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Cost of Capital Calculation in Emerging Markets: Rectification of the Beta Estimates

Introduction

In the context of cross-border investment valuations, the risk is often expressed as the cost of capital. The estimation of an appropriate discount rate is therefore most important to all cross-border investment decisions. This issue goes to the heart of valuation in European emerging markets, whether the investor is a multinational company conducting a purchase price allocation of a recently acquired foreign entity or a medium size company establishing a joint venture in a neighbouring country.

Differences in risk and a lack of understanding of how emerging market returns are influenced by advanced markets and vice-versa, as well as a lack of statistically reliable historical data, are factors that all international managers and investors have to contend with. From a public policy point of view, determining the appropriate cost of equity is crucial in lowering the uncertainty that multinational companies (MNCs), local companies and public sector organisations face when investing in these countries.

During the European integration process, great investment opportunities have arisen due to the wide availability of EU funds supporting cross-border cooperation initiatives. Thus, the significant increase in M&A activity could be observed in new accessions and mature European countries in recent years. As a result, the improvement in valuation techniques has gained a prominent place on the agenda of investors and financial analysts dealing with the region. However, the task entails two substantial challenges. A fundamental valuation requires the determination of an appropriate cost of capital, and most companies estimate their cost of capital using the capital asset-pricing model (CAPM),[2] in which the non-diversifiable risk of a company is measured by calculating the way its stock price moves, both in speed and volatility, in relation to market indexes. The resulting measure is known as a Beta, which is greater than 1.0 if a stock moves, over time, ahead of the market (and is therefore riskier) and less than 1.0 if it tends to move behind the market. A Beta of 1.5 foretells a 1.5% change in an asset's return for every 1% change in the market's return. The higher the Beta, it is argued, the higher the cost of capital. The aforementioned concept of Beta expressing the systematic risk of the underlying asset comes from one of the most popular methodologies, widely accepted by both practitioners and academics, which is the CAPM.[3] However, the traditional CAPM-based models which are

[1] I am indebted to my colleagues Alexander Granget and Daniel Bissinger (from American Appraisal Frankfurt office) for numerous comments and challenging questions.
[2] Brealey R.A., Myers S.C., *Principles of Corporate Finance*, 9th edition, McGraw-Hill, New York, 2008.
[3] W.F. Sharpe, *Capital asset prices: a theory of market equilibrium under conditions of risk*, "*Journal of Finance"* 1964, **19**(3).

normally used to compute the cost of equity capital are difficult to apply in new accession and candidate countries, as the majority of them are still in transition and suffer from a lack of efficient markets.

This article addresses the challenge of how to calculate and properly apply the Betas in the process of valuing companies operating in the emerging markets. It focuses on cross-border investment valuations and reviews several issues regarding the reliability and fitness of estimated Betas in the context of the recent accession of many Eastern European countries to the EU. The argument is supported by a thorough analysis of Betas calculated for companies headquartered in these new or prospective member countries of the EU.

Challenges of the Emerging Markets

A problem arises when the appropriate cost of equity is required to be assessed for the evaluation of a cross-border transaction within the EU, especially in the Central European region. The purpose of the cost of equity calculation is that it will aid the firm's management to make a financial decision in the best interests of its equity shareholders. The practical result of the theory as outlined above is that if a firm's cost of capital is held to be synonymous with the cost of capital to the shareholders, the firm, by accepting all investment opportunities offering a rate of return in excess of the shareholders' cost of capital, will improve their financial position by providing investments for their capital superior in yield to those obtainable elsewhere.

