Cost of Equity in the Brazilian Market – International Investor's Perspective

ABSTRACT

This paper seeks to test the explanatory power of four cost of equity models for the expected return by a foreign investor in the Brazilian market during the past ten years (2004-2013). The models analyzed were Global CAPM, Goldman Sachs, Downside Risk and Local CAPM. In summary, when the whole period (2004-2013) was considered, the Downside Risk Model presented the highest adjusted R^2 (28.6%) and an statistically significant coefficient, indicating that this model was satisfactory to explain expected stocks returns in the Brazilian market. This result is consistent with a degree of partial economic integration of the Brazilian economy, found in a qualitative analysis also presented in the paper.

Keywords: Cost of Equity; Degree of Integration; Foreign Investor.

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1. INTRODUCTION

The growth of financial markets in Asian and Latin American emerging countries, which has captured the attention of global investors, has turned the analysis of a certain country's specific risks and the choice of the methodology to calculate its discount rate into critical features of financial evaluation.

Even among those who support the idea that Capital Asset Pricing Model (CAPM), which was developed by Sharpe (1964) Lintner (1965) and Mossin (1966), is the best available asset pricing model, there is no consensus regarding how it should be used to evaluate assets in international markets (KECK et al, 1998).

In most American multinational companies, the standard way to determine the expected rate of return for international investments is to add a factor regarding the country risk premium to the cost of equity of local investment. However, this practice may result in an overestimation of the cost of equity and thus in the rejection of international investment opportunities (PETIT et al, 1999).

Indeed, investors tend to adjust the methodology according to their own perception of the degree of integration of the markets in which they invest (KECK et al, 1998). Fuenzalida and Mongrut (2010), Stulz (1999) and Harvey (2005) argue that it is possible to draw a parallel between methodologies of cost of equity and the degree of economic integration.

When it comes to economies that are more integrated with the world capital market, Stulz (1999), for instance, affirms that their companies should settle a discount rate which reflects them as part of a global stock portfolio.

Nevertheless, investors who choose markets that are not totally integrated face less diversification opportunity. Mishra and O'Brien (2001) state that asset pricing models in emerging markets divide the risk of such markets into two components: systematic risk, which is measured by the betas in the models, and unsystematic risk, whose inclusion in the models as well as the appropriate methodology for doing so is still under discussion. If markets were completely integrated, for example, country risk would be irrelevant to determine the cost of equity, as it could be eliminated by diversification.

Based on the increasing presence of foreign investors in Brazil and on the controversy regarding the methodology for calculating the discount rate, the aim of this work is to test the explanatory power of a series of methodologies to calculate cost of equity for the expected return of a foreign and diversified investor in the Brazilian Market.

Therefore, this work seeks to test whether the analyzed methodologies are statistically significant to explain the expected return of stocks in the Brazilian market. Moreover, it tries to determine which has been the most appropriate methodology for the Brazilian economy

throughout the last decade (2004-2013) in view of its degree of integration with global markets.

Besides, in accordance with Estrada (2000), Fuenzalida and Mongrut (2010) and Stulz (1999), this work aims to qualitatively relate the cost of equity models to the degree of economic integration by presenting ratios of the degree of integration of the Brazilian market in the past ten years.

The chosen models for this work are CAPM Global, according to Stulz (1999), Goldman Sachs Model, which adds country risk premium in an *ad hoc* fashion (MARISCAL and Lee, 1993), Downside Risk Model, which was developed for emerging markets and takes into account the semistandard deviation of returns with respect to the mean as a significant risk measure (ESTRADA, 2000), and Local CAPM, according to Sanvicente (2014).

The results will be used to try to answer the following main questions:

Are the models used to calculate cost of equity statistically significant for explaining a company's expected return?

Considering the degree of economic integration of the Brazilian economy in the last decade, which cost of equity model presents the highest explanatory power for a company's expected return?

Thus, one expects this work to be used as a tool by foreign investors in Brazil in order to determine the methodology for calculating the discount rate of their investments in the country.

2. LITERATURE REVIEW

2.1. Methods for Calculating Cost of Equity

The main method for calculating cost of equity is based on the Capital Asset Pricing Model (CAPM). It was developed by Sharpe (1964), Lintner (1965) and Mossin (1966), who argue that the expected return of an asset is a linear function of the risk free asset, the systematic risk and the risk premium of a market portfolio in relation to the risk free asset. Originally the model defined the systematic risk of an asset (beta) as its contribution to the variance of a diversified market portfolio (HARVEY, 2005).

Black et al. (1972) and Fama and Macbeth (1973) did find that there is a positive relation between stock return and the beta in the period before 1969, as established by Sharpe, Lintner and Mossin's CAPM.

However, more recent empirical results regarding CAPM reinforce the controversy in relation to the use of the model. Fama and French (1992) affirm that the positive relation between

betas (systematic risk) and expected return of an asset during the period from 1963 to 1990, which is a basic premise of CAPM, disappears. On the other hand, the authors find a statistically significant relation between an asset's return and variables such as firm size, leverage and E/P (Earnings/Price) and Book Value/Market Value indexes.

Harvey (1995) also finds no statistically significant relation between expected stock return and betas in relation to a global portfolio of 20 emerging markets when analyzing more than 800 companies. According to the author, a reason for that could be the lack of integration with global economies in such markets (which prevents the use of a Global Beta), the premise that betas are constant through time (a characteristic that is observed in developed and integrated economies) and the fact that such markets are more prone to the influence of local factors than global events.

Therefore, asset-pricing models that assume complete integration of capital markets fail when trying to explain expected stock returns in partially integrated markets (HARVEY, 1995).

In an integrated economy, the expected returns of an asset may be explained by its covariance in relation to returns of the world market (BEKAERT et al, 2002). Nevertheless, in a segmented or partially integrated market, covariance with a global factor may have little explanatory power for its expected returns (BEKAERT and HARVEY, 1995).

Given the controversy over the appropriate model for calculating the discount rate and the significant risk measure, this paper analyzes four cost of equity methods which are, according to Harvey (2005), widely used to evaluate investments in emerging markets from the perspective of a foreign investor. The explanatory power of each these models will be tested later.

