indexing.

A more nuanced answer is that if we have eliminated all company-specific risk, we have no reason to care about the risk entailed by specific companies or to do anything with such information as we might discover. So it is a (literal) waste to devote any resources to seeking such information.

In short, the logic of diversification implies that research intended to identify mispriced stocks is a waste of money for an ordinary investor. It makes no sense for a diversified investor who has eliminated the risk of mispricing to pay for research designed to identify stocks that are mispriced.<sup>65</sup> If an investor is confident that they have eliminated all risk that can be eliminated, there is nothing to be gained from paying for research about individual stocks.<sup>66</sup>

Don't we need to do research to construct the best possible portfolio? Can't we always do better? Again, the answer is NO.

The same logic that militates against company-specific research militates against research relating to portfolio composition. If one buys into the logic of indexing, it is a waste of time to think much about how to build a better portfolio. On the other hand, the rules of indexing do change now and then. Witness the decision by SPX to measure market capitalization by public float rather than outstanding shares.<sup>67</sup> So it is not necessarily a waste of time to consider the merits of differing approaches to indexing.

As shown above, indexing is the best way to achieve maximum diversification at the lowest possible cost, not only because it is cheap and easy to mimic an index, but also

<sup>65</sup> To be clear, the argument for diversification is NOT based on the idea that the market is efficient. Indeed, the argument for diversification is even more compelling if the market is often wrong about the value of individual companies. It is important to distinguish here between fundamental efficiency – idea that market is accurate – and informational efficiency – fact that one cannot beat the market consistently (any more often than would happen by chance). As noted above, if the market for a given security is fundamentally efficient, there is no need for an investor therein to diversify.

<sup>66</sup> Discuss risk-free bond example.

<sup>67</sup> Logic and date. Note the parallel to modes of stewardship discussed below.

because a broad-market index such as the S&P 500 relies on market prices to dictate how one should distribute funds among portfolio stocks. Thus, if one is committed to investing in a broad-market index fund, there is no point in second-guessing oneself by scrutinizing individual companies. To do so is a literal waste of assets. If such efforts will make no difference in the end, why bother?

It follows that for a diversified investor the single most important factor to consider in choosing a fund is the fee charged by the fund manager. Thus, index funds cater to investors who want diversification by declining to do research. As discussed further below, management fees associated with index funds are significantly lower than those associated with actively managed mutual funds, averaging less than one-tenth of one percent per year of assets under management (AUM). In contrast, actively managed (stock-picking) funds incur management fees of about 0.82% on average.<sup>68</sup> Although 0.82% may not sound like much, total return for SPX has averaged about 6.36% over the last twenty years. At that rate of return 0.82% makes a big difference.

Coincidentally (or not), studies show that on average managed funds underperform the market by about the average percentage management fee.<sup>69</sup> Moreover, the number of funds that beat the market several years running is about the number one would expect based on chance.<sup>70</sup> If I flip a coin enough times, it will occasionally come up heads ten times in a row. But that does not mean I have skills.

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<sup>68</sup> The Investment Company Institute (ICI) reports that the average-expense ratio paid by investors in actively managed equity funds is 0.82% as of 2016 (which does not include sales loads — one time entry or exit fees — that average another 1.1%). In contrast, the average-expense ratio for equity index funds is 0.09% annually. INVESTMENT COMPANY INSTITUTE, *supra* note 87, at 38. Indeed Schwab offers index funds with expenses of 0.03% and zero sales load. CHARLES SCHWAB & Co., SCHWAB EQUITY INDEX FUNDS PROSPECTUS, Schwab S&P 500 Index Fund 1-3 (May 31, 2018). For SPDRs, the expense ratio is 0.0945% per year. PDR SERVICES LLC, *supra* note xxx, at 2. And Fidelity has just introduced a fund with zero management fees.

<sup>69</sup> This is no surprise really since the average return for the market as a whole is what it is.

<sup>70</sup> See BURTON G. MALKIEL, A RANDOM WALK DOWN WALL STREET 177-84 (1996) (summarizing research that demonstrates how managed funds do not necessarily outperform the market due to this added level of management expertise). To be sure, an investor can avoid management fees altogether by constructing and maintaining a portfolio from scratch. But the expenses associated with a do-it-yourself portfolio are significant. Mutual funds pay about one cent per share in brokerage commissions when they trade whereas the \$5 or so per trade charged by the deepest discount brokers works out to five cents per share assuming a round lot of one hundred shares. To be sure, mutual funds may also suffer additional implicit costs because their trades affect market prices. But individuals may suffer similar costs because of high-frequency trading (HFT) practices. Note that fund-level brokerage commissions are not included in the expense ratios set forth above because commissions are deemed to be expenses borne by the fund itself and not part of the management fee charged by the adviser. But since index funds trade far less than actively managed funds, commission expenses can be assumed to be proportionally smaller for index funds. See generally Roger Edelen et al., *Shedding Light on "Invisible" Costs: Trading*

