

MAF012 Total Beta: a review of theory and practice

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Abstract

Modern Portfolio Theory assumes that the marginal investor is diversified and therefore will only be compensated for systematic or non-diversifiable risks. A CAPM market or equity beta only reflects systematic risk. However, the assumption of well-diversified shareholders will often not apply to private companies. The owner of a private company will often have most of his/her wealth invested in the business and total risk may be more relevant than systematic risk. This would increase the cost of equity of private companies which have undiversified investors. Often, valuers will make upward adjustments by adding specific risk and size premiums to the CAPM cost of equity. An alternative approach is to apply Total Beta which captures the total risk of companies. This paper reviews the derivation of the Total Beta methodology and its level of acceptance in the academic literature and valuation reference books. The study then applies the total beta methodology to the JSE Sector Indices with the objective of establishing the average size of the adjustment by sector. The average (non-weighted) market or equity sector beta will increase from 0.76 to 1.61 and the average sector cost of equity based on current estimates for the risk-free rate and equity (market) risk premium will increase from 12.2% to 16.8%. This increase is within the range of ad hoc adjustments often made to a company's cost of equity in order to value private companies. However, there remain significant limitations to using the total beta concept in practice.

Key words: total beta, CAPM, beta, systematic risk, equity risk premium, diversification, specific risk premium, Butler-Pinkerton calculator,

Total Beta: a review of theory and practice

Modern Portfolio Theory assumes that the marginal investor is diversified and therefore will only be compensated for systematic or non-diversifiable risks. A CAPM market or equity beta only reflects systematic risk and for listed companies this may reflect a reasonable assumption. However, the assumption of well-diversified shareholders will often not apply to private companies. As Damodaran (2006) points out, the owner of a private company will often have most of his/her wealth invested in the business. This means that an owner of a private firm is often very concerned about total risk and not only about market or systematic risk. Total Beta can be employed to determine a company's cost of equity that includes total risk instead of only systematic or market risk.

The specific questions to be addressed in this study are:

1. What is the derivation of the Total Beta approach?
2. Is the Total Beta approach recognised as acceptable to value private companies within the academic literature and by the appraisal community?
3. Is the Total Beta approach valid for unlisted subsidiaries of listed companies?

4. What are the Total Betas for the JSE sectors and are these betas significantly different from published JSE sector equity betas?
5. What is the cost of equity per sector using total and equity beta approaches and do these approaches result in significantly different cost of equity estimates?

The study is divided into three parts in order to address these questions. Part 1 analyses the source and derivation of the Total Beta concept from CAPM. Part 2 analyses its application as well as its acceptance within the academic literature, reference books and appraisal communities. Part 3 determines the total beta per JSE sector and sets out estimates of the cost of equity per sector. The total betas and cost of equity estimates based on a Total Beta methodology are analysed in relation to market or equity betas and cost of equity estimates based on equity betas.

The Total Beta Approach

It is expected that the cost of equity for private companies would be higher than for listed firms. If this is the case, then applying a CAPM beta will understate the risk of the business and therefore the cost of equity. Damodaran (2006) indicates that we can add a premium to the cost of equity to reflect this focus on total risk rather than on market risk. He also suggests the use of a Total Beta, which he defines as:

$$\text{Total Beta} = \text{Market beta} / \sqrt{R^2}$$

Effectively, we are dividing the CAPM beta by the correlation co-efficient³⁰. This indicates the undiversified nature of private company investors. If the CAPM beta of a firm is 0.80 and the R² is 0.30, then the firm's total beta would be determined to be:

$$\text{Total Beta} = 0.80 / \sqrt{0.30} = 1.46$$

If the risk free rate was 8% and the market risk premium was 5%, then this will imply that the cost of equity for a private firm would be:

$$\text{Cost of Equity} = 8\% + 1.46 (5\%) = 15.3\%$$

The cost of equity for a listed firm assuming similar operating risks but diversified shareholders would normally be determined as follows:

$$\text{Cost of Equity} = 8\% + 0.8 (5\%) = 12\%$$

As Total Beta reflects total risk, Butler and Pinkerton (2006) indicate that this will include a size premium and a company specific risk premium. Therefore in a modified CAPM setting, analysts may add a company specific risk premium (CSRP) and the use of a Total Beta would capture this risk as well as any size premium.

