



Access to finance, working capital management and company value: Evidences from Brazilian companies listed on BM&FBOVESPA



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ABSTRACT

In this research, we have analyzed the impact of financial leverage on the relationship between working capital and company value and how financial constraints on access to financing affect this relationship. In addition, we have analyzed the relationship between working capital and company value. Using a sample of Brazilian public companies listed on BM&FBOVESPA from 1995 through 2009, we found evidence for the following conclusions: an extra Real (R\$) of investment in working capital is significantly less worth, on average, than an extra Real (R\$) of investment in cash; and, on average, increasing the level of working capital at the beginning of a fiscal year reduces company value.

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1. Introduction

The corporate finance literature has traditionally focused on the study of long-term financial decisions, especially those relating to investment, capital structure, dividends or company valuation decisions. However, short-term assets and liabilities are important components of the total assets of a company and also need to be carefully analyzed. The management of these short-term assets and liabilities warrants careful analysis, considering that the management of working capital plays an important role for corporate profitability and risk, and hence for company value.

The importance of working capital management is not new in the finance literature. In general, a great deal of academic researches has focused on different individual aspects of working capital management: cash management and securities, like the studies of Kim, Mauer, and Sherman (1998) and Faulkender and Wang (2006); trade credit, like the study by Petersen and Rajan (1997), among others. However, Schiff and Lieber (1974), Sartoris and Hill (1983) and Kim and Chung (1990) reinforce the need to consider the joint effects of these individual aspects of working capital management. That is, we need to consider all these aspects simultaneously, as there is a mutual influence between them (i.e., the credit policy of a company influences its sales and, at the same time, the level of inventories and the use of trade credit). Thus, all aspects of managing the working capital influence each other and the company value.

Moreover, several empirical analyses show that there is statistical evidence for the relationship between a company's profitability and

efficiency of working capital management (i.e., the profitability of a company is inversely proportional to its cash conversion cycle), like the studies of Shin and Soenen (1998), Deloof (2003), and Garcia-Teruel and Martinez-Solano (2007).

In this sense, since working capital is an important component of cash flow from operations, and cash flow from operations is part of the estimation of free cash flows, it is easy to conclude that the efficient management of working capital is value relevant to any company. So, we can state that efficient management of working capital is a key part of the overall strategy of any company to create shareholder value.

In order to test the applicability of this concept to the Brazilian market, we focus on the effect of working capital investment on company value. More specifically, we intend to analyze what value do shareholders place on an extra Real (R\$) of working capital held by companies.

In Brazil, given the historical difficulty on access long term financing by local companies, working capital has fundamental importance as a tool for creating shareholder value. For a long time, the main (or the only) source of long term financing was the National Bank for Economic and Social Development (BNDES), but this source was restricted mainly to a few large corporations. Moreover, Brazilian companies commonly use short term financing sources as long term sources through the constant renewal of the credit lines. This is the case of ACC (Advances on Exports Contracts) lines, ACE (Advance against Draft Presentation) lines, factoring and bill discounting, which replace the long term credit lines, although they are considered short-term credit lines. In fact, these kinds of credit lines are indeed long term financing, given the almost automatic renewals of credit lines.

Besides, a company that faces financial constraints can be expected facing a higher financial cost when raising external funds. As a result, the marginal value of cash holding and the marginal

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value of working capital holding may be higher for these kinds of firms since internal funds enable the firms to avoid incurring this higher financial cost. Additionally, if these companies have good investment opportunities, the higher the cost of raising external funds, the higher the probability that these value-enhancing projects will be abandoned if internal funds are insufficient. So, we could infer that for financial restricted companies, higher cash and working capital holdings increase the likelihood of taking positive net present value projects that would otherwise be abandoned, whereas liquidity provides no such benefit for unrestricted companies.

By managing working capital efficiently, companies can reduce their dependence on external funding, and use the released cash for further investments, improving the company financial flexibility. Moreover, by managing working capital efficiently, a firm can lower their financing costs as less external funds will be needed to finance the working capital requirements.

So, the implied relationship between investment in working capital and financing raises the issue of how financing influences the valuation effects of investment in working capital. Consequently, we also focused on how constraints on a company's financing (its access to public capital markets) influence the effect of financing on the relationship between investment in working capital and company value.

Thus, we have two objectives in this study. The first one, using the large panel of firms, is to analyze the relationship between working capital investment and company value. To check the robustness of our results, we also focus our analysis on two sub-samples of companies that should differ in the value shareholders place on an extra Real (R\$) of working capital investment in the firm. To do it, we divided our sample into commercial and non-commercial companies and into low and high stock exchange liquidity firms in order to test for differences in the value shareholders place on an additional investment in working capital between these sub-samples.

The second objective is to analyze whether specific financial characteristics of companies, particularly those that lead to financial restrictions on access to capital, affect this value (the tested hypothesis is that companies with better access to capital markets suffer a lower value reduction when funding the additional investment in working capital). That is, if shareholders believe that difficulty in accessing capital markets may sometimes lead firms to abandon value-creating investments, then the relative value of a Real (R\$) of holding working capital may be worth more than a Real (R\$).

Using the data on Brazilian public companies listed on BM&FBOVESPA from 1995 through 2009, we found evidence for the following conclusions: an extra Real (R\$) of investment in working capital is significantly less worth, on average, than an extra Real (R\$) of investment in cash; on average, increasing the level of working capital, at the beginning of a fiscal year, reduces company value; commercial companies suffer a smaller value reduction when they increase, at the beginning of the fiscal year, the investment in working capital; and, we cannot state that the financial leverage increase to finance the additional working capital investment reduces company value.

The study is structured as follows: after the [Introduction](#) section, item 2 will provide the literature review; item 3 will present the details of the selection criteria of the sample of stocks and the descriptive statistics for each used variable; item 4 will describe the methodological procedures used in this study; item 5 will focus on the analysis of results; and item 6 will present the conclusions, the limitations of this study, and proposals for future lines of research that can improve the knowledge of the topic addressed here. Finally, references are provided in item 7.

2. Literature review

The importance of working capital management is not new in the literature on finance. Some time ago, many researchers ([Gupta, 1969](#); [Gupta & Huefner, 1972](#)) analyzed a range of financial indicators as part of the management of working capital, concluding that there

are differences in the average profitability, activity, leverage and liquidity ratios among industry groups.

Over the years, a point that has received considerable attention from several authors is what optimal level of company working capital. [Deloof \(2003\)](#) and [Howorth and Westhead \(2003\)](#) confirm that companies seek to maintain an optimal level of working capital in order to maximize their value. There is also a long debate about the risk/return tradeoff among different policies for working capital, in which a more aggressive working capital policy is associated with higher returns and higher risks, while more conservative policies for working capital are related with lower risks and returns, according to [Gardner, Mills, and Pope \(1986\)](#) and [Weinraub and Visscher \(1998\)](#).

[Shin and Soenen \(1998\)](#) examine the relationship between different accounting measures of profitability and the cash conversion cycle (understood as a summary measure of efficiency of a company's working capital management). They conclude that companies that manage their working capital more efficiently (i.e. a lower cash conversion cycle) have higher operating cash flow and are potentially more valuable. [Deloof \(2003\)](#) analyzes a sample of large Belgian companies during the period 1992 to 1996 and the results confirmed that these companies could improve their profitability by reducing the number of days of accounts receivable and by reducing inventory levels. In the same vein, [Garcia-Teruel and Martinez-Solano \(2007\)](#) also suggest that managers can create value by reducing the average number of days of accounts receivable and inventory. That is, the studies have showed that as the cash conversion cycle increases it will lead to decreasing company profitability and managers could create a positive value for the shareholders by reducing the cash conversion cycle to a possible optimum level.

On the other hand, company cash and liquidity management has been the focus of some recent research, for example, [Kim et al. \(1998\)](#) and [Faulkender and Wang \(2006\)](#). [Kim et al. \(1998\)](#) study the determinants of liquidity and the company's decision to invest in liquid assets. [Faulkender and Wang \(2006\)](#) analyze the marginal value of cash levels as a function of differences in the financial policies of companies.