Note that management fees as reported (and advertised) by mutual funds do not include the direct expenses of fund operations — such as brokerage commissions and custodial fees.<sup>71</sup> Therein lies another reason why index funds are attractive to investors who understand the benefits of diversification: Index funds engage in very little trading as compared to actively managed funds. On average, portfolio turnover within index funds is about 4% per year, while turnover in actively managed funds is about 50% per year.<sup>72</sup> Assuming that both types of funds pay the same brokerage commission rates, actively managed funds pay more than twelve times as much in commissions as do index funds. Thus, index funds are all the more attractive because of lower operating expenses.<sup>73</sup>

#### A. *The Compulsion to Diversify — and Index*

While the foregoing argument for diversification and indexing is compelling, it actually understates the case for such an investment strategy. Because diversified investors assume less risk for the same return, they are willing to pay a bit more for any given stock. All else equal, a diversified investor will outbid an investor who buys one stock at a time based on consideration of company-specific risk because diversified investors do not care about firm-specific risk.<sup>74</sup>

It follows that market prices are set by diversified investors because diversified investors are willing to pay more. Given that diversified investors have hedged away all firm-specific risk — since they assume less risk — they are willing to pay more for the stocks in which they invest. Thus, the market does not compensate investors for assuming company-specific risk because it is not necessary to assume such risk. Market prices are portfolio prices. Indeed, as more investors have diversified (and indexed) over the years, stock prices have generally risen. The growth of diversification (and indexing)

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*Costs and Mutual Fund Performance*, 69 FIN. ANALYSTS J. 33 (2013) (describing the various hidden costs of fund trading and their effect on investor returns).

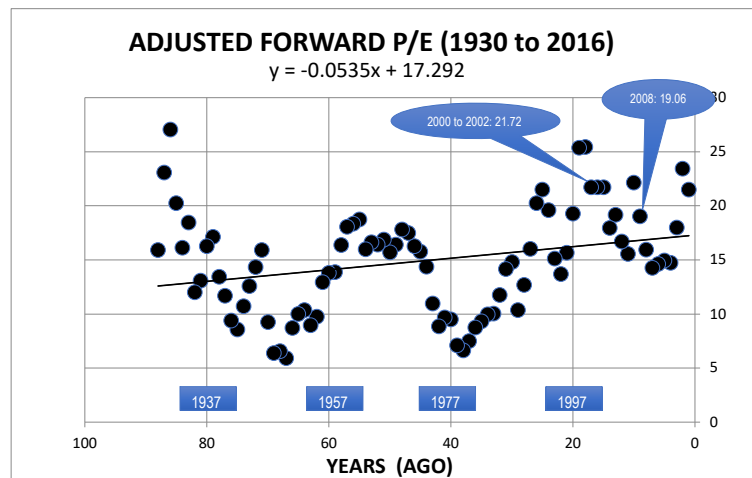
<sup>71</sup> Nor do they include so-called 12b-1 fees that many funds charge to defray promotional expenses.

<sup>72</sup> Discuss measurement of turnover.

<sup>73</sup> Also more tax efficient. But not tax driven.

<sup>74</sup> Note Seeking Alpha. The fact that the market does not offer any return for the assumption of such risk does not prevent stock-picking investors from looking for such gems. And plenty of folks buy lottery tickets every week.

has effectively bid up the price of equities generally.<sup>75</sup> In short, the market has already eaten your free lunch of diversification.



Thus, a stock-picking investor who declines to diversify must pay the higher prices set by diversified investors even though a stock-picking investor assumes more risk. In other words, investors who choose not to diversify effectively pay too much by assuming more risk than necessary for the same return. As a result, investors have no real choice but to diversify.<sup>76</sup>

<sup>75</sup> Data suggest that increasing levels of diversification have led to about 62 BP of the returns enjoyed by equity investors over the last century. See Richard A. Booth, *Appraisal Rights and Economic Growth*, 73 Bus. Law. 1011 (2018). Cannot be repeated.

Over the period 1930 through 2016, increasing P/E ratios have accounted for 0.62% in price return. See Richard A. Booth, *Appraisal Rights and Economic Growth* (noting “that 0.62% of price return is attributable to a general increase in the value of equities as measured by the forward price/earnings ratio”). It seems quite likely that this element of growth has been the result of increasing diversification as well as declines in commissions and other expenses of investing. See Richard A. Booth, *Five Decades of Corporation Law*, 53 VILL. L. REV. 459, 466 (2008) (stating that in the 1980s “as brokerage commissions fell, it became almost costless to assemble a diversified portfolio.”).

<sup>76</sup> By analogy to Gresham’s Law – that bad money drives out good money – one might say that diversified investors drive stock-pickers from the market since stock-pickers are forced to pay prices that are determined as if there is no firm-specific risk. Call it Booth’s Law. In

Thus, the logic of investing in a diversified portfolio of stocks leads ultimately to the conclusion that most investors are effectively compelled to diversify. To be sure, an individual investor is free to invest however she sees fit. She is perfectly free not to diversify. But the logic of diversification implies that a *fiduciary* has duty to diversify if not to recommend indexing.<sup>77</sup>

The bottom line is that it is irrational for most investors not to diversify. But to diversify is to render research a waste. Thus, it is also irrational to spend anything more than the minimum possible amount on investment management.

