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ABSTRACT

As an approach to determining the degree of integration of the Brazilian economy, this paper seeks to test the explanatory power of the Goldman Sachs Model for the expected returns by a foreign investor in the Brazilian market during the past ten years (2004-2013). Using data for the stocks of 53 of the most actively traded firms at the BM&FBovespa, it begins by testing directly the degree of integration of the Brazilian economy during this period, in an attempt to better understand the context in which the model has been used. In sequence, in an indirect test of the Goldman Sachs model, the risk factor betas (market risk and country risk) of the sample stocks were estimated and a panel regression of expected stock returns on these betas was performed. It was found that country risk is not a statistically significant explanation of expected returns, indicating that it is being added in an *ad hoc* fashion by market practitioners to their cost of equity calculations. Thus, although there is evidence of a positive and significant relationship between systematic risk and return, the results for country risk demonstrate that the Goldman Sachs Model was not a satisfactory explanation of expected returns in the Brazilian market in the past ten years, leading us to question the validity of its application in practice.

Keywords: Goldman Sachs Model; Degree of Market Integration; Country Risk; Systematic Risk.

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1. Introduction

The growth of emerging financial markets in Asia and Latin American, which has attracted the interest of international investors, has affected the analysis of a specific country's risk and the choice of methodology in the computation of discount rates for asset valuation purposes.

In the last few years, the rapid economic growth in the BRICS countries (Brazil, Russia, India, China, and South Africa) has dwarfed some of their structural disequilibria. The FED's decision to reduce bond purchases gradually, thereby diminishing the available liquidity in global markets has introduced even greater concerns as to the economic fundamentals of major emerging markets, contributing to an increase in the uncertainties faced by investments in such markets.

For most US multinationals, the conventional practice, when determining required rates of return on investments abroad consists in adding a country risk premium to the cost of equity used for domestic investment purposes. However, such a practice may result in the overestimation of the cost of equity and, as a result, the rejection of international investment opportunities (PETTIT et al., 1999).

Even among those who agree that the Sharpe-Lintner-Mossin CAPM is the best asset pricing model available, there is disagreement as to how it should be used in asset valuation in international markets (KECK et al., 1998).

In fact, Keck et al. (1998) show that, with facing greater uncertainty, investors tend to resort to heuristic valuation procedures, by adding premiums to the discount rate for political, credit and currency risks in the target countries.

In addition, investors tend to adjust their valuation methodology as a function of their perception of how much the particular market is integrated into the world market (KECK et al., 1998). Fuenzalida and Mongrut (2010), Stulz (1999) and Harvey (2005) emphasize that it is possible to construct a parallel between cost-of-equity computation methods and a market's degree of integration.

For fully integrated markets, for example, Stulz (1999) argues that firms should adopt a discount rate treating them as part of world stock portfolio. Global portfolio

diversification would then lead to risk reduction and hence to the lowering of required returns.

However, investors in markets not fully integrated would have their diversification possibilities reduced. For Mishra and O'Brien (2001), asset pricing models in emerging markets divide risks in such markets into two components: a systematic risk component, capture by asset betas, and a non-systematic risk component, whose inclusion in such models is subject to much debate. If markets were fully integrated, for example, country risk would be irrelevant in the estimation of the cost of equity, since it could be eliminated via diversification (HARVEY, 2005).

In view of the growing presence of foreign investors in Brazil and the controversy regarding the computation of discount rates, the paper's objective is to test a model for the estimation of the cost of equity from the viewpoint of a diversified international investor in the Brazilian market.

We test the so-called Goldman Sachs model, developed by Mariscal and Lee (1993), that reflects two aspects widely contemplated by financial market practitioners when overseas investment is involved, according to Keck et al. (1998) and Harvey (2005): the use of integrated market proxies, usually the US market, and the ad hoc addition of premiums for risks that are specific to the markets in which the investments are made.

In addition, the paper examines the degree of integration of the Brazilian market in the 2004-2013 period, as a reflection of the context in which international investors have used the Goldman Sachs model when estimating discount rates.

In the next section, we review the literature on market integration and methodologies for estimating required returns and how they account for market integration and segmentation.

2. Review of Literature

2.1. Market integration

In integrated financial markets, home investors can freely invest in foreign assets, and international investors can invest in domestic assets (BEKAERT et al., 2003). Hence,

assets with identical risks (involving, for example, cash flow and leverage characteristics) would command identical expected returns, regardless of the market in which they are traded.

With the opening up of several emerging markets starting in the 1980's, the interest in the effects of capital market integration on the economy as a whole has expanded.

In an integrated market, an asset's expected returns can be explained by the covariance with world market returns (BEKAERT et al. 2002). However, in a segmented or partially integrated market, the covariance with a global factor may have low explanatory power for expected returns (BEKAERT and HARVEY, 1995).

According to Bekaert et al. (2002), Henry (2002), Bekaert and Harvey (1995), and Errunza and Miller (2000), when an economy moves from a segmented market regime to that of an integrated market, expected returns, return volatilities and correlations with major global market indices are affected in that economy, and it is apparent that market integration is key to the present discussion.

