Sistemas & Gestão 7 (2012), pp 490-501

SISTEMAS & GESTÃO
Revista Eletrônica

# FIRM SIZE MATTERS FOR FINANCIAL CONSTRAINTS: EVIDENCE FROM BRAZIL

## TAMANHO DA EMPRESA IMPORTA PARA RESTRIÇÕES FINANCEIRA: EVIDÊNCIAS DO BRASIL

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Abstract

The purpose of this work is to verify the existence of financial constraints for investment in Brazil and the specific firm size effect on it. Dynamic investment models are estimated for a panel dataset of 289 Brazilian nonfinancial firms for the time period 1995-2006. Results show that Brazilian firms face financial constraints since their investment depend on internally generated funds. Firm size has shown to be, effectively, an important determinant of it. Investment of smaller firms is more sensitive to cash flow than that of larger ones. At the firm level, our findings suggest the need for further developments on information disclosure as a way to mitigate asymmetric information problem. At the policy level, additional advance in the institutional environment might also be important for minimizing financial constraints for Brazilian firms.

**Keywords:** Investment, Financial Constraints, Firm Size, Cash Flow, Brazil

Resumo

*O objetivo deste trabalho é verificar a existência de restrições financeiras para o investimento no Brasil e o efeito específico do tamanho da empresa sobre isso. Modelos dinâmicos de investimento são estimados para um painel de dados composto por observações anuais de 289 empresas brasileiras não financeiras para o período 1995-2006. Os resultados mostram que a empresa brasileira enfrenta dificuldades financeiras, uma vez que tem o seu investimento dependente de fundos gerados internamente. O tamanho da empresa mostrou ser, efetivamente, um importante determinante de situações de restrições financeiras. Empresas de menor porte têm sua política de investimento mais sensível ao fluxo de caixa do que as maiores. No nível da empresa, nossos resultados sugerem a necessidade de avanços na evidenciação de informações como forma de minimizar problemas de informação assimétrica. Ao nível de políticas nacionais, o avanço adicional no ambiente institucional também pode ser importante para minimizar as restrições financeiras das empresas brasileiras.*

**Palavras-chave:** Investimento, Restrições Financeiras, Tamanho da Empresa, Fluxo de Caixa, Brasil

## 1. INTRODUCTION

Financial constraints are at the center of a vast literature that suggests that the high cost of external finance forces firms to use internal funds, thus making their investment projects extremely dependent on the availability of cash flow. Such literature has grown in the last two decades, and so developing economies, with rising importance in international arena, may be object of more attention.

Important publications by Goldman Sachs Economics Research Group point out the relevance of Brazil in global economy. Brazil, Russia, India, and China are crucial emerging markets with the potential to be among the six greatest gross domestic products (GDP) in the world by the year 2050 (Goldman Sachs, 2007; O´Neill, 2001; Wilson & Purushothaman, 2003). Recent successes in Brazilian economy and its increasing presence in global markets are probably related to the structural macroeconomic changes undertaken by the country in the 1990s (Baer & Coes, 2001; Mattos, Cassuce, & Campos, 2007; Studart, 2000).

Under financial constraints, firms may be either unable to obtain external financing or have it only at a very high premium, leading to discourage firm investment. Being financially constrained is a consequence, among other

PROPPI / LATEC
DOI: 10.7177/sg.2012.v7.n3.a16

**Revista Eletrônica Sistemas & Gestão**
Volume 7, Número 3, 2012, pp. 490-501
DOI: 10.7177/sg.2012.v7.n3.a16

possible factors, of asymmetric information about a firm's project between the firm's managers and the firm's investors (Akerlof, 1970; Greenwald & Stiglitz, 1990). Stiglitz (1989) considers that the informational issues may be even more severe in less developed countries due to the smaller scale of firms and the reduced ability of market institutions to adequately gather and evaluate information. The limited research about financial constraints in underdeveloped markets is an important motivation to this study, which is clearly focused on an emerging market.

Investment–cash flow sensitivity has been interpreted as an important signal of financial constraints (Bond, Harhoff, & Van Reenen, 2003; Bond & Meghir, 1994; Fazzari, Hubbard, & Petersen, 1988; Schiantarelli, 1996). Even though alternative interpretations for such sensitivity have been proposed, such as managerial risk aversion to excess debt and managerial discretion and overinvestment (Chirinko & Schaller, 1995; Degryse & De Jong, 2006; Kaplan & Zingales, 1997; Vogt, 1994), more recent literature has confirmed the investment–cash flow sensitivity as indication of financial constraint (Allayannis & Mozumdar, 2004; Alti, 2003; Hovakimian, 2009; D'Espallier, Huybrechts, & López-Iturriaga, 2011).

The purpose of this work is to investigate whether the Brazilian firm faces financial constraints for investment, and the firm size effect on it, using a dynamic investment model and panel data methodology. Firm size has recently been revisited and confirmed as an important determinant of financial constraints (Hadlock & Pierce, 2010).

Our results show that the Brazilian firm faces financial constraints since its investment is dependent on cash flow. Additionally, smaller firms face even more severe financial constraints. Whereas the investment of larger firms does not seem to be particularly affected by internal funds, we find that smaller firms invest at the pace of their cash flow.

We see the extending previous evidence on financial constraints to the Brazilian context as a contribution of this work. Although some previous research has addressed this topic, we use a more robust empirical specification.

The remainder of the paper is organized as follows. Section 2 develops our hypotheses. Section 3 presents the method, sample, and econometric models. Section 4 discusses the results, and Section 5 offers our conclusions.

## 2 BRAZILIAN MARKET, FINANCIAL CONSTRAINTS, AND HYPOTHESES

Relevant international research has reported that investment and growth, at the micro- and macroeconomic level, benefit from financial development (Darrat, Elkhal, & McCallum, 2006; Demirgüç-Kunt & Maksimovic, 1998; Rajan & Zingales, 1998). Indeed, Levine (2002) finds evidence that financial development — considering both bank and stock market activity — is positively related to economic growth for a sample of 48 countries. His evidence highlights the importance of developed financial services for both bank-based and market-oriented environments and of contract enforcement in this context.

In Brazil, some structural macroeconomic changes started in the 1990s might be important determinants for the recent advance of financial services (Baer & Coes, 2001; Mattos, Cassuce, & Campos, 2007; Studart, 2000). These changes include the banking reform, the privatization process, the finishing of state monopoly in crucial sectors of the economy, the external liberalization, and the Plan "Real" in 1994-1995. The banking reform began at the end of the 1980s with the establishment of universal banks followed by the privatization of most state banks in the 1990s. The banking reform created more flexibility into the banking sector and, together with monetary stabilization, has forced banks to operate more effectively as financiers of the productive sector. The external liberalization of the market has attracted new investors and exposed Brazilian companies to a more competitive environment. In addition, the privatization process and the end of state monopoly in crucial sectors of the economy, such as energy and telecommunications, were vital to the growing investments in the Brazilian stock market. Plan "Real" has allowed a dramatic decrease in inflation levels and monetary stability since then [1]. These structural reforms, along with actions undertaken by the Brazilian Securities and Exchange Commission, the São Paulo Stock Exchange, and the Brazilian Institute of Corporate Governance (IBGC), have been of great importance to the advancement of Brazilian capital market. In fact, contrary to his expectations, Levine (2002) reports evidence of Brazil as a market-oriented economy.