³⁰ Alternatively, we can present the beta as $\beta = \rho(\sigma_s/\sigma_m)$ where ρ is the correlation co-efficient and Total Beta = $\beta/\rho = (\sigma_s/\sigma_m)$. We will come back to this later in the study.

The concept of Total Beta can be derived from CAPM and is closely associated with Professor Aswath Damodaran of New York University who has published widely in finance and has published a widely used book on valuations, *Damodaran on Valuations*³¹. Total Beta is referred to in the book and applied to the valuation of a private company.

Derivation of Total Beta

The derivation of Total Beta can be seen as a natural extension of the CAPM market beta formula, which can be presented as follows;

$$\beta = p(\sigma_s / \sigma_m)$$

where p is the correlation co-efficient and σ_s is the standard deviation of the individual share whilst σ_m is the standard deviation for the market index. This presentation of CAPM beta is often referred to in textbooks. For example, Brigham and Ehrhardt³² in *Financial Management: Theory and Practice*, Mayo³³ in *Investments: An introduction* and Correia et al³⁴ in *Financial Management* all refer to this formula to determine a share's equity beta.

For completely undiversified investors, the correlation coefficient falls away, so that Total Beta ($T\beta$) is:

$$T\beta = (\sigma_s / \sigma_m)$$

Practically, from public information on betas and the R^2 , (both of which are normally provided by service providers in the calculation of equity betas), it becomes simple to determine the Total Beta by dividing the equity beta by the correlation coefficient ($\sqrt{R^2}$)

$$T\beta = \beta / p$$

Although, the application of Total Beta is debatable, its derivation is relatively simple and many criticisms may also apply to CAPM and the use of equity betas. The reader is referred to Damodaran (2006) and Kasper (2008) and others to determine the issues regarding the use of Total Beta in the valuation of private companies.

In the determination of betas, σ refers to the standard deviation and not the variance and is derived from the covariance of share j 's return with the market return, divided by the variance of the market return:

$$\beta_j = \text{Cov}_{jm} / \text{Var}_m = p_{jm} \sigma_j \sigma_m / \sigma_m^2$$

Modern Portfolio Theory and CAPM assume well-diversified investors.

The argument that a company, which is not diversified in relation to comparable companies, should use the Total Beta approach is not correct. In fact, the use of Total Beta refers to the

³¹ Aswath Damodaran, (2006), *Damodaran on Valuation: Security Analysis for Investment and Corporate Finance*, 2nd edition, Wiley Finance series, John Wiley & Sons, see pages 57-59 on Total Beta.

³² Brigham, E.F. & Ehrhardt, M.C., *Financial Management: Theory and Practice*, 12 edition, Thomson South-Western, 2008, In Chapter 7 Portfolio Theory and Other Asset Pricing Models, page 254

³³ Mayo, H., *Investments: An introduction*, 9th edition, Thomson South-Western, 2008, In Chapter 6 Risk and Portfolio Management, Page 174

³⁴ Correia, C., Flynn, D. Uliana, E. & Wormald, M., *Financial Management*, 7th edition, Juta & Co., 2011, In Chapter 4, page 4-28, [stated in the form of $\beta = p(\sigma_s \sigma_m / \sigma_m^2)$]

lack of diversification of a company's shareholders, and not the degree of diversification within a company's operations.³⁵

CAPM is based on the assumption that firms will not be compensated for diversification. For example, assume X Ltd is an auto-component manufacturer. The company may decide to diversify by investing in property. The company will not experience an increase in value due to diversification, as it is much easier for shareholders, rather than firms, to diversify. In fact some diversified groups trade at a discount to NAV³⁶. Bradfield and Hendricks (2012)³⁷ state that:

If we are not forced to take on unique risk (since it can be eliminated by diversification), then why should we be rewarded for it? However, no matter how much we diversify, we cannot eliminate market risk

The application of Total Beta takes into account the lack of diversification of the shareholders and may be applicable to the valuation of private companies. Damodaran and Margolis (2008) use a total beta approach to determine the cost of equity in a public to private transition and to value a company, Harmon, as a private company.