Henry (2002) observes that a country's market index, when the economy is in a process of liberalization, achieves abnormal returns of approximately 3.3% on a monthly basis (in real US dollar terms) for eight months since the inception of liberalizing policies. This result is consistent with Global CAPM assumptions, where it is assumed that liberalization policies help to lower the cost of equity level in a given country, since international risk diversification now becomes possible (STULZ, 1999).

Bekaert et al. (2002) discusses the effects of financial market integration using a broad set of macroeconomic indicators. Using data for 20 liberalizing emerging markets, the authors classify their variables into five groups: (a) changes in dividend yields; (b) market liquidity (measured by the ratio between market capitalization and GDP); (c) capital inflows (measured by the flow of US investments divided by total market capitalization); (d) stock dispersion in a particular market and correlation with world markets; and (e) local economic environment (volatility of exchange and inflation rates and the ratio between exports, imports to GDP). The authors conclude that integration is accompanied by an expanding and more liquid capital market, in addition to an increase in return volatility and in correlations with global markets.

Errunza and Miller (2000), Bekaert and Harvey (1999), Bekaert et al. (2002) and Henry (2002) state that increased integration leads to a reduction in the cost of equity, an improvement in the country's credit rating, as well as currency appreciation and economic growth thanks to increasing investment.

Concerning the cost of equity, Bekaert et al. (2002) and Stulz (1995) posit that, once access is given to foreign investors to the local market, portfolio diversification opportunities produce higher domestic asset prices, that is, lower expected returns.

It should be pointed out, however, that many factors may be compatible with a market's liberalization process, without leading to the effective and immediate integration of a country's economy. Bekaert et al. (2002), for example, indicate that economic growth or currency appreciation, usually mentioned as the consequence of higher market integration, are not always the consequence of liberalization measures. This complicates controlling for the variables with which one assesses a market's degree of integration.

2.2. Testing for market integration

According to Solnik (1974), six main factors can cause market segmentation: (a) legal and regulatory constraints; (b) transactions costs; (c) discriminatory taxation; (d) political risk; (e) psychological barriers; and (f) foreign exchange risks. However, Keck et al. (1998) point out that, for one to state that a market is integrated it is not sufficient to observe the above enumerated factors.

Such factors may cause a given market to become riskier, but do not necessarily require a multifactor model for the cost of equity, or even a new single factor model. Keck et al. (1998) argue that a revision in the cost of equity model would be justified only if the same risk were priced differently, or if different risks were priced.

The adoption of a distinct model for a particular national market, in contrast with an international and fully integrated market would have to be justified by how much they differ in terms of their integration to the world market, possibly because the particular national market imposes barriers to investment by foreigners (KECK et al. 1998).

Assuming that the Global CAPM were a model describing precisely how assets are priced in the world market, the expected risk premium in a global stock portfolio would

be identical for all investors, regardless of where they happened to be located geographically.

As a matter of fact, Stulz (1999) argues that the Global CAPM should be used for computing assets' capitalization rates, since in most markets the cost of equity is globally, and not locally determined.

However, Keck et al. (1998) argue that two hypothetical firms, with identical products, cash flows and capital structures, but located in different national markets, one fully integrated and the other partially integrated to the global economy, should have different expected returns.

The firm based in the partially integrated market, from an international investor's viewpoint, faces a risk pricing process which is distinct from that faced by the firm based in the fully integrated market. Thus, when once compares the expected returns for the two firms, their cost of equity models should be as follows.

For the firm located in a fully integrated market (*Home* market):

$$E(r_H) = r_f + (b_{HL} \times b_{LhG}) [E(r_G) - r_f] \quad (1)$$

where b_{HL} is the slope of the regression of the integrated firm's returns against the returns on its home country's index; in turn, b_{LhG} is the slope of the regression of the fully integrated market's index against the returns on a global market index.

For the firm located in a partially integrated market (*Away* market):

$$E(r_A) = r_f + (b_{AL} \times b_{LaG}) [E(r_G) - r_f] \quad (2)$$

where b_{AL} is the slope of the regression of the partially integrated firm's returns against the returns on its own local market index, whereas b_{LaG} is the slope of the regression of the local market index returns against those of the global market index.

If both markets were fully integrated into the world market, the expected returns for both firms would be identical, so that $(b_{HL} \times b_{LhG})$ would be equal to $(b_{AL} \times b_{LaG})$ (STULZ, 1999). For the firm located in the *Away* market, when it is not fully integrated, the cost of equity would be given by:

$$E(r_A) = r_f + (b_{AL} \times b_{LaG} + b_a) [E(r_G) - r_f] \quad (3)$$

with b_a indicating incremental risk, according to Keck et al. (1998), associated with the fraction of the Away market's returns that covary with the global market, but not with the local market. Thus, risk in such a market is priced differently, from the international investor's viewpoint.