Admittedly, it is perfectly rational for an investor who wants to influence management (such as a hedge fund) to put more eggs in one basket. But note that price pressure from diversified investors dictates that a hedge fund must pay a premium for the privilege. That is probably a good thing. It means that hedge funds will seek out companies whose performance can be improved significantly.

other words, stock-pickers assume additional risk without the prospect of any additional return.

<sup>77</sup> See Restatement (Third) of Trusts 229(d) (1992); *Roberson v. Central Jersey Bank & Trust Co.*, 47 F.3d 1268 (3d Cir. 1995). See also Rob Berger, *How to Invest Money Based on Advice from Warren Buffett*, Nov. 24, 2020. Berger quotes Buffett’s 2013 letter to Berkshire Hathaway shareholders, where Buffett described how he has advised trustees to manage the money he will leave to his wife: “Put 10% of the cash in short-term government bonds and 90% in a very low-cost S&P 500 index fund. (I suggest Vanguard’s.) I believe the trust’s long-term results from this policy will be superior to those attained by most investors – whether pension funds, institutions or individuals – who employ high-fee managers.”

It is ironic that some money managers tout their status as fiduciaries but also express disdain for what they call cookie-cutter portfolios.

## B. Some Additional Benefits of Indexing

Although the foregoing discussion should suffice to explain why investing in a capitalization-weighted index fund is a compelling strategy for most investors – especially the fact that it generates higher geometric average returns – it does not capture all of the attendant benefits thereof.

One additional benefit is that indexing forces investors to invest in industries they might otherwise ignore. Indeed, while indexing is often seen as a passive strategy, it is really quite aggressive in that it seeks to ferret out every possible source of return.

Another subtle benefit is that indexing acts as a costless hedge of sorts. Sometimes the losses suffered by one portfolio company generate gains for other portfolio companies – as where one portfolio company loses a major customer to another portfolio company. Or in the case of a natural disaster, insurance companies may lose while construction companies gain.<sup>78</sup>

Yet another benefit of indexing is that it encourages investor discipline. Investing in an index fund is akin to Odysseus lashing himself to the mast to resist the Sirens. Again, investors should avoid the expenses of investment advice and investment management to the extent possible. But even investors who are quite devout about diversification may be tempted to jump from fund to fund or indeed to invest in multiple funds.<sup>79</sup>

Similarly, indexing also encourages long-term investment. By eliminating the temptation to trade, investors are induced to hold stocks longer than they otherwise would do.

Finally, and somewhat paradoxically, portfolio balance trading induces (PBT) (which is discussed further below) requires index funds to sell losers – which is one reason why such funds are said to be tax-efficient. But the point for present purposes is that indexing counteracts the reluctance of many investors to sell stocks that have declined in price – mostly because PBT requires it but also because an investor who understands the logic of indexing (and eschewing stock-picking) will form no attachment to the stocks in their portfolio.

Aside from these direct benefits, indexing also avoids some hidden risks that go with investing in actively managed stock-picking funds that seek to beat the market. One

<sup>78</sup> To be clear, this argument for indexing differs slightly from the central argument for diversification which relies on the law of large numbers and the random distribution of returns. In contrast, this argument relies on the idea that the economy is largely – but not entirely – a zero sum game.

Another possible benefit of indexing in general and capitalization-weighting in specific is a function of big is good – which seems to be an article of faith among business scholars. Industry leaders enjoy numerous advantages.

<sup>79</sup> See, e.g., xxx, *Stop Me Before I Diversify Again*, WSJ. Note funds of funds.

such danger is the so-called practice of window-dressing. Under SEC regulations, funds must report their holdings to the public sixty days after the end of each quarter.<sup>80</sup> So fund managers may be tempted to sell losers and buy winners before the cut-off date. By doing so, the fund manager can avoid reporting that they bought or held stocks that declined in value and rather bought or held stocks that increased in value. Thus, it may appear to anyone who reads such reports that the fund manager has skills. But because window dressing happens after the price of the subject stocks has fallen or risen, the effect is to buy high and sell low. So the losses will show up in the form of lower overall return -- not to mention increased turnover. An investor whose fund has underperformed other similar funds should not be fooled by a report showing that the fund held nothing but winners at the end of the previous quarter. Nevertheless, fund managers persist.

The practice of window dressing is closely related to the possibility of closet indexing – which many investors in actively managed funds see as verging on bad faith if not a BFD by fund managers. The worry is that a fund's holdings may be so similar to those of an index fund as to obviate any possibility of beating the market. If so, why should fund investors pay for active management? To be sure, fund managers may see the strategy as hedging against losses: While they are eager to report that they have beaten the market, they are more fearful of under-performing. But the price of hedging is the prospect of extra return. There is no free lunch. In any event, investors who prefer actively managed funds worry about closet indexing. And it is no surprise that data is readily available measuring the extent to which fund holdings match up with SPX.<sup>81</sup>

## C. The Passivity Paradox

One possible problem with the argument for indexing is that it proves too much. If there is no point in research and stock-picking, why would an index fund ever trade at all – even if such trading amounts to a mere 4% or so of aggregate value as noted above? <sup>82</sup> In other words, why do index funds trade at all other than to deal with inflows and outflows of investor funds? If one can eliminate all of the risk that goes with stock-picking by investing in a diversified portfolio, why not avoid the expenses of trading altogether by following a strict buy-and-hold strategy?