Literature on economic growth and financial systems has highlighted the importance of the advancement of legal system as a determinant of financial development. Strengthening the rights of investors and improving the efficiency of contracts are important steps on the path toward financial development and have positive effects on economic growth (La Porta, López-de-Silanes, Shleifer, & Vishny, 1999, 2000; Levine, 2002, 2005; Wurgler, 2000). Evidence also suggests that investor protection is inversely correlated to the cost of external financing, which prohibits firms in environments with low protection from fully maximizing their growth opportunities (Shleifer & Wolfenzon, 2002). Brazil has a history characterized by poor protection of minority stockholders and creditors with high ownership concentration. Accordingly, Brazil had adopted some legal changes on shareholder protection with Law 10.303/2001 which, for example, limited non-voting capital in 50% of total capital, and Law 10.411/2002 which empowered the Brazilian Security and exchange commission (CVM).

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DOI: 10.7177/sg.2012.v7.n3.a16

As a whole, considering the structural and legal reforms that have taken place since the 1990s, Brazil appears to have started a process of changes that may lead to even more financial development with positive benefits to economic growth. Indeed, since the enactment of the Plan "Real" in the mid-1990s, stock market capitalization and foreign investments, for example, have already grown substantially (Freitas & Prates, 2008; Rodrigues, 2000; Studart, 2000).

Studart (2000) suggests that there has been a change in the financial pattern of Brazilian firms as a consequence of the structural changes in the economy in the 1990s. Namely, the country shifted away from a strongly bank-oriented system that included a high level of State participation toward a more active role for capital markets. Sanvicente (2002) finds that bond market in Brazil experienced significant growth in the period 1997–2001, which is yet another signal of a more active capital market in Brazil.

Despite the aforementioned recent advances in Brazil, the country still presents characteristics that favor the higher costs of external funding and existence of financial constraints. Brazil's capital markets are still much less developed in comparison to more advanced economies. Protection of minority shareholders and creditors continue to be inadequate, and high benefits of control (Dyck & Zingales, 2004) and high ownership concentration (La Porta, López-de-Silanes, Shleifer, & Vishny, 1998; López-Iturriaga & Crisóstomo, 2010) remain important characteristics of Brazilian market. In addition, institutional framework and capital market advances have not been sufficient to reduce the high interest rates in Brazil, compared to European, North American, or even other non-developed countries (Marques & Fochezatto, 2007; Oliveira & Carvalho, 2007; Omar, 2008) [2].

In sum, although the recent changes achieved in Brazil represent advances for capital markets and economic stabilization, the low degree of shareholder and creditor protection as well as high interest rates may limit Brazilian firms' access to external funds. In addition, the inherent asymmetry of information between firm and market must also be important as in other developed markets.

The international evidence, mainly centered in developed countries, has shown that the use of internal funds as a consequence of financial constraints is a reality in distinct geographic and institutional contexts. The evidence is wide ranging and comes, for example, from the United States (Fazzari, Hubbard, & Petersen, 1988; Hubbard, Kashyap, & Whited, 1995; Whited, 1992; Whited & Wu, 2006), United Kingdom (Bond, Harhoff, & Van Reenen, 2003; Bond & Meghir, 1994), Germany (Audretsch & Elston, 2002; Elston, 1998), Italy (Galeotti, Schiantarelli, & Jaramillo, 1994; Schiantarelli & Sembenelli, 2000), Spain (D'Espallier, Huybrechts, & López-Iturriaga, 2011; Maestro, De Miguel, & Pindado, 2007), Canada (Chirinko & Schaller, 1995), Japan (Hoshi, Kashyap, & Scharfstein, 1991), and Australia (Chapman, Junor, & Stegman, 1996), among others. Prior studies have also found financial constraints in transition economies such as the Czech Republic (Lízal & Svejnar, 2002), Bulgaria (Rizov, 2004), and Russia (Perotti & Gelfer, 2001).

Although the Brazilian market has advanced since the mid-1990s, the country still has relatively high interest rates, low protection of minority shareholders and creditors, and high ownership concentration. Taken together with the inherent information asymmetry problem and international evidence, these characteristics support the proposition of the existence of financial constraints in Brazil in the direction of previous results (Crisóstomo, López-Iturriaga, & Vallelado, 2011; Moreira & Puga, 2000; Kalatzis, Azzoni, & Achcar, 2008; Terra, 2003). Therefore, based on this discussion, we formulate the following hypothesis regarding financial constraints for investment policy of Brazilian firms.

> *Hypothesis 1:* Market imperfections affect firm investment policy in a way that firms face financial constraints for investment. Consequently, it is expected that financial situation affects firm investment policy of Brazilian firm.

Firm size has been found to be an important determinant of financial constraints under the argument that it is related to firm fundamentals that may influence the probability of financial constraints. Investment projects of smaller, often younger, firms are usually considered riskier, thus increasing costs of debt, bonds, and stock issue. Moreover, smaller firms tend to have less collateral to guarantee loans. Prior studies in distinct markets, using different firm samples, have reported that firm size may affect financing policy (Audretsch & Elston, 2002; Carpenter, Fazzari, & Petersen, 1994; Chirinko & Schaller, 1995; Gilchrist & Himmelberg, 1995). Recently, Hadlock & Pierce (2010) confirm the relevance of firm size as an important predictor of financial constraints and create a financial constraint index based on firm size and age. The international evidence has shown that smaller firms suffer more strongly the effect of market imperfections that lead to financial constraints. Such evidence, together with previous evidence in Brazil (Crisóstomo, López-Iturriaga, & Vallelado, 2011; Terra, 2003), lead us to the proposition of another hypothesis about firm size and financial constraints in the Brazilian market.

> *Hypothesis 2*: Firm size matters for financial constraints in Brazil. Smaller firms suffer more strongly the effects of market imperfections, being considered *a priori* more prone to face financial constraints. As a result, investment of

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DOI: 10.7177/sg.2012.v7.n3.a16

smaller firms is more sensitive to the liquidity situation than larger ones.

## 3 MODELS, SAMPLE, AND METHOD

The pecking order theory suggests that a group of firms may be in a financial regime in which their investment is dependent and constrained by the availability of internal funds. This theory has induced a number of works that have classified companies as subject to financial constraints *a priori* according to some financial or institutional aspect considered pertinent to characterize the company along the period of study. The analysis consists in the comparison of investment–cash flow sensitivity among samples. This strategy has been adopted in the literature using distinct division criteria such as firm dividend payout (Fazzari, Hubbard, & Petersen, 1988; Hubbard, Kashyap, & Whited, 1995), firm size (Chirinko & Schaller, 1995; Lízal & Svejnar, 2002), and firm links with banks or with company groups (Chirinko & Elston, 2006; Hoshi, Kashyap, & Scharfstein, 1991; Schiantarelli & Sembenelli, 2000). Although results have been consistent with the hypothesis that investment of firms *a priori* considered under financial constraints are more sensitive to the liquidity situation, such strategy has been criticized for not being able to exploit fully the sample separation proposed by the pecking order theory because the financial regime of a firm may vary over time. In this context, researchers have adopted periodic classification of firms to take into account the dynamic financial status of a firm, which may signal its capability to access distinct sources of financing. In this direction, numerous important studies have used annual categorization of firms, as either financially constrained or unconstrained, according to a detailed evaluation (Almeida & Campello, 2007; Bond & Meghir, 1994; Cleary, 1999; Whited & Wu, 2006). However, common sense in the literature suggests that it is not easy to find a perfect criterion to categorize a firm under financial constraint (Goergen & Renneboog, 2001; Gomes, 2001; Hennessy, Levy, & Whited, 2007; Kaplan & Zingales, 1997; Maestro, De Miguel, & Pindado, 2007; Moyen, 2004; Rizov, 2004; Whited & Wu, 2006).

