Investment returns, portfolios, and indexes

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Motivation

What's a "typical" stock return?

Panel A: Individual stocks, monthly horizon ($N = 3{,}575{,}216$)					
Variable	Mean	Median	SD	Skewness	% Positive
Buy-and-hold return, T-bill	0.0037	0.0039	0.003	0.621	92.5%
Buy-and-hold return, stock	0.0113	0.0000	0.181	6.955	48.4%
	% > T-bill	% > VW Mkt return		% > EW Mkt return	
Buy-and-hold return, stock	47.8%	46.3%		45.9%	

Overview

To say anything useful about investment performance, we really need to study large portfolios, not individual securities.

So to start, we will discuss how portfolios are built and maintained.

This week, we will consider a few specific investment strategies: price weighting, equal weighting, and value weighting.

In each case, using some example data, we will ask:

- How to form a portfolio reflecting that strategy?
- How to compute the return on that portfolio?
- How to rebalance the portfolio to stay in line with the strategy?
- What is the connection with the return on an index?

Takeaways

We will see that the answers to the previous questions depend on:

- The price change of each security in the portfolio,
- The payout of each security (dividends, coupons, etc),
- Changes in the total supply of each investment (for example, stock splits, stock dividends, repurchases).

We will also see why value-weighting is a natural benchmark strategy.

Homework 1 builds on these examples.

Building and rebalancing a portfolio

A portfolio is just a collection of securities. To build one:

- Decide on the list of securities you want to include.
- Choose a strategy for how much to allocate to each one.
- Calculate the amounts you need to buy at current market prices.

After building a portfolio, you might also want to rebalance regularly, in order to stay in line with the strategy you chose above:

- Recalculate the portfolio that now aligns with your strategy.
- Buy or sell enough of each security to arrive at this portfolio.

Keeping track of trading activity during rebalancing

Different strategies require different amounts of trading to rebalance.
It is important to track this activity because trading is costly.

- Turnover during any time is gross trading activity, as a percent of starting portfolio size.
    - To be clear, the exact trading costs are still only a fraction of this amount, and depend greatly on who is doing the trading.
- Gross trading activity is total purchases plus total sales.
    - We add them together because both are costly.
- For comparison, net trading activity is purchases minus sales.
    - This does not measure trading costs, but still can be useful: It must equal the total amount added or withdrawn from the portfolio, plus reinvestment of dividends or coupons.

Measuring portfolio returns

The return on a portfolio between two dates can be calculated as:

- The ending value of securities owned and dividends received, divided by the initial value of the securities, minus 1;
- or, the weighted average return of each individual security, being sure to include the dividends that they paid, where the weights are the portfolio's initial dollar allocations.

Either method will give the same answer.

Example 1: Textbook table 2.2, page 46

Stock	Initial price	Final price	Shares (m)	Initial market cap ($m)	Final market cap ($m)
ABC	$25	$30	20	$500	$600
XYZ	$100	$90	1	$100	$90