An extension of this idea is consideration of whether it is valid to apply a Total Beta to a non-listed subsidiary of a listed company. If a company is not listed but it is a division or subsidiary of a major listed company, then it would be reasonable to infer that most of its shareholders are well diversified. It would not be appropriate in this case to apply a Total Beta. In fact, Professor Aswath Damodaran confirmed via email correspondence that it would not be appropriate to use a Total Beta for an unlisted subsidiary of a listed company.³⁸ If a company is part of a listed group then it is generally assumed that the majority of its shareholders are either well diversified or able to diversify.

Diversification will reduce the risk of a firm's operations and for undiversified shareholders; it would make sense to diversify operations. However, as Bradfield and Hendricks (2012) confirm, it is easier for shareholders to diversify than for firms to diversify on behalf of shareholders and therefore shareholders will not reward diversification. The basis of CAPM, as imperfect as it is, is based on the assumption of efficient markets and diversified shareholders. The lack of diversification of a company's operations is not relevant. What is relevant is the lack of diversification of a company's shareholders.

The use of Total Beta in financial theory and the determination of the cost of equity on the basis of total risk or relative volatilities are based on the premise that a private company's

³⁵ A company that operates in numerous sectors will have an equity beta that is a weighted average of the individual sector/divisional betas and we need to derive the individual division's beta when using comparable company data. This is very different to the concept of a Total Beta.

³⁶ For example, Remgro traded at a discount of 6.5% (7.3%) to its intrinsic net asset value in 2014 (2013).

³⁷ Bradfield, D. & Hendricks, D., (2012) Equity Risk Service on the JSE Securities Exchange, published by BNP Paribas Cadiz Securities, Quantitative Research, June 2012, Vo. 14, No. 2

³⁸ I did not refer to GT or the holding company but presented a hypothetical example of a private company that is the subsidiary of a listed company.

shareholders are completely undiversified. This does not always apply. Damodaran's (2006) view is that Total Beta should only apply for private companies with undiversified shareholders.

We are not aware of analysts or corporate finance practitioners using Total Beta to value undiversified firms. Yet, the PWC surveys (2009/10, 2012) indicate that most practitioners do make specific risk adjustments and size adjustments to the cost of equity determined on the basis of CAPM. This means that the cost of equity determination will be subject to adjustments not indicated by CAPM and will in most cases result in a higher cost of equity than determined by only CAPM.

South Africa has challenges regarding the duality of the JSE in that there may be a significant over-weighting of resources in relation to the CAPM definition of a market portfolio, which may impact on betas. Also, there is the size effect and the performance of low price-earnings firms over time³⁹, and other factors, which may impact on the application of CAPM⁴⁰. However, the use of the traditional CAPM beta is widespread as indicated by surveys of practice.

Surveys of the use of CAPM in South Africa

The 2011 KPMG Cost of Capital Survey⁴¹ found that 96% of companies surveyed used historic betas in determining the cost of equity. In the same survey, KPMG states that beta "expresses the systematic risk (market risk) i.e. the risk that shareholders are unable to eliminate by diversification." The survey found that 47% of firms used raw betas and 53% of firms used adjusted betas. An *adjusted beta* refers to the use of a weighted average of the *raw beta* of a company and the *market beta* of 1 and reflects the tendency of betas to move to unity over time.

The 2009/2010 and the 2012 PricewaterhouseCoopers Valuation Methodology Surveys⁴², found that almost all companies surveyed use the CAPM and that companies surveyed source their betas mainly from Bloomberg, BNP Paribas / Cadiz Financial Risk Service and McGregor BFA. These beta service providers provide betas that are based on traditional CAPM betas and these service providers' beta estimates do not reflect Total Betas, although they do provide R^2 and measures of annualised total risk enabling one to determine total betas.

The PwC 2010 and 2012 surveys also found that over 80% of companies would either frequently or sometimes add a premium for specific firm risks. Such unique risks include

³⁹ See for example, Van Rensburg, P. & Robertson, M. (2003), Size, price-earnings and beta on the JSE, *Investment Analyst Journal*, No. 58.

