HORIZON KINETICS

Under the Hood: What's in *Your* Index?
(An Ongoing Series)

When is A P/E Not a P/E, or How To Turn 90 into 22 in Three Easy Steps.

According to the PowerShares QQQ fact sheet, the P/E ratio of the NASDAQ 100 is 22.19x, calculated on a trailing basis, and that is roughly comparable to the P/E of the S&P 500. No doubt, the P/E – the price, in essence – is an important fact for investors who are considering whether to own it or not. But is it really a fact, as we think of facts? Because the QQQ P/E is not the simple mathematical average of the P/E ratios of all of the companies in the index, as one might naturally expect.

First, it is calculated by excluding all firms with negative earnings. It also effectively excludes companies with excessively high P/E ratios. Would you do that? Does it make sense?

Let's reason through the easy one first, the idea of excluding companies with negative earnings. For the simplicity of round numbers, say an investor in private businesses made a $1 million investment in each of 3 small companies, flower shops, convenience stores, what have you, for a total of $3 million. One business earns $100,000 per year, so it has a price-to-earnings ratio of 10x; the second earns $50,000, for a P/E ratio of 20, and the third earns only $20,000 and so has a P/E of 50. This last one is probably situated on a high-growth street corner. Averaging the three P/E ratios of 10, 20 and 50 means that the average P/E of the 3-company portfolio is 26.7x. So far, so good.

But what if business number two *loses* $50,000 a year instead of making $50,000? One can see that averaging the three P/E ratios would be misrepresentative, because then the average P/E ratio would be 13.3x (+10, -20 and +50, divided by 3), which is one-half as expensive as the original P/E of 26.7x. Obviously, the portfolio with a loss-generating company is not cheaper than the all-profitable one. In a sense, the ETF organizers are staying within the logic of averaging individual P/E ratios by eliminating the company with the negative P/E ratio from the calculation as a statistical aberration or outlier. As if it does not exist or have an impact. The resultant P/E, however, does not represent reality.

To try representing reality better, how do we imagine the private investor would look at his or her investments? I think we all know how they'd look at actual dollars. Perhaps they would add up all the earnings of the three businesses, which in the first instance was $170,000 ($100,000 + $50,000 + $20,000), and compare that with the $3 million of total investment: that's 17.1x earnings. In the second instance, including the business that loses $50,000, the three together earn $70,000 a year, not $170,000. Earnings of $70,000 is not a lot for $3,000,000 of investment; that's 42.9x earnings or, in income yield terms, 2.03%. That's reality.

So, in reality one knows that an unprofitable company makes an investment more expensive, while in the world of indexation, such as in the QQQ, unprofitable companies are eliminated, making the P/E lower.

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Now for the more interesting technique of P/E reduction: neutralizing the impact of the excessively high P/E ratio. Companies with very high P/E ratios, say over 100, are effectively eliminated from the calculation of the QQQ valuation. For instance, in 2016, Amazon earned $4.90 per share. The trailing P/E for its current share price would be roughly 188.7x. Since Amazon is a 6.82% position in the NASDAQ 100 Index, its full inclusion would raise the index P/E by some appreciable and observable degree.

Similarly, by this convention, which we'll explain shortly, there is no way of informing prospective NASDAQ 100 purchasers of the valuation impact of holdings other than Amazon, such as Netflix, Tesla, and JD.com. Their trailing P/E ratios are 191x, -82x (yes, that's negative), and -117x, respectively. *Such names effectively do not exist from a P/E risk measurement perspective, even though, as weightings in the index, they definitely affect the risk of any dollar invested in the index.*

The manner in which this is done is as follows. On the PowerShares QQQ fact sheet (see accompanying excerpt), one will note the aforementioned P/E ratio of 22.19. A footnote to that figure indicates that the P/E is calculated using the Weighted Harmonic Mean. Seems harmless enough. Wikipedia provides a definition: *The harmonic mean can be expressed as the reciprocal of the arithmetic mean of the reciprocals of the given set of observations.* Huh?