Example 2: Data on AMGN and GILD from 2017

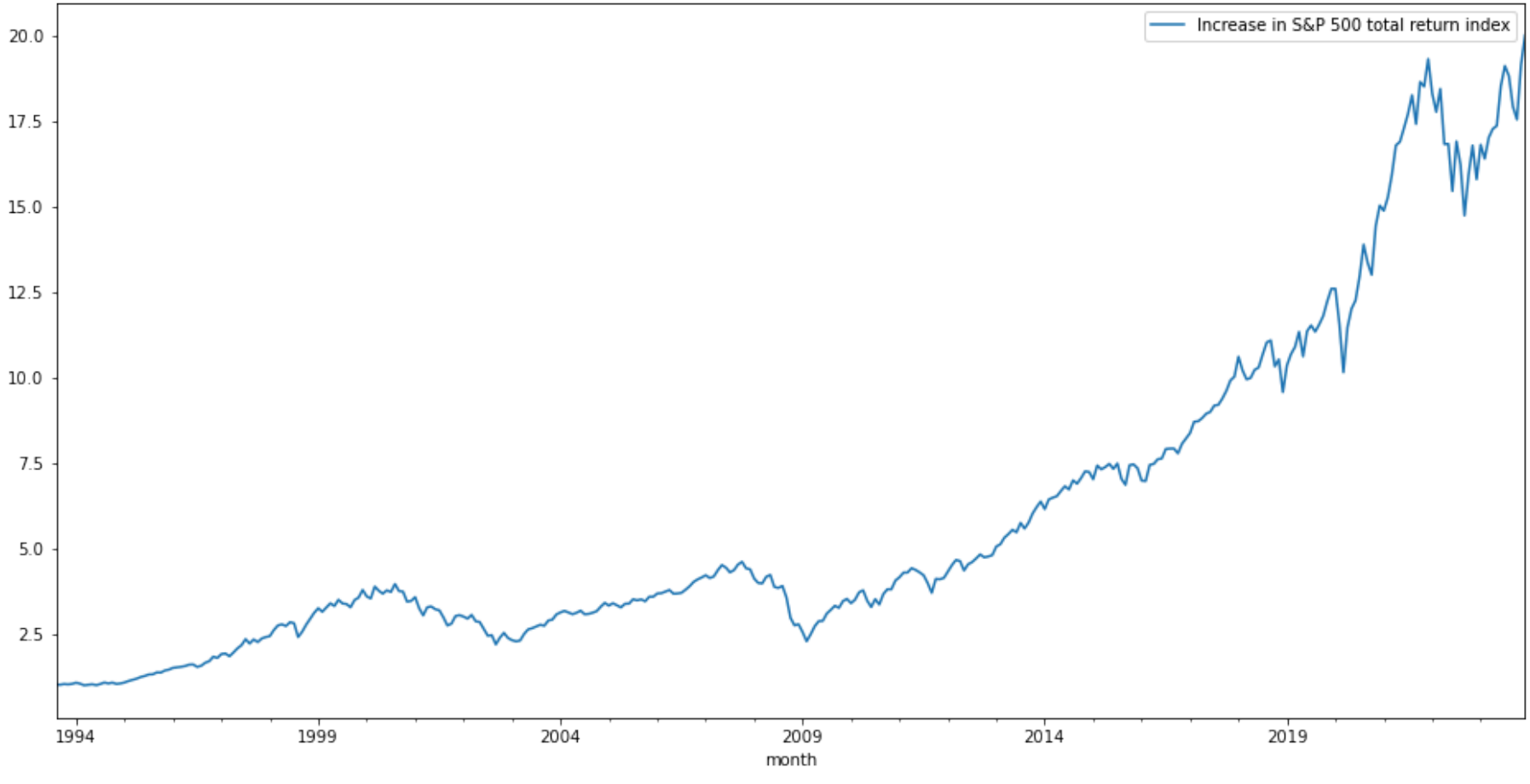
Stock	Initial price	Final price	Initial shares (m)	Final shares (m)	Dividends paid per share, $
AMGN	$146.21	$173.90	738.2	722.2	$4.60
GILD	$71.61	$71.64	1310	1308	$2.08

Importance of the value-weighted portfolio

For many people, a value-weighted portfolio seems like the *least* natural of the strategies that we have looked at. Nevertheless, it is always the benchmark.