2.1.1. Global CAPM

As opposed to Harvey (1995), Pereiro (1999) states that progressive integration and free capital flow have become a reality in the last few decades. In such case, investors anywhere in the world could easily come into and leave a certain market facing minimal transaction costs.

Stulz (1999) argues that the removal of barriers to free capital flow means a reduced risk premium in emerging markets, as risk may be globally diversified, thus causing an increase in asset prices.

Emerging markets, such as Latin American markets, have indeed experienced great development in response to liberalization programs that encourage the inflow of foreign direct investment (STULZ, 1999).

Consequently, the use of CAPM as settled by Sharpe, Lintner e Mossin, which presupposes segmentation of the analyzed market (BEKAERT e HARVEY, 1995), will usually overestimate cost of equity in the case of companies with access to the global markets, since

non-diversifiable risks of an investment in the local market can be internationally diversified (STULZ, 1999).

For this reason, Stulz (1999) proposes an approach for global and diversified investors: Global CAPM, which regards an investment as part of a global portfolio and uses as a proxy for the market portfolio a global stock index, such as MSCI World.

Global CAPM, originally proposed by Solnik (1974), assumes that investors from different but integrated countries have the same consumption basket, meaning that the Purchasing Power Parity holds (FUENZALIDA and MONGRUT, 2010). Therefore, in integrated economies, there would be no reason for the use of other models but the Global CAPM to explain expected asset returns (KECK et al, 1998).

2.1.2. Goldman Sachs Model

According to Harvey (1995), when Global CAPM is used for stocks in emerging markets, i.e., a regression of a stock return on the global market portfolio return is performed, betas are negative or close to zero.

Given the observed low correlation between many emerging and developed markets, together with the predominance of local factors to explain expected returns, Harvey (1995) states that Global CAPM should not be used when investments are evaluated in not completely integrated markets.

Harvey (2005) emphasizes that, when an asset pricing method based on Global CAPM is used, as in Stulz (1999), one assumes that the analyzed market is completely integrated with world markets. So, rejecting this global model, as in Bekaert and Harvey (1995), may be a reflection of rejecting the premise of complete integration of markets.

An adapted model that is widely-used by investment banks and consulting firms is the Goldman Sachs Model (HARVEY, 2005). It was developed by Mariscal and Lee (1993) and is one of the first models in literature that assume the partial integration of markets, especially for emerging economies (FUENZALIDA and MONGRUT, 2010).

Goldman Sachs Model derives from a regression between Standard & Poor's 500 Index return (independent variable) and stock return (dependent variable). The beta obtained is then multiplied by the risk premium of S&P500 Index. Finally, a country risk premium regarding the country that receives the investment is added in an *ad hoc* fashion in order to try to correct a very low cost of equity. This premium is based on the Emerging Markets Bond Index Plus (EMBI+), which is an indicator measured by the bank JP Morgan and consists of the spread between returns of debt instruments in emerging markets (in Dollars) and returns of debt instruments with the same maturity in the American Market (ZENNER et al, 2008).

Even so, the Goldman Sachs Model has some problems. According to Harvey (2005) and Fuenzalida and Mongrut (2010), this method lacks theoretical foundation, as one of the core

premises of Sharpe, Lintner and Mossin's CAPM is that beta (market risk) is a complete measure of the risk of an asset which is to be priced in an efficient portfolio formation. Thus, no other risk measure should be taken into consideration (FAMA and MACBETH, 1973).

Besides, in many versions of this model, risk is double counted, as part of the variability of returns of the market index is correlated with country risk (ESTRADA, 2000). Moreover, the EMBI+, which is added to cost of equity, concerns a risk premium of debt instruments, so it should usually be inferior to a risk premium of equity. Finally, this spread can only be calculated for countries that issue bonds in Dollars.

2.1.3. Downside Risk Model

Given the difficulties of cost of equity methods for determining the factors that influence expected stock returns in emerging and not completely integrated markets, Estrada (2000) finds strong evidence that downside risk measures are correlated with such returns.

The Modern Portfolio Theory measures a portfolio's total risk by the standard deviation of its returns. Although standard deviation identifies risk associated to returns' volatility, it does not distinguish upside risk from downside risk (ESTRADA, 2002).

Thus, the model presented in Estrada (2000) and used in emerging markets is based on Markowitz (1959) observations, and captures the downside risk – which investors try to avoid, as opposed to the upside risk to which investors want to be exposed. So, the author considers the semistandard deviation of returns with respect to the mean as a downside measure, to the detriment of betas, which capture the total systematic risk.

Estrada (2000) uses a sample of assets from 28 countries that comprise the MSCI World Index in order to test the statistical significance of several risk variables to explain expected returns, such as standard deviation (total risk), beta (systematic risk) and downside risk variables, like semistandard deviation of returns with respect to the mean.

The author, as well as Harvey (1995), comes to the conclusion that betas have no significant explanatory power over expected returns of assets, indicating the lack of complete integration in the markets and the omission of relevant explanatory variables as important elements for this result.

In summary, the Downside Risk model considers a proxy for global market, which is multiplied by a parameter regarding the quotient between the semistandard deviation of an asset's returns with respect to the mean and the semistandard deviation of market returns with respect to the mean (ESTRADA, 2000).

Estrada (2002), in accordance with the results of Estrada (2000), affirms that cost of equity based on downside risk lies in intermediate values between those of Global CAPM (which are usually lower due to the investor's potential for diversification) and those obtained by using total risk – measured by the standard deviation – as the risk measure of an asset in an efficient portfolio formation.

2.1.4. Local CAPM

According to Fama and Macbeth (1973) and Sanvicente (2014), the Capital Asset Pricing Model, developed by Sharpe (1964), Lintner (1965) and Mossin (1966), presupposes the use of a single risk factor to calculate the expected return of a stock, which is to be proportional to the amount of systematic risk of the asset (beta).

Therefore, including another premium besides that of the market portfolio is an *ad hoc* fashion, which still lacks theoretical foundation. Indeed, if there are additional risk measures apart from systematic beta to estimate expected returns, premiums are paid for risks which do not contribute to the risk of an efficient portfolio (FAMA and MACBETH, 1973).

