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Financial Integration and the Cost of Capital: A Study of the Brazilian Equity Market

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Abstract

This study analyzes the effect of financial integration on the cost of equity capital of Brazilian listed firms. According to the relevant literature, foreign capital flows are expected to increase stock returns, the so-called revaluation effect. For standard valuation models, higher stock prices imply a lower cost of equity capital, as expected returns fall as stock prices rise. Two analyses are conducted: first, a statistical analysis based on a partial general equilibrium model as suggested by Henry (2003) and Stulz (1999) provides insights that the cost of equity capital in Brazil reduced following the integration with the Global equity market in the period between 1996 and 2013, as expected returns decreased over time. In the second part of the study, a regression analysis is conducted, by estimating the effect of foreign portfolio capital flows on the Brazilian stock market returns using a Global CAPM with an additional parameter for foreign portfolio capital flows. The results of the regression analysis provide evidence that foreign portfolio capital flows are associated to an increase in excess returns on the Brazilian stock market (after controlling for systematic risk). Also, in a second regression estimated between the dividend yield (a direct measure of the cost of equity) and net foreign portfolio capitals, the partial effect of net foreign capitals on the Dividend Yield was negative. These findings are in line with the revaluation effect hypothesis and also support the argument that financial globalization reduces the cost of capital for a previously segmented equity market.

Keywords: financial integration, foreign portfolio capital flows, cost of equity capital, global CAPM

1. Introduction

Foreign portfolio capital flows increased dramatically following the process of de-regulation of financial markets on emerging economies. Theory suggests that as a previously segmented equity market integrates to the global financial market, the cost of equity capital on the previously segmented market falls (Stulz, 2005).

On the other hand, Fratzsher (2012) argues that emerging markets receiving large quantities of portfolio capitals face considerable declining in asset prices during adjustment processes, like in periods of financial turmoil as the global financial crisis of 2008-2009 and the European Sovereign Debt crisis of 2011. As these financial crises hit both developed markets and emerging markets strongly, the debate on the pros and cons of foreign portfolio capital flows came back as an important topic for emerging markets finance.

As one of the principal emerging markets, the Brazilian stock market is an important destination of foreign portfolio capital flows. Some previous studies documented a positive relationship between the returns to the Brazilian stock market and net portfolio capital flows, but there were just a few papers investigating this very important topic. Therefore, the objective of this study is to analyze how the financial integration of the Brazilian equity market to the Global equity market affected the cost of equity capital for Brazilian listed firms.

The study brings the following contributions: (i) a long-term assessment of the effects of financial integration on the cost of equity capital for Brazilian listed firms is conducted, using a partial general equilibrium model framework (whereas previous papers for the Brazilian case used a shorter time horizon and departed only from empirical generalizations instead of employing a theoretical model); (ii) for an empirical estimation of the effects of financial integration (as measured by the net foreign portfolio capital flows) on the cost of equity capital, a

proper asset pricing model (the Global CAPM) is employed to verify whether the so-called "revaluation effect" after large waves of foreign portfolio capital flows indeed took place in the Brazilian equity market; (iii) The direct effect of net foreign portfolio capitals on the cost of capital is also assessed, by estimating a regression between the dividend yield (which is considered a direct measure of the cost of capital) and net foreign portfolio capital flows, whereas previous papers for the Brazilian case evaluated only the effect of foreign capitals on stock returns.

The rest of the paper is organized as follows: section 2 brings a literature review for the effects of financial integration on the cost of equity capital, also presenting the most important previous papers for the Brazilian case. In Section 3, Data and Variables are described. Section 4 brings first a partial general equilibrium model framework and next a statistical analysis based on that model. Section 5 is dedicated to the econometric tests: on section 5.1, the Global CAPM model is described (methodology); On section 5.2, descriptive data for supporting the regression analysis is presented; On Section 5.3, the results of the Global CAPM regression analysis are presented; Section 5.4 brings a robustness test using the dividend yield as a measure for the cost of equity capital, complementing the econometric analysis. Finally, section 6 concludes.

2. Literature Review

2.1 The Effects of Financial Integration on the Cost of Equity Capital

The financial globalization literature mainly aims to investigate how financial globalization affects the equity premium when a previously segmented equity market becomes integrated to the global market. The mechanism that drives the equity cost reduction has two main forces behind: the first, and maybe most relevant, is the reduction in the relative risk of a market's assets after liberalization and integration into the global equity market (Henry, 2003).

The second reason is related to the supply and demand of financial resources, as before portfolio capitals inflows to a given country, the sources of capital that firms can rely to invest on their stocks are more restricted. After liberalization, there are more investors willing to lend capital through equity purchases, so there is an increase in the aggregate amount of funds available, creating competition among suppliers of funds, which in turn, reduces transaction costs, thus lowering the cost of capital (Stulz, 1999).

The integration of a previously segmented equity market to the global market decreases the equity premium, which is the main element of the cost of equity capital. When a previously segmented market opens to foreign investors, the risk stemming from the financial assets from the previously segmented market become shared between domestic and foreign investors, which in turn lowers expected returns on these assets (Errunza & Losq, 1985).