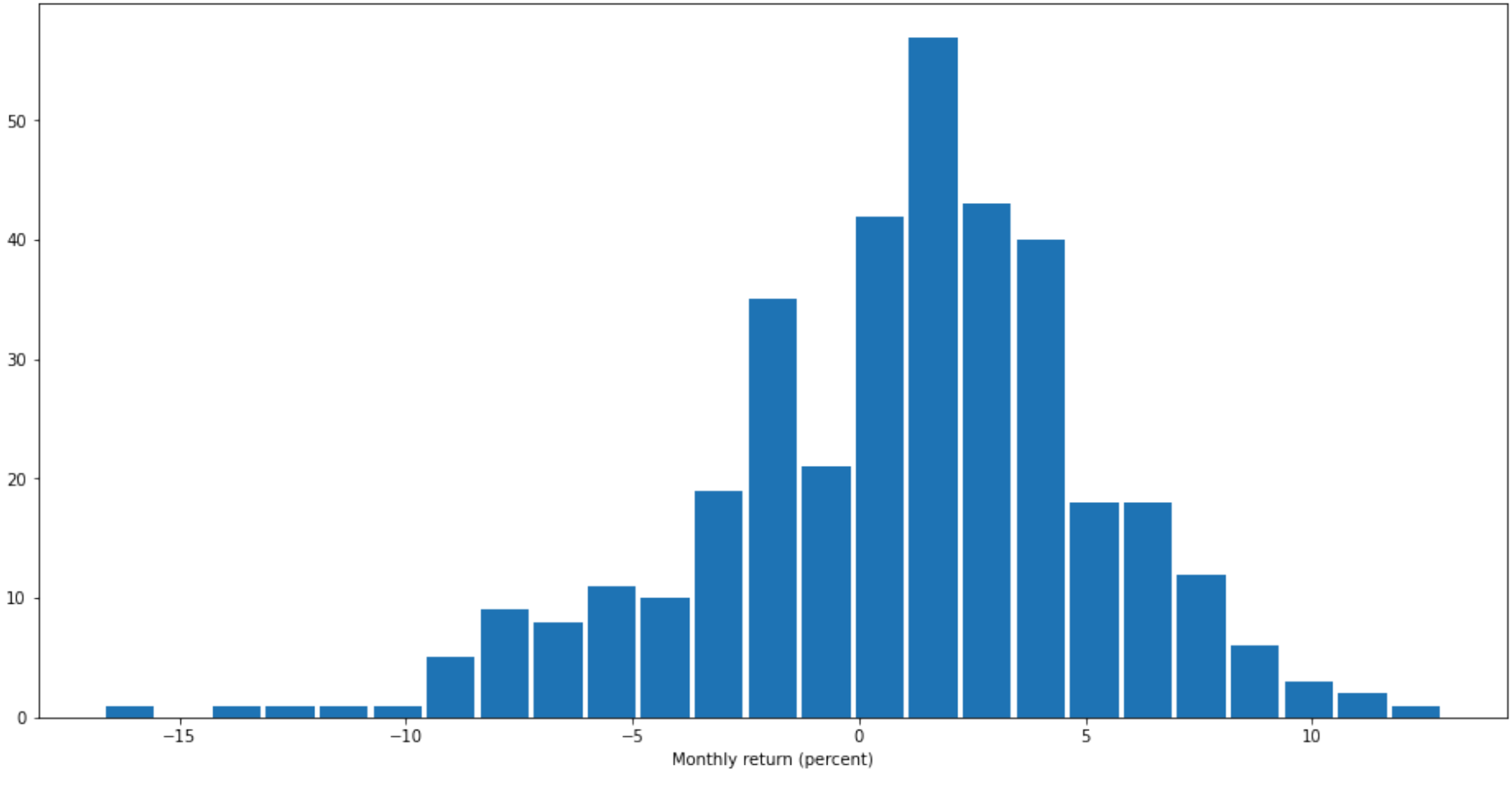
- It represents a proportional slice of the overall market, which means it is the only strategy that everyone can hold.
- Therefore, it also requires the least rebalancing of any strategy. “Passive” investing always means value-weighted investing.
- It is *guaranteed* to match the average return across all investors. Any performance you gain or lose using a different portfolio, is matched by the rest of the market in the opposite direction.
- Although it weights *companies* very unevenly, it diversifies equally across dollars of expected future profits.

30-year return on a value-weighted portfolio



Histogram of monthly returns on that portfolio.

The distribution is roughly symmetric, which is very different than the pattern for individual stocks as documented in the Bessembinder paper.



Statistics of S&P 500 total returns

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Average arithmetic monthly S&P 500 total return: 0.92%
Median monthly return: 1.44%
Skewness of monthly return: -0.57
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Bessembinder documented that for individual stocks, the average return is far above the median, so that skewness is positive and very large. Here we see that at the level of the entire market, instead of individual stocks, the mean and median are close to each other and the skewness is close to zero.

(In fact the ordering has also reversed: The mean is slightly smaller than the median, and skewness is slightly negative. This tells us that at the level of the entire market, the worst returns are bigger than teh best returns. However, the main message is that the difference between mean and median is not nearly as big as it was for individual stocks, and skewness is closer to zero.)