Although indexing has been described as passive investing, it is not a buy-and-hold strategy. Quite to the contrary, indexing entails some periodic trading to keep the portfolio in balance. As explained at length above, many leading index funds seek to

<sup>80</sup> See ICA Rule xxx.

<sup>81</sup> The most common such statistic is  $R^2$  which regresses fund holdings against SPX. If  $R^2$  equals 1.00 (100%) holdings are perfectly correlated. For example, Fidelity Magellan (FMAGX) was reported to be about 94% correlated with SPX as of late 2020 whereas all such similar large growth funds on average were about 91% correlated.

<sup>82</sup> See *supra* text at note xxx. This argument is a variation on the classic efficiency paradox.

mimic the composition of SPX – a capitalization-weighted index comprising the stocks of the 500 largest US companies held in proportion to the aggregate market capitalization of each constituent company. Thus (for example), if ABC Co. is worth \$100B and XYZ Co. is worth \$10B, the index would hold (constructively) ten times as much stock of ABC as it would hold of XYZ. But market prices change continually. ABC may fall in value to \$90B while XYZ may rise in value to \$20B. If so, a capitalization-weighted index fund would need to sell ABC shares or buy XYZ shares (or both) until the proportion reaches nine parts of ABC for every two parts of XYZ.<sup>83</sup> As a result, the composition of SPX changes over time as prices of constituent stocks rise and fall relative to each other. In other words, because stock prices rise and fall, the market portfolio must be rebalanced periodically. As a result, index funds that track SPX must do some trading to maintain holdings in proportion to market capitalization.<sup>84</sup>

The practice with SPX (the index itself) is to rebalance quarterly, while the leading SPX ETF – SPDRs (SPY) – rebalances at least monthly.<sup>85</sup> But the trading prompted thereby is minimal. For the year 2016, turnover for SPX itself was 4.49% and was an even lower 4% for SPY.<sup>86</sup> In contrast, the average turnover rate for actively managed equity funds is at least 50% per year and probably higher.<sup>87</sup>

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<sup>83</sup> Note that holdings here are measured in the dollar amount of each stock and not the number of shares.

<sup>84</sup> This is not always easy to do. For example, COVID 19 led to a dramatic decrease in prices of oil stocks. As a result XOM fell out of the top ten SPX holdings as of EOY 2018 to xx place as of EOY 2019. The question is should one adjust or not for changes that seem likely to be temporary?

<sup>85</sup> See S&P 500 Equal Weight Index, S&P DOW JONES INDICES (noting rebalancing frequency within the S&P 500).

<sup>86</sup> See PDR SERVICES LLC, *supra* note 62, at 2 (recording SPDR rates of capitalization weighted turnover); S&P Capitalization Weighted Turnover, *supra* note xx (listing relative rates of capitalization weighted turnover within the S&P 500).

Virtually all funds must engage in PBT to some extent. Even SPW – the equal weight version of the S&P 500 – must rebalance to keep the weight of each stock therein equal. Indeed, the turnover rate for SPW is much higher than for SPX. See Chart III *supra*. The DJIA also rebalances periodically, although it does so at the discretion of index management. See S&P DJIA methodology. The exception is a unit investment trust (UNIT) wherein a fixed portfolio of securities is held for a specified period. Technically, SPY is a UNIT but the holding period lasts only until the next rebalancing.

<sup>87</sup> The Investment Company Institute (ICI) has reported that the average turnover rate for all equity funds was 26% as of 2016. Assuming that roughly half of investor funds are indexed (a very generous estimate), a 26% average turnover rate for all funds translates to an average turnover of 52% among managed funds. See INVESTMENT COMPANY INSTITUTE, 2017 INVESTMENT COMPANY FACTBOOK, at 38 (57E 2017) (noting that the long-term average turnover for the period 1984 to 2016 is 57%).

To be sure, commissions and spreads today are minimal (although they were not always so). But the cost of trading also includes the effect thereof on market prices. When a fund buys or sells a given stock, the price thereof may rise or fall even before the fund can complete its trade because the market knows how index funds work and when they are likely to buy or sell. Moreover, market makers and other traders may notice the increased volume – and especially so since the advent of high frequency trading (HFT). Indeed, studies indicate that for funds (of all sorts) these front-running costs are somewhat greater than the cost of commissions. On the other hand, ETFs – as opposed to index mutual funds – can compensate to some extent for these costs because they trade during the day like individual stocks. Thus, the price of an ETF may vary a bit from the value of the index itself. In that sense, an ETF is a bit like a futures contract – albeit one that settles continuously. And indeed ETFs have been used as a substitute for index futures in connection with index arbitrage program trading. But the point for present purposes is that the market price of an ETF may reflect these subtle costs of trading at the fund level.<sup>88</sup>

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Market-wide, turnover has been dropping steadily over the last ten years. See NYSE Group Turnover, NYSE MARKET DATA, (recording that the average turnover rate for NYSE group listed stocks has been 45% to 179% (monthly annualized) during the period 2007 to September 2018). No doubt this trend is due in part to investor movement into index funds.