Sanvicente (2014) tries to test the significance of country risk to explain observed returns by analyzing a sample of 204 companies in the Brazilian market. The author verifies that the behavior of the market portfolio is already influenced by country risk, so that it is not necessary to add another factor for a specific risk. These results corroborate the use of Local CAPM to calculate cost of equity in Brazil, even though under the perspective of international investors.

Sanvicente (2008) argues that, in case the local stock market is strongly affected by the international market and by the perception of risk that international investors have towards the country, the effect of such variables would already be reflected in the behavior of the local market portfolio.

In addition, James and Koller (2000), as well as Estrada (2000), criticize the adoption of country risk measures in cost of equity models for emerging markets, due to the fact that it would, in some cases, cause overestimation of the risk of projects and underestimation of risk in other cases. This happens because part of the variance of returns in the local market may already be correlated with country risk, and that brings on double counting. Moreover, the country risk inherent to a certain market may not have homogenous impact on all companies (for instance, an increase in country risk may be related to the expectation of currency depreciation which benefits exporting companies and thus reduce their risk).

It is also important to notice that, in conformity with Bekaert and Harvey (1995), Bodnar et al. (2003) and Fuenzalida and Mongrut (2010), the use of this method presupposes that the analyzed market is segmented in relation to global markets.

2.2. Expected Asset Return

The most common model to estimate enterprise value involves the observation of the investor's expectation of return in terms of both dividend distribution and capital gain (BODIE et al., 2010).

Meanwhile, the intrinsic value of a stock may be defined as the present value of all payments to the investor, including dividends and earnings of the final sell, discounted with an interest

rate adjusted to risk. In market equilibrium, the current price reflects the estimations of intrinsic value (SANVICENTE and CARVALHO, 2013).

Under the assumption that dividends increase in a constant and perpetual rate, it is possible to define a stock's price as follows:

$$P=D_0(1+g)/(r-g): \quad (1)$$

where:

$D_1 = D_0(1+g)$ = dividend due to the next period;
r = discount rate demanded by the stockholder;
g = dividend growth rate.

In accordance with Gordon (1959), this formula is called Constant Growth Dividend Discount Model, which enables the deduction of the market capitalization rate of a stock (or expected return rate), negotiated in its intrinsic value, as follows:

$$r=(D_1/P)+g \quad (2)$$

The first term of this expression corresponds to the stock's dividend yield, and the second one corresponds to the expected dividend growth rate.

Fama and French (2001) support the use of fundamentals of dividends and expected growth to estimate the expected stock return, in opposition of average historical returns as a proxy for expected returns. According to the authors, the standard deviation of expected market premium estimations based on the Constant Growth Dividend Discount Model is less than half in comparison to the model that uses historical returns.

Elton (1999) states that the use of historical returns as a proxy for expected returns presupposes the belief that information surprises which can alter expectation tend to cancel out in the long run and, therefore, average historical returns are an unbiased estimation of expected returns.

Nevertheless, the author also argues that, if there is a tendency for big information surprises, their persistence, which can alter expectations, may create an inertial effect. So the cumulative effect would be big enough to continue to exist, and that would invalidate the use of historical stock returns as a proxy for expected returns.

2.3. Degree of Economic Integration

In financially integrated markets, domestic investors are able to freely invest in international assets and international investors are able to invest in domestic assets (BEKAERT et al., 2003). Thus, assets with identical risks would have the same expected returns, no matter the market in which they are negotiated.

In accordance with Bekaert et al. (2002), Henry (2002), Bekaert and Harvey (1995) and Errunza and Miller (2000), if a segmented market is turned into an integrated market, the country's economy faces changes in its expected returns, volatility and correlation to the main global market indexes. Therefore, the concept of market integration is a core discussion in finance theory.

2.3.1. Indicators of Integration

Bekaert et al. (2002) discuss the effects of financial market integration in detail based on a wide range of ratios.

Through the analysis of liberalization policies in 20 emerging countries, the authors observed a series of macroeconomic variables that are related to the liberalization process. For instance, if the access of foreign investors is allowed in a certain market, liquidity may grow due to the increase in the volume of transactions. Besides, there may also be structural changes, such as more Initial Public Offerings, as the cost of equity tends to decrease due to the liberalization. Thus, projects that were previously declined become more attractive. In addition, individual stocks may be less sensitive to local information and more sensitive to global events (BEKAERT et al., 2002).

In summary, the authors evaluate variables of five different groups, which work as indicators of the degree of economic integration in a country: (i) changes in dividend yield; (ii) market liquidity (measured by the following ratios: stocks value traded/GDP and market capitalization/GDP, all in Dollars); (iii) foreign capital flow to the evaluated market (measured by the percentage of North American investments in local the market in relation to the total market capitalization); (iv) concentration of stocks in the evaluated capital market and correlation to world markets; and (v) local economic environment (volatility of the foreign exchange rate and inflation rate and the ratio exports + imports/ GDP).

Therefore, the authors come to the conclusion that economic integration comes with a larger and more liquid capital market than before, besides an increase in the volatility of returns, which are more correlated with global markets.

Moreover, as well as Errunza and Miller (2000) and Bekaert and Harvey (1995), Bekaert et al. (2002) affirm that more integration leads to an improvement in credit rating, currency appreciation, economic growth (through more investments) and a reduction of cost of capital.

Indeed, according to Henry (2002), the stock market index of a country whose economy is in process of liberalization presents, on average, monthly abnormal returns of 3.3% (in Dollars and real terms) during an eight-month window after the implementation of liberalization policies. Such result is consistent with the premises of Global CAPM, which assumes that liberalization policies tend to reduce the cost of equity of a certain country by allowing asset risk to be internationally diversified (STULZ, 1999).

However, it is important to notice that many factors may be consistent with the process of capital markets integration though without individually revealing an effective economic opening (for instance, economic growth or currency appreciation may be a reflection of a set of variables which are not only related to market integration). As a result, it is evidently difficult to statistically control the variables that indicate a country's degree of economic integration (BEKAERT et al., 2003).

