

The S&P 500 Index Price-to-Book Ratio: Fact or Fiction?

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A security index is among the most fundamental tools for modern investors, since it provides insight into market performance and economic fundamentals. Security indices are perpetually cited in media debates because they can provide a convenient framework for assessing the current state of the markets and trends in the markets. While we generally abstain from such debates and do not measure our portfolios relative to market indices, it appears to us that some investors’ analyses may be relying on traditional fundamental metrics that can become convoluted via the index calculation process – convoluted to the degree that one might even be misled as to whether a certain index or market sector is cheap or expensive.

A principle example of this is the price-to-book ratio (“P/B”) of the S&P 500 Index. The ratio is one of the more regularly used points of reference when debating whether the market is overvalued, fairly valued or undervalued. While the number published for the index by Standard & Poor’s is mathematically correct, at least in the narrow fashion that the calculations are technically correct, one might question whether it is correct in the sense of validity for the purpose of evaluating an investment in that index.

The S&P 500 Index is a market capitalization weighted, float adjusted index. Essentially, each constituent’s weight in the index is its market capitalization, reduced for closely held shares, divided by the sum of all constituents’ adjusted market capitalizations. For example, ignoring a float adjustment, a security index with five large cap stocks might look like:

	<u>Mkt. Cap.</u>	<u>Weight</u>
Exxon Mobil Corp	\$320,789	27.2%
Apple Inc	\$219,166	18.6%
General Electric Co	\$213,131	18.1%
Chevron Corp	\$209,380	17.7%
Intl Business Machines Corp	<u>\$217,650</u>	<u>18.4%</u>
Sum of Mkt. Cap.	\$1,180,115	100%

Source: Bloomberg as of 5/3/2011. Market cap. data in millions.

The actual index level (i.e., price level) is the sum of all the constituents’ adjusted market capitalizations divided by a divisor. In our example, the sum of all market capitalizations would be \$1.18 trillion. Assuming that we desire an initial index level of 100, the divisor for our five company index would initially be 11,801 million. This divisor is the factor that produces a more manageable index value since the sum of market capitalizations is a large number that does not lend itself to easy quotation. The divisor can be considered a fabricated share count for the index which is adjusted as index constituent changes occur over time.¹

¹ Standard & Poor’s, Index Mathematics: Methodology, February 2009.

To further illustrate the effect of constituent changes, let's look at a simple example of a two security index calculation. We will use International Business Machines (IBM) and ExxonMobil (XOM).

<u>Ticker</u>	<u>Shares Out.</u>	<u>Share Price</u>	<u>Market Cap</u>	<u>Index Weight</u>
IBM	1,211	\$172.90	\$209,380	33.0%
XOM	<u>4,959</u>	\$85.60	<u>\$424,555</u>	<u>67.0%</u>
	6,170		\$633,935	100.0%
Index Level				100
Divisor				6,339

Source: Company filings and Bloomberg as of 5/3/2011. Shares outstanding, market cap. data in millions.

In our example we set the initial index level to 100, which required a divisor of 6,339. Now, let's assume the index increases 2% to 102, reflecting underlying security appreciation, and that now a constituent change occurs. The index level should remain unchanged after the constituent change. So, consider a replacement of IBM with Citigroup (C).

<u>Ticker</u>	<u>Shares Out.</u>	<u>Share Price</u>	<u>Market Cap</u>	<u>Index Weight</u>
C ¹	29,206	\$4.50	\$132,013	23.7%
XOM	<u>4,959</u>	\$85.60	<u>\$424,555</u>	<u>76.3%</u>
	34,165		556,568	100.0%
Index Level				102
Divisor				5,457

Source: Company filings and Bloomberg as of 5/3/2011. Shares outstanding, market cap. data in millions.

¹ Citigroup data prior to reverse stock split (1 for 10) on 5/09/2011.

Adjusted such that Index Level remains unchanged.

In the table above we see that the divisor is adjusted to ensure the index level remains unchanged at 102. Preserving this continuity in index price levels is a primary objective of most indices.

Unfortunately, this continuity is not preserved when looking at fundamental measures of the index such as P/B. The most direct calculation for the index's P/B ratio is simply to sum up the market capitalizations of the constituents and divide by the sum of the constituents' book values. It can also be calculated using the divisor (i.e. share count) for the index in conjunction with the index's price level, but both methods yield the same result. The nuance is that the calculation produces a ratio that treats the index as though it were one aggregated enterprise rather than a portfolio of independent companies. Further, when changes are made to the index the ratios change to reflect the current constituents, diminishing the continuity with previous values. Moreover, when constituents have a disproportionate book value relative to other constituents, the calculations can produce rather misleading ratios. Let's revisit the two-security example above but review what happens to the P/B ratios.