In the Brazilian context, we can state that academic research on working capital management is very limited and, moreover, the consulted Brazilian studies also relate to individual aspects of company management of working capital. In relation to trade credit, [Bandeira \(2008\)](#) confirms the hypotheses of substitution, complementarity and reputation for the use of trade credit and [Brando \(2010\)](#) finds evidence of supply of trade credit as a strategic element for those companies and presented evidence that companies with credit restrictions and lower gross margin offer more trade credit. Furthermore, [Nakamura and Palombini \(2010\)](#) study the determinants of working capital management in the Brazilian market and find evidence that the level of debt, size and growth rate can affect the company's working capital management.

Thus, both in Brazil and abroad, there is a range of academic research on various individual aspects of the working capital management. However, according to [Schiff and Lieber \(1974\)](#), [Sartoris and Hill \(1983\)](#) and [Kim and Chung \(1990\)](#), the joint effects of these individual aspects must be considered, as there are mutual influences between them (e.g., a company's credit policy will affect its sales and, at the same time, its inventory levels and supply of trade credit). Thus, all aspects of the management of working capital influence one another and the value of the company.

In this way, [Kieschnick, LaPlante, and Moussawi \(2009\)](#), using the methodology developed by [Faulkender and Wang \(2006\)](#), was the first research to show the relationship between working capital management and firm value for a sample of US firms. Using data on US corporations from 1990 to 2004 period, [Kieschnick et al. \(2009\)](#) find evidence for the following conclusions: (i) a dollar invested in net operating capital is worth less on average than a dollar held in cash; (ii) on average, an additional dollar of investment in net operating

Table 1
Number of sample companies per year. The table shows the number of companies initially obtained in each year of analysis and the number of companies excluded due to the application of the various filters discussed above. Filter 1 shows the number of shares of financial institutions excluded from the sample each year. Filter 2 shows the number of excluded companies that had negative net equity or had no net equity data. The filter 3 shows the number of companies excluded due to lack of market value data. Finally, filter 4 shows the number of companies excluded from the sample due to a cut in liquidity ratio on the stock exchange.

Source: prepared by the authors from Economatica database.

Period	Total companies	Filter 1 (financial institution stocks)	Filter 2 (net equity < 0 or lack of data for net equity)	Filter 3 (no market value data)	Filter 4 (liquidity ratio on stock market < 0.0001)	Total companies in sample
1995	315	28	90	5	32	160
1996	338	29	106	9	28	166
1997	345	31	78	18	47	171
1998	359	31	59	27	50	192
1999	366	31	59	18	64	194
2000	353	27	53	17	64	192
2001	348	29	56	20	66	177
2002	333	29	51	20	62	171
2003	316	26	55	13	60	162
2004	309	26	50	7	63	163
2005	300	24	49	11	50	166
2006	313	23	53	11	47	179
2007	362	35	52	9	49	217
2008	348	33	50	4	46	215
2009	343	33	44	7	54	205
Ave	336.5	29.0	60.3	13.1	52.1	182.0

working capital at current levels of such investment reduces firm value; (iii) the evidence that a dollar invested in net operating working capital is worth less than a dollar is primarily driven by its financing; and (iv) firms with better access to public capital market, and particularly commercial paper markets, face a lower reduction in value from financing investment in working capital.

Also Autukaite and Molay (2011) use a sample of French companies from 2003 to 2009 period and came up with the following conclusions: (i) investors in the French companies are concerned by the increase in cash in companies' accounts but value it less than for US firms; (ii) investors in the French companies care a lot about the working capital management and value an extra euro invested in the working capital less than one; and (iii) the fact that a euro invested in cash or in net operating working capital is worth less than one euro is mainly explained by the financial structure of a company.

This research therefore seeks to analyze the relationship between investment in working capital and company value in the Brazilian

market. Given the evidence of the literature, the hypothesis formulated in this study suggests that, on average, the additional investment of a Real (R\$) in working capital, at current levels of working capital, reduces company value.

In addition, we sought to separately analyze the companies that would face greater restrictions on access to finance and the impact on the relationship between investment in working capital and company value. As it is not easy to categorize in advance which companies would face greater financial constraints (Hennessy, Levy, & Whited, 2007; Kaplan & Zingales, 1997; Moyen, 2004; Whited & Wu, 2006), this study adopts the approach used by Faulkender and Wang (2006) to annually split our sample of stocks into two groups: financially restricted and financially unrestricted. Thus, we use payout ratio, size and issue of debentures with rating to separate the companies. The idea behind this separation is that i) companies with high payout ratios are more likely to generate large amounts of resources internally in order to cover the debt and finance the necessary investments; ii) larger

Table 2
Descriptive statistics. The table presents the descriptive statistics for the variables in our sample of stocks used in this study. $r_{i,t} - R_{i,t}^B$ is the stock excess return (defined as the stock return i during year t minus the benchmark return of stock i in year t). All variables, except LEVER _{t} and $r_{i,t} - R_{i,t}^B$, were standardized by lagged market value of the company (M_{t-1}). C_t is the cash value of the company; EBIT _{t} ; earnings before interest, taxes and extraordinary items; NA_t is equal to total assets minus the value of cash; NNA_t is total assets minus the value of cash and working capital; INTER _{t} is the value of financial expenses; DIVID _{t} is the total dividend paid; LEVER _{t} is the company's leverage ratio (obtained by dividing the long-term liabilities by company market value); NF _{t} is the company's net financing (obtained by the difference between share issues and repurchases plus the difference between debt issuance and debt redemption); NWC_t is the value of working capital (difference between current assets and current liabilities, less cash). ΔX_t indicates variations in the variable X during year t ($X_t - X_{t-1}$).

Source: prepared by the authors from Economatica software data.

	$r_{i,t} - R_{i,t}^B$	C_{t-1}	ΔC_t	$\Delta EBIT_t$	ΔNA_t	ΔNNA_t
Ave	0.2241	0.3659	0.0381	0.0694	0.3976	0.3452
Median	0.0736	0.1512	0.0092	0.0206	0.1299	0.0817
Maximum	9.9445	16.1756	11.4937	7.5737	28.1677	42.5856
Minimum	-2.5054	0.0000	-15.6032	-3.4241	-18.9065	-14.0025
Standard dev.	0.7945	0.8801	0.7096	0.5049	1.7638	2.1918
Asymmetry	4.3551	9.9544	-5.4908	5.5915	4.9578	7.9907
Kurtosis	39.2647	141.0856	206.5246	78.2359	84.9711	131.6926
No. of observations	1.914	1.914	1.914	1.914	1.914	1.914
	$\Delta INTER_t$	$\Delta DIVID_t$	LEVER _{t}	NF _{t}	NWC_{t-1}	ΔNWC_t
Ave	0.0308	0.0094	1.1992	0.4236	0.2685	0.0523
Median	0.0027	0.0000	0.4259	0.0816	0.2018	0.0257
Maximum	10.7713	1.0183	58.8805	28.0805	37.5162	9.0870
Minimum	-13.1571	-1.5920	-0.1108	-4.2172	-35.0478	-30.5040
Standard dev.	0.6802	0.0892	3.2197	1.4475	2.0901	1.0964
Asymmetry	-1.3286	-0.6621	9.8560	8.3375	-1.8506	-12.3401
Kurtosis	131.6423	81.7360	133.8163	111.0956	143.0847	346.3392
No. of observations	1.914	1.914	1.914	1.914	1.914	1.914

Table 3

Multicollinearity analysis: correlation matrix. The table presents the correlation coefficients among all independent variables used in this study. All variables, except LEVER_t, were standardized by lagged market value of the company (M_{t-1}). C_t is the cash value of the company; EBIT_t: earnings before interest, taxes and extraordinary items; NA_t is equal to total assets minus the value of cash; NNA_t is total assets minus the value of cash and working capital; INTER_t is the value of financial expenses; DIVID_t is the total dividend paid; LEVER_t is the company's leverage ratio (obtained dividing the long-term liabilities by company market value); NF_t is the company's net financing (obtained by the difference between share issues and repurchases plus the difference between debt issuance and debt redemption); NWC_t is the value of working capital (difference between current assets and current liabilities, less cash). ΔX_t indicates variations in the variable X during year t ($X_t - X_{t-1}$).

source: prepared by the authors from Economatica software data.