2.4. Cost of Equity and Degree of Economic Integration

The study of asset pricing models may be classified into three main categories: segmented markets, integrated markets and partially integrated markets (BEKAERT and HARVEY, 1995). According to Pereiro (1999), Stulz (1999) and Fuenzalida and Mongrut (2010), it is possible to draw a parallel between cost of equity methods and degree of economic integration in a certain market.

Bekaert et al. (2003) and Stulz (1995) state that, once foreign investors are allowed in a local market, upon the benefits of portfolio diversification, domestic asset prices tend to appreciate as expected returns decrease.

Table 1 presents the four cost of equity methods that have been analyzed in this paper and the respective authors who have deeply studied each of them.

In addition, the cost of equity models presented in table 1 are related to the degree of economic integration, according to Stulz (1999), Pereiro (1999), Harvey (2005), Estrada (2000) and Fuenzalida and Mongrut (2010).

It is important to notice that, in the Goldman Sachs Model, the country risk premium is added to the risk free rate whereas in the Downside Risk Model an additional premium, which is related to the potential for downside that investors seek to avoid, is incorporated in the asset's systematic risk (beta).

3. METHODOLOGY

This paper tests at first the statistical significance of some models of cost of equity to the explanation of expected returns of assets. Then, it tests which model has the highest explanatory power for the expected returns of a foreign and diversified investor in the Brazilian market for each year and for the complete period (2004-2013), in conformity with Harris et al. (2003).

Elton et al. (2004) states that, although there are methodologies which empirically test CAPM and other models of expected returns, most robust tests normally comprise two-step methodologies: the first step consists of performing time series regressions, which are used to estimate betas of risk factors, and the second step consists of using such estimated betas as explanatory variables in cross-section regressions.

In accordance with Fama and French (2001) and Sanvicente and Minardi (1999), expected returns are calculated using the Constant Growth Dividend Discount Model.

Therefore, like Fama and MacBeth (1973) and Harris et al. (2003), through the two-step methodology, the authors estimate the betas of the risk factors for the analyzed assets and run a regression of the expected returns of these assets on the betas.

3.1. Database

The following data was used to carry out this paper:

- Returns in Dollars (logarithm) of all stocks listed in IBrX100 (monthly series from December, 1999 to December, 2013).

- Series of annual dividends in Dollars, ROE and payout of all stocks listed in IBrX100, from January, 2004 to December, 2013. Such information was used to calculate the expected return of stocks according to the Constant Growth Dividend Discount Model (HARRIS et al., 2003).

- U.S. ten-year bond yield (YTM US Treasury Bond 10), used as a proxy of the risk free rate for foreign investors in emerging markets (HARRIS et al, 2003).

- EMBI+Brasil, an indicator by J.P. Morgan that is used in the Goldman Sachs Model as a proxy for country risk premium (HARVEY, 2005).

- Return of the S&P500, proxy for market portfolio in the Goldman Sachs Model, according to Harvey (2005) (monthly series from December, 1999 to December, 2013).

- Return of the MSCI World Index, proxy for the global market portfolio, according to Stulz (1999) (monthly series from December, 1999 to December, 2013).

- Return of IBrX100, proxy for the local market portfolio, used in the Local CAPM (monthly series from December, 1999 to December, 2013).

The stock quotes in Dollars, adjusted by all kinds of corporate actions (splits and dividends), were obtained from Economatica database.

The annualized dividend series in Dollars, as well as the ROE and payout, were obtained from Financial Statements available at IQ Capital Markets database.

The annual payout index was defined as the quotient between dividends per share and earnings per share. Annual ROE was defined as the relation between earnings reported in the fiscal year and net worth, in accordance with Brealey et al. (2013).

U.S. ten-year bond yield, as well as the monthly series of S&P500, MSCI World Index, EMBI+Brasil and IBrX100, in Dollars, was obtained from Bloomberg database.

Annual stock returns in Dollars, as well as annual returns of the world market portfolio, were used in order to calculate the semistandard deviation of returns with respect to the mean in the Downside Risk Model, using the MSCI World index as a proxy for the market portfolio. U.S. ten-year bond yield (YTM US Treasury Bond 10) was used as the risk free rate.

3.2. Sample Selection

The annually analyzed sample of stocks was formed based on the theoretical portfolio composition of IBrX100 published every year in January. The sample was revised annually, so that it obeyed to the criteria of liquidity and market value of stocks.

IBrX100 was chosen instead of IBOVESPA mostly due to the possible inconsistencies which could arise in case IBOVESPA had been chosen. In IBrX, liquidity is a condition to select the stocks, but the portfolio is also weighted by market value. Thus, firms with greater market value (when considering only the number of available stocks – free float) tend to weight more in IBrX.

Ibovespa takes into account only the liquidity of stocks. In case a certain firm presents an operational problem, investors tend to sell stocks. That increases liquidity and thus the weight of a stock in the index. In IBrX, as the market value of such a firm would decrease, its weight in the index would also be reduced.

3.3. Filters

The filter criteria used in the initial sample, i.e., the theoretical portfolio composition of IBrX100 in each year, was established in order to achieve two goals, in conformity with Harris et al. (2003):

- Create a sample composed of liquid stocks, which contains the most traded stocks in the Brazilian market, considering also the market value criteria.
- Create a sample with a reasonable number of stocks, so that the results could be significant for the Brazilian capital market.

Based on the initial sample, which comprised all stocks listed at IBrX100 for each of the ten analyzed years, a filter was made to exclude the following cases:

- Companies that did not have information on dividends, ROE and payout throughout the analyzed financial year.

- Stocks of companies that had no series of prices for the complete twelve months of the analyzed financial year. A fifteen-day tolerance was given to the case of stocks that had no consecutive monthly price information in the period.

- Stocks whose historical series of prices were inferior to 36 months. In order to estimate betas for each year, a time series of 60 months was used, as in Damodaran (2000), with a maximum tolerance of 36 months.

