

Guest Article

There is a 'New' Beta in Town and it's Not Called Total Beta for Nothing!

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When presenting the Butler Pinkerton Model™ (BPM) at various conferences across the country, we often ask audience members to define beta. Typically, a brave attendee responds that beta, "Measures the volatility of the stock relative to the volatility of the market." This is the common perception of beta¹. Yet in reality, it does not adequately capture the relationship.

To do this, you need the "new" beta in town—Total Beta—which fortuitously performs the calculation that so many of us thought, or think, beta performed.

What is Total Beta? The basic concept underlying any beta (Market Beta, Sum Beta, Total Beta, etc.) is that it measures the sensitivity of a change in the return of a security to the change in return of the market portfolio. Total Beta has been in existence since at least 1981². We have relied upon Total Beta as part of a process to quantify empirically both total cost of equity (TCOE) and company-specific risk premiums (CSRPs) for guideline publicly traded companies since 2005.

By using Total Beta, we can specifically, and more objectively, compare private companies with our guidelines to better defend and support the selection of a discount rate. Indeed, we believe Total Beta is the most important tool that analysts can use to develop an appropriate cost of capital for privately held companies (see the accompanying sidebar, "Why Total Beta Trumps all Other Betas.")

Professor Damodaran of New York University's Stern School of Business was, presumably, the first to apply Total Beta in an equation that should look vaguely familiar. Rather than applying a Market Beta in the standard capital asset pricing model (CAPM), Professor Damodaran applies Total Beta in its spot:

TCOE = risk-free rate + (Total Beta x Equity risk premium)

Because Market Beta does such an awful job of describing total risk, two important questions must be considered.

Question: Other than this relatively new concept known as Total Beta, what, if any, other "betas" are needed to value privately held companies?

Answer: None, if you so choose³.

Question: Intuitively, doesn't it make sense to use Total Beta to perform the function that so many of us assumed beta performed?

Answer: Yes, it does make a lot of sense.

We explore these two potentially controversial questions and answers by comparing Total Beta with some of the more popular beta measurements used in the business valuation industry. First, however, we define Total Beta as:

Market Beta divided by "R". or

Total Beta = β/R and equivalently as the:

Standard deviation of a stock divided by the standard deviation of the market; or

Total Beta = σ_s/σ_m

Importantly, please note the identity: **Total Beta = $\beta/R = \sigma_s/\sigma_m$**

Total Beta is concerned with volatility of returns, so it captures total risk⁴—all systematic risk, size risk, and company-specific risk — not just market risk which OLS Market Beta purports to capture⁵. For appraisal purposes, this makes Total Beta very appealing; this is the reference point we use to value privately held companies most of the time.

One calculates Market Beta by ordinary least squares regression (OLS), and "R" is the resulting correlation coefficient between the stock and the market defined as:

$$R = \sigma_{s,m} / \sigma_s \sigma_m$$

Where $\sigma_{s,m}$ represents the covariance of the stock with the market. Covariance is a statistical measure of the degree to which variables move together. *OLS Market Beta is defined as:*

Covariance of the stock and the market divided by the variance of the market; or symbolically as:

$$\beta = \sigma_{s,m} / \sigma_m^2$$

Thus, OLS Market Beta is dependent upon covariance. OLS Market Beta is also the slope of the best-fit linear regression line between the returns of the stock and the returns of the market. As we will find out, the slope of this line and the relative volatility of the stock and the market may have very little in common. *Importantly, OLS Market Beta can also be defined as:*

$$\beta = R \sigma_s / \sigma_m$$

This equation is critical to understanding the difference between Market Beta and Total Beta. As one can see, OLS Market Beta combines the correlation coefficient, R, with relative volatility. Thus, Market Beta is not a pure measure of relative volatility. Total Beta, on-the-other-hand, is the pure measure of relative volatility we as a group thought we had in beta. *Please see the relationship again in the following identity:*

$$\text{Total Beta} = \beta / R = \sigma_s / \sigma_m$$

Consequently, it should now come as no surprise that a low correlation coefficient could result in a low beta and simultaneously conceal a highly volatile stock. We believe some investors have been kidding themselves by falsely believing that they have selected a "defensive" stock because its Market Beta has been well less than 1.0 when in fact the stock's volatility could be five times as high as the market's volatility⁶, for example.