<u>Ticker</u>	<u>Shares Out.</u>	<u>Share Price</u>	<u>Market Cap</u>	<u>Index Weight</u>	<u>Book Value</u>	<u>BV/ Share</u>	<u>P/B</u>
IBM	1,211	\$172.9	\$209,380	33.0%	\$22,671	\$18.7	9.2
XOM	4,959	\$85.6	\$424,555	67.0%	\$146,839	\$29.5	2.9
	6,170		\$633,935	100.0%	\$169,510		
			Index Level	100		Index P/B	3.7x¹
			Divisor	6,339		Weighted Avg. P/B	5.0x²
						Avg. P/B	6.1x³

Source: Company filings and Bloomberg as of 5/3/2011. Shares outstanding, market cap. and book value data in millions.

- (1) Calculated as \$633,935 aggregate market cap. ÷ \$169,510 aggregate book value.
- (2) The sum of IBM's 9.2x book value x its 33% weight in the index and XOM's 2.9x book value x its 67% weight.
- (3) The simple average of IBM's 9.2x book value and XOM's 2.9x book value.

At the inception of our index its P/B is 3.7x—this is how the S&P 500 P/B is quoted. Again, this ratio is calculated as if our index of IBM and XOM were combined into one company. The ratio does not provide as clear a view about the valuations of companies in our index as one may expect. Consider that the weighted average P/B of our index is 5.0x and the simple average P/B is 6.1x. The weighted average, which values each security according to its weight in the index, has the most fidelity to what one actually buys/is exposed to as a purchaser of an index fund or ETF—that is, as a buyer of the S&P 500, one owns more market value of ExxonMobil than of IBM. Both are markedly different than our index P/B ratio. The table below assumes that same constituent change of swapping IBM for Citigroup.

<u>Ticker</u>	<u>Shares Out.</u>	<u>Share Price</u>	<u>Market Cap</u>	<u>Index Weight</u>	<u>Book Value</u>	<u>BV/ Share</u>	<u>P/B</u>
C ¹	29,206	\$4.5	\$132,013	23.7%	\$170,725	\$5.8	0.8
XOM	4,959	\$85.6	\$424,555	76.3%	\$146,839	\$29.5	2.9
	34,165		\$556,568	100.0%	\$317,564		
			Index Level	102		Index P/B	1.8x
			Divisor	5,457		Weighted Avg. P/B	2.4x
						Avg. P/B	1.8x

Source: Company filings and Bloomberg as of 5/3/2011. Shares outstanding, market cap. and book value data in millions.

¹ Citigroup data prior to reverse stock split (1 for 10) on 5/09/2011.

Following this change, the P/B ratio of the index is 1.8x, roughly half of its previous value. The weighted average is 2.4x and the average is 1.8x. All three measures are technically correct, but as with any statistic one needs to understand how it is calculated and its appropriate application—what does the statistic actually mean?

Dispensing with our example, the table below provides the three P/B ratios for the S&P 500. One is the S&P published P/B and two are based on iShares S&P 500 ETF (“IVV”) holdings.

	<u>S&P 500</u> <u>Index</u>
S&P 500 P/B	2.3x
Wgt. Avg. P/B	3.6x
Avg. P/B	3.4x

Source: iShares and Bloomberg as of 5/3/2011

The Standard & Poor’s calculation of the S&P 500 Index P/B ratio is 2.3x, yet the weighted and simple averages of the IVV constituents are ~50% higher, 3.6x and 3.4x respectively. From a valuation perspective this is a material difference. Is the market fairly valued or overvalued? All else being equal, as an investor pays a higher P/B his/her expected return-on-equity declines. At a P/B of 1, an investor should expect to earn 100% of the company’s return-on-equity. At a P/B of 1.5, an investor should expect to earn only 66% of the company’s return-on-equity. It is as if a business earns \$1 million per year and has net assets (book value) of \$5 million. That’s a 20% annual return to the owner. If a buyer pays the owner \$10 million for the business, or 2x book value, then the buyer will earn 10% on the investment, even though the underlying business still produces a 20% return on its book value.

We believe the more relevant reflections of general market valuations are the weighted average and simple average P/B ratios based on the S&P 500 index constituents. As investors, we are not investing in the S&P 500 as though it were one company with aggregated earnings. Rather, we seek to understand valuations of underlying businesses and what investors are paying for each business’s future earnings and assets. We are investing in a collection of companies so that we may earn an economic rate of return in excess of most indices. Broadly speaking, it appears to us that paying an average P/B of 3.6x for near-record corporate profitability and returns-on-equity (*see our March 2011 commentary*) will likely lead to mediocre future returns for S&P 500 indexers. Hence, we continue to look for select investments trading at attractive valuations that possess the potential to generate double-digit rates of return over the long-term.

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