Indexes of investment performance

An index helps track the performance of a given strategy/portfolio.

Examples:

- DJIA: price-weighted portfolio of stocks.
- S&P 500 index: value-weighted portfolio of stocks.
- Bloomberg Agg (fka Barclay's Agg): value-weighted, bonds.

Each index features a list of investments, and a weighting scheme.

The level of the index by itself is a meaningless, arbitrary number.

Index *changes* are connected to returns on the underlying strategy. But the exact connection depends on how the index is constructed.

S&P 500 index calculation

Most US stock indexes are designed to measure returns to their underlying strategy from capital gains alone, *excluding dividends.*

For example, the S&P 500 index is calculated with this formula:

$$\text{S\&P 500 index level} = \frac{\sum P \times Q}{\text{Divisor}}$$

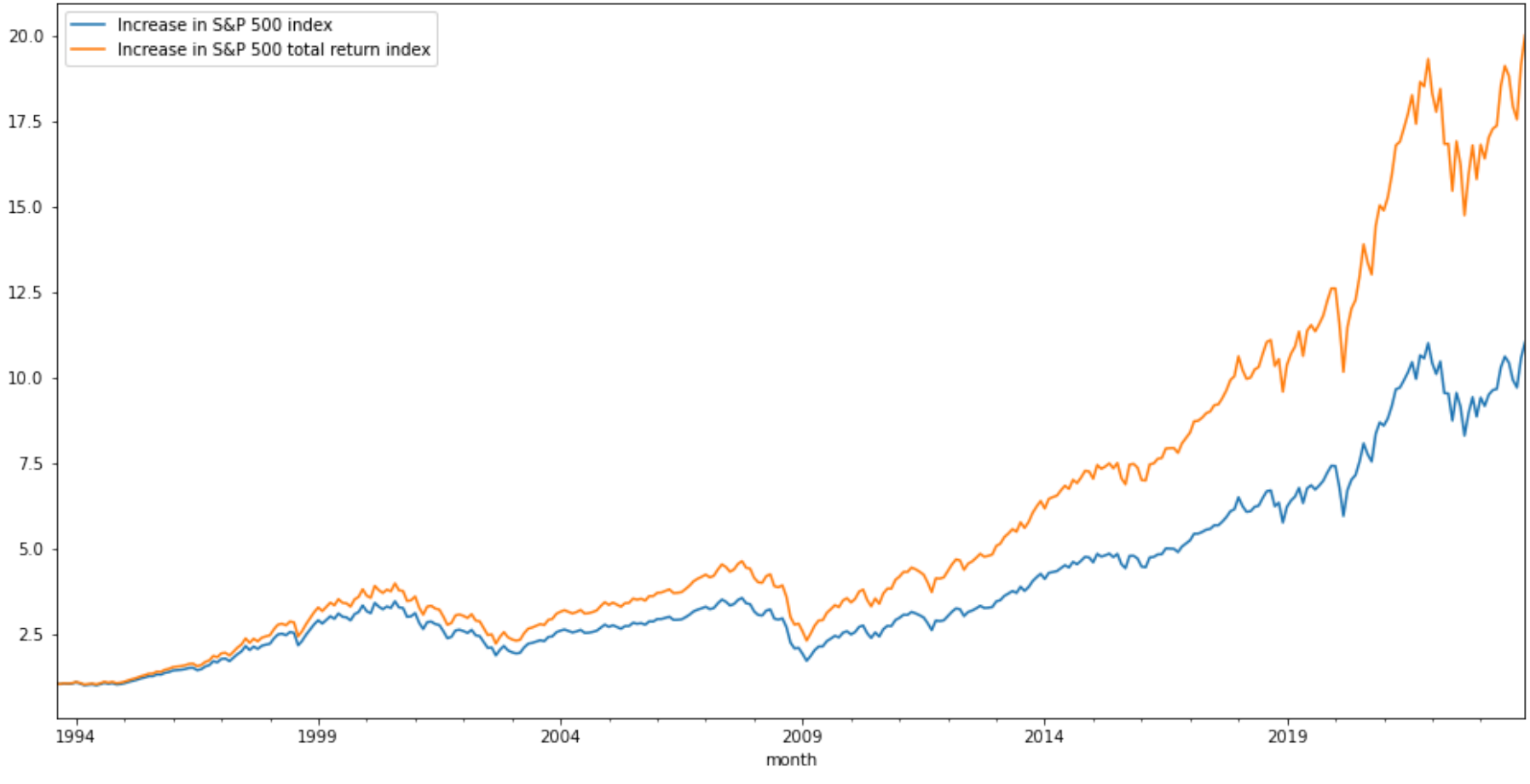
The divisor is adjusted in response to events that change market cap without triggering a capital gain for the individual investor, such as share issuance or repurchase. (We will do an example of this.)