Financial globalization also reduces agency costs of corporate insiders. As foreign investors are usually more sophisticated and better informed, they pressure firms from previously segmented markets to improve corporate governance standards when these markets are liberalized. Improved corporate governance leads to lower cost of capital through reductions in agency costs (Stulz, 2005).

Graham and Harvey (2000) evaluated the impact of financial liberalization of emerging equity markets on the cost of capital of firms by comparing the change in the dividend yield before and after the liberalization process. They found that the dividend yield declined after the liberalization process, providing support for the hypothesis that foreign capital flows reduce the cost of equity capital.

Errunza and Miller (2000) evaluated whether firms from developing and developed countries that issued ADRs (American Depositary Receipts) in the U.S. stock market experienced reductions on the cost of equity capital. The authors expected stocks to exhibit positive returns, reflecting the increases in stocks' prices, also known as the revaluation effect that stocks go through when the risk is shared between domestic and international investors. After firms issued ADRs in the US stock market, stocks experienced higher returns. This finding supports the hypothesis of equity cost reduction due to risk sharing between domestic and international investors.

Foerster and Karolyi (2000) also tested whether firms involved in Global Equity Offerings (GEOs) should benefit from the access to globally integrated markets, by gaining access to capital at a lower cost. The authors also expected that firms from segmented emerging markets in which the investment barriers are higher should realize a greater benefit in terms of lowering their equity capital cost with respect to firms from less segmented markets. Overall, they found evidence that ADR offerings were associated to positive long run returns, especially for firms from emerging markets with low accounting standards, which outperformed their domestic market benchmarks. Therefore, the main findings were that listing abroad increased stock market returns, reducing the cost of equity capital.

Cheri and Henry (2004, 2008) analyzed whether the revaluation effect could be split between firm specific characteristics and the common shock to the whole equity market. The common shock is the risk sharing that

affects all firms, regardless of the status of the firm in the stock market as being of an investible firm (a firm that foreign investors would like to add to their portfolio after liberalization) or non-investible firms (firms that do not possess the characteristics to attract the interest of portfolio investors). The idea is that after liberalization, there is a common shock to expected returns, because as the country moves from being a segmented market to an integrated market, the risk-free rate falls. They investigated if firm-specific risk sharing characteristics could be disentangled from the overall revaluation effect. Indeed, the authors found that investible firms (eligible firms) experienced an average stock price revaluation of 15%, out of which 40% of this effect was due to firm-specific risk-sharing characteristics. Therefore, equity cost reduction does not spillover equally across all listed companies, because the equity cost reduction effect is not transmitted only through the common shock to overall domestic equity market (through the free risk rate), as firms' characteristics play a role in the process.

Patro and Wald (2005) analyzed the impact of stock market liberalization in 18 emerging markets. In line with prior studies cited, authors found that after liberalization process, the inflow of portfolio capitals caused expected returns to fall, implying a lower cost of equity capital, according to predictions of risk sharing between domestic and international investors. They also reported that dividend yields dropped substantially after liberalization.

Christoffersen, Chung, and Errunza (2006) estimated the revaluation effect by checking whether the returns yielded by emerging markets' after financial liberalization were higher when compared to a global returns benchmark. They found a positive revaluation effect, being the returns on emerging markets' stocks higher than the global benchmark during the liberalization of capital flows.

2.2 Financial Globalization and the Brazilian Equity Market

This section brings a short literature review on the main studies that evaluated the effects of financial globalization (foreign capital flows) on the stock market returns for the Brazilian equity market.

Tabak (2003) used VAR and cointegration analysis to study the relationship between foreign capitals and stock market returns. He showed that inflows of foreign portfolio capitals to the Brazilian stock market seem to be induced by increases in the stock market index. Also, he found evidence of cointegration between the IBOVESPA index and international portfolio flows, concluding that the variables have a long-run equilibrium relationship.

Meurer (2006) studied the influence of net inflow of resources from international investors on the Brazilian stock market (BOVESPA), using VAR analysis. The author found that variations in the IBOVESPA index precede a variation in the total participation of foreign investors in the total market capitalization of Brazilian stock market. The contemporaneous correlation between stock returns and foreign capitals was positive, suggesting that foreign portfolio capital flows are contemporaneous associated to higher returns.

Reis, Meurer e Da Silva (2010) also studied the relationship between Brazilian stock market returns and foreign portfolio investments using a linear regression model. Their results supported a positive contemporaneous relationship between stock market returns and foreign portfolio capital inflows. Sanvicente (2014) employed a simultaneous equation test to study the relationship between stock market returns and net foreign portfolio capital flows, concluding that foreign capital flows caused excess stock market returns.

3. Data

3.1 Stock Market Data

Data on the Brazilian and Global stock market returns (means and variances) were collected from *Datastream* database. For the Global stock market data, the U.S market was used as a proxy. For this purpose, the returns to the S&P 500 Composite index were considered to be a proxy for the Global Market's returns. For the statistical analysis (described next), data was collected monthly from January 1996 to December 2013. For the regression analysis, data ranges from January 2000 to December 2013.