Total Beta will always be greater than the OLS Market Beta since "R" will never equal 1.0 (indicating a perfect, positive linear relationship between a stock and the market). From the other side of the identity: the standard deviation of any one particular stock⁷ will almost always be greater than the standard deviation of the market, often times defined as the S&P 500, for example.

Dividing the Market Beta by "R" effectively removes the guideline stock from a well-diversified portfolio perspective. This action takes the correlation coefficient out of the OLS Market Beta; the stock stands alone, which fortuitously happens to be the perspective from which we value privately held companies most of the time. Why else have we traditionally added a CSRPs to the discount rate to value privately held firms? No other type of beta has this perspective. Total Beta trumps all other betas on this point.

Total Beta also captures 100% of a company's total risk when all risks are properly disclosed and the market for the particular stock is efficient⁸. No other measurement of beta comes remotely close to this ability, including modifications to OLS Market Beta measurements such as Sum Beta. Total Beta, therefore, trumps all other betas on this point too. Now let's compare Total Beta to the other "contenders."

Comparing OLS Market Beta to Total Beta: To calculate Total Beta, we defined and used the OLS Market Beta. We disappointingly observed that OLS Market Betas, depending upon the stock, have extremely poor abilities to capture stocks' total risk. In fact, most OLS Market Betas explain substantially less than 30% of stocks' total risk⁹, leaving more than 70% to other forces, such as size, unsystematic risk, and possibly other reasons¹⁰. Despite its faults, we use OLS Market Betas inside the CAPM to measure systematic risk in the BPM™ in a process to provide empirical data on CSRPs as shown below:

$$\text{CSRPs} = (\text{Total Beta} - \text{OLS Market Beta}) \times \text{Equity risk premium} - \text{Size premium}$$

CSRPs is dependent upon both Total Beta and OLS Market Beta. If you want to separate the CSRPs from systematic risk you need both beta measures—a step the authors like to perform even though it is admittedly a moderately subjective exercise. If you want to directly key in on the guideline's TCOE—an approach some appraisers prefer because they then only have to explain one number to a client, judge, or jury—then you only need to look at Total Beta as shown in this formula:

$$\text{TCOE} = \text{risk-free rate} + (\text{Total Beta} \times \text{Equity risk premium})$$

As implied above, appraisers who choose to directly observe the TCOE do not need to estimate a beta, a size premium or, for that matter, a CSR for a privately held company. Theoretically, if you have only one number to defend, it could make a deposition and/or cross examination a bit easier. Therefore, Total Beta trumps all other betas on this point too.

Keep in mind, if you directly focus on TCOE, you must compare and contrast your guideline companies with your subject company on every single risk factor—systematic as well as unsystematic. Conversely, if you separate the two measures (systematic and unsystematic) and take a measure of central tendency for beta, or some other potentially logical representation of systematic risk, you only need to key in on CSR factors when comparing and contrasting your guidelines with your subject company. (We will leave it up to other analysts on how they approach the discount rate and whether to key in on TCOE directly, or attempt to allocate the risk via the BPM and build-up the risk and then compare the private company TCOE against the public companies' TCOE benchmarks).

One point is certain: we believe all appraisers should not only put Total Beta in their "toolbox" now, but also reach for it every time they perform an income approach to valuation. The benefits of Total Beta continue to show themselves. It also has been empirically shown that Total Betas are historically much more stable than OLS market betas or sum betas for that matter. We see this even during the same look-back period where we use different days of the trading week to calculate Total Betas, OLS Market Betas, and CSRPs via the BPM. In other words, there is generally much less volatility in Total Betas than OLS Market Betas. Thus, this is another very important reason that Total Beta trumps all other betas.

A comparison of OLS Market Beta and Sum Beta. Many small public companies (based on market capitalization) have "small" OLS market betas. Excluding the troubling ramifications of market inefficiency¹¹, Sum Betas allegedly capture the lagged response of a company's reactions to movements in the overall stock market. This modification effectively increases the beta measurement and the calculation of the stock's systematic risk.