⁴⁰ See for example, Van Rensburg, P. (2002) "Market Segmentation on the Johannesburg Stock Exchange", *Journal of Studies in Economics and Econometrics*, Vol. 26, No. 3 and Bowie, D.C. & Bradfield, D.J. (1997), Some evidence on the stability of beta coefficients on the JSE, *SA Journal of Accounting Research*, Vol.11

⁴¹ KPMG Corporate Finance, Cost of Capital and Impairment Testing Study: 2011, Empirical survey of South African companies, kpmg.co.za

⁴² PricewaterhouseCoopers Corporate Finance, Signs of the times. Valuation Methodology Survey, 2009/2010, 5th edition, <http://www.pwc.co.za/en/assets/pdf/pwc-valuation-methodology-survey-2010.pdf>

such factors as dependence on key management, dependence on one key customer or supplier, lack of a track record, significant growth expectations and other risks. However, this does not reflect the application of Total Beta although the effect may be similar in relation to increasing the cost of equity. Companies may adjust for specific risks by using the traditional CAPM beta and then add a premium for specific risks but the current experience in South Africa is not to employ a Total Beta methodology. For example, in a regulatory setting, NERSA permits adjustments to CAPM - if applicable for a size premium, specific risks and a liquidity premium.

Is the Total Beta concept widely accepted in the academic literature, valuation reference texts and appraiser communities?

In this section we wish to determine whether valuation analysts and appraisers use Total Beta in practice and whether the concept is accepted within the academic literature and the recognised valuation reference books.

Although surveys of valuation methodologies and cost of capital practices by KPMG (2011) and PWC (2012) indicate a widespread use of CAPM betas, none of these surveys have indicated any use of Total Betas by valuation practitioners in South Africa.

Although closely aligned with Professor Damodaran, Total Beta was first referred to as the “Beta Quotient” by Robert Camp and Arthur Eubank in an article, which was published in the *Journal of Portfolio Management* in 1981.⁴³ Other academic support for Total Beta, (defined as the volatility of a company’s return to the volatility of the market index), was published by Chris Tofallis in the *European Journal of Operational Research*⁴⁴.

In the valuation community, the use of Total Beta was given further impetus by Peter Butler who came across Total Beta in the article, *Estimating the Cost of Equity for a Private Company* by Aswath Damodaran, which was published on Damodaran’s website⁴⁵.

In the USA, appraisers and valuers would normally determine the Total Cost of Equity (TCOE) of a private company by adding a Company Specific Risk Premium (CSRП)⁴⁶ so that;

$$\text{TCOE} = R_f + \beta (\text{ERP}) + \text{SP} + \text{CSRП}$$

ERP = equity risk premium

SP = size premium

⁴³ Camp, R.C. & Eubank, A.A. (1981) The Beta Quotient: A new measure of portfolio risk, *Journal of Portfolio Management*, Vol. 7, No. 4, pages 53-58

⁴⁴ Tofallis, C., (2008), Investment volatility: A critique of standard beta estimation and a simple way forward, *European Journal of Operational Research*, Vol. 187, pages 1358-1367

⁴⁵ http://pages.stern.nyu.edu/~adamodar/New_Home_Page/valquestions/totalbeta.htm

⁴⁶ See for example, Pratt, S.P. & Niculita, A., *Valuing a Business: The Analysis and Appraisal of Closely Held Companies*, 5th edition, McGraw-Hill, 2008, page 200.

The derivation of the first three factors can be obtained from independent service providers and each of these variables is market driven and independent of individual appraisers and is obtained from services and books such as the *SBBI Valuation Yearbook*. The estimation of CSRP however is much more subjective and is based on an appraiser's estimate. Butler and Pinkerton used Total Beta to determine TCOE, so that:

$$\text{TCOE} = R_f + T\beta (\text{ERP}) = R_f + \beta (\text{ERP}) + \text{SP} + \text{CSRP}$$

As the Total Beta ($T\beta$) reflects total risk, it also includes the Size Premium and Butler and Pinkerton determine that one can therefore determine a firm's CSRP by using the market data relating to $R_f + \beta (\text{ERP}) + \text{SP}$ so that:

$$\text{CSRP} = R_f + T\beta (\text{ERP}) - \text{SP}$$

It is simple to determine Total Beta and TCOE for publicly listed companies and so Butler and Pinkerton could therefore *estimate* the total cost of equity (TCOE) for a private company by analysing the TCOEs of comparable listed companies.