With this filter throughout the analyzed period, it was obtained a sample of 55 firms on average per year. For the ten-year horizon, 553 stocks were analyzed. It is important to say that the main filter to exclude firms from the initial sample was the absence of historical data of prices superior to 36 months for calculating betas.

3.4. Econometric Tests

The following steps describe the use of the methodology to test the statistical significance of cost of equity models to explain expected stock return in the Brazilian Market.

3.4.1. Betas Estimation – Global CAPM Model

Based on the regression of excess stocks returns in Dollars (dependent variable) on excess market returns (explanatory variable), using MSCI World index as a proxy, global betas are estimated for each year. The series that was used to estimate the global betas uses monthly data from the 60 previous months to the analyzed period, in case it was available.

3.4.2. Betas Estimation – Goldman Sachs Model

Based on the multiple regression of excess stocks returns in Dollars (dependent variable) on excess market returns (explanatory variable), using S&P 500 as a proxy, and on EMBI+Brasil (explanatory variable), the betas of the Goldman Sachs model are estimated for each year. The series used to estimate it comprises monthly data of returns from the 60 previous months to the analyzed period, in case it was available.

3.4.3. Betas Estimation –Downside Risk Model

The downside risk parameter is estimated by the coefficient between the semistandard deviation of returns of an asset with respect to the mean in each year, and the semistandard deviation of market return with respect to the mean in the same year, in conformity with Estrada (2000).

3.4.4. Betas Estimation – Local CAPM Model

Based on the regression of excess stocks returns in Dollars (dependent variable) on excess market returns (explanatory variable), using IBrX100 as a proxy for market portfolio, local betas are estimated for each year. The series used to estimate local betas comprises monthly data of returns from the 60 previous months to the analyzed period, in case it was available.

3.4.5. Estimation of Expected Stock Returns

In conformity with Sanvicente and Minardi (1999), Harris et al. (2003) and Fama and French (2001), the annual expected stock return was calculated through the Constant Growth Dividend Discount Model. The expected annual growth was calculated, in accordance with Bodie et al. (2010), by multiplying the Return on Equity (ROE) and the retention rate of profits (average values) for the analyzed financial year.

3.4.6. Panel Data and Cross Section Regressions

Based on Fama and Macbeth (1973) and Elton et al. (2004), betas of firms obtained through time series regressions work as explanatory variables in cross section regressions for each year.

Besides, in order to analyze the whole period (2004-2013) and enable more precise estimators and more powerful test statistics, betas are used as explanatory variables in a panel data regression.

Due to the lack of data for the same group of stocks in the whole period (2004-2013), this work used unbalanced panel in order to estimate the regression.

When it comes to choosing between Fixed Effects Model and Random Effects Model to estimate the panel data regression, according to Wooldridge (2010), Fixed Effects are widely considered a more convincing tool since Random Effects do not permit an arbitrary correlation between unobserved effects and explanatory variables. Moreover, for explanatory variables that change in time, the use of Random Effects is only recommended when the sample is randomly selected (WOOLDRIDGE, 2010). This is not the case in this work, as the annual sample of firms was selected based on the stocks that compose IBrX100, whose criteria include liquidity and market value.

Therefore, since it is difficult to assume the hypothesis of (i) independence between explanatory variables and unobserved effects and (ii) random selection of the sample for each year, this work uses Fixed Effects estimation.

In summary, four regressions were run for each year, i.e., one regression for each analyzed cost of equity model (Global CAPM, Goldman Sachs, Downside Risk and Local CAPM). In

addition, a regression was run in relation to the whole period (2004-2013), for each analyzed model, using panel data.

4. RESULTS

This section presents the main results based on the described methodology.

The following equation (for both cross section and panel data regressions) was used for each of the four cost of equity models:

$$R_{it}=\gamma_0+\gamma_1\beta_{1it}+\gamma_2\beta_{2it}+\eta_{it} \quad (3)$$

where:

R_{it} : expected return of an asset in a certain year;

β_{1it} : variable relative to the asset's systematic risk. In the Downside Risk Model, as in Estrada (2000), this variable incorporates an additional risk premium; and

β_{2it} : variable relative to the country risk (used only in the Goldman Sachs Model case).

For each model to be consistent with theory the intercepts obtained with the cross section and panel data (γ_0) regressions are expected to be equal 0 and the coefficient (γ_1) is expected to be positive and statistically significant, i.e., there should be a positive relation between expected returns and systematic risk in the period.

When it comes to the Goldman Sachs Model, besides the previous conditions for γ_0 and γ_1, the coefficient γ_2 is also expected to be positive and individually statistically significant. Moreover, coefficients γ_1 e γ_2 are expected to be positive and jointly significant (F statistic). Table 2 describes null and alternative hypotheses (with emphasis on the specific case of the Goldman Sachs Model).

In order to determine which model has the highest explanatory power on expected return of assets, the adjusted R^2 of cross section and panel data regressions are analyzed, in conformity with Harris et al. (2003).

Therefore, it is possible to infer, both for the whole period and for each year, which of the four models present the highest explanatory power. The reason for using the adjusted R^2 is to avoid overestimation of the impact of adding an independent variable to the regression (ANDERSON et al., 2007).

4.1. Econometric Tests

Table 3 shows the sample size, the coefficients for cross section and panel data regressions (which used the betas obtained through the time series regressions as explanatory variables), the test statistic and the adjusted R^2 for each year and for the whole period.

Based on the econometric tests, it is possible to notice that Goldman Sachs Model presented the highest adjusted R^2 for three out of the ten analyzed years (2004, 2005 e 2011). On the other hand, when it comes to the whole period (2004-2013) through the use of Fixed Effects model and panel data regression, resulting in more robust test statistics, the Downside Risk Model presented the highest adjusted R^2 (28.6%).

Nevertheless, if the issue is regarded year by year, the four models presented coefficients that were not statistically significant with a 95% confidence interval. The coefficients γ_1 of Global CAPM in 2011 and Goldman Sachs Model in 2004, 2005 and 2011 were an exception to this case.

Besides, the intercepts of the four models throughout the ten years proved statistically significant in a 5% level (except for Global and Local CAPM in 2011 and Goldman Sachs Model in 2004 and 2011). This may indicate the necessity of additional factors to explain expected returns, as in Fama and French (1992).