Needless to say, an index (as such) does not pay any brokerage commissions when it constructively trades. Nor does it charge any fee against itself for the expense of maintaining the index – gathering and analyzing price and return data. Thus, a fund that invests real money cannot ever quite match the performance of the index itself.

<sup>88</sup> It is well known that when a stock is added to an index, its price increases. And vice versa. Thus, it seems likely that when a stock is on the verge of being added to an index, its price will likely rise as traders anticipate more demand for such stocks. So even the index pays more. Some index funds effectively avoid these costs by investing in more than 500 stocks. Note also that ETFs effectively adjust for such costs because they trade throughout the day rather than at a price fixed at the end of the day.



#### IV. The Dark Side of Diversification

Some commentators have argued that indexing does affirmative harm to the markets by subtracting from the quantity and quality of investor research.<sup>89</sup> The suggestion seems to be that investors have a duty to do research whether they like it or not: Everyone should do their bit to keep the market efficient – just like everyone should vote.<sup>90</sup>

Again, this worry is a variation on the efficiency paradox – which is really no paradox at all. The classic worry is that if investors believe that the market is efficient – in the sense that market prices react quickly to new information or are the best estimate of stock value – they will stop doing research. The market will cease to be efficient. Prices will diverge from what they should be. And research will once again become an economically rational thing to do. But in the real world we do not see wild swings in the quantum of research done by investors or the efficiency of the market. Rather, the paradox is an allegory of sorts about how the market works. If some investors think other investors are less informed, they will do research until a dollar spent thereon generates merely a dollar in gain. In other words, they will stop doing research when it is more costly than the extra return it generates. But that is exactly what we mean by equilibrium. So the efficiency paradox is true but trivial.<sup>91</sup>

More important, indexing is not about devotion to the efficient market. Rather, indexing derives from the logic of diversification – which is all the more compelling if one is worried that the market is inefficient – if one is worried about the risk of mispricing.<sup>92</sup> But the argument that index funds shirk their duties as investors seems to be based on the idea that indexing is nothing more than a thinly veiled way of free-riding on the efforts of

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<sup>89</sup> See Lucian A. Bebchuk & Scott Hirst, *Index Funds and the Future of Corporate Governance: Theory, Evidence, and Policy*, 119 Columbia L. Rev. 2029 (2019); John C. Coates, *The Future of Corporate Governance Part I: The Problem of Twelve*, Harvard Public Law Working Paper No. 19-07 (September 20, 2018); Jill E. Fisch, Assaf Hamdani & Steven Davidoff Solomon, *The New Titans of Wall Street: A Theoretical Framework for Passive Investors*, 168 U. Penn L. Rev. 17 (2020); Sean J. Griffith, *Opt-In Stewardship: Toward an Optimal Delegation of Mutual Fund Voting Authority*, 98 Tex. L. Rev. 983 (June 14, 2019); Dorothy Shapiro Lund, *The Case Against Passive Shareholder Voting*, 43 J. Corp. L. 101 (2018). See also Jill E. Fisch, *Confronting the Circularity Problem in Private Securities Litigation*, 2009 Wisconsin L. Rev. 333 (arguing that indexing is devastating to the markets). But see Edward B. Rock & Marcel Kahan, *Index Funds and Corporate Governance: Let Shareholders Be Shareholders*, NYU Law and Economics Research Paper No. 18-39 (April 4, 2019); Marcel Kahan & Edward B. Rock, *Systemic Stewardship with Tradeoffs* (November 30, 2021).

<sup>90</sup> Marvin Chirelstein on rationality of voting.

<sup>91</sup> On the other hand, such wild swings do evolve in some slow-moving markets such as for agricultural products – which is why the commodities markets were established.

<sup>92</sup> See *supra* text at note xxx.

quality investors (as they are sometimes called).<sup>93</sup> To the contrary, indexing follows from the logic of diversification. And index fund investors affirmatively want index fund managers to spend as little as possible on research and monitoring of individual portfolio companies not because they reckon that someone else will do the work but rather because there is nothing that can be done with the product of such efforts if one is committed to a strategy indexing.<sup>94</sup>

To be clear, some critics worry that index funds may have too much power – that too many investors have gravitated to index funds and that fund managers may thus be able to exert excessive influence over portfolio companies. That is a wholly different worry. But it may be somewhat connected to worries about free-riding if index fund managers somehow subvert the corporate governance system by failure to vote or otherwise show up when it is important to do so. So there are two possibilities. One is that index fund managers might abuse their considerable influence. The other is that they will fail exercise their rights as stockholders (and that their failure will somehow undermine the market). As I argue elsewhere, neither of these possibilities is a real worry.<sup>95</sup> But the point for present purposes is that they are two different worries. The more relevant worry here is more that the market may not work as well as it now does if too many stockholders tune in and turn on to index and drop out of doing company-specific research.

So the question remains as to how much *informed* trading is necessary to keep the market efficient – to facilitate the process of price discovery (as it is sometimes called).<sup>96</sup> Some studies from the late 1990s and early 2000s find that only about one-quarter of trading was then motivated by stock-picking and suggest that it would be enough if as little as about one-tenth of trading volume was attributable to informed investors – those who do company-specific (or fundamental) research – for the market to be as efficient as it needs to be.<sup>97</sup>

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<sup>93</sup> See LAWRENCE A. CUNNINGHAM, *QUALITY SHAREHOLDERS: HOW THE BEST MANAGERS ATTRACT AND KEEP THEM* (Columbia 2020).