The selection of comparable companies would continue to require professional judgement but it is expected that estimates are more objective in relation to the alternative, which is a highly subjective estimate of CSRP. Butler and Pinkerton founded an online subscription service, which has become known as the Butler-Pinkerton Calculator (BPC)⁴⁷ which will for a fee enable one to determine the total beta of specified comparable (guideline) listed companies.

Whilst the CAPM beta assumes a well-diversified investor, the use of BPC or Total Beta assumes that a shareholder in a private company is not diversified at all. Therefore, this may also be unrealistic and will need to be adjusted for the degree of diversification of shareholders.

The Total Beta or the BPC is now included in well-known and respected valuation and cost of capital textbooks such as *Financial Valuation* by James Hitchener (2011)⁴⁸, *Cost of Capital* by Shannon Pratt and Roger Grabowski (2010)⁴⁹, and *Understanding Business Valuation: A Practical Guide to Valuing Small to Medium-Sized Businesses* by Gary Trugman (2008)⁵⁰. Yet the BPC and Total Beta has been subject to controversy in relation to its application and acceptance by the academic and valuation communities.

Trugman (2008) (see pages 371-373) is generally positive about the contribution that Total Beta can make to determine the Total Cost of Equity of guideline companies in the valuation of private companies.

⁴⁷ Go to www.bvmarketdata.com and click on the Butler Pinkerton Calculator option.

⁴⁸ Hitchener, J.R. *Financial Valuation: Applications and Models*, 3rd edition, 2011, Wiley Finance Series, John Wiley & Sons

⁴⁹ Pratt, S.P. & Grabowski, R.J. *Cost of Capital: Applications and Examples*, 4th edition, 2010, Wiley Finance Series, John Wiley & Sons

⁵⁰ Trugman, G. *Understanding Business Valuation: A Practical Guide to Valuing Small to Medium-Sized Businesses*, 3rd edition, 2008, AICPA

Hitchener (2011) (see pages 214-215) focuses on the limitations of using data for the income approach from the same sources used to apply the market approach to valuing a firm. Hitchener (2011) (on page 215) states;

It should also be noted that there has been some lively debate and a high degree of criticism over the propriety of the TBM (total beta model) that will likely continue as analysts evaluate the applicability of this resource to help calculate unsystematic risk.

Pratt and Grabowski (2010) are generally critical of the use of Total Beta and quotes Ibbotson and Associates on page 308, that “the cost of capital should reflect the risk of the investment, not the cost of funds to a particular investor”.

Pratt and Grabowski (2010) include other criticisms of the Total Beta approach which includes the proposition that if diversified investors are prepared to pay more for firms than undiversified investors, then prices and values will approach the values of diversified investors. Pratt and Grabowski (2010, page 307) go on to state:

How can a company estimate its cost of capital if it needs to guess if the pool of likely buyers is diversified? Using total beta to estimate the cost of equity capital determines investment value (the value to a particular investor), not fair market value or fair value for financial reporting. The total cost of equity derived from total beta may not be consistent with the definitions of fair market value or fair value. As the more diversified buyer is likely to pay a higher price, the value of the business and business interests in most cases must be greater than their value determined using total beta.

Total Beta has been subject to significant criticism by some academics whilst a number of academics have supported the use of Total Beta. Kasper (2008)⁵¹, Helfenstein (2009)⁵² and Walker (2010)⁵³ are highly critical of the use of Total Beta. Kasper (2008) states that TCOE has not gained scholarly support and violates financial theory. Butler and Pinkerton have written a number of rebuttals to this criticism⁵⁴.

Petersen, Plenborg and Scholar (2006) specifically investigated the use of total beta by private equity firms and found that private equity firms that invest in unlisted entities do not use a Total Beta approach although the sector will often increase the required rate of return due to an investment’s lack of liquidity, risk, debt structures and uncertainty as to achieving a viable exit strategy.⁵⁵ In private equity transactions that are based on highly leveraged

⁵¹ Kasper, L. (2008) The Butler Pinkerton Model for Company-Specific Risk Premium – A Critique, *Business Valuation Review*, Vo. 27 (Winter), pages 233-243

⁵² Sarah von Helfenstein, (2009), Revisiting Total Beta, *Business Valuation Review*, Vo. 28, No. 4, pages 201-223

⁵³ Walker, M.M. (2010), Evaluating the Butler-Pinkerton Model: Is it better than the Buildup Method?, *Business Appraisal Practice*, 3rd quarter, pages 22-31

⁵⁴ Please refer to www.bvmarketdata.com for rebuttals by Butler or Pinkerton – specifically, <http://www.bvmarketdata.com/defaulttextonly.asp?f=bpmarticles>

⁵⁵ See for example, Petersen, C., Plenborg, T. and Scholar, F. (2006), Issues in Valuation of Privately Held Firms, *Journal of Private Equity*, Vol. 10, No.1, pages 33-48. This study specifically investigated the use of total beta by private equity firms.

financial structures, any Hamada relevering of an unlevered CAPM beta will result in a high cost of equity.