	C_{t-1}	ΔC_t	$\Delta EBIT_t$	ΔNNA_t	$\Delta INTER_t$
C_{t-1}	1.00				
ΔC_t	-0.37	1.00			
$\Delta EBIT_t$	0.16	0.04	1.00		
ΔNNA_t	0.13	0.02	0.01	1.00	
$\Delta INTER_t$	0.17	0.05	0.15	0.33	1.00
$\Delta DIVID_t$	0.06	0.09	0.18	0.12	-0.02
LEVER _t	0.11	0.00	0.06	0.17	-0.06
NF _t	0.22	0.11	0.20	0.26	0.17
NWC _{t-1}	-0.05	0.14	-0.27	0.06	0.10
ΔNWC_t	-0.12	0.28	0.15	-0.58	-0.12
	$\Delta DIVID_t$	LEVER _t	NF _t	NWC _{t-1}	ΔNWC_t
C_{t-1}					
ΔC_t					
$\Delta EBIT_t$					
ΔNNA_t					
$\Delta INTER_t$					
$\Delta DIVID_t$	1.00				
LEVER _t	-0.02	1.00			
NF _t	0.02	0.42	1.00		
NWC _{t-1}	0.00	-0.04	-0.21	1.00	
ΔNWC_t	0.02	-0.13	0.01	-0.02	1.00

companies usually have better access to the capital markets than smaller companies and should therefore face fewer restrictions in raising the funds for their investments; and iii) companies that issue rated debentures are usually better known and should face fewer difficulties to raise funds for their investment projects.

Thus, given the evidence indicated by Fazzari and Petersen (1993) – investment in working capital is more sensitive to financial restrictions than investment in fixed assets – we can expect that restrictions on access to finance have a material impact on the relationship between investment in working capital and company value. Thus, the additional hypothesis to be tested in this study suggests that companies with better access to capital markets (unconstrained companies) undergo lower value reduction when they fund additional investment in working capital.

Table 4

Multicollinearity analysis: variance inflation factors (VIF). The table presents the variance inflation factors for all independent variables used in this study. All variables, except LEVER_t, were standardized by lagged market value of the company (M_{t-1}). C_t is the cash value of the company; EBIT_t: earnings before interest, taxes and extraordinary items; NA_t is equal to total assets minus the value of cash; NNA_t is total assets minus the value of cash and working capital; INTER_t is the value of financial expenses; DIVID_t is the total dividend paid; LEVER_t is the company's leverage ratio (obtained by dividing the long-term liabilities by company market value); NF_t is the company's net financing (obtained by the difference between share issues and repurchases plus the difference between debt issuance and debt redemption); NWC_t is the value of working capital (difference between current assets and current liabilities, less cash). ΔX_t indicates variations in the variable X during year t ($X_t - X_{t-1}$).

Source: prepared by the authors from Economatica software data.

Variable	VIF	Tolerance
C_{t-1}	1.5694	0.6372
ΔC_t	1.3931	0.7178
$\Delta EBIT_t$	1.3221	0.7564
ΔNNA_t	2.2288	0.4487
$\Delta INTER_t$	1.2628	0.7919
$\Delta DIVID_t$	1.1079	0.9026
LEVER _t	1.4886	0.6718
NF _t	1.7678	0.5657
NWC _{t-1}	1.2977	0.7706
ΔNWC_t	1.9628	0.5095

There are a lot of other studies that present evidence consistent with our additional hypothesis. For instance, Almeida, Campello, and Weisbach (2004) find that constrained firms systematically save cash out of cash flow while unconstrained firms do not. Acharya, Almeida, and Campello (2005) show that financially constrained firms whose investment opportunities arise when operating cash flows are relatively low have a strong propensity to save cash rather than pay down debt. On the other hand, unconstrained firms and constrained firms with a high correlation between the presence of investment opportunities and high cash flows pay down debt rather than save cash.

So, the idea behind this additional hypothesis is that a company that faces financial constraints can be expected facing a higher financial cost when raising external funds. As a result, the marginal value of cash holding and the marginal value of working capital holding may be higher for these kinds of firms since internal funds enable the firms to avoid incurring this higher financial cost.

Additionally, if these companies have good investment opportunities, the higher the cost of raising external funds, the higher the probability that these value-enhancing projects will be abandoned if internal funds are insufficient. So, we could infer that for financial restricted companies, higher cash and working capital holdings increase the likelihood of taking positive net present value projects that would otherwise be abandoned, whereas liquidity provides no such benefit for unrestricted companies.

3. Data and descriptive statistics

This section presents the details of the selection criteria for the sample of stocks used in the calculations. The descriptive statistics for each variable used in this study and the multicollinearity analysis are then presented.

3.1. Sample

Initially, the sample of companies to be analyzed in this study consists of all those listed on the BM&FBOVESPA between December, 1995 and December, 2009. The data used in this study were gathered

from the database of the consulting company Economatica. All prices refer to closing prices, in nominal value adjusted for bonuses, dividends, stock splits and other forms of income.

We exclude stocks in financial institutions, stocks with negative net worth or worthless shares stocks without market value data, stock with liquidity ratio to less than 0.001, and, finally, in cases in which there were two or more classes of shares, we selected only the most liquid for each company. Table 1 shows the number of companies obtained in each year of analysis.

There is an average of 182 companies per year. It is noteworthy that, in trying to avoid survival bias (Malkiel, 2003), even if a company has delisted and stopped trading on the stock exchange after a certain date, it was only removed from the sample in the delisting year, but remains in it for previous periods.

3.2. Descriptive statistics

Table 2 presents the descriptive statistics for each variable used in this study. It should be remembered that all independent variables used in this study, except for leverage, were deflated by the company's lagged market value, which allows us to interpret the results as the increase in market value associated with a monetary unit variation in the explanatory variable.

From Table 2, it is clear that the total number of observations is 1914. Moreover, there is a large discrepancy between the mean and median values and the minimum and maximum values of any variable.

Comparing our sample with those ones of the studies on US firms (Kieschnick et al., 2009) and French firms (Autukaite & Molay, 2011), some differences can be highlighted. The average level of cash holdings ($C_{i,t-1}$) is much more higher in Brazil (0.36) than it is in France (0.06) and in the USA (0.171). In contrast, the average level of working capital ($NWC_{i,t-1}$) is higher in the USA (0.594) than it is in France (0.42) and Brazil (0.27). While the average level of market leverage ($LEVER_{i,t}$) for French firms (0.21) is very close to the one for US firms (0.219), for Brazilian firms it is oddly more than 1.0 (1.20). Regarding to the average stock excess return ($r_{i,t} - R_{i,t}^B$), while in France it is very close to zero and in the USA it is a little bit negative (-0.048), in Brazil it is strongly positive (0.22).

3.3. Correlation matrix and VIF factors

We performed a multicollinearity analysis between all independent variables, as shown in Tables 3 and 4. Firstly, from the analysis of the coefficients shown in Table 3, we can see that some variables have strong correlation with others: variable C_{t-1} shows a strong negative correlation with the variable ΔC_t ($r = -0.37$); variable ΔNNA_t shows a strong correlation with the variables $\Delta INTER_t$ ($r = 0.33$) and ΔNWC_t ($r = -0.58$). Furthermore, variable $LEVER_t$ is strongly correlated with variable NF_t ($r = 0.42$).