2.3. Cost of equity and market integration

Asset pricing models may be classified into three main categories: segmented, fully integrated, and partially integrated markets (BEKAERT and HARVEY, 1995). According to Pereiro (1999), Stulz (1999) and Fuenzalida and Mongrut (2010), it is possible to associate cost-of-equity estimation methods and a market's degree of integration.

Table 1 illustrates the methods in the present paper, and expanded upon in the next subsection, with emphasis on the Goldman Sachs model.

Table 1 – Cost of Equity and Market Integration.

Cost of equity estimation method	Market portfolio proxy	Systematic risk measure	References	Degree of market integration
Global CAPM	MSCI World Index	Global beta	Solnik (1974); Stulz (1995)	Fully integrated
Goldman Sachs model	S&P 500	S&P 500 beta	Mariscal and Lee (1993)	Partially integrated
Downside Risk model	MSCI World Index	Semi standard deviation	Estrada (2000)	Partially integrated
Local CAPM	Local market index	Local index beta	Sharpe (1964); Lintner (1965); Mossin (1966)	Segmented

In the Goldman Sachs model, the country risk premium is added in an ad hoc manner to the risk free rate. In the Downside Risk model, the downside investors are averse to is

priced in the estimation of the beta coefficient, as an added premium to that for systematic risk.

Table 1 shows that, as pointed out by Keck et al. (1998), with greater uncertainty and market complexity in markets not fully integrated investors tend to resort to multifactor models, such as the Goldman Sachs version, and to the addition of ad hoc risk premiums.

2.4. Cost-of-equity estimation methods

The basic approach to estimating the cost of equity is the CAPM developed by Sharpe (1964), Lintner (1965) and Mossin (1966). It says that an asset's expected return is a linear function of the risk free rate, the asset's systematic risk and the market portfolio's risk premium. The CAPM characterizes the asset's systematic risk as its contribution (beta) to the variance of returns on a diversified market portfolio.

Black et al. (1972) and Fama and MacBeth (1973) find, as predicted by the CAPM, that stock returns and their betas are positively associated in the pre-1969 period.

However, later tests of the CAPM lead to questioning the model's applicability. Fama and French (1992) find that the positive association between betas and expected returns disappears in the 1963-1990 period. In contrast, they find significant association between returns and size, leverage, earnings/price and book-to-market ratio.

Similarly, Harvey (1995) does not find a significant association between returns and betas measured against a global portfolio for over 800 firms in 20 emerging markets. This would be explained by the lack of integration of those markets into the global economy, making it unfeasible the use of a global beta, or by the assumption that betas are constant over time, or by the fact that emerging markets are more susceptible to local than to global factors. This is evidence that asset pricing models that are predicated on full market integration would not be able to explain expected returns in partially integrated markets (HARVEY, 1995).

This leads to the discussion of four cost-of-equity estimation methods that are widely used, according to Harvey (2005), for the purpose of investment analysis in emerging markets from an international investor's viewpoint.

2.4.1. Global CAPM

In contrast with Harvey (1995), Pereiro (1999) argues that the increasing integration and free intermarket capital flows have allowed investors from any part of the world to enter and exit any given market at minimal transactions costs.

Stulz (1999) argues the removal of barriers to the free flow of capital leads to lower risk premiums in emerging markets, since risks can now be globally diversified.

In reality, emerging markets, such as those in South America, have undergone significant development as a result of liberalization programs that have encouraged international investment (STULZ, 1999).

Hence, for the firms with access to the global stock market, the use of the Sharpe-Lintner-Mossin CAPM that presumes market segmentation (BEKAERT and HARVEY, 1995) will tend to overestimate the cost of equity, since diversifiable risks in a local market investment could now be diversified internationally (STULZ, 1999).

Thus, Stulz (1999) proposes a Global CAPM approach, in which any investment is part of a global portfolio, using a global market index such as the MSCI World Index as a proxy for the market portfolio.

Global CAPM, originally proposed by Solnik (1974), assumes that investors from different integrated countries have the same consumption baskets, implying the validity of Purchasing Power Parity (FUENZALIDA and MONGRUT, 2010). In integrated economies, therefore, there would be no reason for the use of models other than Global CAPM (KECK et al., 1998).

2.4.2. Goldman Sachs model

According to Harvey (1995), when Global CAPM is used for stocks in emerging markets, and a regression is run against the global market proxy, such as the MSCI World Index, betas are negative or close to zero.

Given the low correlations between many emerging markets and developed markets, in

addition to the preponderance of local factors as explanations for expected returns, Harvey (1995) states that Global CAPM should not be used when investments in not fully integrated markets are contemplated.

Harvey (1995) emphasizes that, when one uses an asset pricing method based on the Global CAPM, as in Stulz (1999), one is assuming that the market examined is fully integrated into the world market. The rejection of such a global model, therefore, is explained by the failure of the full market integration assumption.

One adaptation that is widely used by many investment banks and consulting firms is the Goldman Sachs Model, developed by Mariscal and Lee (1993). It is one of the first models to assume partial market integration, especially in emerging markets (FUENZALIDA and MONGRUT, 2010).