Although there is a wide range of commonly used methods to derive the cost of equity for companies operating in these emerging markets, the majority of them appear to be more of a problem than a solution.[4] This is particularly inconvenient when a valuation for financial reporting is required (for example, under IFRS 3 [Business Contributions] or IAS 36 [Impairment of Assets]).[5] Under these conditions, valuators are obliged to adopt the market participant approach[6] to derive the cost of capital. There are also other methods which can be used to derive the cost of capital under market participant conditions, but these are not free of risks and pitfalls for over-hasty analysts. One popular method, which is especially useful when the company is a non-quoted closely held entity, is peer group analysis.[7] In this approach we seek to determine the closest possible approximation for systematic risk by calculating an industry Beta. The underlying assumption is that the systematic risk is similar for all businesses in that industry and the way the business is financed is the major source of differentiation. Typically, a number of comparable peer group companies would be used to arrive at an estimate of the cost of equity for the analysed company, with their Betas being assumed to be relevant indicators of market risk. A simple mean or median of pure-play comparable unlevered Betas may serve as a representative proxy for the company's unlevered Beta. The unlevered Beta is then relevered based on a target capital structure. Quite simply, the published Beta coefficients are adjusted to reflect the potential level of debt relevant to the analysed company.[8]

Traditionally, Beta is derived by applying ordinary least squares (OLS) to realised historical returns on a particular stock and a selected relevant index (benchmark). As a result we obtain a

[4] Peksyk M. *On the methods of accounting for country risk in foreign direct investment appraisal*. Ph.D. thesis, Brunel University / Henley Management College, January 2008.
[5] Antill N., Lee K., *Company Valuation Under IFRS*, Harriman House Ltd., 2008.
[6] Budyak J.T., *Discount rate considerations - a market participant perspective*," Valuation Strategies", July/August, 2008.
[7] Pettit J., *The WACC User's Guide*, 2005. Available at Social Science Research Network.
[8] Mills R.W., *The Dynamics of Shareholder Value*, Mars Business Associates Ltd, 1998.

Beta coefficient that could be interpreted as a measure of the systematic risk (also known as the market risk), expressing how changes in the market would affect the stock price.

The Beta is used to adjust the required rate of return for the systematic risk attributable to each stock. One of the drawbacks of the traditional OLS estimate is the assumption that the Beta of emerging markets is stationary. It is obvious that no economic variable, including the Beta coefficient, is constant over time. However, for some purposes, an individual might be willing to act as if the values of Betas for individual securities were constant or stationary over time. For example, a person who wishes to assess the future risk of a target company's cash flow is really interested in the behaviour of the averages of the Betas over time and not directly in the values appearing in particular time intervals. Sharpe and Cooper[9] assert that the high probability of falling into similar risk classes in successive periods indicates at least some stability in Beta. There is general agreement that although Betas are not stationary, they are to some extent predictable. Therefore, based on the premises outlined above, one would normally calculate straightforward historical Betas and apply them to forward-looking valuation models.

The next challenge related to historical Beta estimates is that they are historical as opposed to forward-looking. There is evidence that Betas tend to regress to some long-run equilibrium value (usually the industry average).[10] Consequently, historically estimated Betas are on average too small – they are biased towards zero. For example, even if all Betas in a market were truly equal to 1.0, sampling errors could force the historical estimate to vary around 1.0. Stock with a Beta below 1.0 would have a negative measurement error. There is, of course, no reason why we would expect it to have a negative measurement error again in the future. Our best guess is that the Beta would be 1.0 in the future. Thus, we would find that the Beta would regress back to the mean (that is, 1.0). Even if true Betas are not all equal to 1.0, statistically estimated Betas that are very small or very large would most probably have large negative or positive measurement errors.

Moreover, Dimson states that: "infrequent trading will bias Beta estimates so as to cause the estimates to appear stable. Infrequently traded securities will have low Beta estimates, while frequently traded securities will have high estimates. Provided the frequency of trading is serially correlated, the Beta estimates will be a relatively stable, regressing somewhat to the mean".[11] Similar evidence for small-stock in large markets has been found.[12]

However, in markets where there are insufficient numbers of shares to allow the portfolio theory to work properly, we can observe anomalies that could be perceived as an opportunity for share trading strategies, but are non-meaningful for project appraisal or business enterprise valuations. Straightforward calculated Betas are negative for emerging markets. The simple interpretation of this fact is that these particular stocks move counter to the market. Although the inclusion of a stock which moves counter to the market can substantially reduce the risk of a portfolio,[13] the use of this result to construct the peer group for cost of capital derivation for non-quoted companies tends to be inappropriate. By applying a negative Beta to CAPM, we would receive a cost of capital that is lower than the return on risk-free assets. Consequently, we would