3.2 Variables

The table below summarizes the variables used in the study:

Table 1. Variables

Variable	Legend	Calculation	Interpretation	Source
Ibovespa Returns	Rm	Monthly averaged returns for all stocks of the index	Equity premium for the Brazilian market	Datastream
Ibovespa Volatility	Var(Rm)	Monthly variance of Ibovespa's returns	Volatility of the Brazilian stock market	Datastream
CDI	Rf	Monthly spread on the interbank deposit rate	Brazilian Risk-free rate	Central Bank of Brazil
S&P 500 composite Returns	Rw	Monthly averaged returns for all stocks of the index	Proxy for the world's equity premium	Datastream
S&P 500Volatility	Var(Rw)	Monthly variance of S&P returns	Proxy for world's market volatility	-
T-bill return	Rfw	Monthly returns to 3-month Treasury Bill	Proxy for World's risk free rate	Datastream
Covariance between Ibov and S&P	Cov(Rm,Rw)	Covariance	Integration of Brazilian market with global market	-
Correlation between Ibov and S&P	Corr(Rm,Rw)	Correlation	Integration of Brazilian market with global market	-
Excess Ibovespa Returns	Rm-Rf	Monthly difference between market returns and risk free rate	Excess return on the Brazilian stock market	-
Net Foreign Portfolio Capital Flows	Fk	Monthly net foreign portfolio capital flows (inflows minus outflows) as a percentage of total stock market traded volume. It includes only flows to the equity market (stocks).	Measure of foreign portfolio investor's activity on the stock market	Central Bank of Brazil and Securities and Exchange Commission (CVM)
Dividend Yield	Dy	Dividends Paid divided by the stock price	Measure of the cost of equity capital	Datastream
Market-to-Book ratio	MKB	Market value of equity divided by the Book value of Equity	Measure of investment opportunities	Datastream

4. Equilibrium Analysis

The first analysis was conducted using a partial general equilibrium framework proposed by Henry (2003) and Stulz (1999). After the model is developed and presented, the statistics required to estimate the effects of financial globalization on the cost of equity capital are calculated.

4.1 The Model

According to the partial general equilibrium model developed by Henry (2003) and Stulz (1999), there are two components to a country's cost of capital, which are the risk free rate and the equity premium. Following large inflows of portfolio capitals, both elements should fall. The main assumptions of the model are that (i) the equity market of a given small country is completely segmented from the world's equity market and that (ii) investors both from the domestic and from the global market have a constant relative risk aversion and only care about expected returns and variance of their portfolios.

Let $E[R_m]$ denote the equilibrium rate of return on aggregate domestic stock market before liberalization, and rf denote the risk free rate of return in the domestic market. Also, let $E[R_W]$ denote the rate of return on the world's stock market, and rf_w denote the world's risk free rate. The authors assume that the price of risk, given by the ratio between the excess returns and the variance of returns is given by a constant "C", both at the small segmented market before liberalization and at the global equity market:

$$C_d = \frac{E[R_m] - rf}{Var[R_m]} \tag{1}$$

$$C_w = \frac{E[R_W] - rf_W}{Var[R_W]} \tag{2}$$

Isolating the equilibrium returns for both the domestic and the world market, we obtain the following:

$$E[R_m] = rf + C_d Var[R_m] \quad (3)$$

$$E[R_w] = r_{fw} + C_w Var[R_w] \quad (4)$$

$$E[R_w] - r_{fw} = C_w Var[R_w] \quad (4')$$

Next, the process of liberalization occurs, and foreign investors are allowed to trade on the domestic market and also domestic investors can trade abroad, and the authors cited assume dividends in the domestic market have constant mean and variance. Let $E'[R_m]$ denote the new required rate of return in the domestic market, and consider that because the domestic market becomes fully integrated to the world's market, the new relevant risk free rate is the global one, r_{fw}.

Thus, the risk premium on the domestic market now becomes a function of the beta coefficient between the domestic market and the world market, $\beta_{m,w}$, and the world risk premium, $E[R_m] - r_{fw}$. Following liberalization, we have that:

$$E'[R_m] = r_{fw} + \beta_{m,w}\left(E[R_W] - r_{fw}\right) \quad (5)$$

Assuming that the country that has just liberalized its equity market is small when compared to the world's market portfolio, it should have little or negligible effects on world's returns variance and risk premium, which implies that the rate of return on the world's market is still given by $E[R_m] - r_{fw} = C_w Var[R_w]$. Using the definition of Beta as the covariance between the domestic and world's returns divided by the variance of worlds' returns yields:

$$\beta_{m,w} = \frac{Cov\left(R'_m R_W\right)}{Var\left(R_W\right)} \quad (6)$$

By Substituting for (6) and (4') on equation 5 we get the new required rate of return on the previously segmented domestic market:

$$E'[R_m] = r_{fw} + \frac{Cov(R'_m R_W)\ C_w}{Var(R_W)} Var(R_W) \quad (7)$$

Cancelling out the world's returns variances from the equation above, we see that the new required rate of return on the domestic market depends on the world's risk free rate and the covariance between the domestic market returns and the world's returns, multiplied by the constant Cw. The author further assumes that the prices of risk Cd and Cw are equal, because both domestic and international investors have the same constant relative risk aversion coefficient. Considering Cw = Cd = C, and subtracting (7) from (3) we can assess the change in required returns after liberalization:

$$\Delta E[R_m] = (r_{fw} - r_f) + C_w\left[Cov(R'_m R_W) - Var(R_m)\right] \quad (8)$$

For the first term of the right-hand side of equation, Henry (2003) argues that because emerging countries (in case the economy liberalizing its equity market) have lower capital-to-labor ratios, the risk free rate of the country should be higher than the world's risk free rate, what implies the first term of right-hand side of equation to be negative.