According to the predictions of the pecking order theory, a firm may prefer retained earnings over using debt or new stock issue because of specific financing costs. Tax advantages make leverage an interesting source of financing only at low levels of borrowing. At the same time, debt is also subject to bankruptcy costs, which increases with high probability of bankruptcy. New share issues, on the other hand, have informational signaling costs besides the concrete costs associated with transactions charges, which can be very high. Information asymmetry may exacerbate both the costs of debt and of new share issues because poorly informed financiers will require a premium to protect themselves from losses. These costs contribute to a financial hierarchy that makes internal finance even more attractive to support firm investment.

We use a sample division strategy with average firm size as split criterion. This criterion has been extensively used to identify groups of firms that may be more or less inclined to suffer financial constraints. The rationale is that firm size is correlated with firm fundamentals that may influence the probability of financial constraints. Smaller firms usually do not have a long history of relation with the funding market, tend to have less collateral to guarantee loans, and thus market may see investment in such firms as riskier. That increases costs of debt, bond, and stock issue. Prior studies in distinct markets, using different firm samples, have reported that firm size may affect financing policy (Audretsch & Elston, 2002; Carpenter, Fazzari, & Petersen, 1994; Gilchrist & Himmelberg, 1995; Hadlock & Pierce, 2010).

### 3.1 Models and variables

To contrast the proposed hypotheses, we estimate a model of investment that takes into account the proposals of the hierarchy of finance theory. Such models are based on the Euler equation for optimal capital accumulation in the presence of convex adjustment costs proposed by Bond & Meghir (1994). The models are based on the first-order condition of a maximization process. Investment is explained by discounted expected future investment, adjustment costs, output fluctuations, cash flow, and leverage, which capture the effects of tax advantages as well as bankruptcy costs of debt and may cause a nonlinear relation between investment and leverage.

In the absence of financial regimes indicative of possible financial constraints, no investment–cash flow sensitivity is expected. In this Euler equation model, investment in capital goods is adjusted for expected changes in input prices and net marginal output while controlling for future profitability on investment spending and financial factors, cash flow, and leverage. Future unobservable variable values are approximated by instrumental variables. The basic model is

$$\left(\frac{Inv}{K}\right)_{i,t+1} = \varsigma + \beta_1\left(\frac{Inv}{K}\right)_{i,t} + \beta_2\left(\frac{Inv}{K}\right)^2_{i,t} + \beta_3\left(\frac{\mathbf{\mathit{E}}}{K}\right)_{i,t} + \beta_4\left(\frac{Y}{K}\right)_{i,t} + \beta_5\left(\frac{D}{K}\right)^2_{i,t} + \delta_{t+1} + \alpha_i + \mu_{i,t+1}, \quad (1)$$

where the *t* refers to time period; subscript *i* refers to firm; $\delta_{t+1}$ is the error term related to time-specific effects; $\alpha_i$ is the error term associated with firm-specific effects, which includes unobservable firm-specific characteristics; $\mu_{i,t+1}$ is the random error term; *K* is the capital stock of the firm; *Inv* refers to investment in capital goods, measured as the increment in K during the current year, adjusted for depreciation ($(1-\lambda)K_t$), where λ is the depreciation rate; *CF* is the cash flow, defined as the sum of net profits and depreciation; Output fluctuation (*Y*) is proxied by year sales; and *D* refers to debt. The recent bond market growth in

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DOI: 10.7177/sg.2012.v7.n3.a16

Table 1. Sample by sector

| Sector | Observations | | Firms | |
|---|---|---|---|---|
| | *N* | % | *n* | % |
| Chemicals | 231 | 8.23 | 22 | 7.61 |
| Electrical and instrument engineering | 104 | 3.70 | 11 | 3.81 |
| Mining, metals and metal goods | 430 | 15.31 | 44 | 15.22 |
| Motor vehicles, and transport equipment | 234 | 8.33 | 23 | 7.96 |
| Wood, paper and paper products | 101 | 3.60 | 9 | 3.11 |
| Communication and media | 122 | 4.34 | 15 | 5.19 |
| Textile, clothing, leather and footwear | 293 | 10.43 | 28 | 9.69 |
| Petroleum and fuel products | 94 | 3.35 | 9 | 3.11 |
| Food, drink and tobacco | 209 | 7.44 | 21 | 7.27 |
| Miscellaneous manufacturing industries | 209 | 7.44 | 20 | 6.92 |
| Electrical | 310 | 11.04 | 34 | 11.76 |
| Building and transportation | 152 | 5.41 | 17 | 5.88 |
| Business sector services | 117 | 4.17 | 12 | 4.15 |
| Trade and retailing | 103 | 3.67 | 11 | 3.81 |
| Miscellaneous services | 99 | 3.53 | 13 | 4.50 |
| Total | 2,808 | 100.00 | 289 | 100.00 |

Brazil reported by Sanvicente (2002) motivates us to use two measures of debt (*D*): total debt, which includes bank and bond debt, and only bank debt. This use of two different measures of debt is also important for sensitivity analysis of the results.

### 3.2 Sample and empirical method

We estimate the proposed models using panel data methodology, which allows the treatment of unobservable heterogeneity associated to fixed firm effects. At the same time, unobservable specific firm errors can be eliminated from the equation through variable transformation by first differences (Arellano & Bover, 1990). We estimate the models using Arellano & Bond's (1998) system estimator. This method of estimation provides better estimators when the period of study is relatively short, as shown by Blundell & Bond (1998).

For the empirical analysis, we have gathered data from Economática database and built an unbalanced panel data of 289 nonfinancial firms listed in São Paulo Stock Exchange (BM&FBOVESPA) during the period 1995-2006, in a total of 2,808 firm-year observations. Fifteen sectors are represented in the sample, as shown in Table 1. To allow for dynamic analysis, only firms with six or more consecutive years of valid data are retained. Some firm-year observation variables have been "winsorized" at the top and bottom 5% percentiles to remove the impact of outliers, following prior works (Bhagat, Moyen, & Suh, 2005; Cleary, 1999, 2006).

Panel data methodology is the most efficient tool to use when the sample is a mixture of time series and cross-sectional data once it takes into consideration the unobservable and constant heterogeneity of each firm.