Whereas multicollinearity analysis is difficult to interpret only from a correlation matrix, additionally we obtained variance inflation factors (VIF) for all independent variables used in this study, as shown in Table 4. The determination of the variance inflation factors (VIF) is also a method of measuring the level of collinearity among the regressors in a regression equation.

Variance inflation factors (VIF) measure how much the variance of the estimated coefficients is increased over the case of no correlation among the X variables. If no two X variables are correlated, then all the VIFs will be 1. If VIF for one of the variables is around or greater than 5, there is collinearity associated with that variable.

According to the data presented in Table 4, all VIFs are less than 5,¹ so, it is not possible to establish the existence of significant problems

of multicollinearity. That is, there were no significant multicollinearity problems, so no variable was excluded from this study.

4. Methodology

In order to test the hypotheses formulated in this study, we use the methodology developed by Faulkender and Wang (2006), which was also used by Kieschnick et al. (2009), to estimate the additional value perceived by the market resulting from changes in companies' working capital during the fiscal year. The methodology generates estimates of the additional value the market incorporates into equity values that result from changes in the working capital position of firms over the fiscal year.

In our model, the dependent variable is the excess stock return over the fiscal year, which is defined as the return on stock i during fiscal year t minus the benchmark return of stock i during fiscal year t . To obtain the estimate of excess stock returns we used the model proposed by Fama and French (1993) for the creation of 25 (twenty five) benchmark portfolios formed in accordance with company size and book-to-market (B/M) ratio.

Moreover, as we intend to evaluate changes in market value associated with changes in the working capital of companies, it is important to control for other factors that may be related to variations in working capital and might also interfere in the company market value. Thus, the regression model considers as independent variables not only changes in the working capital of companies, but also changes in other company factors, such as the cash levels, financial leverage, profitability and size.

The first performed test focuses on the average cross-section regression slopes of the annual returns on stocks for several variables, as in Eq. (1)²:

$$r_{i,t} - R_{i,t}^B = \beta_0 + \beta_1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta_2 \frac{C_{i,t-1}}{M_{i,t-1}} + \beta_3 \frac{\Delta EBIT_{i,t}}{M_{i,t-1}} + \beta_4 \frac{\Delta NA_{i,t}}{M_{i,t-1}} + \beta_5 \frac{\Delta INTER_{i,t}}{M_{i,t-1}} + \beta_6 \frac{\Delta DIVID_{i,t}}{M_{i,t-1}} + \beta_7 LEVER_{i,t} + \beta_8 \frac{NF_{i,t}}{M_{i,t-1}} + \varepsilon_{i,t} \quad (1)$$

The dependent variable in the regression model is the excess stock return, $r_{i,t} - R_{i,t}^B$, in which $r_{i,t}$ is the return on stock i during fiscal year t and $R_{i,t}^B$ is the benchmark return on stock i in year t . The independent variables are: $C_{i,t}$, which is the cash value of company i in year t ; $EBIT_t$, which are earnings before interest, taxes and extraordinary items; NA_t , which is the total value of assets minus cash value; $INTER_t$, which is the value of financial expenses; $DIVID_t$, which is the total amount of the dividend paid; $LEVER_t$, which is the company's leverage level (obtained by dividing long-term liabilities by the market value of the company), and NF_t , which is the company's net finance (obtained by the difference between the value of the emission of shares and the value of repurchases plus the difference between the value of debt issuance and the value of debt redemption). And finally, ΔX indicates unexpected variations in variable X , given that the expected change is zero.

Additionally, to prevent having the largest companies dominate the results, we standardize all variables (except for leverage) by lagged company market value ($M_{i,t-1}$). Thus, since the stock return is the spread of $M_{i,t} - M_{i,t-1}$ divided by $M_{i,t-1}$, this standardization enables

² Kieschnick et al. (2009) and Faulkender and Wang (2006) also incorporated company's R&D expenditures into the model. However, in Brazil company's R&D expenditures are accounted as deferred assets and amortized over a certain period, preventing us to get these data from the analysis of company's financial statements. On the other side, US accounting rules (Financial Accounting Concepts Statement – SFAS No. 2) recommend the appropriation of company's R&D expenditures directly on the period it occurs. Therefore, we have assumed that company's R&D expenditures to be zero for all firms in this study.

¹ Kleinbaum, David G.; Kupper, Lawrence L.; Nizam, Azhar e Muller, Keith E. *Applied Regression Analysis and other Multivariate Methods*. Belmont, CA: Duxbury Press, 4th edition, 2007, p. 315.

us to interpret the estimated coefficients in the regression equation above as the Real (R\$) change in value (shareholder wealth) for a one Real (R\$) change in each corresponding independent variable.

To analyze the effect of investment in working capital on company value, following Kieschnick et al. (2009), the variables NWC_{t-1} and ΔNWC_t were included in Eq. (1), resulting in the following model:

$$r_{i,t} - R_{i,t}^B = \beta_0 + \beta_1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta_2 \frac{C_{i,t-1}}{M_{i,t-1}} + \beta_3 \frac{\Delta EBIT_{i,t}}{M_{i,t-1}} + \beta_4 \frac{\Delta NNA_{i,t}}{M_{i,t-1}} + \beta_5 \frac{\Delta INTER_{i,t}}{M_{i,t-1}} + \beta_6 \frac{\Delta DIVID_{i,t}}{M_{i,t-1}} + \beta_7 LEVER_{i,t} + \beta_8 \frac{NF_{i,t}}{M_{i,t-1}} + \beta_9 \frac{NWC_{i,t-1}}{M_{i,t-1}} + \beta_{10} \frac{\Delta NWC_{i,t}}{M_{i,t-1}} + \varepsilon_{i,t} \quad (2)$$

In which NNA_i is the value of total assets minus the value of cash and working capital, and NWC_t is the value of working capital (calculated as the difference between the value of current assets and current liabilities, less cash).

Additionally, apart from the regressions above, we also analyze a new model, in which a new independent variable is included in the analysis: $(NWC_{i,t-1} / M_{i,t-1}) \times (\Delta NWC_{i,t} / M_{i,t-1})$. This new variable seeks to analyze the effect on company value of the interaction between the current level of working capital current ($NWC_{i,t-1}$) with the change in working capital ($\Delta NWC_{i,t}$). The purpose of this new variable is to capture the effects of investment of a Real (R\$) in working capital, at current levels of working capital. It is expected that the coefficient of this new variable will be negative, that is the additional investment of one monetary unit in working capital, at current levels of working capital, reduces the value of the company. Thus, this new model is represented by Eq. (3) below:

$$r_{i,t} - R_{i,t}^B = \beta_0 + \beta_1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta_2 \frac{C_{i,t-1}}{M_{i,t-1}} + \beta_3 \frac{\Delta EBIT_{i,t}}{M_{i,t-1}} + \beta_4 \frac{\Delta NNA_{i,t}}{M_{i,t-1}} + \beta_5 \frac{\Delta INTER_{i,t}}{M_{i,t-1}} + \beta_6 \frac{\Delta DIVID_{i,t}}{M_{i,t-1}} + \beta_7 LEVER_{i,t} + \beta_8 \frac{NF_{i,t}}{M_{i,t-1}} + \beta_9 \frac{NWC_{i,t-1}}{M_{i,t-1}} + \beta_{10} \frac{\Delta NWC_{i,t}}{M_{i,t-1}} + \beta_{11} \frac{NWC_{i,t-1}}{M_{i,t-1}} \times \frac{\Delta NWC_{i,t}}{M_{i,t-1}} + \varepsilon_{i,t} \quad (3)$$