Damodaran offers relevant insights and whilst in agreement with Total Beta, cautions against use of the model in a number of situations. For example, he states the following as quoted in Hitchener (2011)⁵⁶:

It is not the appropriate measure of risk if an asset is being valued to a potential buyer, who is partially or mostly diversified. Thus, when valuing a private business for sale to a publicly traded company, it is not appropriate to use total beta (and cost of equity).

If asked to assess fair value, where fair value is the value to the best potential buyer of a business, using total beta is unlikely to provide the answer, unless you happen to be in a business where all of the potential buyers are undiversified.

Whilst the Total Beta is generally derived from CAPM, we are really analysing an investment on the basis of the relative volatility of an investment with the volatility of the market as indicated by respective standard deviations.

There is a lack of evidence that Total Betas are used in South Africa nor is there evidence of the use of alternatives to CAPM such as APT, although a few companies are now employing the Fama-French three-factor model.

Whilst the application of Total Beta may be useful in the valuation of private companies, particularly in relation to an unsatisfactory alternative (a subjective CSRP), it remains to be seen whether this method will become generally accepted over time by academics and by practitioners. At this current time, it is a fair to conclude that the use of the Total Beta method is generally not yet accepted in practice or in research studies. Further, there is little empirical testing on comparing returns for private companies relative to the market index over time to evaluate whether the Total Beta approach is valid to predict returns.

Determination of Total Betas and Cost of Equity for JSE Sector Indices

The application of the Total Beta methodology to determine the cost of equity of a private company with undiversified shareholders requires that the total beta of a comparable listed company be employed to determine the cost of equity of a private company. In this section, the equity betas of JSE Sector indices are adjusted by applying the following formula to the JSE Sector indices:

$$T\beta = \beta/\sqrt{R^2}$$

The objective is that in the valuation of a private company with undiversified shareholders, total risk indicated by a firm's Total Beta would be more relevant rather than any adjustment made for systematic risk indicated by the CAPM beta. The use of the comparable sector's

⁵⁶ Wisehart, D. Boston's Battle of the Beta, in *Financial Valuation: Applications and Models* by J.R. Hitchener, Chapter 6, Addendum 3, page 6

Total Beta would be employed to determine the Total Beta of the private company being valued. The objective in this section is to indicate the materiality of the adjustment to a company's cost of equity that may arise from the use of a Total Beta methodology in South Africa.

The equity betas are sourced from the BNP Paribas /Cadiz Financial Risk Service for the December 2014 quarter. Figure 1 presents the comparative equity and total betas for the JSE Sector Indices.