<sup>94</sup> SCOTUS has made a similar point in defining materiality, namely that a fact cannot be material if it makes no difference as a matter of law. See *Santa Fe Industries, Inc. v. Green*, 430 U.S. 462 (1977); *Virginia Bankshares, Inc. v. Sandberg*, 501 U.S. 1083 (1991).

<sup>95</sup> See Richard A. Booth, *The Proper Role of Index Funds in Corporate Governance* (forthcoming).

<sup>96</sup> The term informed trading was first used by Ronald Gilson and Renier Kraakmann in their classic article, *The Mechanisms of Market Efficiency*, 70 Va. L. Rev. 549 (1984).

<sup>97</sup> See Richard A. Booth, *The Buzzard Was Their Friend – Hedge Funds and the Problem of Overvalued Equity*, 10 U. Penn. J. Bus. & Emp. L. 879 (2008) (collecting studies at 895 note 51). Compare data regarding non-competitive bidding for government securities. Neither is it clear how efficient the market needs to be. Given that market prices change continuously, it seems obvious that we do not need total precision. What would that even mean? Rather, it is good enough if prices are good enough. Note changes in market micro-structure from spreads of one-eighth dollar to one cent. Cf. FRANCIS FUKUYAMA, *THE ORIGINS OF POLITICAL*

To be clear, the logic of diversification and indexing does not apply to activist investors who seek to influence the business strategies of investee firms. Think Warren Buffett. For such investors, expected returns derive from active participation in management. For them, it is no contradiction to expect return to exceed expected return (as it were). Market efficiency does not imply that a business cannot be improved. So the logic of diversification (and indexing) does not apply to such investors as it does to ordinary investors who must invest in a company as-is. Indeed, diversification is an affirmatively *bad* idea for activist investors who must carefully choose the businesses in which they invest. Although such an investor might build a diversified portfolio over time (as has Buffett), the more one knows about each target business or industry when making an investment, the better one will do.<sup>98</sup>

In addition, there will always be some ordinary investors (and traders) who disdain the idea of the efficient market, who think they know better than the crowd and think they can beat the market even though few ever succeed in doing so.<sup>99</sup> But it seems an odd

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ORDER: FROM PREHUMAN TIMES TO THE FRENCH REVOLUTION (2011) (discussing good enough government).

For the record, trading volume for SPX stocks as measured by aggregate share volume divided by index value has been relatively stable since 1985 except for the years 2008 through 2012 but somewhat higher following that period than before that period.

<sup>98</sup> This same logic applied in the rise and demise of conglomerate mergers and acquisitions. Although it was the idea of diversification – together with other factors – that prompted the formation of holding companies beginning in the 1960s on the theory that a diversified conglomerate would be worth more as a whole than the sum of its parts, the market ultimately discovered that it is easier and cheaper – and more rewarding – for investors to hold diversified portfolios of companies more focused on doing what they do and doing it very well. Richard A. Booth, *Five Decades. Five Decades of Corporation Law – From Conglomeration to Equity Compensation*, 53 Villanova L. Rev. 459 (2008).

Thus, one subtle benefit of diversification and indexing by large numbers of ordinary investors is that it makes takeovers more expensive. As noted above activist investors (hedge funds, private equity funds, and other investors who seek to influence the management strategies of target businesses) must pay the premium prices that are effectively set by diversified investors in order to gain influence or control. It follows that they must perceive significant room for improvement. See *supra* text at note xxx. This should be somewhat reassuring to those who suspect that such investors are focused on short-term returns or otherwise seek to promote policies that are inconsistent with the interests of minority stockholders and the broader economy. In other words, because of diversification and indexing by the mass of investors and the consequent increase in stock prices, acquirors must pay higher prices to gain control. The presumable result is that there are fewer takeovers. And those that still make economic sense are presumably higher quality opportunities that generate greater gains.

<sup>99</sup> Then again, stock-picking is not as irrational as playing the lottery. Although stock pickers are unlikely to beat the market, neither are they likely to be beaten by the market (by much) because the market is quite efficient even for individual stocks.

idea that we should depend at all on the efforts of arguably irrational investors – financial anti-vaxxers who have no good reason to think their analysis is superior and who trade on idiosyncratic whims and hunches.<sup>100</sup>

The point for present purposes is that the trend toward indexing among ordinary investors does nothing to detract from the volume of informed trading by activist investors. Still, is such trading enough? Does it matter that stock-picking by individual investors has declined as it has? Perhaps more to the point, does it matter that investors have moved away from actively managed funds and that actively managed funds have responded by trading less? In the end, it is not clear how to answer this question because it ultimately depends on knowing how much trading is necessary. It may be that there is more trading today than we really need.<sup>101</sup> It also raises the logically prior question of what constitutes informed trading? Have we lost anything of real value that helps to keep the market efficient?