However, if one analyzes the whole period (2004-2013), using a larger sample and more robust test statistics, the Downside Risk Model presented a statistically significant coefficient γ_1 with a 95% confidence interval. Thus, this suggests that premiums added to a stock's systematic risk and related to the potential for downside that investors seek to avoid are significant to explain expected returns, as in Estrada (2000).

In addition, the test statistics for the whole period using the Goldman Sachs Model also indicated an individually statistically significant coefficient γ_1. Besides, there is evidence to reject the null joint hypothesis $F_{2,550}$ that the coefficients are equal to 0, with a 90% confidence interval.

The other two analyzed models (Global CAPM and Local CAPM), did not present statistically significant coefficients for the whole period with a 95% confidence interval.

Thus, the results using Goldman Sachs Model do not provide evidence to reject the Capital Asset Pricing Model premise that systematic risk is significant to explain expected returns, in conformity with Fama and Macbeth (1973). Even though, the statistically significant intercept may indicate the necessity of additional factors to explain expected returns, as in Fama and French (1992).

It is important to notice that country risk was not statistically significant to explain expected returns (the coefficient γ_2 is not significant). Therefore, capital market practitioners have been adding it in an *ad hoc* fashion in order to calculate cost of equity using Goldman Sachs

Model. Thus, it represents a priced factor that does not contribute to the risk of an efficient portfolio. Based on this conclusion regarding the coefficient γ_2, Goldman Model was not satisfactory to explain expected returns in the Brazilian market in the past ten years.

In summary, when the issue is regarded year by year, although it is possible to determine the cost of equity model that presents the highest explanatory power, the test statistics of the four of them do not permit rejecting the null hypothesis that they are not satisfactory to explain expected returns in the local market.

Nevertheless, when the whole period (2004-2013) was considered and a larger sample was used, the Downside Risk Model presented the highest adjusted R^2 (28.6%) and statistically significant coefficient, indicating that this model was satisfactory to explain expected stocks returns in the Brazilian market in the past ten years.

In the subsection ahead, this paper calculates some ratios of the degree of integration for the Brazilian economy in order to analyze additional factors that may contribute to discussing the results of the econometric tests.

4.2. Degree of Integration Ratios

From the standpoint of Errunza and Miller (2000), Bekaert and Harvey (1995) and Bekaert et al. (2002), the ratios that measure the degree of integration in the Brazilian economy are now presented. Based on that, the degree of integration is related to the results of the econometric tests for the cost of equity models, as in Stulz (1999), Pereiro (1999), Harvey (2005), Estrada (2000) and Fuenzalida and Mongrut (2010).

All the database used to calculate the indicators of degree of integration derives from the Balance of Payments Statistics Yearbook of the International Monetary Fund, except for annual market capitalization and stocks value traded, which were obtained from the Standard & Poor's Global Stock Markets Factbook.

Based on the results regarding the integration ratios, it is possible to notice the increasing liquidity of the Brazilian capital market (which is measured by the index market capitalization/GDP) in the period 2004-2007.

Besides, except for 2009, all years presented an increase in the volume of foreign direct investment in the Brazil. The reduction of the growth rate of this indicator in 2012 and 2013 may be the result of governmental intervention policies, such as in the foreign exchange market. This policy was implemented in response to high international markets volatility, thus increasing uncertainty in the macroeconomic scenario and, as pointed by Bekaert (1995), creating a barrier against more integration of the Brazilian market.

When it comes to the economic environment, especially the ratio exports + imports / GDP, which is a proxy for the degree of economic integration, according to Bekaert et al. (2002), its level remained relatively stable throughout the analyzed period.

In order to enhance the analysis of the degree of integration in the Brazilian market, graph 1 presents the expected return of the sample in each year, measured as a simple average of the individual stocks expected returns, as in Harris et al. (2003). They were obtained through the Constant Growth Dividend Discount Model, as described in the methodology section and in Sanvicente and Carvalho (2013).

In addition, table 5 shows the expected return of the sample in three different periods.

One can notice the reduction in the average expected return in the period 2009-2013 in relation to the five previous years, which can be an indicator of more integration in the Brazilian economy, in accordance with Stulz (1999), Henry (2002), Bekaert et al. (2002) and Pereiro (1999).

Therefore, based on the qualitative analysis of the set of indicators, the Brazilian economy has given no sign of complete integration with global markets throughout the ten analyzed years. It presented ratios that, according to Bekaert et al. (2002), are consistent with the process of integration of the capital market (such as increase in liquidity, more foreign investments and reduction in the returns expected by investors) but without individually showing complete and effective openness of the economy (the external scenario of lower interest rates may, for instance, have been a determinant factor for the presence of foreign investors in Brazil).

So, as a relation is established between the results of the degree of integration and the econometric tests, the rejection of the Global CAPM for the whole period may also be a reflection of rejecting the hypothesis of complete integration in the Brazilian market. Besides, the existence of indicators which are consistent with the integration process (such as the increase in liquidity in the capital market) and the reduction in the average expected returns throughout the last ten years indicate that the national economy does not remain isolated from the world scenario. Thus, rejecting Local CAPM for the whole period may also be a reflection of rejecting the hypothesis of complete segmentation in the Brazilian economy.

In accordance with Pereiro (1999), Estrada (2000) and Fuenzalida and Mongrut (2010), who have drawn a parallel between degree of economic integration and the cost of equity models, the highest explanatory power of the Downside Risk Model and, most of all, the statistical significance of its coefficient (when one considers the whole period) are, therefore, consistent with the partial degree of integration of the Brazilian economy throughout the last decade, which is corroborated by the ratios of the degree of integration.

5. FINAL CONSIDERATIONS

The Capital Asset Pricing Model of Sharpe, Lintner and Mossin outlined the way in which academicians and market practitioners relate risk and return of assets. One of the core concepts of this model is that the market portfolio is mean-variance efficient, meaning that, according to Markowitz (1959), for each level of systematic risk the return is maximized. So

the expected return of an asset is a linear function of its systematic risk, which is measured by its beta, and this beta is a complete measure of an asset's risk in an efficient portfolio formation.