With respect to the change in the equity premium, the argument is that the covariance between the domestic equity market returns and the world's equity market returns is smaller than the variance of the domestic equity market returns, implying second term is also negative. Thus, Henry (2003) concludes that the change on expected returns due to the liberalization of a previously segmented equity market is negative. Therefore, the cost of equity capital is likely to decline after liberalization.

4.2 Statistical Analysis

The table number 4 brings a statistical analysis based on the partial general equilibrium framework presented above. All the statistics required for estimating the change on expected returns were calculated (basically variances and covariances between the Brazilian equity market and the Global equity market on a continuous time series analysis from 1996 to 2013). The table shows step by step how to calculate the change on expected returns as described on equation number 8 using the statistics required by the model.

Table 2. Financial globalization and the cost of capital (for selected periods)

Variable	1996-1998	1999-2001	2002-2004	2005-2007	2008-2010	2011-2013	1996-2013
$Var(R_m)$	0.019	0.010	0.006	0.003	0.006	0.002	0.008
$Var(R_w)$	0.002	0.002	0.001	0.000	0.004	0.001	0.002
$Cov(R'_mR_w)$	0.004	0.003	0.002	0.000	0.004	0.001	0.002
C_w	6.72	-2.35	-12.1	42.5	-1.09	8.75	1.40
rf	0.02	0.015	0.014	0.011	0.008	0.007	0.012
rfw	0.004	0.003	0.001	0.003	0.000	0.000	0.002
$[Cov(R'_mR_w)- Var(R_m)]$	-0.014	-0.006	-0.004	-0.002	-0.002	-0.001	-0.005
$(rfw- rf)$	-0.016	-0.011	-0.013	-0.008	-0.008	-0.007	-0.010
$C_w[Cov(R'_mR_w)- Var(R_m)]$	-0.099	0.016	0.052	-0.108	0.002	-0.012	-0.007
$\Delta E [R_m]$	-0.115	0.004	0.038	-0.117	-0.005	-0.020	-0.018

Source: Data on returns from Datastream, 2014; Calculations by author.

The first two rows of the table present statistics for the variances of the Brazilian and U.S stock markets (S&P 500 composite, a proxy for Global returns), Var (Rm) and Var (Rw), respectively. The third row brings the covariances between the Brazilian stock market index and the U.S stock market index, Cov (Rm,Rw). The fourth row presents the price of risk Cw, as described in the section 4.1. On the fifth and sixth row the Brazilian risk-free rate (rf) and the U.S risk-free rate (rfw) are shown.

On the seventh row, the statistic for the subtraction between the covariance between the Brazilian and the Global market and the variance of the Brazilian market is presented, Cov (R'm,Rw) – Var (Rm), as it is one of the main components of the framework to evaluate the change in the equity premium after integration. Next, the difference between the global's risk-free rate (rfw) and the Brazilian risk-free rate (rf) is shown, as this subtraction is the first term of the framework to evaluate the change in the equity premium after integration.

The ninth row brings the second term of the equation describing the change in the equity premium, which is the multiplication between the prisk of risk Cw and the term Cov (R'm, Rw) – Var (Rm). Finally, the last row presents the change in the equity premium, as described in section 4.1, equation 8. It is computed by summing the (rfw-rf) term and the Cw[Cov (R'm, Rw) – Var (Rm)] term. The statistics are shown for selected periods between 1996 and 2013, using sub-periods divisions. In the last column, the statistics are calculated for the overall period between 1996 and 2013. Thus, looking at the sub-periods we can assess the evolution of the statistics, but the overall picture can be understood by evaluating the 1996-2013 statistics in the last column, as integration is better evaluated if understood as a process that takes time to occur.

Looking at the variance of the Brazilian stock market, Var (Rm), clearly it has declined over time, falling from 0.019 in 1996-1998 to 0.002 in 2011-2013. However, the variance of the overall period between 1996-2013 was 0.008, four times the variance of the Global returns, Var (Rw). It indicates that integration helped to reduce the volatility in the Brazilian market, but still the domestic volatility was much higher than the global volatility in the broad period analyzed.

On the other hand, the covariance between the Brazilian stock market returns and the Global returns showed a more or less instable behavior, rising and falling depending on the sub-periods. As for Cw, the price of risk, as it depends on the difference between the global expected returns and the global risk free rate in the numerator (as per equation 2), the sign of the coefficient changes depending whether returns in the given sub-periods were positive or negative. But overall, the coefficient was 1.40 for the period between 1996-2013.