In the Goldman Sachs model, a regression is run between stock returns and returns on the S&P 500. The beta thus estimated is multiplied by the risk premium on the S&P 500 index. Finally, a country risk premium is added, in an ad hoc fashion, to correct for an extremely low cost of equity. Such a premium is based on the Emerging Markets Bond Index Plus (EMBI+), computed by JP Morgan, measuring the spread between yields on sovereign debt instruments issued by the country of interest, traded overseas, and yields on US Treasury securities with similar time to maturity (ZENNER et al. 2008).

However, a few problems have been encountered with the use of the Goldman Sachs model. As pointed out in Harvey (1995) and Fuenzalida and Mongrut (2010), the method lacks theoretical foundations, since one of the results of the Sharpe-Lintner-Mossin CAPM is that beta is the complete measure of risk for an asset priced as part of an efficient portfolio. Hence, no additional risk measure should be considered (FAMA and MacBETH, 1973).

2.4.3. Downside Risk model

In view of the difficulties faced by the cost-of-equity estimation methods for determining the relevant risk factors for stocks in emerging and not fully integrated markets, Estrada (2000) has obtained strong evidence for the correlation of downside risk measures with stock returns.

Modern Portfolio Theory represents a portfolio's total risk by the standard deviation of

returns. This fails to separate upside from downside fluctuations (ESTRADA, 2002). Using a sample of assets from 28 countries included in the MSCI World Index, Estrada (2000) tests the significance of several risk measures as predictors of expected returns, such as standard deviation (total risk), beta (systematic risk), and semi-standard deviation of returns (downside risk).

As in Harvey (1995), Estrada (2000) concludes that global betas, commonly used for integrated economies, have no significant explanatory power for stock expected returns in emerging markets, indicating that such markets are not fully integrated, as well as the omission of relevant variables. However, downside risk measures, particularly the ratio between semi-standard deviation of stock returns and semi-standard deviation of market index returns have significant explanatory power for returns in emerging markets.

The Downside Risk model uses a global market proxy, multiplied by a parameter defined as the ratio between the semi-standard deviation of an asset's returns and the semi-standard deviation of market returns. Thus, such a parameter, in addition to accounting for systematic risk, also incorporates an added premium that depends on the downside return volatility.

In consonance with the results in Estrada (2000), Estrada (2002) states that the cost of equity based on downside risk is somewhere between the values obtained with the Global CAPM (usually lower, given the investor's diversification possibilities) and those obtained using total risk, as measured by standard deviation.

2.4.4. Local CAPM

According to Fama and MacBeth (1973) and Sanvicente (2014), the Sharpe-Lintner-Mossin model presupposes the use of a single risk factor in the determination of an asset's expected returns, which is proportional to the quantity of non-diversifiable (beta) risk of the asset.

Thus, the inclusion of any premium beyond that of the market portfolio would be an ad hoc procedure without theoretical basis. Fama and MacBeth (1973), for example, determined that risk measures other than beta do not contribute to the construction of an efficient portfolio.

Sanvicente (2014) tested the significance of country risk for observed returns, using a sample of 204 firms in the Brazilian market. Observing that the performance of the local proxy for the market portfolio is already affected by country risk, the addition of a country risk premium would then be unnecessary, a result that would provide support for the use of Local CAPM when assessing the cost of equity in Brazil, even from the viewpoint of international investors.

Sanvicente (2008) states that, in a scenario in which the local stock market is strongly affected by the world market and the perception of risk that international investors have regarding a particular country, the effect of variables such as country risk would already be reflected in the local market portfolio.

2.5. Asset expected returns

Usually, one estimates a firm's value by observing the return an investor expects in the form of both dividend payments and capital gains (BODIE et al., 2009).

At the same time, a stock's intrinsic value may be defined by the present value of all payments to the investor, including dividends and terminal selling price, discounted at a risk-adjusted interest rate. In equilibrium, current market price would reflect intrinsic value estimates (SANVICENTE and CARVALHO, 2013).

Assuming that dividends grow perpetually at a constant rate, the stock price may be written as:

$$P = D_0(1 + g)/(r - g) \quad (4)$$

Where:

$D_1 = D_0(1 + g)$ = next period's expected dividend

r = rate of return required by the investor

g = rate of growth of dividends

Proposed by Gordon (1959), the formula is known as Constant Growth Discounted

Dividend Model, that allows us to extract the stock's required rate of return from a security traded at its intrinsic value as:

$$r = (D_1/P) + g = \text{dividend yield} + \text{expected dividend (and earnings) growth}$$

Fama and French (2002) favor the use of dividend and expected growth fundamentals in the estimation of expected returns, as opposed to the use of average historical returns as a proxy for expected returns, adding that the standard deviation of expected market risk premiums obtained with the Discounted Dividend Model is less than half the standard deviation resulting from the use of historical returns.

Elton (1999) claims that the use of historical returns as a proxy for expected returns is based on the belief that informational surprises that are capable of altering expectations would tend to cancel each other over time and, therefore, average historical returns would be an unbiased estimate of expected returns. However, he shows that, with the possibility of large and persistent surprises, an inertial effect may result. Their cumulative effect could be sufficiently large to invalidate the use of historical returns as proxies for expected returns.