When the unobserved effect is correlated with independent variables, pooled ordinary least squares regressions produce estimations that are biased and inconsistent. We may overcome this econometric issue by using either the first differences or the fixed effects (within) estimators. Then, if the strict exogeneity condition fails, both the first differences and fixed effects (within) estimators are inconsistent and have different probability limits. The general approach for estimating models that do not satisfy strict exogeneity is to use a transformation to eliminate the unobservable effects and instruments to deal with endogeneity (Wooldrigde, 2002). Thus, we use the two-step system estimator (SE) with adjusted standard errors for potential heteroskedasticity proposed by Blundell & Bond (1998). This econometric method considers the unobserved effect transforming the variables into first differences and uses the generalized method of moments (GMM) to deal with endogeneity problems. Those differences are reflected in the quality of the instruments involved (Levine, Loayza, & Beck, 2000). The existence of weak instruments can lead to a poor asymptotic precision in finite samples (Alonso-Borrego & Arellano, 1999). Consequently, in this dynamic model, we must use an estimator that lessens this problem, substituting the specification in differences with the original regression specified in levels such as the system estimator (Blundell & Bond, 1998; Huang & Ritter, 2010; Öztekin & Flannery 2009). Performing the model in that way, the system estimator involves two kinds of equations with their own instruments. The first category of equations is in levels and its instruments are the lagged differences in the dependent variable and the independent variables. The second category of equations consists of equations in first differences with the levels of the dependent variable and the independent variables as instruments (Antoniou, Guney, & Paudyal, 2008; Arellano & Bond, 1998; Goergen & Renneboog, 2001; Wooldrigde, 2002). In our case, by using the GMM method, we can build instruments for those variables that are potentially endogenous. Even more, by using the dynamic dimension of panel data, we may check response processes across time

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Table 2. Sample descriptive statistics

| Variable | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|
| Inv/K | 0.1158 | 0.5384 | –0.8823 | 3.8316 |
| CF/K | 0.3756 | 1.1013 | –1.2839 | 2.9916 |
| Y/K | 2.5607 | 2.6906 | 0.0000 | 8.5936 |
| Debt/K | 1.0750 | 1.3848 | 0.0000 | 4.3110 |
| Bank Debt/K | 0.8003 | 0.9552 | 0.0000 | 2.9585 |

and identify how the different determinants included in our integrated signaling model explain investment.

To test model specifications validity, we calculate the Sargan/Hansen test of overidentification of restrictions. This test examines the lack of correlation between the instruments and the error term. Given the use of first-difference transformations, we expect some degree of first-order serial correlation, although this correlation does not invalidate results. However, the presence of second-order serial correlation does signal omitted variables. Thus, we use the adjustment for small samples suggested by Windmeijer (2005). Because our sample size is not very large, the Windmeijer's proposal improves the robustness of our results and avoids any potential downward bias in the estimated asymptotic standard errors.

## 4 RESULTS

Table 2 reports summary descriptive statistics of the sample variables. Average investment intensity of 11.58% is a bit inferior to some more advanced markets such as 12.9% in the United States (Chiao, 2002), 13.9% in Germany (Harhoff, 1998), 12.5% in Belgium, and 11.7% in the United Kingdom (Bond, Elston, Mairesse, & Mulkay, 2003). Brazilian firms present an average (CF/K) ratio of 37.56% with an average output ratio (Y/K) of 256%. Leverage ratios are high, being 107.5% for total debt (Debt/K) and about 80% for bank debt (Bank Debt/K).

The theoretical dynamic adjustment cost model predicts a negative investment–cash flow correlation under the assumption that the firm may raise the required funds to finance its investment projects at a given cost, which corresponds to the absence of financial constraints. Results in Table 3 refer to the estimation of the basic Euler-equation model for the whole sample. We estimate the models using GMM in system (Table 3, Panel A, i). The Sargan/Hansen test of overidentifying restriction of the instruments does not rejected the null hypothesis of valid instruments, and, the Arellano-Bond test of second order auto-correlation in

Table 3. Basic Euler-equation model for the full sample

$$\left(\frac{Inv}{K}\right)_{i,t+1} = \varsigma + \beta_1\left(\frac{Inv}{K}\right)_{i,t} + \beta_2\left(\frac{Inv}{K}\right)^2_{i,t} + \beta_3\left(\frac{\boldsymbol{E}}{K}\right)_{i,t} + \beta_4\left(\frac{Y}{K}\right)_{i,t} + \beta_5\left(\frac{D}{K}\right)^2_{i,t} + \delta_{t+1} + \alpha_i + \mu_{i,t+1}$$

| | Panel A. Total debt | | | Panel B. Bank debt | | |
|---|---|---|---|---|---|---|
| Variables | (i) GMM | (ii) GLS | (iii) OLS | (i) GMM | (ii) GLS | (iii) OLS |
| (Inv/K)i,t | 0.1039 | 0.0789** | 0.0789** | 0.1421** | 0.0835** | 0.0835** |
| | (0.0688) | (0.0337) | (0.0338) | (0.0667) | (0.0335) | (0.0336) |
| (Inv/K)2i,t | –0.0411 | –0.0195* | –0.0195* | –0.0696** | –0.0211* | –0.0211* |
| | (0.0321) | (0.0111) | (0.0112) | (0.0297) | (0.0111) | (0.0111) |
| (CF/K)i,t | 0.0464** | 0.0184* | 0.0184* | 0.0415** | 0.0188** | 0.0188** |
| | (0.0206) | (0.0095) | (0.0096) | (0.0199) | (0.0095) | (0.0096) |
| (Y/K)i,t | 0.0317*** | 0.0160*** | 0.0160*** | 0.0369*** | 0.0144*** | 0.0144*** |
| | (0.0109) | (0.0043) | (0.0043) | (0.0102) | (0.0043) | (0.0043) |
| $(D/K)^2$i,t | 0.0081 | 0.0025 | 0.0025 | 0.0113 | 0.0103*** | 0.0103*** |
| | (0.0055) | (0.0018) | (0.0018) | (0.0090) | (0.0038) | (0.0038) |
| Intercept | 0.1113 | 0.0650 | 0.0650 | –0.5002 | 0.0659 | 0.0659 |
| | (0.5309) | (0.0587) | (0.0589) | (0.4843) | (0.0586) | (0.0589) |
| N. obs. | 2,808 | 2,808 | 2,808 | 2,808 | 2,808 | 2,808 |
| N. firms | 289 | 289 | | 289 | 289 | |
| F | 2.49 | | 2.86 | 2.6 | | 3.16 |
| p-value | 0.0010 | | 0.0000 | 0.0000 | | 0.0000 |
| AR2 | 0.3120 | | | 0.5800 | | |
| Sargan/Hansen | 285.06 | | | 286.82 | | |
| p-value | 0.2810 | | | 0.271 | | |
| Wald | | 54.8 | | | 60.47 | |
| p-value | | 0.0000 | | | 0.0000 | |
| Adj. R2 | | | 0.0125 | | | 0.0144 |

Notes: Models estimated by system generalized method of moments (GMM). GLS is generalized least squares for panel data. OLS is pooled ordinary least squares. Estimated coefficients and standard errors robust to heteroscedasticity (in parentheses), concerning model of Equation 1, are presented. Dependent variable $(Inv/K)_{i,t+1}$. Sargan/Hansen is the test of overidentifying restrictions. AR2 is the test of absence of second-order correlation in the residuals. ***, **, and * denote statistical significance of the coefficients at 1, 5, and 10% levels.

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the residuals also does not rejected the null hypothesis of the absence of such correlation. Both tests also validate the other model estimated for bank debt (Table 3, Panel B, i). All standard errors are estimated robust to heteroskedasticity. As previously mentioned, to avoid omission bias, all models incorporate industry dummies (unreported in virtue of space priority).