Nevertheless, even among those who agree that CAPM is the best available asset pricing model, there is divergence when it comes to the way it should be used to evaluate assets in international markets (KECK et al, 1998).

Indeed, Black et al. (1972) and Fama and Macbeth (1973) found a positive relation between asset returns and betas (systematic risk) in the period before 1969. However, Fama and French (1992) reject this core premise of CAPM when they use a sample of firms from 1963 to 1990. So, additional factors, such as firm size and indicators like Book-to-Market, work as proxies for the risk factors of rationally priced assets.

In order to justify the adoption of a different cost of equity model for a certain market, when compared to another external and completely integrated market, one should believe that they differ in relation to the degree of integration, and that the first presents barriers to foreign investors (KECK et al., 1998). Fuenzalida and Mongrut (2010), Stulz (1999) and Harvey (2005) emphasize that it is possible to draw a parallel between the cost of equity models and the degree of integration in an economy.

Therefore, this paper had the purpose of testing the explanatory power of a series of cost of equity methods on the expected returns of a foreign and diversified investor in the Brazilian market.

So it was tested whether the analyzed methodologies were statistically significant to explain expected returns of assets in the Brazilian market. Moreover, based on the adjusted R^2, the aim was to determine which of such methodologies was the most appropriate to the Brazilian economy throughout the last decade (2004-2013) given its degree of integration with global markets.

In summary, the results of the cross section regressions for each year showed that the four models (Global CAPM, Goldman Sachs, Downside Risk and Local CAPM) are not satisfactory to explain expected returns, as they presented non-significant coefficients and significant intercepts, with a 95% confidence interval.

However, for the whole period, using a larger sample in the panel data regression and the Fixed Effects estimation, it was possible to obtain more robust test statistics, as well as to control the correlation between explanatory variables and non-observed effects. The results of the panel data regression showed that the Downside Risk and Goldman Sachs models have the highest explanatory power (adjusted R^2 equal to 28.6% and 27.9%, respectively) and individually statistically significant coefficient γ_{1t},(market risk) with a 95% confidence interval. In the Goldman Sachs Model, there was evidence to reject the joint null hypothesis $F_{2,550}$ that the coefficients are both equal to 0, with a 90% confidence interval.

The analysis of the Goldman Sachs Model for the whole period does not provide evidence to reject the Capital Asset Pricing Model and the premise that systematic risk is a significant factor to explain expected returns, thus establishing a linear and positive relation between risk and return, in conformity with Fama and Macbeth (1973).

It is important to notice that country risk was not a statistically significant factor to explain expected returns (non-significant coefficient γ_{2t}), thus being added in an *ad hoc* fashion by market practitioners in order to calculate cost of equity using the Goldman Sachs Model.

Nevertheless, the significance of the Downside Risk Model for the whole period suggests that the premium added to systematic risk - and related to the potential for downside that investors try to avoid – is a significant factor to explain expected returns, in accordance with Estrada (2000).

Moreover, by calculating the integration ratios of the local market, based on the works of Errunza and Miller (2000), Bekaert and Harvey (1995) and Bekaert et al. (2002), it is possible to classify the Brazilian economy as being in a stage of partial integration with world markets.

Therefore, by drawing a parallel between degree of economic integration and cost of equity model, in accordance with Pereiro (1999), Estrada (2000) and Fuenzalida and Mongrut (2010), the highest explanatory power of Downside Risk Model for the whole period and, more important, the statistical significance of its coefficient $\gamma_{1,}$ are consistent with the degree of partial integration in the Brazilian economy throughout the last decade.

A suggestion for future studies is to consider a statistical approach regarding the indicators of degree of integration in the Brazilian economy, as in Keck et al. (1998) (this paper deals with this issue only qualitatively) in order to broaden the discussion on cost of equity methods in Brazil given the degree of economic integration with global markets.

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TABLES AND GRAPH

Table 1 – Cost of Equity and Degree of Integration

Cost of Equity Models	Proxy - Market Portfolio	Systematic Risk Measure	References	Degree of Economy Integration
Global CAPM	MSCI World Index	Global Beta	Solnik (1974); Stulz (1995)	Complete Integration
Goldman Sachs Model	S&P 500	Beta relative to S&P500	Mariscal e Lee (1993)	Partial Integration
Downside Risk Model	MSCI World Index	Semistandard deviation with respect to the mean	Estrada (2000)	Partial Integration
Local CAPM	Local Stock Index	Beta relative to local stock index	Sharpe (1964), Lintner (1965) e Mossin (1966)	Segmentation

Source: Author

Table 2 – Tested Hypotheses

Methodology	**Hypotheses**	**t Statistic**	**F Statistic**
Global CAPM, Downside Risk Model, Local CAPM	Null Hypothesis	H_0: $\gamma_1 = 0$	
	Alternative Hypothesis	H_a: $\gamma_1 > 0$	
Goldman Sachs Model	Null Hypothesis	H_0: $\gamma_1 = 0$; $\gamma_2 = 0$	H_0: $\gamma_1 = 0$ e $\gamma_2 = 0$
	Alternative Hypothesis	H_a: $\gamma_1 > 0$; $\gamma_2 > 0$	H_a : H_0 is not true