2.6. Use of Cost of Equity Estimation Methods in Brazil

According to Keck et al. (1998), global market integration implies that investors, be they local or international, should use Global CAPM to estimate the cost of equity. For those investors in relatively segmented markets, however, the use of Local CAPM would be justified.

However, even professionals that adopt the Sharpe-Lintner-Mossin version of the CAPM differ in their approach when dealing with overseas investments.

In a survey involving 2,700 University of Chicago students, Keck et al. (1998) indicate that increasing market uncertainty and complexity leads investors to resort to heuristic procedures when valuing their investments, such as, for example, the choice of discount rate estimation method as a function of their perception how integrated the market is.

Contrasting with one of the central results of the CAPM, that beta is sufficient for pricing an asset's risks, most survey respondents say that they use multifactor models,

adding political, credit and currency exchange risk premiums to the discount rate. The uncertainty associated with a perception of less than complete market integration, in certain instances, also led to the use of global market proxies, to the detriment of local market indexes.

In Brazil, cost of equity estimation follows the same trend observed by Keck et al. (1998). Sanvicente (2014) informs that an examination of valuation reports in going private offers from 2008 to 2013 indicates that analysis use the yields on long-term US Treasury securities as a proxy for the risk free rate. As to the market risk premium, the common practice is to use the averages of historical returns over long time series as a proxy for market portfolio returns. The preferred choice is for the S&P 500, with the argument that local market series are not long enough.

In addition, in all reports an adjustment is made for country risk, using, in over 50% of the cases, the EMBI+ published by JP Morgan (SANVICENTE, 2014).

The results in Sanvicente (2014), as in Keck et al. (1998) and Harvey (2005), are evidence of the use of heuristic procedures when there is greater uncertainty and complexity involving the emerging market invested in.

3. Methodology

The present paper initially determines the level of integration of the Brazilian market in the 2004-2013 period, with the help of the Keck et al. (1998) methodology. Subsequently, the paper tests the Goldman Sachs model in terms of its prediction of how expected returns are determined. Both the full period (2004-2013) and two five-year sub-periods (2004-2008 and 2009-2013) are considered.

Elton et al. (2006) state that, even though there exist methods to test the CAPM and other expected return models empirically, more robust tests involve a two-stage procedure. In the first stage, time series regressions are used for estimating betas for the various risk factors contemplated; the second stage consists in using such estimated betas as predictors in cross section regressions.

Therefore, in accordance with Harris et al. (2003) and Elton et al. (2006), the paper first calculates betas for the risk factors considered, and then regresses expected returns against the first-stage betas.

Expected returns, as in Fama and French (2002), Sanvicente and Minardi (1999) and Harris et al. (2003), are computed with the Discounted Dividend Model.

3.1. Data sources

In the present paper, the following data were used:

- a) Monthly log returns of all stocks included in the IBrX 100 index, from December 1999 to December 2003.
- b) Annual dividends, in US dollars, as well as return on equity and payout ratios for all stocks included in the IBrX100 index, for the 2004-2013 period, as required by the calculation of expected returns according to the Dividend Discount Model.
- c) Monthly yields to maturity of 10-year US Treasury Bonds, as a proxy for the risk free rate faced by international investors in emerging markets, as in Harris et al., 2003.
- d) Monthly values of EMBI+ Brazil, as proxy for the country's default risk on its sovereign debt.
- e) Monthly returns on the S&P500, as a proxy for the market portfolio in the Goldman Sachs model, from December 1999 to December 2013.
- f) Monthly returns on the MSCI World Index, as a proxy for the global market portfolio, also for the period from December 1999 to December 2013.
- g) Monthly returns on the IBrX 100, as a proxy for the local market portfolio, used in the market integration tests, and also from December 1999 to December 2013.

Stock prices were collected in the Economática database, converted into US dollars and adjusted for dividends and stock splits. Annualized dividends, as well as values for return on equity and payout ratios were obtained in the IQ Capital Markets database.

Yields to maturity for 10-year US Treasury Bonds and the historical series for the S&P500, MSCI World, EMBI+ Brazil and the IBrX 100 indexes were provided by Bloomberg.

3.2. Sample selection

The list of stocks considered in each year was defined according to the composition of IBrX 100 portfolio as of January of each year. The portfolio is rebalanced once a year as a function of each stock's liquidity and the market capitalization of its free float.

The choice of the IBrX 100 index, instead of the Ibovespa, was based on the fact that in the former, market capitalization is used as a source of stock weights in the portfolio, instead of its share in total trading volume.

3.3. Exclusion criteria

The initial sample was adjusted for certain criteria:

- a) Firms for which dividend, return on equity or payout ratio data were not available in a given year, were excluded from that year's sample data.
- b) Stocks without complete 12-month price series for a particular year were excluded from that year's sample data.
- c) Stocks with less than 36 months of historical price series were ignored, since beta estimation required the use of at least 36 months of price data.

