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CORPORATE INVESTMENT AND CASH-FLOW SENSITIVITY: EVIDENCE FROM A JASMIN REVOLUTION PERIOD IN TUNISIAN MARKET

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ABSTRACT

This study investigates the impact of financial constraints on investment decisions and corporate cash holding of Tunisian firms over the period of 2003-2013. We will investigate this task in a particular context which is the Jasmine Revolution. Our results show that the investment decisions of firms with financial constraints are significantly sensitive to the availability and the level of internal funds versus unconstrained ones. Generally, our results suggest that financial constraints significantly influence the decisions of Tunisian companies. In particular, these financial constraints are considered more handicapping during negative cash years and after the revolution.

Keywords: Investment, Financial constraints, Jasmine revolution, Precautionary motive, Cash-flow, Cash holding.

JEL Classification: G31 - G32 – O55.

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Contribution/ Originality

The study contributes to the existing literature by considering jointly the effects of financial constraints on investment decisions and corporate cash holding. It believes that constrained firms present investment cash-flow sensitivity higher than firms less constrained and conversely, they present lower cash-flow cash sensitivity.

1. INTRODUCTION

The existence of imperfections in the financial markets, identified in forms of agency problems and asymmetric information can cripple companies to systematically finance from the external financial market and increase the risk of underinvestment. Failing to raise the necessary funds from the external market, these companies will use internal funds to finance the company's activities and cover the cost of its investment program. They will be motivated to hold cash as a precaution. At this study we try to analyze link between internal funds and the ability of firms to invest. We examine the effects of cash-flow levels on corporate investment capabilities present and future in an imperfect market environment. In the Tunisian context, we will study jointly the investment cash flow sensitivity and cash flow cash sensitivity by testing the effect of financial constraints before and after the revolution. We presume that constrained firms present investment cash-flow sensitivity higher than firms less constrained and conversely, they present lower cash flow cash sensitivity. We found that the investment cash flow sensitivity is significantly higher for constrained companies relative to less constrained ones. This effect of financial constraints is more handicapping after the

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revolution. Our results provided no evidence of a higher cash flow cash holding sensitivity for constrained companies compared to unconstrained ones. In the following we present in a second section a theoretical review on the role of financial constraints in corporate investment decisions. At the third section we present an empirical review. The fourth section will be dedicated to the presentation of the sample and the methodology adopted. In the fifth section, we present the results and analysis. The conclusion is presented in the sixth section.

2. THEORETICAL REVIEW

Theoretically under the existence of asymmetric information and agency costs, firms could miss the investments if they are undertaken they will increase value. In this context, Fazzari *et al.* (1988) and a large number of theoretical and empirical studies has analyzed the role of financial constraints in corporate investment decisions. They present evidences and explanations on the positive association between investment and internal funds. Fazzari *et al.* (1988) argue, in a context of imperfect capital markets, that managers often use a funding hierarchy to undertake their investment projects. In this context they suggest that with a low rate of dividend distribution, firms have a strong dependence of its cash flow due to the excessive cost of external funds. Fazzari *et al.* (1988) used the distribution of dividends as test variable of the correlation between investment and cash flow. They confirm their assumptions by showing, that the cash flow coefficient admits a positive sign and that this coefficient is much higher when dividend ratio is much lower. They showed that the sensitivity of investment to cash flow is higher in the case of companies financially constrained (those that distribute less dividends). However, more recent work, have argued that the approach proposed by Fazzari *et al.* (1988) have a few weaknesses. First, Kaplan and Zingales (1997); Kaplan and Zingales (2000) developed a simple theoretical model showing that the cash flow investment sensitivity of companies does not necessarily decrease monotonically with the level of available internal capital or increases monotonically with the difference between the cost of external and internal capital. They show that the sensitivity of investment to cash-flow and cash may reveal the presence of investment opportunities instead of reflecting the presence of financial constraints. These authors found that the companies were classified as more financially constrained have cash flow investment sensitivity lower than those classified as less financially constrained. Then Cleary (1999) show that companies with poor financial status have low investment cash flow sensitivity. In the same context, the theoretical literature has focused on the role of cash in financing investments in a context of financial constraints. It shows that maintaining cash reserves for precautionary motive allows companies to deal with unexpected contingencies and not risk underinvestment Myers (1977); Stiglitz and Weiss (1981) and Myers and Majluf (1984). Firms would therefore conserve cash to take advantage of different investment opportunities and not miss investment with NPV. In this logic, Almeida *et al.* (2004) formulated a theoretical model based on financial restrictions determined by the theory of asymmetric information. They showed that companies, classified as financially constrained, exhibited high positive sensitivity of cash holding to changes in cash flow levels. Their model presuppose that companies with high difficulties to raise new external funds adopt a financial policy that is oriented towards the preservation of cash in a systematic way due to a significant change in its cash flow compared to companies that do not face financial restrictions. Seungjin and Qui (2007) presented a theory of precautionary motive for corporate cash holding which suggests that optimal cash holding changes in the presence of volatility of cash flow and that there is a negative relationship between current investment and volatility of cash flow affected by financial constraints. Their theory shows that financial constraints could affect the connection between the volatility of cash flow, the cash holding and investment. We assume in this framework that once the firms are constrained they will finance investments through internal cash flows and or a high level of cash holding and a low level of current investment because investment and the cash holding reserve are the two main competing uses of cash flows (Chang *et al.*, 2007). We expect then that the