	P/E Ratio
Stock A	10
Stock B	20
Stock C	30
Stock D	300
Average P/E:	90x

To translate that bewildering language into the 3-step recipe via which an egregiously high P/E ratio is cleansed into a harmless middling sort of group average, we'll use a couple of examples. Observe the following hypothetical equal-weighted 4-stock portfolio consisting of a range of low, somewhat high and egregiously high-valuations, ranging from 10x to 300x. A simple average results in a portfolio P/E of 90x.

The first step in the P/E transformation process, from the definition of Harmonic Mean, is to calculate the reciprocals of each P/E ratio, so that, for example, 10 is turned into 1/10, or 0.10. This is done for each of the 4 companies, and those reciprocals will be added up.

	P/E Ratio	Step 1: Reciprocal of the P/E Ratios	
Stock A	10	1/10 =	0.10
Stock B	20	1/20 =	0.05
Stock C	30	1/30 =	0.033
Stock D	300	1/300 =	0.003
Average P/E:	90x	Sum =	0.1867

This step is the critical part of the alchemy, because note how Stock D is treated. Its P/E ratio of 300, which is very large in relation to Stock A's P/E of 10, is transformed, as 1/300, into 0.003. This is very small. So small, that when those four fractions are added together, Stock D accounts for only 1.61% of the sum of those fractions (.003 ÷ .1867); whereas, it began as an equal one-quarter member of the four-stock portfolio. Now, it is virtually a rounding error.

Steps 2 and 3, as shown in the accompanying table, involve taking an average of the reciprocals just summed, in this case dividing by four, since it is a four-stock portfolio, and then taking the reciprocal of that number. That completes the strange journey of transforming a fairly understandable, if alarming, P/E of 90x into the more comforting Harmonic Mean P/E ratio of only 21.5x

	P/E Ratio	Step 1: Reciprocal of the P/E Ratios		Step 3: Reciprocal of the Step 2 average
Stock A	10	1/10 =	0.10	
Stock B	20	1/20 =	0.05	
Stock C	30	1/30 =	0.033	
Stock D	300	1/300 =	0.003	
Average P/E:	90x	Sum =	0.1867	
Step 2: Average of the reciprocals:			0.1867/4 = 0.0465	1/.0465 = **21.5x**

A more representative and straightforward way of calculating the index P/E ratio would be to simply divide its total market capitalization by the total GAAP net profit that all those companies produce, as in the private investor example. Done this way, the P/E is not 22.19, but 25.77x. Moreover, the lowest P/E stock in the NASDAQ 100 is Ebay, at, oddly, only 4.8x. That's because almost two-thirds of its $7.8 billion of reported earnings in 2016 was from a non-cash tax adjustment and a gain on the sale of a stock. Its real earnings were $2.3 billion, which is more than analysts expect it to earn this year, and the real P/E is 16.61x. If one is comfortable with this single adjustment, the NASDAQ 100 P/E is 26.33x, not 22.19.

However, comparing the total market value of the companies in the index to their total earnings is not the accepted procedure and, the NASDAQ 100 Index is not represented as a high P/E, concentrated portfolio. Incidentally, measuring the NASDAQ 100 valuation in a manner more aligned with accepted procedure, by calculating the simple average of the P/E ratios of the 91 profitable companies, results in a valuation of 43.6x earnings. Or, even closer to accepted practice, if one calculates the weighted average P/E ratios of the 91 profitable companies (giving proportionately greater weight to the larger companies), then the QQQ valuation is 41.04x. No active manager would be permitted to manage a concentrated, high P/E portfolio for an institutional client. Only an index enjoys this privilege.

Without dwelling on the figures themselves, the industry sector concentration in the NASDAQ 100 is as extreme as its company-specific concentration. It is readily seen that it lacks many of the presumed characteristics of a bona fide diversified index, and that it is truly expensive if one includes those of its components that are in fact remarkably expensive. Indeed, it has many of the characteristics that advocates of indexation claim, not without justification, typify the worst aspects of active management, including no sense of risk control and no valuation discipline, yet which are all available in an index format at a reduced fee.

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