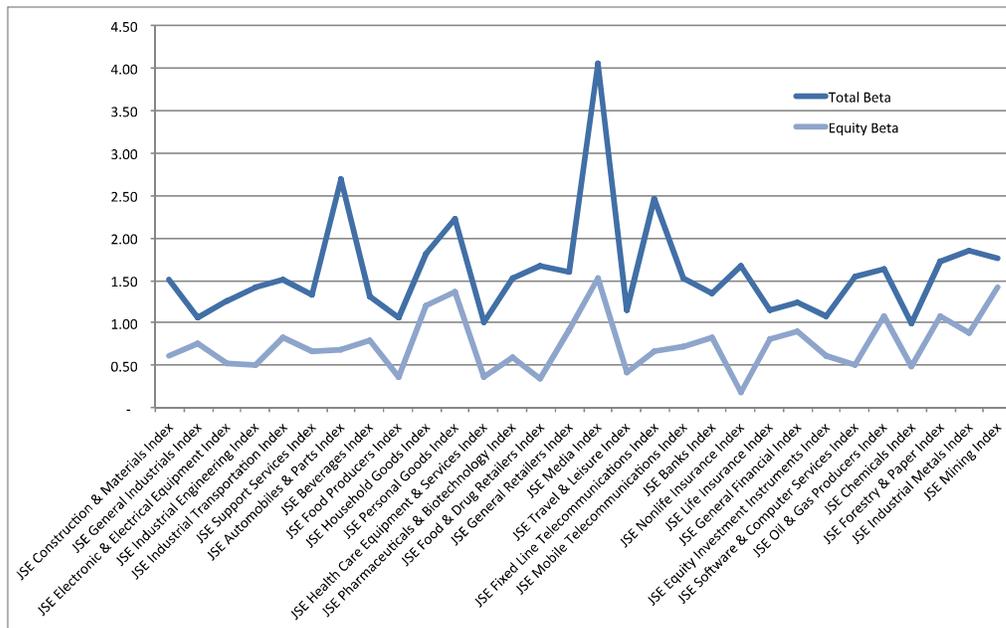


Figure 1: The Total Betas of the JSE Sector Indices

In order to determine the likely impact on each sector's cost of equity, the CAPM cost of equity is determined using a risk-free rate of 8% which reflects the rounded up yield on the R186 government bond at 31 December 2014 which was 7.96%. A market risk premium of 5.5% is employed, which is a reasonable estimate of the likely market risk premium (see Correia et al, 2015, p.7-26).

Figure 2 sets out the cost of equity per sector on the JSE as at 31 December 2014 and using the BNP Paribas / Cadiz Financial Risk Service betas as at 31 December 2014. The cost of equity for each sector is significantly higher than the cost of equity based on a sector's market or equity beta.

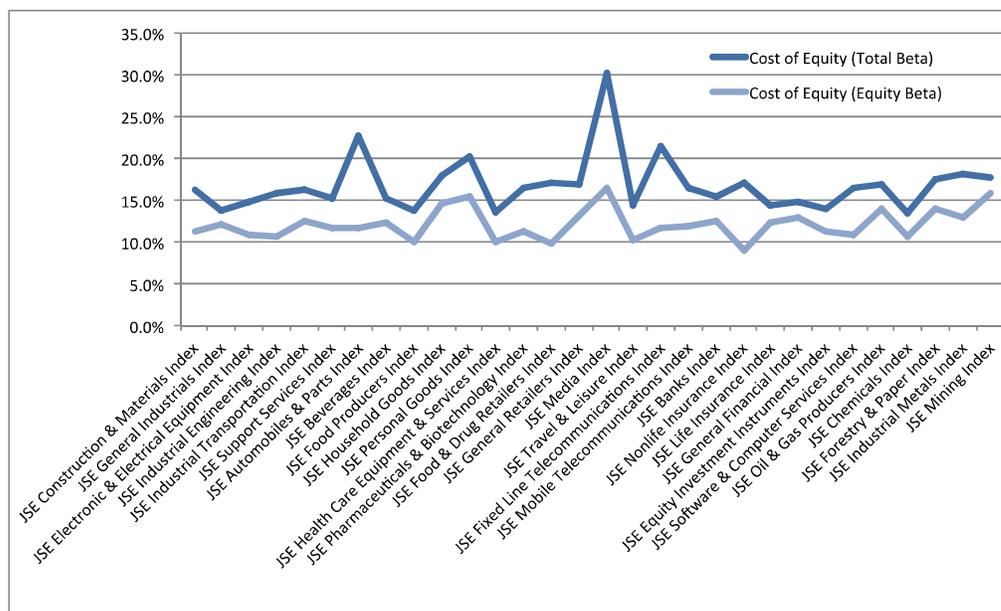


Figure 2: Cost of Equity per JSE Sector Index

The average Sector equity and total betas, which are not weighted on the basis of market capitalisation, as well as the estimated average cost of equity per sector, are set out in Table 1 below:

Table 1: Average total beta, equity beta and cost of equity estimates

Average JSE Sector Indices	Total Beta	Equity Beta	T-test	P-value
Beta	1.61	0.76	6.6604	0.00001
Cost of Equity	16.8%	12.2%	6.3988	0.00001

The average beta is 2.12 times the average equity beta. The average equity beta of 0.76 is low as the average sector beta is not value weighted and the JSE ALSI is disproportionately affected by the high beta of the Mining sector, which forms about 30% of the market capitalisation of the JSE and has an average equity beta of 1.43. The average estimated cost of equity increases from 12.2% to 16.8%, a difference of 4.6% if a total beta approach is employed to determine a sector’s cost of equity. The differences in means are statistically significant at the 1% level. The increase of 4.6% represents an increase of 38% relative to the CAPM average cost of equity of 12.2%.