The results shown in Table 3 lead to the rejection of the null hypothesis of perfect markets and the absence of financial constraints and therefore support Hypothesis 1. Results show a positive significant correlation between investment (Inv/K) and cash flow (CF/K). Such positive sensitivity is a strong signal that the Brazilian firms face difficulties in accessing external funds and are thus forced to use internal funds to finance investment. The positive investment–cash flow sensitivity is robust to the two different measures of debt (total debt in Panel A, and bank debt in Panel B) as well as to distinct estimation methods. In each panel, investment–cash flow sensitivity is found to be positive and significant for GMM in system estimates and also for generalized least squares for panel data (GLS) (Panels A and B, column ii) and pooled ordinary least squares (OLS) regressions (Panels A and B, column iii). These alternative estimates are important for sensitivity analysis.

Additional results provide evidence to support Hypothesis 2, which proposes that smaller firms, *a priori* considered as more prone to face financial constraints, indeed have more difficulties to finance their investment with external funds.

To test the firm size influence, we classify firms based on firm average total assets during the period of study. The 50% firms with average total assets above the median compose the group of larger firms, being the set of smaller firms composed of firms with total assets under the median value.

Considering previous evidence that firm size has implications for financial constraints (Audretsch & Elston, 2002; Chirinko & Schaller, 1995; Gilchrist & Himmelberg, 1995; Hadlock & Pierce, 2010; Harhoff, 1998), we estimate the model for Equation (1) for two subsamples of firms: smaller firms and larger firms. As previously mentioned, firms have been classified by average total assets during the period of study. Values in Table 4 refer to descriptive statistics for each group of firms. The results show that significant differences exist between the two subgroups of firms. For example, the subgroup of 144 smaller firms has inferior investment intensity, which may be a consequence of underinvestment problems, but superior output. The subgroup of 145 larger firms has superior cash flow as well as superior leverage capacity. The higher leverage is an indication of easier access to external financing.

Table 4. Descriptive statistics by firm size

| | Smaller firms | Larger firms | |
|---|---|---|---|
| Variable | Mean | Mean | p-value |
| SIZE | 10.7727 | 13.7070 | 0.0000 |
| Inv/K | 0.0923 | 0.1388 | 0.0221 |
| CF/K | 0.1786 | 0.5674 | 0.0000 |
| Y/K | 2.8614 | 2.2679 | 0.0000 |
| Debt/K | 1.0250 | 1.1237 | 0.0590 |
| Bank debt/K | 0.7553 | 0.8441 | 0.0138 |
| N. firms | 144 | 145 | |
| N. obs. | 1,325 | 1,423 | |

Notes: Mean value of each model variable by firms grouped by size. *p*-value refers to mean comparison between subsamples of smaller and bigger firms.

Estimated models for the group of smaller firms show that such sub sample of firms (Table 5) have significant positive investment–cash flow sensitivity, which is in accordance with previous findings in distinct markets and our proposed hypothesis. Investment–cash flow sensitivity associated with smaller firms contrasts with the absence of such sensitivity in the group of larger firms (Table 6). At the same time, smaller firms tend to present more persistence on investment as demonstrated by the significant correlation between previous and current investment in this group of firms. The results for system GMM estimates is confirmed for models estimated with the two different measures of debt and for alternate estimation methods, GLS and OLS, for sensitivity analysis.

As a whole, our findings, which are robust to two different measures of debt and three estimation methods, provide evidence that the Brazilian firm faces financial constraints. The positive investment–cash flow sensitivity has been verified. First, the whole set of firms exhibits such sensitivity. Second, dividing the sample by firm size it is noticeable that smaller firms have their investment dependent on internal funds while larger firms do not show such dependence.

## 5 CONCLUSIONS

We analyze the extent to which investment of Brazilian nonfinancial firms is affected by financial constraints. Loosening financial constraints and enhancing firms investment opportunities in Brazil may result in higher economic growth and positive externalities for the development of a number of smaller emerging economies. In recent years, Brazil's government has implemented a far-reaching policy of capital markets liberalization and reform of the banking system. After more than a decade of structural

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Table 5. Basic Euler-equation model for the sub sample of smaller firms

$$\left(\frac{Inv}{K}\right)_{i,t+1} = \varsigma + \beta_1\left(\frac{Inv}{K}\right)_{i,t} + \beta_2\left(\frac{Inv}{K}\right)^2_{i,t} + \beta_3\left(\frac{\pounds}{K}\right)_{i,t} + \beta_4\left(\frac{Y}{K}\right)_{i,t} + \beta_5\left(\frac{D}{K}\right)^2_{i,t} + \delta_{t+1} + \alpha_i + \mu_{i,t+1}$$

| | Total Debt | | | Bank Debt | | |
|---|---|---|---|---|---|---|
| Variables | (i) GMM | (ii) GLS | (iii) OLS | (i) GMM | (ii) GLS | (iii) OLS |
| $(Inv/K)_{i,t}$ | 0.1823** | 0.1124** | 0.1096** | 0.2290** | 0.1157** | 0.1151** |
| | (0.0820) | (0.0466) | (0.0470) | (0.0906) | (0.0464) | (0.0468) |
| $(Inv/K)^2_{i,t}$ | –0.0758 | –0.0252 | –0.0244 | –0.0789 | –0.0260* | –0.0259* |
| | (0.0512) | (0.0154) | (0.0155) | (0.0537) | (0.0154) | (0.0155) |
| $(CF/K)_{i,t}$ | 0.0749** | 0.0398*** | 0.0385*** | 0.0789** | 0.0420*** | 0.0406*** |
| | (0.0342) | (0.0136) | (0.0136) | (0.0344) | (0.0135) | (0.0135) |
| $(Y/K)_{i,t}$ | 0.0475*** | 0.0202*** | 0.0206*** | 0.0512*** | 0.0190*** | 0.0195*** |
| | (0.0158) | (0.0057) | (0.0057) | (0.0160) | (0.0057) | (0.0057) |
| $(D/K)^2_{i,t}$ | –0.0018 | 0.0035 | –0.0004 | –0.0025 | 0.0196 | 0.0048 |
| | (0.0059) | (0.0113) | (0.0026) | (0.0143) | (0.0160) | (0.0053) |
| Intercept | 0.1806 | 0.0103 | 0.1096 | 2.9056 | 0.1063 | 0.1098 |
| | (0.4397) | (0.1450) | (0.1723) | (4.8104) | (0.1710) | (0.1722) |
| N. obs. | 1,385 | 1,385 | 1,385 | 1,385 | 1,385 | 1,385 |
| N. firms | 144 | 144 | | 144 | 144 | |
| *F* | 2.79 | | 2.49 | 2.33 | | 2.53 |
| *p*-value | 0.0000 | | 0.0004 | 0.0030 | | 0.0003 |
| AR2 | 0.914 | | | 0.69 | | |
| Sargan/Hansen | 133.89 | | | 137.74 | | |
| *p*-value | 0.3660 | | | 0.2830 | | |
| Wald | | 48.02 | | | 49.47 | |
| *p*-value | | 0.0003 | | | 0.0002 | |
| Adj. $R^2$ | | | 0.0200 | | | 0.0206 |

Notes: GMM is generalized method of moments. GLS is generalized least squares for panel data. OLS is pooled ordinary least squares. Estimated coefficients and standard errors robust to heteroscedasticity (in parentheses) reported. Dependent variable $(Inv/K)_{i,t+1}$. Sargan/Hansen is the test of overidentifying restrictions. AR2 is the test of absence of second-order correlation in the residuals. ***, **, and * denote statistical significance of the coefficients at 1, 5, and 10% levels.