constrained companies have a cash flow investment higher sensitivity and displayed lower sensitivity cash flow cash holding.

3. EMPIRICAL REVIEW

Various empirical studies such as those of Allayannis and Mozumdar (2004) and Pawlina and Renneboug (2005); Cleary (2006); Love and Zicchino (2006); Aggarwal and Zong (2006) and Islam and Mozumdar (2007) have focused on the analysis of the relationship between investment and internal funds. The study of Pawlina and Renneboug (2005) show that firms with excess cash and strong growth opportunities chooses to finance investment through internal resources. Love and Zicchino (2006) found that financial factor, indicating the degree of financial stress, have positive effect on investment. In turn, Aggarwal and Zong (2006) argue that firms characterized by financial constraints have higher cash flow investment sensitivity than firms not financially constrained. Baum *et al.* (2006) show that when macroeconomic conditions are volatile, managers have a more conservative behavior by increasing the company's cash position to finance their investments. The authors explain their results by the low ability of managers to forecast cash flow when the economy is not stable. Chang *et al.* (2007) report that financial constraints do affect Australian firms' decisions. They show that constrained companies have higher cash flow cash sensitivity and displayed lower cash flow investment sensitivty. In the same context, Denis and Sibilkov (2010) show for a sample of US public companies between 1985 and 2002, that a higher level of cash holding allows financially constrained firms to undertake value projects that could be omitted. Sheu and Lee (2012) found that excess cash is clearly sensitive to both capital and total asset especially for firms with both financial constraints. Different conclusions were presented by Disatnik *et al.* (2014) who find that hedging cash flow as a precaution reduce the corporate cash holding and enable it to rely relatively more on bank credit lines to stock up on cash. Their model further predicts that cash would be negatively related to cash flow hedges, while bank credit lines are positively related to cash flow hedges. Their results show that the choice between holding cash and credit lines depends on the hedging strategy adopted y the company. In a particular context of acquisitions, Erel *et al.* (2014) provide additional evidence to support relationship between investment and internal funds. The authors speculated that the companies targeted for acquisition are financially constrained. They note that the cash holding level of these companies, the sensitivity of cash flow to cash and the sensitivity of cash flows to investments drop significantly, while investment increases significantly following the acquisition. These effects are more pronounced in the offers that are most likely to be associated with financing improvements.

4. DATA AND METHODOLOGY

4.1. Data

To empirically evaluate the different sensitivities cash-flow to investment and cash-flow to cash, we took a sample of 30 Tunisian companies listed on the period between 2003 and 2013.

4.2. Methodology

In our empirical work we adopt the Chang *et al.* (2007) methodology to test our assumptions. We first consider the investment-cash flow sensitivity for constrained and non constrained firms. We seek to determine how financial constraints affect this sensitivity. The model adopted is as follow:

Model 1

$$INVS_{it} = \beta_1 CFLO_{it} + \beta_2 FC_{it} + \beta_3 FC_{it} * CFLO_{it} + \beta_4 CROI_{it-1} + \beta_5 LEVI_{it-1} + \beta_6 LIQI_{it-1} + \beta_7 VENT_{it} + \xi_{it}$$

With FC is a binary variable that takes a value of 1 if a company is financially constrained and zero otherwise. β1 and (β 1 + β 3) respectively measures the sensitivity of cash flow to corporate investment of financially unconstrained and constrained companies. VENT: variable represents the sales, CROI represent growth opportunity, CFLO: represent the cash flow and LEVI represent the firm leverage. LIQI is the cash holding which is added to capture the impact of corporate cash holding on investment.