The difference between the two risk-free rates (rfw-rf) is always negative, but tending to zero. It shows that the Brazilian risk-free rate declined over time. When subtracting the variance of the Brazilian market from the covariance between the Brazilian market and the global market, the result is always negative too. When multiplying this term for the Cw coefficient, for some periods, the resulting term is positive for some sub-periods, but negative for the 1996-2013 period overall.

Recalling, Henry's (2003) conditions for the reduction in the cost of equity capital after the integration with the global equity market was given by (1) the difference between the global risk free rate and the local risk free rate, expected to be negative; (2) the difference between the covariance between the returns of the local market with the global market and the variance of the local market multiplied by Cw, also expected to be negative.

The last row of the table shows the change in expected returns. The change was negative for most of sub-periods, and negative when computing it for the overall 1996-2013 period (-0.018). This result suggests that financial

globalization has decreased the cost of equity capital for Brazilian firms in the period between 1996-2013, but in some sub-periods, the cost of equity increased (1999-2001, 2002-2004).

The first element of the equity cost reduction is due to the risk free rate: as the Brazilian market becomes integrates with the Global market, domestic agents gain access to a lower risk-free rate. The second element of the equity cost reduction pertains to the risk-sharing hypothesis, because as the Brazilian market integrates, the relevant volatility becomes the global one, expressed by the covariance between domestic and global returns. As the Global market is less volatile than the domestic market (Henry, 2000), the volatility of returns and hence the risk of investments available for domestic investors after integration falls.

The risk-sharing motivation seems more reasonable when assuming that foreign investors (namely institutional investors) started to trade in the previously segmented market, sharing the risks associated to the financial asset with the local investors (Stulz, 2005). The other rationale behind the risk-sharing hypothesis, that local investors can trade freely in international markets, is a bit more complicated, and may not hold if we consider that domestic investors can face barriers to trade in international markets, or if the market continues to be at least mildly segmented even after some level of integration (as argued by Errunza & Losq, 1985).

The assumption that local firms consider the global risk free rate as the new benchmark for risk free rate is also not completely plausible. Maybe for the most sophisticated institutional investors in Brazil it could hold, but for many firms seeking capital to fund their projects in the capital market, it may not be the case that they have full access to the global risk-free rate. In general, the data seems to support the hypothesis of reduction in the cost of equity capital due to financial integration for the Brazilian market.

5. Regression Analysis

5.1 The Global CAPM - Methodology

The second methodology employed is a regression analysis to evaluate the impact of foreign portfolio capital flows (a measure of financial integration) on the cost of equity capital of Brazilian firms. Since only real returns are observable, it is insightful to complement the previous analysis with an econometric test. It was estimated an adapted version of the Global CAPM (Capital Asset Pricing Model), in which an additional parameter was included, to capture the partial effect of foreign portfolio capital flows on stock market returns.

Under the assumption of financial integration, the traditional CAPM does not hold. For the traditional CAPM, excess returns are a function of the stock's sensitivity to the local market's excess returns. For the Global CAPM, instead, returns are proportional to the stocks' global beta coefficient, which measures the sensitivity of a given stock (or equity market broadly) to the returns to a global portfolio. The higher is the exposure of a given equity market to global systematic risk; higher should be the returns yielded.

For the partial effect of net foreign capitals on the stock market's excess returns (the gamma coefficient shown in the model below), the literature suggests that foreign capitals increase stocks' returns, as after a previously segmented market becomes integrated to the global market, the flows of foreign portfolio capitals drive stock prices up, the so-called revaluation effect, as it was discussed in the literature review.

The Global CAPM regression model is presented below:

$$R_t - rf_t = \alpha + \beta\left(r_{wt} - rfw_t\right) + \gamma Fk_t + \mu_t \tag{9}$$

R_t denotes the monthly returns to the BOVESPA stock market;

Rf_t denotes the monthly Brazilian risk free rate (CDI);

Rw_t denotes the monthly returns to the Global market (using the S&P 500 Composite index as a proxy for the Global Market);

Rwf_t denotes the monthly returns to the 3-months T-bill;

Fk_t denotes the monthly net foreign portfolio capital flows (inflows minus outflows);

α, β, γ denote regression coefficients;

μ_t denote the residual.

The regression was estimated using Ordinary Least Squares (OLS) with Robust Standard errors, to correct for any potential problems related to non-spherical variance of residuals. Therefore, the estimates are consistent (as the CAPM is a traditional asset pricing model with a long record of testing) and efficient (robust to heteroskedasticity).

The Durbin-Watson test is also presented, to ensure the estimation is not affected by serial autocorrelation. Both stock market returns and net foreign portfolio capital flows are stationary in level.

5.2 Descriptive Statistics

The descriptive statistics shown below are supportive for the regression analysis, which is conducted next. This is the reason why data ranges from 2000 to 2013 only (the time series range used for the regressions).