[9] Sharpe W.F., Cooper G.M., *Risk-return classes of New York stock exchange common stocks, 1931-1967*, "Financial Analysts Journal" 1972, **28**(2).
[10] For the WACC calculation later in this paper we used the mean reversion adjustments suggested by Bloomberg, that is Adjusted Beta = (0.67) * RAW BETA + (0.33) * 1
[11] Dimson E., *Risk measurement when shares are subject to infrequent trading* ," Journal of Financial Economics" 1979, **7**(2).
[12] Ibbotson R.G., Kaplan P.D., Peterson J.D., *Estimates of small-stock betas are much too low*,"Journal of Portfolio Management"; 1997. Lo A.W., MacKinlay A.C., *An econometric analysis of nonsynchronous data*, "Journal of Econometrics" 1990, **45**.
[13] Blume E.M., *On the assessment of risk*, "The Journal of Finance" 1971, **36**(1).

have to challenge the main premise of corporate finance that is the expectation that the equity is more risky and therefore more expensive than the debt; whereas, especially in this particular case, the cost of equity would be lower than the sovereign debt.

The behaviour of R-squared causes interest among researchers and analysts. One interpretation concentrates on the fact that R-squared could be treated as a fitness indicator. That is to say, the higher the R-squared the stronger our claim could be that the Beta in a particular regression model reflects the stronger relationship between market and stock returns. However, it was also proved that in developed markets R-squareds tend to be low, as the proportion of the variance of returns explained by the market declines steadily in line with market development. In other words, the importance of the market factor decreases and the unsystematic risk is supposed to be responsible for the stock movements.[14]

Interestingly, R-squareds tend to be much higher in emerging markets than in developed markets (such as the US and UK), providing they are calculated against local indices. This could be explained partly by the fact that there are fewer stocks in each emerging market, and supported by the observation that during periods of crisis all assets move together and hence correlations tend to increase.[15]

Sometimes the significant decrease of R-squareds can be explained by the impact of the outlier type of observations. Influential points and outliers need to be identified. Little confidence can be placed in regression results that have been dominated by a few observations, regardless of the total size of the study. This again is typical for emerging markets, where significant volatility tends to occur; sometimes additionally amplified by a sudden change in currency exchange rates (this issue is discussed later). The first concern should be to verify that these data points are correct. Clearly identifiable errors should be corrected if possible or else eliminated from the dataset.[16]

Another challenge that is frequently faced in the quest for a reliable Beta comes from the fact that we are dealing with time series which tend to have, by nature, a sequential order that is referred to as autocorrelation. This is a really serious problem due to the fact that one of the fundamental assumptions underlying the regression model is that the error terms associated with the subsequent observations are uncorrelated. Positive autocorrelation will result in an underestimation of the standard error of the estimated coefficients (Beta and Alpha). This in turn yields an inflated t ratio, which means that it is possible that coefficients will be found to be significantly different from zero when in fact they are not. As a result, Betas would be accepted instead of being rejected.[17]

Basically, there are two commonly adopted methods to detect autocorrelation: the so-called residual plots and the Durbin Watson test. A scatter plot can easily reveal serial correlation, where the error terms tend to be correlated showing an asymmetric (curved) pattern (see Figure 1).

[14] Ibid.
[15] Moussavian M., *Global Emerging Equity Markets*, Credit Suisse First Boston, 2000.
[16] Rawlings J.O., Pentula S.G., Dickey D.A., *Applied Regression Analysis: a Research Tool*, 2nd edn., Springer-Verlag, New York, 1998.
[17] Chatterjee S., Hadi A.S., *Regression Analysis by Example*, 4th edn., Wiley-Interscience, 2006.