For further analysis of the impact of financial constraints on different sensitivities: cash-cash flow and investment-cash flow , Chang *et al.* (2007) propose to test whether the effect of financial constraints are persistent in the years with a positive and negative cash flow. We will increase then the equation (1) by adding an additional term of interaction FC*CFLO and a binary variable (NEG), which takes 1 when the cash flow is negative and 0 otherwise. The regression resulting equation is:

Model 2

$$INVS_{it} = \beta_1 CFLO_{it} + \beta_2 FC_{it} + \beta_3 FC_{it} * CFLO_{it} + \beta_4 FC_{it} * CFLO_{it} * NEG_{it} + \beta_5 CROI_{it-1} + \beta_6 LEVI_{it-1} + \beta_7 LIQI_{it-1} + \beta_8 VENT_{it} + \xi_{it}$$

β_3 in equation (3) measures the differences in the investment and cash flow sensitivity between constrained and less constrained companies in positive cash flow years. β_4 captures the impacts of negative cash flow years on cash flow sensitivities.

In a second series of tests we examine the sensitivity of cash flow to cash holding. The models used are as follows.

Model 3

$$\Delta LIQI_{it} = \beta_1 CFLO_{it} + \beta_2 FC_{it} + \beta_3 FC_{it} * CFLO_{it} + \beta_4 TAIL_{it} + \beta_5 CROI_{it-1} + \beta_6 LEVI_{it-1} + \beta_7 EXPE_{it-1} + \beta_8 \Delta ALIQ_{it} + \beta_9 \Delta DECT_{it} + \xi_{it}$$

Wit h LIQI is cash ratio, TAIL is the size of the company, CROI variable represents growth opportunities. The model controls the use of alternative sources of liquidity as changes in other liquid assets (ΔALIQ) and changes in short-term debt (ΔDECT). LEVI captures the effect of the change in debt on change in cash holding and EXPE represent

the capital expenditures, β_1 and (β_1 + β_3) respectively measures the sensitivity of cash flow to cash holding for financially unconstrained and for financially constrained companies.

Model 4

$$\Delta LIQI_{it} = \beta_1 CFLO_{it} + \beta_2 FC_{it} + \beta_3 FC_{it} * CFLO_{it} + \beta_4 FC * CFLO * NEG$$
$$\beta_5 TAIL_{it} + \beta_6 CROI_{it-1} + \beta_7 LEVI_{it-1} + \beta_8 EXPE_{it-1} + \beta_9 \Delta ALIQ_{it} +$$
$$\beta_{10} \Delta DECT_{it} + \xi_{it}$$

β_3 in equation (4) measures the differences in the cash flow and cash sensitivity between constrained and non constrained firms in positive cash flow years and β_4 captures the impacts of negative cash years on cash flow sensitivities.

5. EMPIRICAL AND DESCRIPTIVE RESULTS

Statistical analysis of the variables of the study is presented in the tables below. Table 1 shows the correlations between the variables used in the regressions for our analysis.

Table-1. Matrix correlation between variables

	LIQI	ALIQ	LEVI	TAIL	CROI	EXPE	VENT	INVS	CFLO
LIQI	1.000000	-0.1349	-0.2827	-0.1024	0.0321	0.0779	-0.0156	0.0175	0.2481
ALIQ	-0.1349	1.000000	-0,7124	-0.2479	-0.0445	0.3231	-0.3615	0.0431	0.3365
LEVI	-0.2827	-0,7124	1.000000	0.1706	-0.0135	-0.4184	0.2587	0.0087	0.1029
TAIL	-0.1024	-0.2479	0.1706	1.000000	0.0133	-0.4184	0.0848	0.0090	0.2331
CROI	0.0321	-0.0445	-0.0135	0.0133	1.000000	0.0121	0.6741	0.0365	0.3486
EXPE	0.0779	0.3231	-0.4184	-0.4184	0.0121	1.000000	0.1207	0.3352	0.1207
VENT	-0.0156	-0.3615	0.2587	0.0848	0.6741	0.1207	1.00000	-0.0425	0.0258
INVS	0.0175	0.0431	0.0087	0.0090	0.0365	0.3352	-0.0425	1.00000	0.1059
CFLO	0.2481	0.3365	-0.0224	0.1029	0.2331	0.3486	0.1207	0.1059	1.00000

Source: Author's Estimations using STATA.