Table 6. Basic Euler-equation model for the sub sample of larger firms

$$\left(\frac{Inv}{K}\right)_{i,t+1} = \varsigma + \beta_1\left(\frac{Inv}{K}\right)_{i,t} + \beta_2\left(\frac{Inv}{K}\right)^2_{i,t} + \beta_3\left(\frac{\pounds}{K}\right)_{i,t} + \beta_4\left(\frac{Y}{K}\right)_{i,t} + \beta_5\left(\frac{D}{K}\right)^2_{i,t} + \delta_{t+1} + \alpha_i + \mu_{i,t+1}$$

| | Total debt | | | Bank debt | | |
|---|---|---|---|---|---|---|
| Variables | (i) GMM | (ii) GLS | (iii) OLS | (i) GMM | (ii) GLS | (iii) OLS |
| $(Inv/K)_{i,t}$ | 0.0063 | 0.0372 | 0.0385 | 0.0149 | 0.0355 | 0.0411 |
| | (0.1211) | (0.0486) | (0.0491) | (0.1106) | (0.0483) | (0.0487) |
| $(Inv/K)^2_{i,t}$ | 0.0079 | –0.0133 | –0.0137 | 0.0050 | –0.0135 | –0.0155 |
| | (0.0491) | (0.0160) | (0.0162) | (0.0493) | (0.0160) | (0.0161) |
| $(CF/K)_{i,t}$ | 0.0169 | –0.0129 | –0.0156 | 0.0276 | –0.0094 | –0.0141 |
| | (0.0442) | (0.0147) | (0.0149) | (0.0443) | (0.0146) | (0.0147) |
| $(Y/K)_{i,t}$ | 0.0310 | 0.0133* | 0.0138* | 0.0313 | 0.0110 | 0.0104 |
| | (0.0220) | (0.0071) | (0.0071) | (0.0222) | (0.0072) | (0.0072) |
| $(D/K)^2_{i,t}$ | 0.0106 | 0.0320*** | 0.0073*** | 0.0178 | 0.0552*** | 0.0209*** |
| | (0.0104) | (0.0120) | (0.0027) | (0.0182) | (0.0177) | (0.0059) |
| Intercept | 0.3464 | 0.0091 | 0.2158** | –0.4385 | 0.0037 | 0.2136** |
| | (0.5531) | (0.0960) | (0.1082) | (0.4706) | (0.0958) | (0.1080) |
| N. obs. | 1,423 | 1,423 | 1,423 | 1,423 | 1,423 | 1,423 |
| N. firms | 145 | 145 | | 145 | 145 | |
| *F* | 1.49 | | 1.79 | 1.53 | | 2.08 |
| *p*-value | 0.0980 | | 0.0197 | 0.0830 | | 0.0042 |
| AR2 | 0.202 | | | 0.212 | | |
| Sargan/Hansen | 139.8 | | | 136.93 | | |
| *p*-value | 0.2430 | | | 0.3000 | | |
| Wald | | 34.38 | | | 37.05 | |
| *p*-value | | 0.0166 | | | 0.0078 | |
| Adj. $R^2$ | | | 0.0104 | | | 0.0142 |

Notes: GMM is generalized method of moments. GLS is generalized least squares for panel data. OLS is pooled ordinary least squares. Estimated coefficients and standard errors robust to heteroscedasticity (in parentheses) reported. Dependent variable $(Inv/K)_{i,t+1}$. Sargan/Hansen is the test of overidentifying restrictions. AR2 is the test of absence of second-order correlation in the residuals. ***, **, and * denote statistical significance of the coefficients at 1, 5, and 10% levels.

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transformations, we assess the situation and the obstacles that Brazilian firms face in their investment process.

Based on a sample of 289 nonfinancial firms quoted in São Paulo Stock Exchange between 1995 and 2006, we build a panel data of 2,808 firm-year observations. The industry composition of our sample rules out the possibility of industry selection bias. We use GMM as estimation procedure due to two main advantages. First, it allows us to control for firms' fixed effects or unobservable constant heterogeneity. Second, it allows us to address problems of endogeneity stemming from the specification of the Euler equation we use.

Our results confirm the effect of financial constraints on capital expenditure process of Brazilian firms. The sensitivity of investment to cash flow as a signal of financial constraints has been previously discussed in the literature, and latest research seems to confirm the suitability of such metric. Consistently, we find that, broadly speaking, the investment of Brazilian firms depends on the availability of internal funds. This result is robust to controlling for previous investment, output fluctuations, and corporate debt.

We also confirm that firm size influences financial constraints for investment in Brazil. Investment policy of smaller firms is dependent on internal funds, contrary to the situation of larger ones. Indeed, that is a meaningful signal that smaller firms suffer more strongly the effects of market imperfections.

From the results of this paper, two reflections can be viewed. On the firm level, in accordance with most of the literature on the international arena, our findings suggest that financial constraints arise as a consequence of the imperfect substitutability of internal and external funds due to adverse selection and informational problems. This way, firms should try to improve disclosure of corporate information to possible funds providers. On the policy level, given the importance of corporate investment for economic growth, new institutional conditions should be put in place in a way to strengthen capital markets.

Some future research may be viewed from here. Better corporate governance is considered to be able to improve access to external finance. This way, future research could address how corporate governance mechanisms are able to shape corporate investment and funding in institutional settings in which rights of creditors and external investors are still not adequate, as is the case of Brazil.

## 6. NOTES

[1]. According to an official inflation index (IPCA), annual inflation in Brazil has reached 2,477% in 1993. Since the Plan "Real" in mid 1994, inflation has decreased to 916% in 1994, 22% in 1995, and has been under 10% since then with the exception of 12% in 2002.

[2]. Marques & Fochezatto (2007) present data about interest rates relative to year 2005 in different undeveloped countries. Brazil has the highest interest rates (19.24%), followed by Russia and Venezuela with 13% and 12.7%, respectively. All other countries in their study present interest rates below 8%, reaching a minimum 2.2% in China.

## 7. ACKNOWLEDGEMENTS

This work has received support from ALBAN scholarship program (id: E03D23923BR) and *Fundação Cearense de Apoio ao Desenvolvimento Científico e Tecnológico* (FUNCAP) (Program PPP/FUNCAP/CNPq, PP1-0033-00010.01.00/10 SPU N.: 10582573-5). We are also grateful to anonymous referees' valuable suggestions.

## 8. REFERENCES

Akerlof, G. A. (1970). The market for lemons: quality uncertainty and the market mechanism. *The Quarterly Journal of Economics, 84*(3), 488-500.

Allayannis, G., & Mozumdar, A. (2004). The impact of negative cash flow and influential observations on investment–cash flow sensitivity estimates. *Journal of Banking & Finance, 28*(5), 901-930.

Almeida, H., & Campello, M. (2007). Financial Constraints, Asset Tangibility, and Corporate Investment. *The Review of Financial Studies, 20*(5), 1429-1460.