Figure 1: Scatter Plot

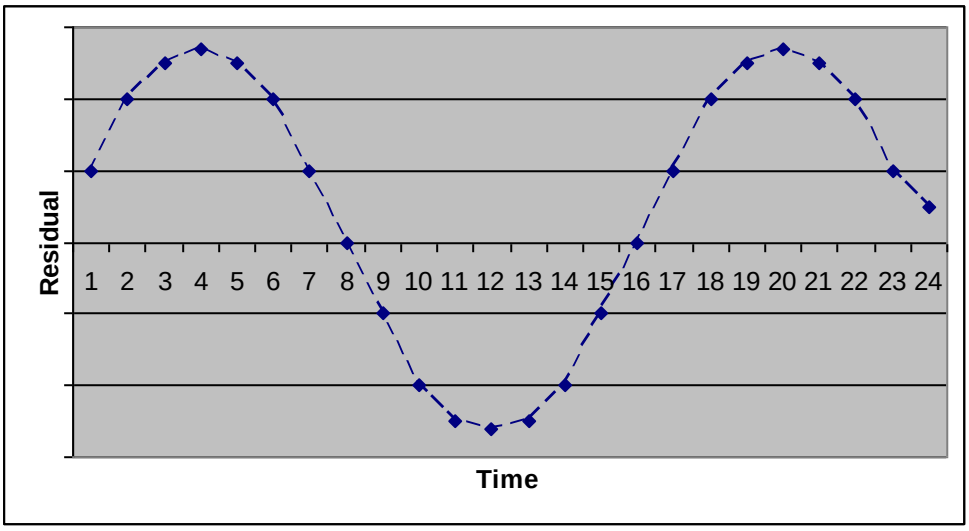
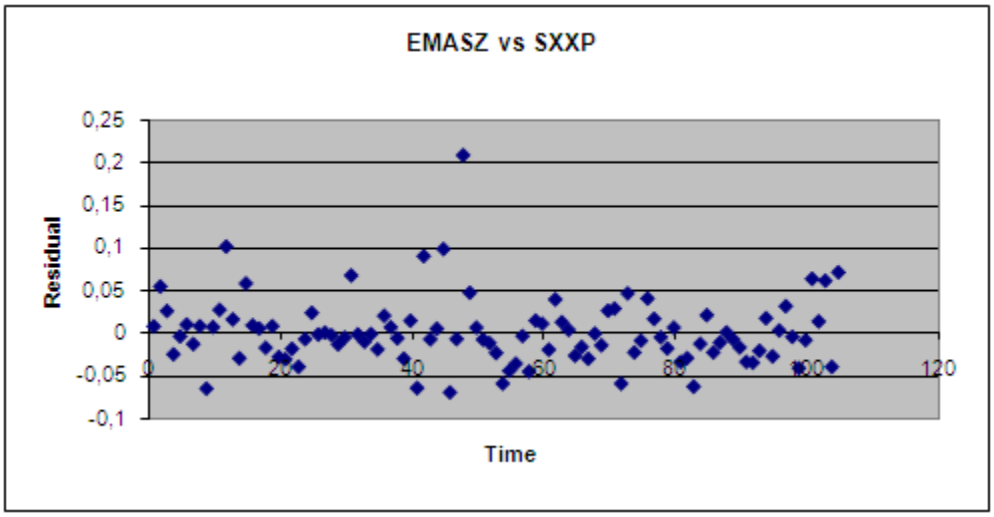


Figure 2 presents a residual null plot created for one of the companies (EMASZ HU) included in the peer group examined. The plot indicates that there are no problems with the fitted model.

Figure 2: Residual Null Plot



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Another way to detect autocorrelation is through the use of the Durban Watson test. Statistics offer several remedies for correcting autocorrelation, such as adjustment of the coefficient standard errors (e.g. Hanson method) and improvement of the specification of the model.[18]

According to pure CAPM theory, we should calculate the returns of our shares against the returns received from the market portfolio. That portfolio, which should contain all the marketable assets available to the investor, is in fact unobservable.[19] For years, the most popular index to use was MSCI World, as it was believed to reflect the world market returns and thus be the best proxy for the market portfolio. Unfortunately, this approach does not bring the best results, not least due to the segmentation and incompleteness of the emerging markets that should act as solid constituents of the universal portfolio. What we are actually using is the so-called benchmark Beta computed against a component of the market portfolio.[20] Consequently, what we receive is a Beta that should not be treated as if it is the true market Beta, but rather we should treat it as a Beta computed against the observable component of the true but unobservable market portfolio. Acceptance of this fact helps us to comfortably move into more familiar areas, such as the European market. For the purpose of this publication, we will adopt the market participant/industrial investor perspective, with the assumption that the European index stands well for the proxy of a locally well diversified market player. Consequently, we regress the returns of the shares from our selected peer group on the returns of the benchmark. The result should inform us about how much of the systematic risk will be added to our portfolio with the acquisition of the assets in question.