Instead of using OLS regression, Sum Beta uses multiple linear regression to calculate a beta. Instead of only using current market movements to calculate beta, Sum Beta calculations also use the returns of the market in a prior period. Sum Beta is merely the addition of the two beta coefficients arrived at using current, as well as prior period, market movements in a multiple linear regression. We have no criticism of what Sum Beta attempts to do—other than the implied inefficiency in the market for many stocks, which may or may not be the case (see footnote 11). We do, however, question if it has become obsolete, given the introduction of Total Beta¹². Consider the following quote from Morningstar's *Beta Book*, 2006 ed.:

"Because of non-synchronous price reactions, the traditional betas estimated by ordinary least squares are biased down for all but the largest companies." (Emphasis added)

The non-synchronous price reactions referred to above are company-specific; Total Beta captures all of these price reactions. Since Total Beta captures these along with every other disclosed risk, business appraisers need not be concerned that some small guideline companies have potentially low measurements of systematic risk.

Total Beta's inclusion of CSR (as well as all systematic risks) picks up the OLS Market Beta's "slack" in the measurement of total risk—our reference point when we value privately held companies. As a result, there is no need to "correct" market risk if our reference point is total risk and the benchmark is an efficiently traded stock. It's precisely why the aforementioned quote does *not* read: *"Because of market inefficiency, the traditional betas estimated by ordinary least squares are biased down for all but the largest companies."*

The market for many smaller stocks is efficient in the semistrong form¹³. Their total risk just happens to be dominated by CSR, rather than systematic risk. If the market for a particular stock is efficient, regardless of its "low" measure of systematic risk, its corresponding Total Beta never needs corrective action. This is yet another benefit to the Total Beta measurement.

Why bother with a Sum Beta adjustment if the stock trades in an efficient market? While the OLS Market Beta may be low, the use of Sum Betas apportions more of the total risk to systematic risk. The natural result is a smaller and artificially low CSR because the total risk of the company should not change for an efficient stock¹⁴. Consequently, we believe that the calculation of Sum Beta is an unnecessary and subjective step for efficient stocks after the introduction of Total Beta.

Having made the argument above that Total Beta never needs correction, let us now introduce the proverbial "wrench." If a guideline is thinly traded—as in an inefficient market—then appraisers need to explore the possibility that there may be an implicit illiquidity discount in the calculation. By noting when there is a gap in trading volume and/or when the statistical significance of the linear regression is below 80%, the BPM helps alert appraisers to this possibility. We subjectively chose 80% as a demarcation line between the ability/inability to allocate total risk among its various components. We do not believe that there is much confidence in the calculation of beta (systematic risk),

and hence any other component of total risk as these percentages fall below 80%.

If there is an implicit illiquidity factor in the TCOE of a guideline company, then appraisers must consider it when assigning a lack of marketability discount to their subject company, or if they want to use the guideline at all.

Whether one labels the allocation of risk (systematic or company specific) is not really that important for business appraisers¹⁵ as long as all of the risks are accounted for with Total Beta, and you are consistent among your guidelines and your subject company. While the BPM attempts to allocate the risk when subjectively deemed possible, as previously mentioned, focusing on TCOE is another viable approach¹⁶. If you decide to allocate the risk, you can use the TCOEs as reasonableness checks—another benefit to Total Beta.

What about forward-looking betas? Forward-looking betas, such as Smoothed Betas, supply interesting information. Yet, as we have alluded previously, why not use a forward-looking Total Beta if you are interested in using a forward-looking perspective, when available? *Remember:* Total Beta is the only beta that views risk from a stand-alone perspective and captures 100% of the disclosed systematic and unsystematic risks. Remember as well that you calculate Total Beta by one side of the identity with the following formula:

Total Beta = σ_s/σ_m

If a guideline has publicly traded options, you can calculate implied forward-looking volatilities (standard deviations) for the guideline and the market—the only two inputs into Total Beta—to get to a forward-looking TCOE. Adjustments to forward-looking OLS Market Betas are inherently guesses. Then again, forward-looking total betas are based on empirical data (option prices).