Similarly, we sought to analyze the interaction between the company's current leverage level ($LEVER_{i,t}$) with the change in working capital ($\Delta NWC_{i,t}$). That is, in the same way as in the previous model, we include a new independent variable in the proposed model in Eq. (2): $(LEVER_{i,t} / M_{i,t-1}) \times (\Delta NWC_{i,t} / M_{i,t-1})$. The purpose of including this new variable is to capture the effects of leverage on the relationship between working capital and company value and to test the additional hypothesis stated in this study (companies with better access to capital markets suffer a lower value reduction when funding the additional investment in working capital). Thus, this new model is represented by Eq. (4) below:

$$r_{i,t} - R_{i,t}^B = \beta_0 + \beta_1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta_2 \frac{C_{i,t-1}}{M_{i,t-1}} + \beta_3 \frac{\Delta EBIT_{i,t}}{M_{i,t-1}} + \beta_4 \frac{\Delta NNA_{i,t}}{M_{i,t-1}} + \beta_5 \frac{\Delta INTER_{i,t}}{M_{i,t-1}} + \beta_6 \frac{\Delta DIVID_{i,t}}{M_{i,t-1}} + \beta_7 LEVER_{i,t} + \beta_8 \frac{NF_{i,t}}{M_{i,t-1}} + \beta_9 \frac{NWC_{i,t-1}}{M_{i,t-1}} + \beta_{10} \frac{\Delta NWC_{i,t}}{M_{i,t-1}} + \beta_{11} LEVER_{i,t} \times \frac{\Delta NWC_{i,t}}{M_{i,t-1}} + \varepsilon_{i,t} \quad (4)$$

Besides, to test the additional hypothesis stated in this study (companies with better access to capital markets suffer a lower value reduction when funding the additional investment in working capital), we attempt to separately analyze the companies that face greater restrictions in access to finance. The implied relationship

between investment in working capital and financing raises the issue of how financing influences the valuation effects of investment in working capital. Consequently, in this paper we also focus on how constraints on a company's financing (its access to public capital markets) influence the effect of financing on the relationship between investment in working capital and company value.

According to Faulkender and Wang (2006), there is a great deal of debate in the literature on how to measure financial constraints. So, in accordance with Almeida et al. (2004) and Faulkender and Wang (2006),³ we use three alternative schemes to annually split our sample of stocks:

- o Payout ratio (dividend payout rate): In each year, we classify companies according to annual payout ratios and we assign each one to the group of companies with financial restrictions (unrestricted) those firms whose payout ratios are smaller (larger) or equal to the company's payout ratio in the 30th (70th) percentile of the yearly payout ratio distribution. The idea behind this separation is that firms with high payout ratios are more likely to have great internal fund generation to cover their debt obligations and to finance their investment, and should therefore receive lower benefits from cash holdings than firms with low payout ratios.
- o Company size: we use net sales to measure company size. In each year, we classify all companies in our sample according to their net sales at the end of the previous fiscal year and those companies whose net sales were lower (higher) or equal to the company's sales in the 30th (70th) percentile of the annual size distribution were assigned to the restricted (unrestricted) group. It is expected that larger companies have better access to capital markets than smaller companies and, therefore, should face fewer restrictions to raise funds to finance their investments.
- o Rated debentures (long-term debt): In each year, we assign all companies to the financially unrestricted (restricted) group those companies that had (not) issued rated long-term debt. Companies that issue rated bonds are typically better known and should face fewer difficulties in raising funds to finance their investment projects.

From this separation of the sample into two groups in each of the three alternative scenarios, we analyze again the regression provided in Eq. (4) in each of the six sub-samples, whose results are presented in Table 7. The purpose of this analysis in three alternative scenarios, as discussed above, is to test whether companies with better access to capital markets undergo a lower value reduction when funding the additional investment in working capital.

5. Analysis of results

Initially, in Section 5.1, we analyze the results of regressions (1), (2) and (3) for the large panel of companies that seek to analyze the effect of investment in working capital on company value, for the period from 1995 to 2009 (Table 5).

In item 5.2, in order to test the additional hypothesis stated above, we first analyze the results of regression (4) for the entire sample of companies, in order to capture the effects of financial leverage on the relationship between working capital and company value. Next, we sought to separately analyze the companies that would face greater restrictions in access to finance through three alternative scenarios (payout ratio, company size and rated debentures) for the separation of the sample into two groups: those with and those without restrictions in access to diverse sources of funding.

³ Actually, Faulkender and Wang (2006) use four alternative schemes to annually partition the sample. The authors, beyond the three alternative schemes used in this study, used too commercial paper rating. In Brazil, given the limited representativeness of the sample of companies that issued rated commercial papers in the analyzed period, we used three alternative schemes to annually partition the sample in the restricted and unrestricted groups instead of the original four.

Then, item 5.3 presents the tests indicated in regressions (1), (2) and (3) for control sub-samples. First, in item 5.3.1, we present these tests considering a sub-sample composed only of commercial companies and another of the other companies (Table 8). Moreover, in item 5.3.2 we empirically analyze the effect of investment in working capital on the value of companies with low and high liquidity on the stock exchange.

It is noteworthy that, in order to determine the best model between fixed and random effects, we use the test suggested by Hausman (1978). According to this test, under the null hypothesis (H_0), estimators of the model with random effects are consistent and efficient; under the alternative hypothesis (H_1), estimators with random effects are not consistent, but the estimators with fixed effects are consistent. We conduct this test for all models proposed and, for example, for Eq. (2) the result was found to be 30.11 (p -value < 0.01), which rejects H_0 , that is, the most appropriate model would be the fixed effects model. Therefore, as all the results of this test were similar for the other models, we used the panel data methodology with fixed effects for all models proposed.

5.1. Effect of working capital on company value

Before reviewing the results of regressions (2) and (3), which focus on the effect of investment in working capital on company value and seek to test on the hypotheses of this study (on average, the additional investment of one monetary unit in working capital, at current levels of working capital, reduces the company value), model 1 of Table 5 presents the results of regression (1), which does not use, as in Kieschnick et al. (2009), variables $NWC_{i,t}$ and $\Delta NWC_{i,t}$ to estimate average stock return.

The results of this regression indicate that the average slope of variable $\Delta C_{i,t}$ during the period under analysis (December 1995 to December 2009) is positive and highly significant (p -value < 0.01). That is, under the methodology described above, an extra Real (R\$) of cash is valued by shareholders at R\$ 1.05 (one real and five cents) over the years.

It is important to highlight that Kieschnick et al. (2009) estimate the cash holdings coefficient to be 1.297 for US firms (i.e., the investors of US companies value an extra dollar of cash at \$ 1.297), while Autukaite and Molay (2011) find 0.108, which means that for French firms, investors value each additional euro of cash less than one euro.

Furthermore, all other coefficients of the variables are statistically significant at 5% and all of them show signs according to what was expected. It is worth mentioning the results for the variables $\Delta INTER_{i,t}$ and $LEVER_{i,t}$, whose coefficients are negative and significant at 5.00% ($t = -1.98$) and 1.00% ($t = -5.43$), respectively.

Model 2 of Table 5 presents the results of regression (2). In this model we include variables NWC_{t-1} and ΔNWC_t in model (1)'s regression equation to estimate the average return on stocks for the period.

Again, it is noteworthy that all estimated coefficients in model 2 also show the expected signs for all the variables used and all of them are statistically significant at 5.00%.

The results in model 2 show that, from the shareholder perspective, the additional investment a Real (R\$) in working capital is valued at R\$ 0.17 ($t = 3.54$), which is significantly less than R\$ 1.02 ($t = 8.51$), which corresponds to the perceived value of an additional investment a Real (R\$) in cash in the same period. Given this evidence, the maintenance of excessive levels of working capital can easily result in lower returns and lower company valuation by the market (shareholders). We believe that this result is consistent with several studies (Deloof, 2003; Garcia-Teruel & Martinez-Solano, 2007; Shin & Soenen, 1998), which show that a company's profitability is inversely proportional to its cash conversion cycle (that is, the less invested in working capital, the greater the profitability of the company).

Model 3 in Table 5 presents the results of regression (3), which specifically seeks to test the hypothesis that, on average, the additional investment a Real (R\$) in working capital, at current working capital levels, reduces company value. In model 3, we included a new independent variable in the analysis ($NWC_{i,t-1} \times \Delta NWC_{i,t}$), whose aim is to analyze the interactive effect, on company value, of the current level of working capital ($NWC_{i,t-1}$) on changes in working capital ($\Delta NWC_{i,t}$).