This adjustment is in line with average adjustments to the CAPM cost of equity made by practitioners and reflected in the PWC surveys (2010, 2012). Furthermore, many companies use hurdle rates, which are higher than the weighted average costs of capital (WACC) based on CAPM. This includes companies such as Sasol and Grindrod, which multiplies a CAPM-determined WACC by 1.3, and these companies have *diversified* shareholders.

Therefore the adjustments made by valuation practitioners and companies (even those with diversified investors) indicate that CAPM is not able to accurately determine a company's cost of equity. Although, CAPM is employed, it is adjusted for such factors as a size premium and specific risk factors. These adjustments will often reflect professional judgement.

Does this mean that we consider the total beta approach to be a valid alternative approach to determine the cost of equity of private companies? The total beta approach is based on CAPM and is anchored to CAPM and therefore if CAPM is unable to fully capture systematic risk, then the total beta approach will be unable to capture total risk. Furthermore, it is based on the assumption that investors in private companies are completely undiversified. This will often not be true and the level of diversification will vary for each investor.

Private companies will be of value to listed companies or diversified investors and the valuation of private companies may reflect the views of fully diversified investors as listed companies may acquire the equity shares of such private companies at a premium to the value set by an undiversified investor. Furthermore, future research into the applicability of the Fama-French Three Factor Model (1992) to South African companies may be more relevant to firstly determine the cost of equity of listed companies and thereafter we can make adjustments for a lack of marketability and other factors. The concept of total beta is useful in order to focus on the impact of total risk on required returns but we consider its wider use would be premature until further research is undertaken into its validity and empirical relevance. Calvert and Smith (2011) indicate that the total beta approach does not yet pass the judicial checks for reliability of testimony⁵⁷.

Conclusion

This paper explored the concept of Total Beta for determining the cost of equity for companies, which have undiversified shareholders. Whilst the Total Beta method to derive the cost of equity of private companies is subject to continuing debate, it is important to consider the alternative that is often applied in practice, which often consists of adding size and specific risk premiums to a CAPM determined cost of equity. This is set out in the KPMG (2011) and PWC Valuation Methodology surveys (2009/10, 2012). The estimation of these size and specific risk premiums is subject to the possibility that such adjustments are arbitrary and are subject to the skill and experience of a practitioner in deriving the cost of equity of a private company.

The use of a total beta has the advantage that this is based on market data and derived from data provided by independent beta service providers. Yet, the method remains subject to

⁵⁷ Smith and Calvert state that "the four court standards for reliability are: (1) whether a theory or technique can be, and has been, tested; (2) whether the theory or technique has been subject to peer review and publication; (3) a techniques known or potential rate of error and the existence and maintenance of standard controlling the techniques operation; and (4) whether a particular technique or theory has gained general acceptance in the relevant scientific community."

debate and controversy in relation to its applicability, which requires an analysis of the diversified nature of a company's shareholdings. The assumption of completely undiversified investors for private companies is often not valid. Yet, CAPM assumes fully diversified shareholders and this condition may often not be met in the valuation of private companies. CAPM has its own empirical problems although it is conceptually appealing and widely used by practitioners at least as a first step to determine a company's cost of equity.

The fact is that the application of Total Beta method is generally not yet accepted in practice or in research studies. Further, there is little empirical testing on comparing returns for private companies relative to the market index over time to evaluate whether the Total Beta approach is valid to predict returns.

It is expected that practitioners will continue to make ad hoc specific risk and size adjustments to a CAPM cost of equity. Whilst, the use of Total Beta may provide a further tool for practitioners to test their specific adjustments to the CAPM cost of equity for private companies, it would be premature to promote the wider use of the total beta approach. It is more useful to further test The Fama-French Three Factor Model for South Africa and the validity of CAPM should be further analysed as the relevance of the total beta approach is tied to the relevance of CAPM.

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