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1. Some textbooks describe beta as a relative volatility measure.
2. Please see "The Beta Quotient: A New Measure of Portfolio Risk" by Robert C. Camp and Arthur A. Eubank, Jr. published in the Summer 1981 edition of the Journal of Portfolio Management, pages 53 - 57. (Note: This article refers to Total Beta as the Beta Quotient).
3. The authors still rely upon market betas to capture CSRPs in the BPM. However, you do not have to isolate CSRPs if you do not want to. Moreover, Total Beta is so "powerful" that you never again have to look at a size premium unless you want to. In the interest of full disclosure, the authors still look at size premiums to calculate benchmark CSRPs.
4. It has long been accepted that volatility, or standard deviation, is an appropriate measure of risk for standalone assets.
5. Models other than the CAPM—such as the Fama French Three Factor Model—may capture other systematic risks rather than just market or single-factor beta risk. Despite its faults, we have modeled the BPM off CAPM theory since the CAPM remains today the most widely-used cost of capital model.
6. In this example, the stock's Total Beta would equal 5.0.
7. Not including closed-end mutual funds that often times have more than 500 stocks in their portfolios.
8. Total Beta will not capture "surprises" or risks not previously disclosed.
9. Ibbotson SBBI, *2008 Valuation Yearbook*, p. 112.
10. As stated above, the BPM depends on standard CAPM theory. Analysts who use a different underlying model—such as the Fama French Three Factor Model or others—will arrive at different conclusions regarding CSR, for example.
11. It seems that if OLS Market Betas historically and consistently fail to measure systematic risks for smaller publicly traded stocks, and everyone knew it, then this "phenomenon" would eventually be arbitrated away.
12. Sum Beta does not appear to be widely used on Wall Street anyway. For example, we could not find any mention of it in the most recent (2009) CFA required reading materials. On the other hand, OLS Market Beta is quite prevalent.
13. A market is semistrong form efficient if prices incorporate all publicly available information.
14. Using the same assumptions for the risk-free rate, the equity risk premium, the look-back period, the valuation date, and the market proxy.
15. Note that we did not say for portfolio managers.
16. In our presentations, given the inherent subjectivity of CSRP calculations (because they are potentially dependent upon unstable beta calculations), we have referred to the BPM as a "value-add" and commented that the significant contribution behind the Total Cost of Equity and Public Company Specific Risk Calculator™ available at www.bvmarketdata.com to be the Total Beta (developed in 1981) and TCOE calculations, which were developed by Professor Damodaran. In fact, we have developed templates (written reports), available to subscribers, describing each approach (TCOE-focused versus CSRP-focused).

Why Total Beta Trumps all Other Betas

Total Beta is the best and most complete measurement of risk for business appraisers to focus on to value privately held companies. *Why?* In our estimation, Total Beta:

1. Has the same perspective that we use to value private companies—namely as a stand-alone asset. All other measures of beta represent systematic risk as part of a well-diversified portfolio that is most appropriate if you are a money manager or stock analyst—not a business appraiser.
2. Captures 100% of historical (disclosed) risks. Such is the case whether they are systematic or unsystematic risks, if the stock trades in an efficient market. No other measurement of beta, including Sum Beta, comes remotely close to this percentage.

3. Is generally much more stable than any other beta measurement, providing more confidence in the measure of risk to compare and contrast risk factors between guidelines and your closely held company.
4. Allows for direct comparison to public companies rather than relying upon averages of publicly traded data. *For example:* industry risk premiums used in the build-up approach capture all of the companies in an industry. Some of these companies may have little comparability to your private company. Gary Trugman's book, *Understanding Business Valuation: A Practical Guide to Valuing Small and Medium Sized Businesses*, provides analyses of the BPM: "Now, instead of using the entire industry, we can choose better guideline data as a starting point."
5. Captures all of the disclosed risks; one does not need to subjectively "correct" for any perceived low measurement of systematic risk – unless possibly the stock traded in an inefficient market.
6. Provides a means to defend and support one metric—Total Beta—rather than Market Beta, the size premium and the CSRP to a judge, jury, or client. Moreover, all three of these inputs are generally more subjective (*read:* more volatile) than Total Beta.

Source: Keith Pinkerton, ASA, CFA, and Peter J. Butler, CFA, ASA.

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Commentary:

None



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