The results for model 3 support the hypothesis stated above. When analyzing the coefficient of variable $NWC_{i,t-1} \times \Delta NWC_{i,t}$, it is observed that it is negative and highly statistically significant ($t = -2.86$). That is, according to what was originally expected, additional investment of a Real (R\$) in working capital, at current levels of working capital, reduces the company value by approximately R\$ 0.01.

We believe that this evidence helps to understand the importance of efficient management of working capital. Moreover, the results are in line with researches (Deloof, 2003; Howorth & Westhead, 2003) that confirm that companies seek to maintain an optimal level of working capital in order to maximize their value.

5.2. Effect of restrictions on access to finance on the relationship between investment in working capital and company value

The fourth and last model, presented in Table 6, seeks to analyze the interaction between the company's current leverage level ($LEVER_{i,t}$) with the change in working capital ($\Delta NWC_{i,t}$). To this end, a new independent variable was included in model (2): $LEVER_{i,t} \times \Delta NWC_{i,t}$.

It is noteworthy that we obtain the results presented in Table 6 from the broad panel of companies, serving as a basis for comparison with the results presented in Table 7, in which we separated, based on three alternative scenarios, the sample companies into two groups: those with and those without restrictions in access to diverse sources of funding.

Table 5

Estimates of regressions (1), (2) and (3): effect of working capital on company value. The table shows the results of regressing the excess stock return ($r_{i,t} - R_{i,t}^B$) on changes in firm characteristics over the year. All variables, except $LEVER_{i,t}$ and $r_{i,t} - R_{i,t}^B$, were standardized by lagged market value of the company (M_{t-1}). C_t is the cash value of the company; $EBIT_t$: earnings before interest, taxes and extraordinary items; NA_t is equal to total assets minus the value of cash; NNA_t is total assets minus the value of cash and working capital; $INTER_t$ is the value of financial expenses; $DIVID_t$ is the total dividend paid; $LEVER_t$ is the company's leverage ratio (obtained dividing the long-term liabilities by company market value); NF_t is the company's net financing (obtained by the difference between share issues and repurchases plus the difference between debt issuance and debt redemption); NWC_t is the value of working capital (difference between current assets and current liabilities, less cash). ΔX_t indicates variations in the variable X during year t ($X_t - X_{t-1}$).

Source: prepared by the authors from Economatica database.

Variable	Model 1	Model 2	Model 3
Intercept	0.0276**	0.0824**	0.079**
C_{t-1}	0.7699***	0.7924***	0.6505***
ΔC_t	1.0464***	1.0198***	0.9774***
$\Delta EBIT_t$	0.189**	0.381***	0.3678***
ΔNA_t	0.0338**		
ΔNNA_t		0.0113**	0.0153**
$\Delta INTER_t$	-0.0806**	-0.0939**	-0.1714**
$\Delta DIVID_t$	1.8884***	1.6093***	1.6083***
$LEVER_t$	-0.0749***	-0.1045***	-0.0977***
NF_t	0.1055***	0.0831**	0.1188***
NWC_{t-1}		0.0715**	0.029**
ΔNWC_t		0.1673***	0.216***
$NWC_{t-1} \times \Delta NWC_t$			-0.0075***
$LEVER_t \times \Delta NWC_t$			
Adjusted R ²	0.29	0.31	0.32
Number of observations	1.748	1.748	1.748

*** Indicates statistical significance of 1%.

** Indicates statistical significance of 5%.

According to the results for model 4, considering the entire sample of companies, the coefficient of the variable $LEVER_{i,t} \times \Delta NWC_{i,t}$ was not statistically significant (it is not possible to conclude that there is some interactive effect between the variables $LEVER_{i,t}$ and $\Delta NWC_{i,t}$). That is, although the sign for this coefficient is negative (as expected), we cannot say that increased financial leverage to finance additional investment in working capital reduces the value of the company.

It should be noted that except for the variable $LEVER_{i,t} \times \Delta NWC_{i,t}$, the magnitude and sign of the other variables remained similar to those found in other models. All the other coefficients estimated in model 4 also showed the expected signs for all the variables used and all are statistically significant at 5%.

To test the additional hypothesis formulated in this study (companies with better access to capital markets undergo a lower value reduction when they fund additional investment in working capital), we separately analyze the companies that face greater restrictions in access to funding. In order to do it, we again estimate model 4 using the observations obtained by separating the sample of companies into three different alternative scenarios, whose results are presented in Table 7.

The results do not favor the additional hypothesis formulated in this study. When we analyze the coefficients of the variable $LEVER_{i,t} \times \Delta NWC_{i,t}$ between the groups of companies with restrictions and without restrictions in access to diverse sources of funding, we find that they are not statistically significant. That is, although in the three scenarios analyzed, the interaction coefficients between leverage and change in working capital are more negative for the group of companies with restrictions, it is not possible to conclude that there is a statistical difference between the two groups.

Moreover, some of the results between groups of companies with restrictions and without restrictions should be emphasized. Firstly, we find that the marginal value of money held as cash is significantly higher for constrained companies under all three alternative schemes to split the sample of stocks, which is consistent with the findings in Faulkender and Wang (2006) and in Almeida et al. (2004). In other words, the average slope of variable $\Delta C_{i,t}$ in the period analyzed, which was statistically significant at 5% in all regressions, is significantly higher in the restricted group of companies. An intuitive explanation is that constrained companies are more dependent on internal funds and therefore hold higher cash levels than do firms that can easily raise more funds in the market when needed.

Moreover, by analyzing differences in other coefficients of the groups of companies with restrictions and without restrictions, we find that the coefficients of the variable $\Delta DIVID_{i,t}$ are statistically significant at 5% in all regressions. In the three analyzed scenarios, the average slope of this variable for the restricted group of companies is significantly higher than for the unrestricted group of companies (i.e. the marginal value, as perceived by the shareholders, of a Real distributed via dividends is higher in the group of companies with restrictions).

Finally, it is noteworthy also that the coefficients found for variable $\Delta NWC_{i,t}$ in the three analyzed scenarios are significantly higher for the group of companies with restrictions. That is, during the period under analysis, the value, perceived by shareholders, of an additional Real (R\$) of investment in working capital, is higher for companies with limited access to financial markets.

5.3. Further tests on sub-samples

To test the robustness of our results, we focus our analysis on two sub-samples of companies that should differ in the value shareholders place on an extra Real (R\$) of working capital investment in the firm. Thus, in item 5.3.1 we divide our sample into commercial and non-commercial companies and we replicate the tests indicated in regressions (1), (2) and (3) to seek differences between these

groups of companies. Subsequently, in item 5.3.2 we subdivide our sample of firms into low and high stock exchange liquidity firms, in order to test for differences in the value shareholders place on an additional investment in working capital between these sub-samples.

5.3.1. Effect of working capital on commercial and non-commercial company value

We separate our sample of companies into two sub-samples: one composed only of commercial companies and the other consisting of the other companies that, in accordance with the Economatica classification, includes about 17 different business sectors. It is understood that the value of the investment in working capital and, therefore, the impact on company value, are different for commercial and industrial companies.

Companies linked to the commercial sector usually have a higher percentage of working capital (relative to total assets) than, for example, industrial companies. Moreover, management of the operational activities of these companies typically focuses on accounts receivable and inventories, and tries to finance them with more short-term funding. Industrial companies, on the other hand, have a higher proportion of fixed assets in relation to total assets and, usually, the management of these companies focuses on long-term cash needs.