The effect was the reduction to the use of data for 55 firms, on average, over the 10-year period. The total number of observations was 553 firm-years.

3.4. Market integration test

The test proposed by Keck et al. (1998) identifies the incremental risk, interpreted as a proxy for market integration, on the basis of the regression betas in two distinct

scenarios: in the first scenario, it is assumed that a particular firm is located in an integrated market, and in the second one used the market in which it is in fact located (Brazil, in this case).

The proxy chosen for an integrated market was the United States, and the market portfolio was represented by the S&P 500. For Brazil, the market proxy was the IBrX 100 index.

Finally, for a global market portfolio, the proxy used was the MSCI World Index.

Given the sample selection procedure for each year, betas were first estimated, with historical excess returns over a 60-month period, provided at least 36 months were available. Thus, two betas are calculated for each firm: one for the integrated market (US), and the other for the Brazilian market.

The incremental risk measure (b_a), proposed by Keck et al. (1998), was assessed for each sample year and for the full 2004-2013 period, resulting in annual and full-period averages. For each of those results a one-tail test of the null hypothesis of a zero mean was performed, against the alternative hypothesis that the incremental risk measure is positive, indicating less than full integration of the Brazilian market.

3.5. Test of the Goldman Sachs model

Initially, stocks' excess returns were regressed against S&P 500 excess returns and the EMBI+ Brazil series to obtain estimates for betas according to the Goldman Sachs model, for each year. Each regression used the previous 60 months of data, when available.

Subsequently, the estimated betas were used as explanatory variables in panel data regressions. Since data were not available for all sample firms in every year, an unbalanced panel was used.² The analysis was performed for three periods: 2004-2013 (the full sample period), 2004-2008, 2009-2013, in an attempt to determine the impact of the 2008-2009 financial crisis on the relevance of the Goldman Sachs model.

² Since the sample size in each year was not large enough, individual stock betas were used, and not portfolios, as was the case in Harris et al. (2003). According to Claessens et al. (1995), the use of panel data and estimation with the fixed effects model, because the data are centered around their means, tends to attenuate the estimation bias caused by the use of individual stocks.

Panel data estimation was chosen in order to account for the possibility of correlation between regressors and the error term. According to Wooldridge (2008), that possibility, if not dealt with adequately, would lead to the use of an inconsistent estimator. The principal causes are: (a) omitted variables, that is, the omission of variables that are correlated with the regressors and the dependent variable; (b) errors-in-variables problems: it is possible that, since a variable of interest is not observable, one ends using an imperfect measure that is not correlated with the response variable, and may even be correlated with the error term; (c) simultaneity: regressors and response variables may be simultaneously determined.

The use of panel data, is an attempt to deal with such issues. Two main approaches are available: (a) fixed effects; (b) random effects. The fixed effects approach is based on the transformation of the original data into values around their corresponding means, in order to eliminate unobserved effects before the estimation. In turn, the random effects model is appropriate when the unobserved effect is uncorrelated with all explanatory variables.

According to Wooldridge (2008), the random effect specification treats specific individual effects as random variables, and also allow for the inclusion of explanatory variables that are constant over time, in contrast with the fixed effects specification.

The choice between the two specifications is done with tests of whether there are significant differences involving the explanatory variables that change over time (WOOLDRIDGE, 2008). The Hausman test is used, for which the null hypothesis is the random effects model.

Rejection of the null in the Hausman test indicates that the main assumption of the random effects model, that is, that the unobserved effect is not correlated with the explanatory variables is not true. This means that the fixed effects estimator should be used. However, even when the Hausman test fails to reject the null hypothesis, it is possible to use the fixed effects model. In this case, the estimator is consistent, but it is less efficient than the random effects estimator.

3.6. Estimation of stock expected returns

As in Sanvicente and Minardi (1999), Harris et al. (2003), and Fama and French (2002), each stock's annual expected return was calculated with the Discounted Dividend Model. Expected growth rates in dividends were estimated by multiplying return on equity and earnings retention rates.

4. Expected Results

In this paper, we attempt to answer the following question:

Given the degree of integration of the Brazilian economy in the last 10 years, is the Goldman Sachs model relevant for the explanation of expected returns in the local market from the viewpoint of an international investor?

As pointed out in Pereiro (1999), Estrada (2000), Stulz (1999) and Fuenzalida and Mongrut (2010), it is possible to link cost-of-equity estimation methods and the degree of integration of a particular market. The Goldman Sachs model, as discussed in Pereiro (1999) and Harvey (2005), was constructed for the context of a partially integrated economy. A rejection of the model may be a reflection, for example, of the rejection of the assumption of partial integration of the Brazilian market over the 10-year period.

Hence, our first approach is to determine how integrated the Brazilian economy was during the 10-year period (2004-2013), using the incremental risk measure described in Keck et al. (1998).

In the second, two-stage approach, in which we regress expected returns against betas for market risk and country risk, the expected result is that the intercept be equal to zero, and that the slope coefficients are positive and statistically significant, both individually (through t tests) and collectively (through an F test). In other words, it is expected that there is a positive association between expected returns and market and country risk over the period under analysis.