Alonso-Borrego, C., & Arellano, M. (1999). Symmetrically normalized instrumental variable estimation using panel data. *Journal of Business & Economic Statistics, 17*, 36-49.

Alti, A. (2003). How Sensitive Is Investment to Cash Flow When Financing Is Frictionless? *The Journal of Finance, 58*(2), 707–722.

Antoniou, A., Guney, Y., & Paudyal, K. (2008). The determinants of corporate debt ownership structure: Evidence from market-based and bank-based economies. *Managerial Finance, 34*(12), 821-847.

Arellano, M., & Bond, S. (1998). Dynamic panel data estimation using DPD98 for Gauss: A guide for users. *The Institute for Fiscal Studies, 1*, 1-27.

Arellano, M., & Bover, O. (1990). La econometria de datos de panel. *Investigaciones Económicas, 14*(1), 3-45.

Audretsch, D. B., & Elston, J. A. (2002). Does firm size matter? Evidence on the impact of liquidity constraints on firm investment behavior in Germany. *International Journal of Industrial Organization, 20*(1), 1-17.

Baer, W., & Coes, D. V. (2001). Privatization, regulation and income distribution in Brazil. *The Quarterly Review of Economics and Finance, 41*(5), 609-620.

**Revista Eletrônica Sistemas & Gestão**
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DOI: 10.7177/sg.2012.v7.n3.a16

Bhagat, S., Moyen, N., & Suh, I. (2005). Investment and internal funds of distressed firms. *Journal of Corporate Finance, 11*(3), 449-472.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Jounal of Econometrics, 87*, 115-143.

Bond, S., Harhoff, D., & Van Reenen, J. (2003). Investment, R&D and Financial Constraints in Britain and Germany, The Institute for Fiscal Studies, Working Paper Series No. W99/5.

Bond, S. R., Elston, J. A., Mairesse, J., & Mulkay, B. (2003). Financial factors and investment in Belgium, France, Germany, and the United Kingdom: a comparison using company panel data. *The Review of Economics and Statistics, 85*(1), 153-165.

Bond, S. R., & Meghir, C. (1994). Dynamic investment models and the firm's financial policy. *The Review of Economic Studies, 61*(2), 197-222.

Carpenter, R. E., Fazzari, S. M., & Petersen, B. C. (1994). Inventory investment, internal-finance fluctuations, and the business cycle. *Brookings Papers on Economic Activity, 1994*(2), 75-122.

Chapman, D. R., Junor, C. W., & Stegman, T. R. (1996). Cash flow constraints and firms' investment behaviour. *Applied Economics, 28*(8), 1037-1044.

Chiao, C. (2002). Relationship between debt, R&D and physical investment, evidence from US firm-level data. *Applied Financial Economics, 12*, 105-121.

Chirinko, R. S., & Elston, J. A. (2006). Finance, control and profitability: the influence of German banks. *Journal of Economic Behavior & Organization, 59*(1), 69-88.

Chirinko, R. S., & Schaller, H. (1995). Why Does Liquidity Matter in Investment Equations? *Journal of Money, Credit & Banking, 27*(2), 527-548.

Cleary, S. (1999). The Relationship between Firm Investment and Financial Status. *The Journal of Finance, 52*(2), 673-692.

Cleary, S. (2006). International corporate investment and the relationships between financial constraint measures. *Journal of Banking & Finance, Volume 30, Issue 5, May 2006, Pages 1559-1580., 30*(5), 22.

Crisóstomo, V. L., López-Iturriaga, F. J., & Vallelado, E. (2011). Financial Constraints for Innovation in Brazil. Latin American Business Review, 12(3), 165-185.

D'Espallier, B., Huybrechts, J., & López-Iturriaga, F. J. (2011). Analyzing firm-varying investment-cash flow sensitivities and cash-cash flow sensitivities: A Bayesian approach. Revista Española de Financiación y Contabilidad, XL(151), 437-465.

Darrat, A. F., Elkhal, K., & McCallum, B. (2006). Finance and Macroeconomic Performance: Some Evidence for Emerging Markets. *Emerging Markets, Finance & Trade, 42*(3), 5-28.

Degryse, H. A., & De Jong, A. (2006). Investment and internal finance: Asymmetric information or managerial discretion? *International Journal of Industrial Organization, 24*(1), 125-147.

Demirgüç-Kunt, A., & Maksimovic, V. (1998). Law, Finance, and Firm Growth. *The Journal of Finance, 53*(6), 2107-2137.

Dyck, A., & Zingales, L. (2004). Private Benefits of Control: An International Comparison. *The Journal of Finance, 59*(2), 537–600.

Elston, J. A. (1998). Investment, liquidity constraints and bank relationships: evidence from german manufacturing firms. In S. W. Black & M. Moersch (Eds.), *Competition and convergence in financial markets: the German and Anglo-American models* (Vol. 5, pp. 135-151). Amsterdam: Elsevier Science North-Holland.

Fazzari, S. M., Hubbard, R. G., & Petersen, B. C. (1988). Financing Constraints and Corporate Investment. *Brookings Papers on Economic Activity, 1988*(1), 141-206.

Freitas, M. C. P. d., & Prates, D. M. (2008). Investimentos estrangeiros nos sistemas financeiros latino-americanos: os casos da Argentina, do Brasil e do México. *Revista de Economia Contemporânea, 12*(2), 189-218.

Galeotti, M., Schiantarelli, F., & Jaramillo, F. (1994). Investment decisions and the role of debt, liquid assets and cash flow: evidence from Italian panel data. *Applied Financial Economics, 4*(2), 121-132.

Gilchrist, S., & Himmelberg, C. P. (1995). Evidence on the role of cash flow for investment. *Journal of Monetary Economics, 36*(3), 541-572.

Goergen, M., & Renneboog, L. (2001). Investment Policy, Internal Financing and Ownership Concentration in the UK. *Journal of Corporate Finance, Volume 7, Issue 3, pp. 257-284, September/2001., 7*(3), 28.

Goldman Sachs. (2007). *BRICs and Beyond*: The Goldman Sachs Group, Inc. Goldman Sachs Global Economics Group.

Gomes, J. F. (2001). Financing investment. *The American Economic Review, 91*(5), 1263-1285.

Greenwald, B. C., & Stiglitz, J. E. (1990). Asymmetric Information and the New Theory of the Firm: Financial Constraints and Risk Behavior. *The American Economic Review, Papers and Proceedings of the Hundred and Second Annual Meeting of the American Economic Association (May, 1990), 80*(2), 160-165.

Hadlock, C. J., & Pierce, J. R. (2010). New Evidence on Measuring Financial Constraints: Moving Beyond the KZ Index. *Review of Financial Studies, 23*(5), 1909-1940.

**Revista Eletrônica Sistemas & Gestão**
Volume 7, Número 3, 2012, pp. 490-501
DOI: 10.7177/sg.2012.v7.n3.a16

Harhoff, D. (1998). Are there Financing Constraints for Innovation and Investment in German Manufacturing Firms? *Annales d'Économie et de Statistique, 49/50*, 421-456.

Hennessy, C. A., Levy, A., & Whited, T. M. (2007). Testing Q theory with financing frictions. *Journal of Financial Economics, 83*(3), 691-717.

Hoshi, T., Kashyap, A., & Scharfstein, D. (1991). Corporate structure, liquidity, and investment: evidence from Japanese industrial groups. *Quarterly Journal of Economics, 106*(1), 33-60.