In accordance with the results for model 1, the coefficient of the variable $\Delta C_{i,t}$, during the period of analysis (December 1995 to December 2009) is significantly higher for the sub-sample of commercial companies. That is, according to the methodology described above, in the perception of shareholders, the additional investment of a Real (R\$) in cash held by commercial companies is valued at R\$ 1.25 ($t = 7.59$), while the same investment in other companies is valued at R\$ 1.02 ($t = 8.42$). These results are consistent with our

Table 6
Estimates of regression (4): Effect of restrictions on access to finance on the relationship between investment in working capital and company value. The table shows the results of regressing the excess stock return ($r_{i,t} - R_{i,t}^B$) on changes in firm characteristics over the year. All variables, except $LEVER_t$ and $r_{i,t} - R_{i,t}^B$, were standardized by lagged market value of the company (M_{t-1}). C_t is the cash value of the company; $EBIT_t$: earnings before interest, taxes and extraordinary items; NA_t is equal to total assets minus the value of cash; NNA_t is total assets minus the value of cash and working capital; $INTER_t$ is the value of financial expenses; $DIVID_t$ is the total dividend paid; $LEVER_t$ is the company's leverage ratio (obtained dividing the long-term liabilities by company market value); NF_t is the company's net financing (obtained by the difference between share issues and repurchases plus the difference between debt issuance and debt redemption); NWC_t is the value of working capital (difference between current assets and current liabilities, less cash). ΔX_t indicates variations in the variable X during year t ($X_t - X_{t-1}$).
Source: prepared by the authors from Economatica database.

Variable	Model 4
Intercept	0.0784**
$C_t - 1$	0.7675***
ΔC_t	1.0199***
$\Delta EBIT_t$	0.3825***
ΔNA_t	
ΔNNA_t	0.0108***
$\Delta INTER_t$	-0.0791**
$\Delta DIVID_t$	1.6057***
$LEVER_t$	-0.0987***
NF_t	0.0924***
NWC_{t-1}	0.0509***
ΔNWC_t	0.1946***
$NWC_{t-1} \times \Delta NWC_t$	
$LEVER_t \times \Delta NWC_t$	-0.0170
Adjusted R ²	0.31
Number of observations	1.748

*** Indicates statistical significance of 1%.
** Indicates statistical significance of 5%.

Table 7
Effect of restrictions on access to finance on the relationship between investment in working capital and company value. The table presents the regressions results across groups of financially constrained and unconstrained companies (see *Methodology* section for definitions). In all regressions, the dependent variable is the excess stock return. All variables, except $LEVER_t$ and $r_{i,t} - R_{i,t}^B$, were standardized by lagged market value of the company (M_{t-1}). C_t is the cash value of the company; $EBIT_t$: earnings before interest, taxes and extraordinary items; NA_t is equal to total assets minus the value of cash; NNA_t is total assets minus the value of cash and working capital; $INTER_t$ is the value of financial expenses; $DIVID_t$ is the total dividend paid; $LEVER_t$ is the company's leverage ratio (obtained dividing the long-term liabilities by company market value); NF_t is the company's net financing (obtained by the difference between share issues and repurchases plus the difference between debt issuance and debt redemption); NWC_t is the value of working capital (difference between current assets and current liabilities, less cash). ΔX_t indicates variations in the variable X during year t ($X_t - X_{t-1}$). Source: prepared by the authors from Economatica database and ratings extracted from the National Debenture System (SND).

Variable	Payout ratio		Firm size		Debentures	
	Constrained	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained
Intercept	0.0718	0.0531	0.0593	-0.0264**	0.0681	0.0139***
$C_t - 1$	0.8468***	0.7473***	0.97***	0.7831**	0.8027***	0.6776***
ΔC_t	1.3363**	0.9177***	1.1576***	0.9217***	1.1525***	0.8746***
$\Delta EBIT_t$	0.3013**	0.3301	0.199	0.5901**	0.2326***	0.3424***
ΔNNA_t	0.0051	0.0098***	0.1357***	-0.0512	-0.0346	0.047
$\Delta INTER_t$	-0.0237	-0.0974	-0.2929	0.3395	-0.1505***	0.3053
$\Delta DIVID_t$	1.6995***	1.5307**	1.7944***	1.4335**	1.9377***	1.4774**
$LEVER_t$	-0.1604**	-0.0924***	-0.1802***	-0.1027***	-0.189***	-0.1083***
NF_t	0.285	0.0385***	0.1428	-0.0096	-0.1388	0.0836**
NWC_{t-1}	0.1046***	0.0323***	0.1072	0.0352	0.1153	0.0531***
ΔNWC_t	0.2874**	0.1798***	0.2675***	0.0108***	0.3317**	0.1491***
$NWC_{t-1} \times \Delta NWC_t$	-0.2709	-0.0036	-0.151**	-0.0219	-0.1329***	-0.0037
Adjusted R ²	0.13	0.34	0.16	0.17	0.27	0.28
Number of observations	729	610	561	622	980	768

*** Indicates statistical significance of 1%.

** Indicates statistical significance of 5%.

expectations, since the shareholders of commercial companies assign more relative value to the additional cash that these companies get.

With respect to model 2, for both sub-samples considered, the conclusions set out above still apply, that is, from the shareholder perspective, the additional investment of a Real (R\$) in working capital is worth significantly less than the additional investment a Real (R\$) in cash. Furthermore, when comparing the coefficients of the variable $\Delta NWC_{i,t}$ between the sub-samples, it is evident that for the group of commercial companies, this coefficient is almost twice that observed for the non-commercial group of companies.

In model 3 of Table 8, we find that the results also favor the initial hypothesis of this study for both sub-samples. When analyzing the coefficient of the variable $NWC_{i,t-1} \times \Delta NWC_{i,t}$, it is apparent that it is

negative and statistically significant at 5% for both the sub-sample of commercial companies and for the sub-sample of non-commercial companies ($t = -2.28$ and $t = -2.79$, respectively). Furthermore, given that the estimate of this coefficient for this sub-sample of commercial companies is higher than the same ratio observed for the sub-sample of non-commercial companies, we can say that commercial companies would undergo a smaller value reduction when they raise, at the beginning of the fiscal year, their level of investment in working capital.

5.3.2. Effect of working capital on the value of low and high liquidity companies

We also use the liquidity ratio on the stock exchange (IL), calculated by BM&FBOVESPA, to separate the broad panel of companies into

Table 8
Estimates of regressions (1), (2) and (3) for commercial and non-commercial companies. The table presents the regressions results across groups of commercial and non-commercial firms. In all regressions, the dependent variable is the excess stock return. All variables, except $LEVER_t$ and $r_{i,t} - R_{i,t}^B$, were standardized by lagged market value of the company (M_{t-1}). C_t is the cash value of the company; $EBIT_t$: earnings before interest, taxes and extraordinary items; NA_t is equal to total assets minus the value of cash; NNA_t is total assets minus the value of cash and working capital; $INTER_t$ is the value of financial expenses; $DIVID_t$ is the total dividend paid; $LEVER_t$ is the company's leverage ratio (obtained by dividing the long-term liabilities by company market value); NF_t is the company's net financing (obtained by the difference between share issues and repurchases plus the difference between debt issuance and debt redemption); NWC_t is the value of working capital (difference between current assets and current liabilities, less cash). ΔX_t indicates variations in the variable X during year t ($X_t - X_{t-1}$). Source: prepared by the authors from Economatica software data.