5. Results Obtained

5.1. Incremental risk

Using the methodology described in Keck et al. (1998), incremental risk was calculated for each sample firm in each year. It should be recalled that incremental risk was estimated by the difference between the betas calculated for each sample firm, in two different markets: the US, integrated market, and the Brazilian market, for which the degree of integration is being assessed. The averages of the incremental risk measure were calculated across firms for each sample year and for the full period. The corresponding descriptive statistics are presented in Table 2, for the full 10-year period.

Table 2: Descriptive statistics: incremental risk (2004-2013).

Statistic	Value
Average	-0,003
Standard error	0,03
Median	0,01
Standard deviation	0,71
Variance	0,51
Kurtosis	49,96
Skewness	-5,00
Range	11,76
Minimum	-7,59
Maximum	4,17
Number of observations	553

Table 3 displays the sample averages obtained for incremental risk in each of the sample years, as well as the results of t-tests for the null hypothesis of full integration (incremental risk measure equal to zero, against the alternative of partial integration, under which the risk measure would be positive). This one-tail test is done at the 5% level, for which the critical t-value is approximately equal to 1.67.

Table 3: Test of integration with annual incremental risk measures, 2004-2013

Period	Average incremental risk	Degrees of freedom	t-statistic
2004-2013	-0,03	552	-0,94
2004	-0,07	46	-1,62
2005	0,06	52	2,43
2006	-0,15	54	-0,80
2007	-0,13	54	-0,60
2008	0,25	56	4,98
2009	0,10	50	4,30
2010	-0,01	56	-0,48
2011	-0,03	59	-0,95
2012	-0,05	60	-1,13
2013	-0,24	58	-4,32

The results indicate that, for the full period, there is no evidence for rejecting the null hypothesis of full integration. When examined on an annual basis, it is observed that the same result is obtained for 7 of the 10 years, with rejection clearly occurring in the 2008-2009 period encompassing the financial crisis.

5.2. Test of the Goldman Sachs model

For testing purposes, the following specification was used:

$$R_{it} = \gamma_0 + \gamma_1\beta_{1it} + \gamma_2\beta_{2it} + \eta_{it} \quad (5)$$

Where:

R_{it} = excess expected returns for stock i in year t .

β_{1it} = estimated beta for market risk, for stock i in year t , by multiple regression of past observed excess returns against excess returns on the market index (the S&P 500) and the country risk indicator (EMBI+ Brazil).

β_{2it} = estimated beta for country risk, for stock I in year t, resulting from the same multiple regression with the stock's excess expected returns, the excess returns on the proxy for the market portfolio (the S&P 500), and the country risk index.

The necessary calculation of expected returns for individual stock using the Discounted Dividend Model, which are used as the dependent variable in regression equation (5), generated the following results over the 2004-2013 period.

Figure 1: Average stock expected returns in the Brazilian market, 2004-2013.

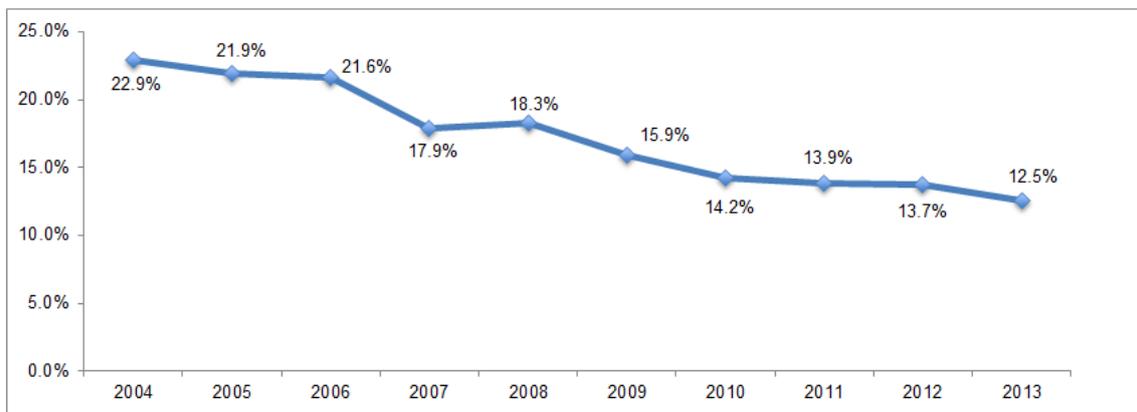


Figure 1 indicates that, over the period, there was a reduction in the average cost of equity in the Brazilian market, with the exception of a slight increase in 2008, as would be expected as a reflection of the financial crisis. As was pointed out in the review of literature, a reduction in cost of equity, equivalent to an increase in security prices, accompanies an increase in a particular market's integration into the world market.