Table 3. Descriptive statistics for time series variables – Jan/2000 to Dec/2013

	Mean	Variance	Std. Dev	Min	Max	N
Rm	.0092	.0053	.0733	-.248	.1792	168
Rf	.0110	.0000	.0035	.004	.0208	168
Rm-Rf	-.0017	.0053	.0731	-.259	.1622	168
Rw	.0016	.0022	.0478	-.222	.1086	168
Rfw	.0015	.0000	.0015	.0000	.0050	168
Fk	.0251	.0020	.0525	-.1091	.2429	168
Dy	.0397	.0001	.0108	.0220	.0700	156

Source: Economatica, Datastream, CVM and Central Bank of Brazil.

The average monthly returns for the Brazilian stock market (Rm) were centered on zero in the period between 2000 and 2013. The excess return (Rm-Rf) was slightly negative in the period, probably affected by the strong devaluations that the index went through in the 2008 and 2011 crises, and also considering that the Brazilian risk free rate is substantially high (it can be seen by the difference between average Rf and Rfw).

Net foreign porfolio capital flows (Fk) were positive in the period, implying that on average, the period was marked by an inflow of portfolio capitals. The average inflow corresponded to 2,5% of total stock market traded volume. In the month in which the highest inflow was observed, it accounted for 24% of total stock market traded volume. On the other hand, in the month in which the highest outflow was reported, it accounted for 10.9% of total stock market traded volume. Therefore, the participation of foreign investors in the Brazilian stock market is indeed substantial.

Table 4. Correlation matrix for time series variables – Jan/2000 to Dec/2013

	Rm	Rf	Rw	Rfw	Fk	Dy_Ibov
Rm	1.00					
Rf	0.08	1.00				
Rw	0.68***	-0.07	1.00			
Rfw	0.02	0.40***	-0.08	1.00		
Fk	0.26***	-0.19**	0.33***	0.07	1.00	
Dy	-0.13*	0.63***	-0.17**	-0.02	-0.11	1.00

Note. *** Significant at 0.01 level; ** Significant at 0.05 level; *Significant at 0.1 level.

The correlation matrix shows positive association between the Brazilian stock market returns, Rm, and net foreign portfolio capital flows, Fk (0.26, $p < 0.01$). The interpretation is that net foreign portfolio capital flows are apparently associated to a contemporaneous increase in aggregate stock market returns. This finding is a first indication that net foreign portfolio capitals could be associated to higher stock returns. As the correlation is positive, the behavior of foreign investors in the period between 2000 and 2013 seems to be of exerting a buying pressure on Brazilian stocks, pushing returns upwards.

The Dividend Yield is negatively correlated to Ibovespa (Rm) returns and to S&P returns (Rw), but positively correlated to the Brazilian risk free rate (Rf). The Dividend Yield is not correlated to net foreign capital flows (Fk) in level, but is negatively correlated when computing the first difference (-0.30, $p<0.01$). As the dividend yield is considered a proxy for the cost of capital, the negative correlation between dividend yield and stock market returns indicates that as stock prices rise, the cost of capital declines. Also, as the first difference of the dividend yield is negatively correlated to net foreign capital flows; it may be the case that net foreign capitals are negatively associated to the cost of capital.

The Brazilian risk-free, Rf, rate is negatively correlated to foreign capitals, Fk (-0.19, $p < 0.05$). It could suggest that net foreign capital flows could be driving the risk-free rate downwards, but one has to bear in mind that the risk-free rate in Brazil is administered by the Central Bank, and not completely subject to market forces. Also, the Brazilian risk free rate is positively correlated to the U.S risk free rate (0.40, $p < 0.01$), what could be considered a signal of integration of the Brazilian financial market with the global financial market.

With respect to the integration of the Brazilian equity market with the Global equity market, the correlation between the returns to the Brazilian stock index (RM) and the Global stock index, proxied by S&P 500 composite returns (Rw), is substantial (0.68, $p < 0.01$). It may suggest that the Brazilian equity market is exposed to similar systematic risks that affect the Global market, what ultimately implies that the Brazilian equity market is integrated to the Global market, at least to a considerable extent.

The correlation between foreign portfolio investment (Fk) and the returns to the Global index (Rw) is also positive and statistically significant (0.33, $p < 0.01$). It could suggest that financial globalization is higher in times of positive returns, what is actually contented in the literature (Stulz, 1999; Sanvicente, 2014). It could be the case that foreign investors are more confident to invest in emerging markets when the Global equity market is going through a good momentum, posting high returns.

5.3 Regression Results

The table number 5 shown below brings the results for the estimation of the regression equation number 9 (Global CAPM):

Table 5. The global CAPM: OLS time series regression with robust standard errors (2000 to 2013)

Dep.Var: *Rt-Rft*	*Coefficients*	*Robust std errors*
α	0.000	.000
β*(Rwt-Rfwt)*	1.038***	.093
γ*(Fkt)*	.167*	.091
F(2,165)	76.87***	
N	168	
R-squared	.479	
DWatson	1.787	

Note. *** Significant at 0.01 level; ** Significant at 0.05 level; *Significant at 0.1 level.

The regression is statistically significant ($F = 50.92$, $p < 0.01$), presenting R-squared statistic of 0.47. The intercept is not statistically significant, which is in line with asset pricing theory (the intercept measures the regression's pricing error, and should equal zero when the main factors are excess returns, according to Cochrane, 2001). The Durbin-Watson statistic provided evidence that the regression is not affected by serial autocorrelation (1.78).