Variable	Model 1		Model 2		Model 3	
	Commercial firms	Non-commercial firms	Commercial firms	Non-commercial firms	Commercial firms	Non-commercial firms
Intercept	-0.0748	0.0328**	-0.0573	0.094**	-0.0291	0.0933**
$C_t - 1$	0.8309**	0.7368***	1.0185	0.7598***	0.8861***	0.615***
ΔC_t	1.2497***	1.0217***	1.2149***	0.9756***	1.1830***	0.9296***
$\Delta EBIT_t$	0.2563**	0.1655***	0.434*	0.3595***	0.3292*	0.3466***
ΔNA_t	0.0622	0.0342**				
ΔNNA_t			0.0261	0.0105**	0.024	0.0149**
$\Delta INTER_t$	-0.0457	-0.0913***	-0.0451	-0.1044**	-0.0911	-0.1812***
$\Delta DIVID_t$	1.9402***	1.8851***	1.8924**	1.5845***	1.6745**	1.5865***
$LEVER_t$	-0.1335	-0.0762***	-0.1204	-0.1064***	-0.1219	-0.0999***
NF_t	0.2124***	0.1017**	0.1335***	0.0789**	0.1596***	0.1148***
NWC_{t-1}			0.1369***	0.0648***	0.1523**	0.0148**
ΔNWC_t			0.2818**	0.1488***	0.3249**	0.2062***
$NWC_{t-1} \times \Delta NWC_t$					-0.0051**	-0.0084***
Adjusted R ²	0.20	0.28	0.28	0.31	0.29	0.32
Number of observations	83	1.665	83	1.665	83	1.665

*** Indicates statistical significance of 1%.

** Indicates statistical significance of 5%.

* Indicates statistical significance of 10%.

two sub-samples: one composed of stocks of companies with low liquidity and another one of stocks of companies with high stock market liquidity. To do so, for each year of the analyzed period, we classify all companies in our sample according to the participation or not in the IBOVESPA theoretical portfolio. Those companies whose stocks participate (do not participate), at the beginning of each year of the analyzed period in this study, in the IBOVESPA theoretical portfolio were assigned to the group of high (low) liquidity companies.

The purpose of this separation is to check whether there are differences, in terms of impact on the company value while investing in working capital, for companies that have low liquidity and for companies with high liquidity on the stock exchange.

The results of the analysis are presented in Table 9. In accordance to the results for model 1, the coefficient of the variable $\Delta C_{i,t}$, is significantly higher for the sub-sample of low liquidity companies. According to the methodology, in the perception of shareholders, the additional investment of a Real (R\$) in cash in low liquidity companies is valued at R\$ 1.08 ($t = 7.63$), while the same investment in high liquidity companies is valued at R\$ 0.64 ($t = 1.98$) by shareholders. We believe that this finding is consistent to what was expected given that companies with low liquidity on the stock exchange, when compared with companies with high liquidity, are typically smaller companies with low investment opportunities and less internal generation of resources and their shareholders assign more relative value to the additional cash that these companies get.

Regarding model 2, the difference between the coefficients of the variable $\Delta NWC_{i,t}$ of the two sub-samples considered should be highlighted. The coefficient of this variable for the group of companies with low liquidity ($t = 3.29$) is about 80% higher than the same coefficient ($t = 2.88$) for the group of companies with high liquidity.

With respect to model 3, shown in Table 9, although the coefficient of the interaction between the current level of working capital ($NWC_{i,t-1}$) and the change in working capital ($\Delta NWC_{i,t}$) is more negative for the group of companies with low liquidity, it is not possible to conclude that there is a statistical difference between the two groups, since the coefficient for the group of companies with high liquidity is not statistically significant.

6. Conclusions

In this article we analyze the relationship between working capital and company value. More specifically, we analyze what value do shareholders place on an additional Real (R\$) of working capital held by companies.

Moreover, we analyze whether specific financial characteristics of companies, particularly those that lead to financial restrictions on access to capital, affect this value.

Using a sample of Brazilian public companies listed on BM&FBOVESPA from 1995 through 2009, we find evidence for the following conclusions:

- 1) in the analyzed period, an extra Real (R\$) of investment in working capital is worth significantly less, in the perception of shareholders, than an extra Real (R\$) of investment in cash;
- 2) on average, increasing the level of working capital investment by a Real (R\$), at the beginning of the fiscal year, reduces company value, which favors the hypothesis of this study (additional investment of a Real (R\$) in working capital, at current levels of working capital, reduces the company value). Moreover, given the evidence shown in Section 5.3.1, we can state that commercial companies would undergo a smaller value reduction when they increase, at the beginning of the fiscal year, the investment in working capital;
- 3) we cannot say that the increase in financial leverage to finance additional investment in working capital reduces the company value; and
- 4) given the evidence found in this study, we cannot state that companies with better access to capital markets undergo a lower value reduction when they fund additional investment in working capital.

The results of this study should be interpreted with caution due to the limitations of the research. An important limitation concerns the sample size, both in terms of time horizon used and in terms of the relatively small amount of stock available in the Brazilian market for carrying out similar studies (the reduced number of stocks of the sample reflects the high concentration of the Brazilian stock market). Another important limitation may be related to the low stock exchange liquidity of Brazilian stocks, especially those that are not part of the theoretical IBOVESPA portfolio. Finally, given the large

Table 9

Estimates of regressions (1), (2) and (3) for high and low liquidity companies. The table presents the regressions results across groups of low stock exchange liquidity and high stock exchange liquidity firms. In all regressions, the dependent variable is the excess stock return. All variables, except LEVER_t and $r_{i,t} - R_{f,t}^e$, were standardized by lagged market value of the company (M_{t-1}). C_t is the cash value of the company; EBIT_t: earnings before interest, taxes and extraordinary items; NA_t is equal to total assets minus the value of cash; NNA_t is total assets minus the value of cash and working capital; INTER_t is the value of financial expenses; DIVID_t is the total dividend paid; LEVER_t is the company's leverage ratio (obtained by dividing the long-term liabilities by company market value); NF_t is the company's net financing (obtained by the difference between share issues and repurchases plus the difference between debt issuance and debt redemption); NWC_t is the value of working capital (difference between current assets and current liabilities, less cash). ΔX_t indicates variations in the variable X during year t ($X_t - X_{t-1}$).

Source: prepared by the authors from Economatica database.

Variable	Model 1		Model 2		Model 3	
	Low stock exchange liquidity	High stock exchange liquidity	Low stock exchange liquidity	High stock exchange liquidity	Low stock exchange liquidity	High stock exchange liquidity
Intercept	0.0733**	-0.0328**	0.1337***	-0.0461***	0.131***	-0.0542***
C_{t-1}	0.7732***	0.6344**	0.7973***	0.6145*	0.6622***	0.6201*
ΔC_t	1.0754***	0.6416**	1.0253***	0.6297**	0.9816***	0.5731**
$\Delta EBIT_t$	0.1758**	0.197*	0.371***	0.3971**	0.3499***	0.3735***
ΔNA_t	0.0301**	0.0361**				
ΔNNA_t			0.0034**	0.0119	0.0078***	0.016
$\Delta INTER_t$	-0.0859**	-0.0772**	-0.0992**	-0.052*	-0.1826**	-0.122**
$\Delta DIVID_t$	1.9897***	1.4206***	1.6815***	1.2574*	1.6682***	1.284*
LEVER _t	-0.0713***	-0.1367***	-0.1021***	-0.13*	-0.0948***	-0.1194**
NF_t	0.1164**	0.0834***	0.0962**	0.0648*	0.1209***	0.0914**
NWC_{t-1}			0.0781**	0.049**	0.0364**	0.0269*
ΔNWC_t			0.1812***	0.1043***	0.2345***	0.1323**
$NWC_{t-1} \times \Delta NWC_t$					-0.0079***	-0.0029
Adjusted R ²	0.28	0.25	0.31	0.28	0.32	0.28
Number of observations	1.384	364	1.384	364	1.384	364

*** Indicates statistical significance of 1%.
 ** Indicates statistical significance of 5%.
 * Indicates statistical significance of 10%.

amount of missing values in the Economatica database, it is possible that the results may have been affected by this limitation.

We hope that this study may contribute to the development of future research on the theme of working capital management. Therefore, we suggest some improvements for future studies by considering the following aspects:

- o Given the various constraints for obtaining finance in Brazil, many companies have permanent lines of financing for working capital. Therefore, a study similar to this one could be carried out on a sample which separately considered these lines of funding in the amount of working capital in each period, and
- o We believe that the stocks excluded from the sample through the liquidity filter considered in this study are those one that are more impacted by scarcity and/or by excess of working capital. A researcher could analyze these firms separately and verify the impact of working capital in the company's value, noting that the market value of these stocks may not be realistic and be subject to price manipulation.

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