The Goldman Sachs model will be validated if (a) we cannot reject the null hypothesis that γ_0 is equal to zero; (b) we reject the null hypotheses that γ_1 and γ_2 are equal to zero, against the alternative that they are positive. In particular, we are interested in the significance of the country risk premium (positive γ_2), since this is how the Goldman Sachs model differs from both Global and Local CAPM. Table 4 summarizes the hypotheses involved in our tests.

Table 4: Hypotheses being tested.

Hypotheses	t test	F test
Null	$H_0: \gamma_1 = 0; \gamma_2 = 0$	$H_0: \gamma_1 \text{ and } \gamma_2 = 0$
Alternative	$H_1: \gamma_1 > 0; \gamma_2 > 0$	$H_1: H_0 \text{ is not true}$

5.2.1. Results for the full period (2004-2013)

Although the Hausman test did not lead to the rejection of the null hypothesis that the random effects model would be appropriate (chi-square = 2.7554, p-value = 0.2522), equation (5) was estimated with the fixed effects model. According to Wooldridge (2008), the assumption that unobserved effects are uncorrelated with the explanatory variables is an exception to the rule, and for this reason the fixed effects model is widely used. In addition, for time-varying explanatory variables, the random effects model is recommended only when the sample is randomly selected. This is not the case in the present paper, in which, for every year, the stocks selected were those included in the IBrX 100 index. Still, even when the Hausman test does not reject the null hypothesis, the fixed effects estimator is still consistent.

Robust standard errors were used, and Table 5 presents the results for the full period.

Table 5: Panel data regression with fixed effects, 2004-2013. Dependent variable: individual expected stock returns (t statistics in parentheses).

γ_0	γ_1	γ_2
0,1156	0,0120	-0,0002
(10,148)	(2,102)	(-0,538)
$R^2 = 0,4339$ F-statistic = 2,8185 p (F statistic) = 0,0000 Total observations = 553		

The results displayed in Table 5 indicate that: (a) the significant intercept may indicate that additional factors would be required for explaining expected returns, or that the risk free rate is not adequately measured, as in Fama and MacBeth (1973); (b) the

hypothesis that market risk is relevant is not rejected, there being a positive market risk premium in expected returns; (c) the main contribution of the Goldman Sachs model, with the inclusion of a country risk premium, does not seem to be appropriate, since no significant premium was detected. As pointed out by Harvey (2005), in a fully integrated market, as the results of our tests on incremental risk seem to indicate is the Brazilian case, country risk premium would be irrelevant, since it could be diversified away.

5.2.2. Results for the 2004-2008 and 2009-2013 sub-periods

In an attempt to ascertain the impact of the 2008-2009 financial crisis, we analyze our data for two 5-year sub-periods, before and during the financial crisis versus after the crisis.

Table 6 displays the results obtained for the two sub-periods.

Table 6: Panel data regression with fixed effects, 2004-2008 and 2009-2013. Dependent variable: individual expected stock returns (t statistics in parentheses).

a) 2004-2008

γ_0	γ_1	γ_2
0,1714	-0,0018	-0,0012
(9,773)	(-0,234)	(-1,217)
$R^2 = 0,5417$ F-statistic = 2,6701 p (F statistic) = 0,0000 Total observations = 265		

b) 2009-2013

γ_0	γ_1	γ_2
0,0651	0,0295	-0,0013

(2,487)	(1,781)	(-2,071)
$R^2 = 0,6254$ F-statistic = 3,7136 p (F statistic) = 0,0000 Total observations = 288		

The sub-period results show that the support for rejecting the null of no market risk premium is basically found in the 2009-2013 period. The results for the relevance of a country risk premium, if anything, are even more unfavorable in the latter period.

6. Concluding Remarks

This paper is concerned with determining the appropriateness of the widely used Goldman Sachs model for the setting of expected returns in the Brazilian market. Since the model is predicated on the assumption that such a market is not fully integrated to the world market, it includes a premium for country risk. That type of risk would be diversifiable, hence, not priced, if the market were fully integrated.

In addition to testing the model's implication that the country risk premium is positive and significant, in addition to a premium for market risk proxied by an international index, to reflect how the model is used in practice, the paper tests the significance of a direct measure of market integration, as developed by Keck et al. (1998).

In contrast with previous attempts at testing some version of the CAPM, such as Fama and French (1992), this paper uses expected excess returns implicit in current stock market prices.

Both analyses, using annual data for more than 50 firms in the Brazilian market over the 2004-2013 period, lead to negative conclusions regarding the relevance of the Goldman Sachs model. If anything, the results point to the validity of using the S&P 500 index as a proxy for market risk in integrated markets. The results also indicate that the estimated intercept in our version of a two-factor model is positive and significant, indicating the need for including other risk factors – possibly those empirically determined by Fama and French (1992) – for Brazilian stocks, an avenue for future study.

Finally, competing explanations, such as Global CAPM and Local CAPM could also be considered. Since both the S&P500 and the local market index (the Ibovespa) are highly correlated with the MSCI World Index, it is likely that both would be appropriate predictors of expected Brazilian stock returns. It is at least clear that the Brazilian market is sufficiently integrated in order to render the use of the Goldman Sachs invalid.

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