The *Beta* coefficient, which measures the sensitivity of the Brazilian stock market to the Global Equity market (recalling that the returns to the S&P 500 composite index were used as a proxy for the Global Market), was statistically significant and positive (1.04, $p < 0.01$). The interpretation is that there is a one-to-one effect of the global market returns on the Brazilian market returns, which can be considered an evidence of financial integration: for a 1% variation on the returns to the Global Market, the returns on the Brazilian equity market oscillate 1.04%.

The *Gamma* coefficient measures the partial effect of net foreign portfolio capital flows (Fk) on the Brazilian stock market returns. The coefficient is statistically significant and positive (0.169, $p < 0.1$). The interpretation is that for a 1% net flows of foreign portfolio capitals, the stock market index appreciates 0.17%. It can be also interpreted as a rough measure of the "average revaluation effect" experienced by the stock market between 2000 and 2013. As foreign portfolio capital flows are associated to an increase in stock prices, expected returns should decline over time. Overall, the regression analysis provides evidence in favor of the equity cost reduction hypothesis.

5.4 A Robustness Test Using the Dividend Yield

To provide a second econometric testing for the equity cost reduction hypothesis (and also to add robustness to the previous findings), it is interesting to evaluate the effects of foreign portfolio capital flows on the cost of equity capital using a measure for the cost of equity other than stock returns. The Dividend Yield is commonly used as a proxy for the cost of equity (Graham & Harvey, 2000).

The idea is to regress the IBOVESPA dividend yield (IBOVESPA is the main index from the BOVESPA stock market, including the most important listed Brazilian firms) against the same variable calculated for net foreign portfolio capitals, after controlling for important variables potentially influencing the dividend yield. A dynamic model for the Dividend Yield is presented below:

$$dDy_t = \alpha + \beta dDy_{t-1} + \delta d\ln MKB_t + \gamma Fk_t + \mu_t \quad (10)$$

dDy_t denotes the first difference of the averaged IBOVESPA's dividend yield (averaged across all IBOVESPA's constituents in each month);

dDy_{t-1} denotes the lagged first difference of the Dividend Yield;

$d\ln MKB_t$ denotes the first difference of the log of the averaged IBOVESPA's market-to-book ratio (averaged across all IBOVESPA's constituents), as a control for investment opportunities;

Fk_t measures the net foreign portfolio capital flows;

α, β, δ, γ denote regression coefficients;

μ_t denotes the residual.

For this regression, it is to be expected the partial effect of net foreign portfolio capital flows Fk (measured by the gamma coefficient) to be negative, instead of positive as it was for the previous regression in which stock returns were used as the dependent variable. The reason for this change is because the dividend yield is a direct measure of the cost of equity capital (as the dividend yield is the ratio between the dividends paid and the stock's price, thus yielding the return earned by an investor by holding the given stock). Therefore, if foreign capitals reduce the cost of equity capital, the partial effect of this variable on the dividend yield must be negative.

The main assumption we need to rely on to estimate the regression above is that the dividends payment process does not change after foreign portfolio capitals begin to flow to a previously segmented equity market (which is a reasonable assumption). Graham and Harvey (2000) argue that the variability on the stock price typically dominates changes on the dividend yield (because firms do not change the dividend payment stream very often). Thus, we are measuring the stock price appreciation due to foreign portfolio capital flows using another variable.

The other variables included in the model are controls. The Dividend Yield and the Market-to-Book ratios were first-differenced because they are not stationary in level. A lagged form of the dividend yield was included to prevent serial correlation (as the dividend yield is usually serially correlated). The Market-to-Book ratio is controlling for investment opportunities (usually firms with high investment opportunities use their cash to invest more rather than distributing dividends, thus the expected effect of this controlling variable is negative). For the dividend yield estimation, the time series available were a bit shorter (from 2001 to 2013, monthly).

Table 6. Dividend yield: OLS time series regression with robust standard errors (2001 to 2013)

Dep.Var: *dDyt*	*Coefficients*	*Robust std errors*
α	.0004*	.0002
β(dDyt-1)	.0357	.0842
δ(dlnMKB)	-.0174***	.0040
γ(Fkt)	-.0145***	.0051
F(3,150)	13.83***	
N	154	
R-squared	.269	
DWatson	1.8839	

Note. *** Significant at 0.01 level; ** Significant at 0.05 level; *Significant at 0.1 level.

The regression is statistically significant ($F=13.83$, $p < 0.01$), presenting R-squared of 0.269. The control for the lagged dividend yield is not statistically different from zero. The control for investment opportunities is statistically significant and negative (-0.174, $p < 0.01$), which is line with the expectation. The Durbin-Watson statistic (1.88) indicates that the regression was not influenced by serial autocorrelation.

The partial effect of net foreign capitals (Fk) on the dividend yield was statistically significant and negative (-0.145, $p < 0.01$). Since the dividend yield was first differenced, it is harder to assess a direct interpretation for this elasticity. However, the negative sign is according to the expectations: as foreign portfolio capital flows cause the

cost of equity capital to decrease, the dividend yield, which is a direct measure of the cost of equity, must be decreasing in net foreign portfolio capitals. This finding provides second econometric evidence in support for the equity cost reduction hypothesis.