So the index return *does not* include the return from dividends. There is an S&P 500 “total return” index, but it is not as well-known.

It doesn’t have to be this way! The DAX is a total return index.

Comparison of S&P 500 index and total return index

Dividends are important, especially over long horizons!

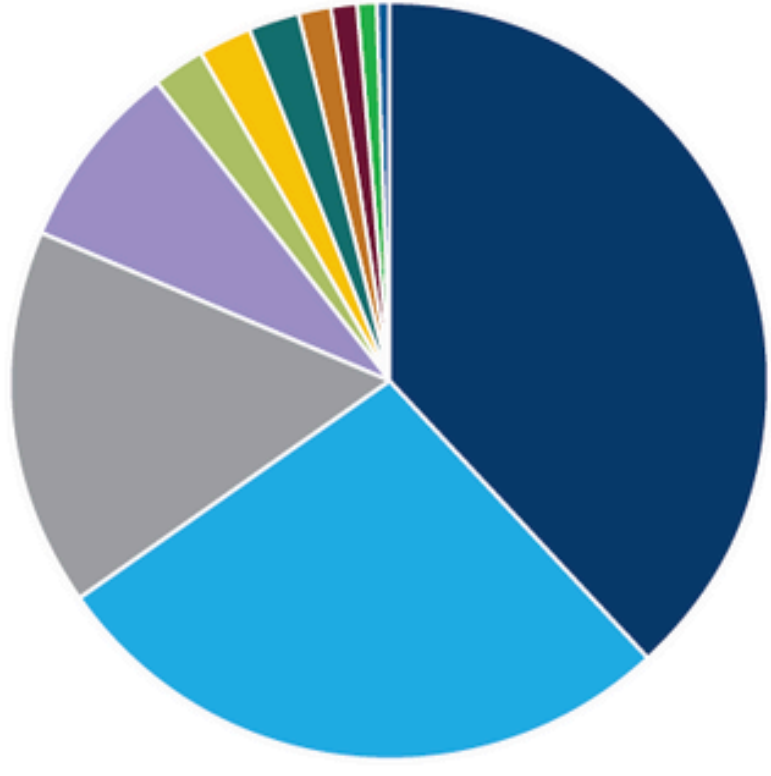


The Agg: Bloomberg/Barclays aggregate bond index

- The best-known US bond market index. The formal name has changed several times. It is generally just called the “Agg.”
- It reflects a value-weighted portfolio of a broad range of fixed-income securities. Like most bond indexes, it is a “total return” index, meaning it does include coupon reinvestment.
- But unlike stocks, it is not obvious which securities to include. Currently it’s mostly Treasuries, MBS, and IG corporate. But this is always a source of debate and controversy. For example, some argue for adding munis and junk bonds.
- It’s also not obvious if the portfolio represented by this strategy is really the correct benchmark for investors to use.
- Many basic questions remain open about portfolio management and performance assessment with fixed income.

Bloomberg Barclays U.S. Aggregate Bond Index, sector breakdown (%)

Treasuries	38.2
MBS pass-through	27.2
Industrial	16.1
Financial institutions	8.1
Agencies	2.3
Utility	2.2
CMBS	2.1
Supranational	1.4
Sovereign	1.1
Local authorities	1.0
ABS	0.3
Covered	0.0



Source: Bloomberg, data as of 08/31/21.

Agg index historical performance

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