The last (but definitely not least) issue to be discussed is the problem of currency exchange rates. For most theoreticians and practitioners, it is obvious that one cannot simply compare interest rates across bonds in different currencies.[21] However, it is common practice in the industry to accept the premise that by regressing the returns of a Polish company quoted in PLN on the Warsaw Stock Exchange using the DJ STOXX 600,[22] quoted in EUR, one can obtain the Beta of this company reflecting the perspective of the pan-European investor. Fine, when in the case of Poland there was no significant volatility in the EUR/PLN exchange rate observed, especially in the period covered by this research (May 2005 - May 2007), then in the case of Turkey, proper accounting for currency effects may pay off. Table 2 presents the results of appropriate accounting for currency effects in pan-European Beta estimations. The situation becomes even more serious when a peer group built out of central and southern European energy companies has to be created for the purpose of a potential acquisition planned by an energy company operating from a mature EU country.

[18] Defusco R.A., McLeavey D.W., Pinto J.E., Runkle D.E., *Quantitative Methods for Investment Analysis*; Association for Investment Management and Research, USA, 2001, p.450 et sqq.
[19] Campbell J.Y., Lo A.W., McKinlay C., *The Econometrics of Financial Markets*, New Jersey, Princeton University Press, 1997.
[20] Eun C.S., *The benchmark beta, CAPM, and pricing anomalies*," Oxford Economic Papers" 1994, **46**(2).
[21] Mills R.W., *The Dynamics …*, op. cit.
[22] Dow Jones STOXX Index is a broad based capitalization-weighted index of European stocks. The equities use free float shares in the index calculation.

Comparable Analysis of the Competitive Approaches to the Cost of Equity Capital Estimation in Emerging Markets

For the purpose of this exercise, we use pure play unlevered Betas calculated over a sample of two years' weekly data (approx 104 observations) as a proxy for the target's Beta.[23] The peer group has been built upon the assumption that the potential target company is situated in a new EU accession country and the acquirer is a well diversified sectoral (energy) investor headquartered in a mature EU country. The results for the straightforward calculated Betas are presented in Table 1. Subsequently, Table 2 shows the results cleaned of currency effects and identified statistical issues. Then the test for significance of the regression coefficients was run and companies that did not pass these tests were removed from the peer group. The results were then used to derive the price per share using the Discounted Cash Flow method (based on the Free Cash Flow to Capital valuation model). This model appears to be the most useful, bearing in mind that it concentrates on seven key value drivers and does not require thousands of lines within long spreadsheets.[24]

As the hypothetical energy company business model was being used, the 20/80 (D/E) capital structure was applied, receiving the price of EUR 3.28 for straightforward calculated Betas and EUR 2.66 for currency adjusted. The concluded impact of the currency mismatching and unadjusted raw data in the process of the cost of capital derivation on the final share price is about 15.8%. This difference should be carefully considered when the decision is made on how the currency should be treated in the cost of capital derivation, as the consequences of miscalculation may be severe.[25] Luckily, even when using data from financial information providers (e.g. Bloomberg), these currency adjustments may be easily made to derive reliable Betas.