Whatever the answer to this question – if there is an answer – it is not fair to characterize portfolio balance trading (PBT) by index funds as uninformed trading. It is very much informed (and disciplined) as to the relative market capitalization of portfolio companies. As such, PBT serves to reward companies who do what they should do – who maximize share value – and to punish companies that do not do so.<sup>102</sup> And it does so without mercy. Whereas activist investors and actively managed funds might give an underperforming portfolio company some slack, an index fund must do what it says it will do.<sup>103</sup>

The critics would presumably concede that different investors and traders focus on different factors when they make investing and trading decisions.<sup>104</sup> And the critics would also likely concede that it takes all kinds (so to speak) – that the market is better off if investors and traders follow many different strategies in making their investing and trading decisions. It seems quite unlikely that anyone would argue that all investors and

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<sup>100</sup> See *Mills v. Electric Auto-Lite Co.*, 396 U.S. 375 (1970); *TSC Industries, Inc. v. Northway, Inc.*, 426 U.S. 438 (1976).

<sup>101</sup> One way to approach the question might be to look at volatility. But how do we know how much volatility is enough or too much?

<sup>102</sup> Needless to say, it is not universally agreed that the overriding goal of public corporations should be to maximize stockholder wealth.

<sup>103</sup> Worries about market capitalization in Succession.

<sup>104</sup> For example, some investor-traders subscribe to various schools of fundamental analysis, while other follow the tenets of technical analysis. See MALKIEL, *supra* note xxx. While most investors invest long, others engage in short selling.

*Cf.* JAMES SUROWIECKI, *THE WISDOM OF CROWDS: WHY THE MANY ARE SMARTER THAN THE FEW AND HOW COLLECTIVE WISDOM SHAPES BUSINESS, ECONOMIES, SOCIETIES AND NATIONS* (Doubleday Anchor 2004).

traders should focus on the same factors – should make their decisions in lock-step with each other based on some one mode of analysis that is ordained to be the one true word of the market god. Rather, the argument would likely be akin to the admonition to attend the church of your choice. But if so, it is difficult to see exactly what the argument would be.<sup>105</sup> To be sure, PBT contributes relatively little to aggregate volume. So the argument might be that index funds should trade more than they do. But it is difficult to see how this argument would fare any better than the argument that index funds ought to do a different sort of research. Again, unless it can be argued that there is one true approach to analysis that one ought to follow as a righteous investor, the argument that one should trade more is bound to fail.<sup>106</sup> Moreover, index investors might argue that indexing acts as a check on wasteful efforts to beat the market by providing investors with an alternative to the costly-casino version of investing.<sup>107</sup> Thus, the emergence of indexing permits the market to fine-tune how much gets invested in research and in that sense makes the market even more efficient than it might otherwise be.

There is also a sense in which indexing by significant numbers of investors creates trading opportunities for *other* investors. Since PBT is based on the *past* performance of portfolio stocks (over as long as three months), index funds and the index itself must lag the market in individual stocks. Accordingly, index investors effectively cede some gain to first-movers – the active traders who collectively effect real change in the prices of individual stocks. And since everyone knows the trading strategy of index funds, other investors can engage in front-running – trading ahead of index funds on the basis of the likely effect index fund trading will have on market prices. So one might argue that indexing mildly encourages others to engage in a bit more informed trading than they otherwise might do.<sup>108</sup>

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<sup>105</sup> I am reminded of the movie *What's Up Doc?* in which a Ryan O'Neill, frustrated by the antics of Barbra Streisand, says with exasperation, "You're so different!" to which she replies, "I'll try to be the same."

<sup>106</sup> It is possible that the critics have misunderstood how indexing works. It may be that they assume (incorrectly) that index funds do no trading at all – that they are akin to the unit investment trusts (UITs) of old that assembled a fixed portfolio to be held for some specified number of years and then liquidated. Although many ETF index funds are indeed organized as UITs because that is the category that fits best for purposes of SEC rules, it is simply incorrect to think that index funds eschew all trading.

<sup>107</sup> See Lynn A. Stout, *Are Stock Markets Costly Casinos? Disagreement, Market Failure, and Securities Regulation*, 81 Va. L. Rev. 611 (1995). See also Paul G. Mahoney, *Is There a Cure for Excessive Trading?* 81 Va. L. Rev. 713 (1995); Lynn A. Stout, *Agreeing to Disagree Over Excessive Trading*, 81 Va. L. Rev. 751 (1995).

<sup>108</sup> As noted above, PBT requires an index fund to buy high and sell low. On the other hand (and as noted above), index ETFs may exploit the trading opportunities created by indexing (which explains why this rather exotic instrument was added to what might have seemed a surplus population of derivative instruments in the first place) since the price of an ETF may vary from both the underlying stocks and the index itself (whether in anticipation of pending PBT or for other reasons). As with program trading, if the index is overpriced relative to the underlying stocks (for example), they can bid down the price of the ETF accordingly.

Similarly, the trend toward indexing has the effect of magnifying the efforts of activist investors to effect reform in the companies they target. As I discuss elsewhere, since many index funds engage in mirror voting – casting their votes in proportion to the votes of other investors – activist investors can exert more influence under the proxy system than they otherwise would be able to do.<sup>109</sup> To be sure, the overall effect of diversification (and thus indexing) has been to raise stock prices by reducing investor risk and thus to make takeovers generally more expensive. But the tendency of indexing and PBT to magnify changes in the price of individual stocks both up and down may magnify the gains of activist investors and create more lucrative opportunities for activist investment in disfavored companies.