Hovakimian, G. (2009). Determinants of Investment Cash Flow Sensitivity. *Financial Management, 38*(1), 161–183.

Huang, R., & Ritter, J. (2010). Testing theories of capital structure and estimating the speed of adjustment. *Journal of Financial and Quantitative Analysis, forthcoming*.

Hubbard, R. G., Kashyap, A. K., & Whited, T. M. (1995). Internal finance and firm investment. *Journal of Money, Credit, and Banking, 27*(3), 683-701.

Kaplan, S. N., & Zingales, L. (1997). Do investment-cash flow sensitivities provide useful measures of financing constraints? *Quarterly Journal of Economics, 112*(1), 169-215.

Kalatzis, A. E. G., Azzoni, C. R., & Achcar, J. A. (2008). Financial constraints and investment decisions: evidence from a highly unstable emerging economy. Applied Economics, 40(11), 1425-1434.

La Porta, R., López-de-Silanes, F., Shleifer, A., & Vishny, R. W. (1998). Law and Finance. *Journal of Political Economy, 106*(6), 1113-1155.

La Porta, R., López-de-Silanes, F., Shleifer, A., & Vishny, R. W. (1999). The quality of government. *Journal of Law, Economics and Organization, 15*(1), 222-279.

La Porta, R., López-de-Silanes, F., Shleifer, A., & Vishny, R. W. (2000). Investor protection and corporate governance. *Journal of Financial Economics, 58*(1-2), 3-27.

Levine, R. (2002). Bank-Based or Market-Based Financial Systems: Which is Better? *Journal of Financial Intermediation, 11*(4), 398-428.

Levine, R. (2005). Finance and Growth: Theory and Evidence. In P. Aghion & S. N. Durlauf (Eds.), *Handbook of Economic Growth* (Vol. 1, pp. 865-934): Elsevier Science.

Levine, R., Loayza, N., & Beck, T. (2000). Financial intermediation and growth: Causality and causes. *Journal of Monetary Economics, 46*, 31-77.

Lízal, L., & Svejnar, J. (2002). Investment, Credit Rationing, and the Soft Budget Constraint: Evidence from Czech Panel Data. *The Review of Economics and Statistics, 84*(2), 353-370.

López-Iturriaga, F. J., & Crisóstomo, V. L. (2010). Do leverage, dividend payout and ownership concentration influence firms' value creation? An analysis of Brazilian firms. *Emerging Markets Finance and Trade, 46*(3), 80-94.

Maestro, M. H., De Miguel, A., & Pindado, J. (2007). Modelo de inversión basado en la ecuación de Euler con límite máximo de endeudamiento: evidencia empírica internacional. *Cuadernos de Economía y Dirección de la Empresa, 30*, 93-128.

Marques, A. M., & Fochezatto, A. (2007). Taxa de juros e prêmio de risco: investigando a hipótese Bresser-Nakano para a economia brasileira, 1995-2005. *Revista de Economia Contemporânea, 11*(2), 371-375.

Mattos, L. B., Cassuce, F. C. C., & Campos, A. C. (2007). Determinantes dos Investimentos Diretos Estrangeiros no Brasil, 1980-2004. *Revista de Economia Contemporânea, 11*(1), 39-60.

Moreira, M. M., & Puga, F. P. (2000). Como a Indústria Brasileira Financia o seu Crescimento". Uma Análise do Brasil Pós-Real. *Revista de Economia Contemporânea, 5*(edição especial), 1-39.

Moyen, N. (2004). Investment-Cash Flow Sensitivities: Constrained versus Unconstrained Firms. *The Journal of Finance, 59*(5), 2061–2092.

O´Neill, J. (2001). Building better global economics BRICs. The Goldman Sachs Group, Inc., New York, *Global Economics Paper 66*.

Oliveira, G. C., & Carvalho, C. E. (2007). O componente "custo de oportunidade" do spread bancário no Brasil: uma abordagem pós-keynesiana. *Economia e Sociedade, 16*(3), 371-404.

Omar, J. H. D. (2008). Taxa de juros: comportamento, determinação e implicações para a economia brasileira. *Revista de Economia Contemporânea, 12*(3), 463-490.

Öztekin, Ö., & Flannery , M. J. (2009). Institutional Determinants of Capital Structure Adjustment Speeds. Available at SSRN: http://ssrn.com/abstract=1364273.

Perotti, E. C., & Gelfer, S. (2001). Red barons or robber barons? Governance and investment in Russian financial–industrial groups. *European Economic Review, 45*(9), 1601-1617.

Rajan, R. G., & Zingales, L. (1998). Financial Dependence and Growth. *The American Economic Review, 88*(3), 559-586.

Rizov, M. (2004). Credit Constraints and Profitability. *Emerging Markets, Finance & Trade, 40*(4), 63-83.

Rodrigues, D. A. (2000). Os Investimentos no Brasil nos Anos 90: Cenários Setorial e Regional. *Revista do BNDES, 7*(13), 107-136.

**Revista Eletrônica Sistemas & Gestão**
Volume 7, Número 3, 2012, pp. 490-501
DOI: 10.7177/sg.2012.v7.n3.a16

Sanvicente, A. Z. (2002). A Evolução Recente do Mercado Primário de Debêntures. *Revista da Comissão de Valores Mobiliários, 34*, 63-70.

Schiantarelli, F. (1996). Financial constraints and investment: methodological issues and international evidence. *Oxford Review of Economic Policy, 12*(2), 70-89.

Schiantarelli, F., & Sembenelli, A. (2000). Form of ownership and financial constraints: Panel data evidence from flow of funds and investment equations. *Empirica, 27*(2), 175-192.

Shleifer, A., & Wolfenzon, D. (2002). Investor protection and equity markets. *Journal of Financial Economics, 66*(1), 3-27.

Stiglitz, J. E. (1989). Markets, Market Failures, and Development. *The American Economic Review, 79*(2), 197-203.

Studart, R. (2000). Financial opening and deregulation in Brazil in the 1990s Moving towards a new pattern of development financing? *The Quarterly Review of Economics and Finance, 40*(1), 25-44.

Terra, M. C. T. (2003). Credit Constraints in Brazilian Firms: Evidence from Panel Data. *Revista Brasileira de Economia, 57*(2), 443-464.

Vogt, S. C. (1994). The cash flow/investment relationship: Evidence from US manufacturing firms. *Financial Management, 23*(2), 3-20.

Whited, T. M. (1992). Debt, Liquidity Constraints, and Corporate Investment: Evidence from Panel Data. *Journal of Finance, 47*(4), 1425-1460.

Whited, T. M., & Wu, G. (2006). Financial Constraints Risk. *The Review of Financial Studies, 19*(2), 531-559.

Wilson, D., & Purushothaman, R. (2003). Dreaming With BRICs: The Path to 2050. The Goldman Sachs Group, Inc., New York, *Goldman Sachs - Global Economics Paper No: 99*, 1-23.

Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of Econometrics, 126*, 25–51.

Wooldrigde, J. (2002). *Econometric analysis of cross section and panel data*. Cambridge, MA: MIT Press.

Wurgler, J. (2000). Financial markets and the allocation of capital. *Journal of Financial Economics, 58*(1-2), 187-214.