Summary

The Discounted Cash Flow method is commonly used to determine the value of a target company in a merger or cross-border acquisition transaction, as well as in determining the value of a business for financial reporting purposes. Determination of the appropriate cost of capital is a necessary element in the Discounted Cash Flow model. The most commonly used technique for determining the cost of equity capital is the CAPM, which posits that the cost of equity capital is equal to the sum of (1) the risk-free rate and (2) the Beta for the investment multiplied by the market risk premium. Thus, the Beta is an essential element in CAPM and, therefore, is often an essential element in the Discounted Cash Flow model. Although the majority of market participants are fully equipped with highly sophisticated tools to help them derive Betas for any occasion, they should remain fully aware of the consequences of the blind misapplication of the right means. Professor Money makes a very useful comment on the misapplication of acknowledged theories, stating that there are people who make mistakes by applying the wrong

[23] This is a commonly used approach utilised by financial auditors.
[24] Mills R.W., *The Dynamics …*, op. cit.
[25] As an experiment, the alternative valuation scenario was run, which assumed that the exemplary company was all equity financed, as often happens with start-up companies and young companies in emerging markets. This experiment resulted in the shocking value of EUR 3.05, which translates to a 19.7% difference in derived prices.

theory (or applying it incorrectly) to solve a particular problem. The theory, if tested and accepted, is usually correct.[26]

The CAPM is a very controversial concept and discussions around its appropriateness still attract equal numbers of supporters and opponents, specifically in the context of foreign investment appraisals. However, Chan and Lakonishok[27] point out that we might need decades of additional data before the CAPM can be *rejected* with statistical confidence. In fact, typical statistical results are often so weak and confidence intervals so wide that we cannot reject anything and, thus, conclude whether CAPM is right or wrong. The current turbulent environment produces market data that can only strengthen the historical confusion around CAPM theory.[28]

Although some of the charges may be well supported by renowned practitioners, there is still plenty of room for improvements which may be of value to analysts operating in emerging markets. In particular, one could consider a few of the more problematic issues prevailing in emerging markets, such as low liquidity of stocks, synchronicity of prices and normality of distribution. But these are issues worth covering in separate articles.

Table 1

Staright forward Beta (mixed currencies, raw observations) TESTS											
					F test (linearity)			t-test (linearity confirmation)			
Company Ticker	Raw	Adjusted	No. of observations	R^2	F calculated	F (critical value)	Test result	t-Stat calculated	t-Stat (critical value)	*p* value	Test result
Zoren TI	0,55	0,70	103	0,02	2,0612	0,8235	Beta is significant	1,4357	1,9837	0,0500	Beta is not significant
Akenr TI	1,10	1,07	103	0,12	13,7727	0,8235	Beta is significant	3,7112	1,9837	0,0500	Beta is significant
Ayen TI	1,07	1,04	103	0,13	15,0920	0,8235	Beta is significant	3,8848	1,9837	0,0500	Beta is significant
PEP PW	1,47	1,32	104	0,15	18,0000	0,8235	Beta is significant	4,2426	1,9835	0,0500	Beta is significant
EMASZA HB	0,60	0,73	104	0,07	7,6774	0,8235	Beta is significant	2,7708	1,9835	0,0500	Beta is significant

Table 2

Beta with tailored adjustments (one currency, transformed data where necessary) TESTS											
					F test (linearity)			t-test (linearity confirmation)			
Company Ticker	Raw	Adjusted	No. of observations	R^2	F calculated	F (critical value)	Test result	t-Stat calculated	t-Stat (critical value)	*p* value	Test result
Zoren TI	0,96	0,98	103	0,05	4,9811	0,8235	Beta is significant	2,2318	1,9835	0,0500	Beta is significant
Akenr TI	1,56	1,37	103	0,17	20,9807	0,8235	Beta is significant	4,5805	1,9835	0,0500	Beta is significant
Ayen TI	1,48	1,32	103	0,18	22,0207	0,8235	Beta is significant	4,6926	1,9835	0,0500	Beta is significant
PEP PW	1,68	1,46	104	0,18	22,3902	0,8235	Beta is significant	4,7318	1,9833	0,0500	Beta is significant
EMASZA HB	0,79	0,86	104	0,11	12,0940	0,8235	Beta is significant	3,4776	1,9833	0,0500	Beta is significant

[26] Money A.H., speech addressing the conferment of the Honorary Degree of Master of the College at Greenlands, 28 October 2006.
[27] Chan L.K.C., Lakonishok J., *Are the reports of beta's death premature?*, "Journal of Portfolio Management" 1993, **19**(4).
[28] Goldman M., *Market turmoil may require new ways to build up cost of capital*, "The Value Examiner" 2009, January/February.

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