In short, it seems at least plausible to conclude that indexing and index funds live in a symbiotic relationship with activist stock-picking investors and the funds that cater them. In other words, it is not at all clear that indexing detracts from the efficiency of the market. Quite to the contrary, indexing may make the market a bit more efficient than it otherwise would be by reducing the noise in the system.<sup>110</sup>

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Indeed, ETFs have been heavily used for program trading. So there is good reason to think that trading by index investors neutralizes much of any advantage that goes to active traders (and indeed may exploit its own mirror advantage). But this is itself a form of informed trading.

<sup>109</sup> See Richard A. Booth, *The Proper Role of Index Funds in Corporate Governance* (forthcoming).

<sup>110</sup> On the other hand, the peculiar interests (and disinterests) of index investors may have implications for law, regulation, and public policy that differ from those that would serve the interests of other investors. For example, index investors might prefer market prices to adjust more quickly all else equal and might thus disfavor prosecution of insider trading that has the effect of accelerating price adjustments (while favoring the prosecution of cases where the defendants have perpetuated mispricing) because index investors eschew stock-picking and have no interest in identifying mispriced stocks. Similarly, index investors are likely to be opposed to securities fraud class actions that seek to recover from the company for misstatements of fact because as index investors they are likely to hold many more shares from before any such fraud than they are likely to buy during the fraud period. Thus, index fund investors will almost always lose more because the company pays than they gain from their share of any recovery. I discuss these and differences between the interests of index investors and other more conventional stock-picking investors in a forthcoming piece. See Richard A. Booth, *The Proper Role of Index Funds in Corporate Governance* (forthcoming).

## Conclusion

The proposition that a prudent investor should be diversified is widely accepted if not incontrovertible for ordinary investors – investors who have no reasonable expectation of influencing company management or business policy. Indeed, fiduciary duty requires that trustees and other investment managers assure that their clients be diversified. But the idea of diversification is not well articulated or understood even by sophisticated investors. This article fills that gap by laying out the logic (and mathematics) of diversification for ordinary investors who invest in common stock. As shown here, diversification can eliminate almost all of the company-specific risk that goes with investing in equities without any sacrifice of expected return. The only risk that remains is the risk that the market as a whole may do better or worse than expected. Thus, it is often said that diversification is the only free lunch in the market. It follows that diversified investors who assume less risk because they are diversified will pay more for the shares in which they invest and will thus dictate market prices. It further follows that undiversified stock-picking investors assume more risk than necessary and thus pay too much for the stocks in which they invest. In other words, the market has eaten their free lunch.

The logic of diversification explains why investors have flocked to index funds – which offer maximum diversification for minimum fees – and why almost half of all stock in US companies is held by such funds. But the idea of diversification alone does not explain how much to invest in which companies. Fortunately, the market provides the answer to this question, and the answer turns out to be indexing. Generally speaking, we can depend on individual companies to maximize returns for their own stockholders by seeking out the most profitable opportunities in which to do business. Since market price is a function of expected return (divided by the required rate of return), it follows that ordinary investors should invest their funds in proportion to the aggregate market value of investee companies because by doing so investors are assured that their money is spread evenly across all lines of business in the economy in proportion to prospects for return. Thus, ordinary investors should invest in index funds that hold shares in proportion to the market capitalization of all possible portfolio stocks. It turns out that the 500 (or so) largest US stocks account for more than 80% of total market value. And as it happens, the value-weighted version of the S&P 500 (SPX) comprises exactly that portfolio. It follows that investing in an index fund that tracks SPX is a good way – possibly the best way – achieve maximum diversification at the lowest possible expense.

Thus, it is mostly coincidence that investors favor index funds that track SPX as opposed to other indices. SPX was designed to measure the market and not as a normative strategy for investing. But it turns out that SPX provides the best guide for how to allocate investment funds within a portfolio of US common stocks. In other words, if SPX did not exist, it would be necessary to invent it. Moreover, by so allocating funds, the expenses of investment management can be kept to a minimum, because following an affirmative strategy of indexing precludes expending any fund assets on company-specific research. To engage in such research would be a literal waste of

assets – and thus a breach of fiduciary duty – since there is nothing fund managers can do with the fruits thereof without violating an announced strategy of indexing. Similarly, indexing keeps the expenses of trading at the fund level to a minimum because the only trading that is necessary or appropriate is portfolio balance trading (PBT) to keep fund holdings proportional to the market capitalization of portfolio companies.

Finally, it is wrong to characterize indexing as a passive investment strategy or one by which index investors free-ride on the efforts of traditional stock-picking investors who engage in company-specific fundamental research. To the contrary, indexing magnifies the disciplinary effects of market prices on portfolio company management. Moreover, indexing by some (or many) investors creates trading opportunities for other investors since index investors effectively cede first mover advantages to investors who engage in company-specific research. Thus, there is a symbiotic relationship between index investors and activist investors – and indeed among all investors of diverse interests – that arguably makes the market more efficient than it would otherwise be (in the absence of indexing).

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