Source: Author

Sample (Number of Observations)	**47**	**52**	**55**	**54**	**57**	**51**	**57**	**60**	**61**	**59**	**553**
Global CAPM	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2004-2013**
γ1 Global	0,040	0,025	0,001	(0,036)	0,006	(0,012)	(0,017)	0,048	(0,017)	(0,051)	0,009
t Statistic	1,653	1,418	0,088	(4,101)	0,386	(0,490)	(0,730)	**1,835**	(0,874)	(2,134)	1,411
intercept	0,104	0,122	0,168	0,205	0,150	0,141	0,136	0,045	0,145	0,155	0,123
t Statistic	**1,921**	**3,079**	**7,361**	**9,887**	**5,121**	**3,161**	**3,401**	1,031	**4,580**	**4,948**	**10,823**
Adjusted R^2	0,036	0,019	(0,019)	0,230	(0,015)	(0,015)	(0,008)	0,039	(0,004)	0,058	0,278
Goldman Sachs Model	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2004-2013**
γ1 Goldman	0,048	0,029	0,004	(0,029)	0,006	(0,013)	(0,014)	0,047	(0,015)	(0,049)	0,012
t Statistic	**2,168**	**1,873**	0,421	(3,214)	0,512	(0,605)	(0,651)	**1,922**	(0,743)	(1,828)	**2,102**
γ2 Goldman	0,007	0,001	0,001	0,001	(0,000)	(0,000)	0,001	(0,003)	(0,000)	0,000	0,000
t Statistic	1,093	0,259	0,539	1,474	(0,432)	(0,024)	0,788	(2,654)	(0,122)	0,386	(0,538)
intercept	0,078	0,104	0,159	0,197	0,147	0,147	0,139	0,033	0,146	0,152	0,116
t Statistic	1,438	**2,630**	**5,973**	**8,040**	**5,089**	**3,176**	**3,393**	0,787	**4,777**	**4,299**	**10,148**
Adjusted R^2	0,097	0,048	(0,031)	0,164	(0,031)	(0,033)	(0,022)	0,084	(0,011)	0,057	0,280
Downside Risk Model	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2004-2013**
γ1 Downside	(0,022)	(0,002)	0,003	0,001	0,020	(0,018)	(0,016)	(0,009)	0,015	(0,004)	0,005
t Statistic	(1,108)	(0,409)	0,551	0,179	1,520	(0,734)	(1,018)	(0,477)	0,976	(0,347)	**2,674**
intercept	0,252	0,186	0,146	0,131	0,114	0,152	0,142	0,138	0,089	0,107	0,121
t Statistic	**4,053**	**5,420**	**3,240**	**2,920**	**3,419**	**3,279**	**4,004**	**3,390**	**2,628**	**2,81**	**15,687**
Adjusted R^2	0,005	(0,016)	(0,013)	(0,019)	0,023	(0,009)	0,001	(0,013)	(0,001)	(0,015)	0,286
Local CAPM	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2004-2013**
γ1 Local	0,073	0,045	0,021	(0,037)	0,032	(0,005)	(0,036)	0,064	(0,011)	(0,078)	
t Statistic	1,408	1,199	0,653	(1,217)	0,985	(0,112)	(0,927)	1,579	(0,398)	(2,425)	(0,104)
intercept	0,111	0,128	0,150	0,172	0,129	0,125	0,144	0,055	0,131	0,178	0,140
t Statistic	**1,932**	**3,178**	**4,449**	**5,589**	**3,784**	**2,643**	**3,544**	1,246	**4,111**	**4,851**	**7,985**
Adjusted R^2	0,021	0,008	(0,011)	0,009	(0,001)	(0,020)	(0,003)	0,025	(0,014)	0,078	0,274

Table 3 – Panel Data and Cross-Section Regressions
Source: Author

Table 4 –Integration Ratios

	Unit	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Market Capitalization/GDP		0,50	0,54	0,65	1,00	0,36	0,72	0,72	0,50	0,55	0,49
Stocks Traded/GDP		0,14	0,17	0,23	0,43	0,44	0,40	0,42	0,39	0,37	N/A
Exports + Imports/GDP		0,29	0,27	0,26	0,25	0,27	0,22	0,23	0,25	0,27	0,28
Annual Economic Growth Rate	%	5,71%	3,16%	3,96%	6,10%	5,17%	-0,33%	7,53%	2,73%	1,03%	2,49%
Foreign Direct Investment	USD Billion	18,17	15,46	19,38	44,58	50,72	31,48	53,34	71,54	76,11	80,89
FDI Growth (%)			*-16,1%*	*22,6%*	*83,3%*	*12,9%*	*-47,7%*	*52,7%*	*29,3%*	*6,2%*	*6,1%*
Foreign Exchange Rate	BRL/USD	2,93	2,43	2,18	1,95	1,83	2,00	1,76	1,67	1,95	2,16

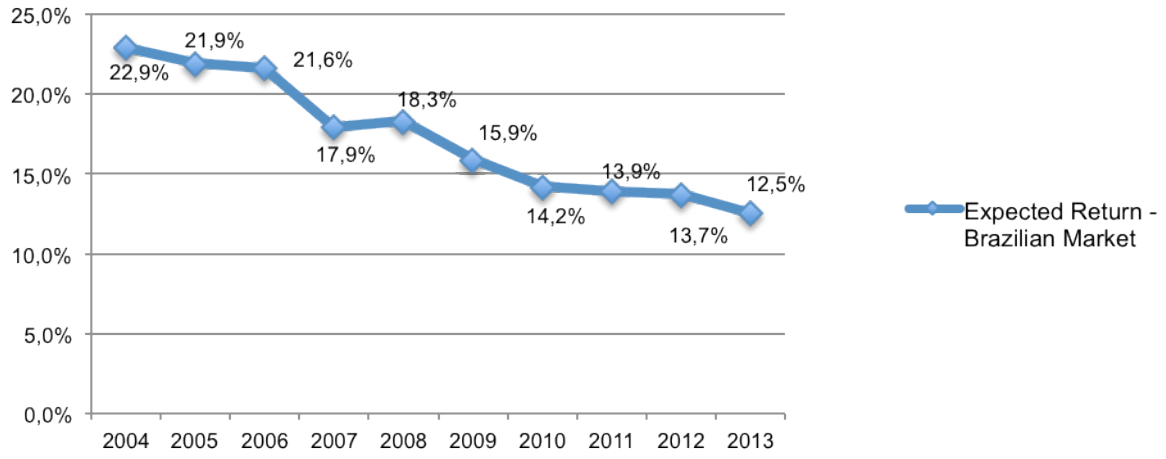
Source: Author

Table 5 – Average Expected Return

Average Expected Return		
2004-2013	2004-2008	2009-2013
17,3%	20,5%	14,0%

Source: Author

Graph 1 – Expected Return in the Brazilian Market



Source: Author