6. Conclusions

The purpose of this study was to analyze whether the integration of the Brazilian equity market to the Global equity market reduced the cost of equity capital for Brazilian listed firms. The first analysis consisted in a time series statistical analysis based on a partial general equilibrium model proposed by Henry (2003) and Stulz (1999). The results from this analysis suggest that, as the Brazilian equity market integrated with the Global equity market, expected returns on the Brazilian market decreased. This can be viewed as a first indication that the cost of equity capital for Brazilian firms declined as the Brazilian market became integrated to the global financial market.

For the second analysis, an econometric estimation was conducted. A Global CAPM with an additional parameter to measure the partial effect of foreign portfolio capital flows on stock returns was employed. The results from this regression supported the revaluation effect hypothesis, as the marginal effect of net foreign portfolio capital flows on stock returns was statistically significant and positive (after controlling for systematic risk).

Finally, a robustness test was conducted, by estimating a regression between the Dividend Yield for the IBOVESPA index (the dividend yield provides a direct measure for the cost of equity) and net foreign portfolio capital flows. The partial effect of net foreign portfolio capital flows on the dividend yield was statistically significant and negative, providing another evidence in favor of the equity cost reduction hypothesis.

References

Bekaert, G., & Harvey, C. R. (2000). Foreign speculators and emerging equity markets. *The Journal of Finance, 55*(2), 565-613. http://doi.org/10.1111/0022-1082.00220

Chari, A., & Blair, H. P. (2008). Firm-specific information and the efficiency of investment. *Journal of Financial Economics, 87*(3), 636-655. http://doi.org/10.1016/j.jfineco.2007.03.008

Chari, A., & Henry, P. B. (2004). Risk sharing and asset prices: Evidence from a natural experiment. *The Journal of Finance, 59*(3), 1295-1324. http://doi.org/10.1111/j.1540-6261.2004.00663.x

Christoffersen, P., Chung, H., & Errunza, V. (2006). Size matters: The impact of financial liberalization on individual firms. *Journal of International Money and Finance, 25*(8), 1296-1318. http://doi.org/10.1016/j.jimonfin.2006.09.003

Cochrane, J. H. (2001). *Asset Pricing*. Princeton University Press.

Errunza, V. R., & Miller, D. P. (2000). Market segmentation and the cost of the capital in international equity markets. *Journal of Financial and Quantitative Analysis, 35*(4), 577-600. http://dx.doi.org/10.2307/2676256

Errunza, V., & Losq, E. (1985). International asset pricing under mild segmentation: Theory and test. *The Journal of Finance, 40*(1), 105-124. http://doi.org/10.1111/j.1540-6261.1985.tb04939.x

Foerster, S. R., & Karolyi, G. A. (2000). The long-run performance of global equity offerings. *Journal of Financial and Quantitative Analysis, 35*(4), 499-528. http://dx.doi.org/10.2307/2676253

Fratzscher, M. (2012). Capital flows, push versus pull factors and the global financial crisis. *Journal of International Economics, 88*(2), 341-356. http://doi.org/10.1016/j.jinteco.2012.05.003

Henry, P. B. (2000). Stock market liberalization, economic reform, and emerging market equity prices. *The Journal of Finance, 55*(2), 529-564. http://doi.org/10.1111/0022-1082.00219

Henry, P. B. (2003). *Capital account liberalization, the cost of capital, and economic growth* (No. w9488). National Bureau of Economic Research. http://doi.org/10.3386/w9488

Meurer, R. (2006). Fluxo de capital estrangeiro e desempenho do IBOVESPA. *Revista Brasileira de Finanças, 4*(1), 345-361.

Patro, D. K., & Wald, J. K. (2005). Firm characteristics and the impact of emerging market liberalizations. *Journal of Banking & Finance, 29*(7), 1671-1695. http://doi.org/10.1016/j.jbankfin.2004.06.032

Reis, L., Meurer, R., & Da Silva, S. (2010). Stock returns and foreign investment in Brazil. *Applied Financial Economics, 20*(17), 1351-1361. http://doi.org/10.1080/09603107.2010.498342

Sanvicente, A. Z. (2014). The foreign capital flows and the behavior of stock prices at BM&FBovespa. *BAR-Brazilian Administration Review, 11*(1), 86-106.

Stulz, R. M. (1999). Globalization, corporate finance, and the cost of capital. *Journal of Applied Corporate Finance, 12*(3), 8-25. http://doi.org/10.1111/j.1745-6622.1999.tb00027.x

Stulz, R. M. (2005). The limits of financial globalization. *The Journal of Finance, 60*(4), 1595-1638. http://doi.org/10.1111/j.1540-6261.2005.00775.x

Tabak, B. (2003). The random walk hypothesis and the behaviour of foreign capital portfolio flows: The Brazilian stock market case. *Applied Financial Economics, 13*(5), 369-378. http://doi.org/10.1080/09603100210134550