Table 2 reports the average, maximum and minimum values and standard deviations of the variables of the study in time for the entire sample. Tunisian companies have an average of 3.9% of Investment. It varies between (-4.8) and (5.8). The level of investment varies significantly between Tunisian firms. A high difference is found in the level of leverage between companies. It presents an average value of 53% and varied between a maximum and minimum value about 7% and 2.41 respectively.

Table-2. Descriptive statistics

	Obs	Mean	Std. Dev.	Min	Max
INVS	330	0.0396529	0.604307	-4.893508	5.843595
LIQI	330	0.1065948	0.1204387	0.0002486	0.6835111
LEVI	330	0.536832	0.3329487	0.0070132	2.41353
CFLO	330	0.0762734	0.0836256	(0.4063967)	0.4142204
CROI	330	1.43801	0.788497	0.0937619	6.762115
TAIL	330	11.08641	0.9390694	9.589029	14.29894
VENT	330	0.7484954	0.5316723	0.0044447	2.884359
DECT	330	0.7359193	0.1883688	0.0656112	1
ALIQ	330	0.1766586	0.3300547	1.283671	0.9763021
EXPE	330	0.0071366	0.1398359	(0.9416966)	0.8464454

Source: Author's Estimations using STATA.

5.1. Analyses of Investment Cash Flow Sensitivity

Table 3 presents the estimation results of the first model for the whole sample. Column1show the results of the analysis of the effect of financial constraints on investment for the first classification (depending on size). The second column shows the results based on the dividend payment classification. Indeed our choice of classification system is based on further studies. On the one hand, the size of one of the most widely used proxy for measuring the financial constraints because of transaction costs and asymmetric information problems that decrease with size. Large companies will have easier access to raise funds. Small firms are likely to be most affected by information asymmetry and could face the risk of bankruptcy. On the other hand we have classified as financially constrained companies relying on the dividend policy. Fazzari *et al.* (1988) argue that companies with a low payout ratio are more financially constrained because they will face a higher cost of external financing.

Table-3. Investment-cash flow Sensitivities

Variable INVS	**(1)**	**(2)**
CFLO	0.8621205	1.010012
	(4.95)***	*(2.32)****
FC	-0.0690946	-0.197061
	(-2.61)***	*(-2.89)****
FC*CFLO	0.2282304	0.9474018
	(1.21)	*(1.74)**
CROI	0.0084931	0.0391938
	(0.66)	*(1.39)*
LEVI	0.3516537	1.339097
	(10.57)***	*(12.16)****
$LIQI_{t-1}$	-0.095771	0.2297415
	(-1.20)	*(1.14)*
VENT	0.0073882	0.0002637
	0.42	*(0.01)*
C	-0.1240382	0.1299138
	(-2.31)	*(0.85)*
	R-sq : 0.60901447	R-sq : 0.59773942

Source: Author's Estimations using STATA.

With LIQI: cash ratio: cash and marketable securities to assets. INVS: investment measured by capital expenditures reported to the stock of capital. FC: binary variable that takes 1 if the firm is constrained 0 otherwise. LEVI: leverage measured by total debt divided by total assets. CFLO: is the cash flow: net income plus depreciation and amortization and provisions. The size is equal to the natural log of total assets. CROI: measure the growth opportunities: the ratio-to-Market book. VENT: measures sales equal to the amount of sale on total assets. Significance levels are respectively 1% ***, 5% ** 10% *

The results show that capital expenditures of large firms (unconstrained firms) have a lower significant investment-cash flow sensitivity compared to small firms (constrained firms). The β1 coefficient is positive and significant. The unconstrained firms have cash flow-investment sensitivity about 0.86. The investment cash flow sensitivity of constrained firms is captured by (β1 + β3). The estimated value is about 1.09 (0.86 + 0.22). This significant and positive value shows that constrained firms have higher cash flow-investment sensitivity than that experienced in the unconstrained firms. The difference of cash flow-investment sensitivity between small and large firms is captured by the interaction term coefficient (β3). Column 2 shows the results for the second classification system which in turn show significant investment-cash flow sensitivity for constrained companies which higher than unconstrained firms. Each decrease (increase) of a unit of cash flow, the investment of small firms decrease (increase)

by an average of 1.090, while those of companies without constraints increase (decrease) is 0.862. The coefficient β1 is equal 1.010 with a t-statistic (2.89). The coefficient β3 in turn has the value of 0.947. This value is significant at 10%. The value of the interaction term coefficient (β1 + β 2) is greater than β1 which leaves us suggest a significant and higher cash flow-investment sensitivity of firms with zero dividend policy than for companies that distribute dividends. These results are consistent with the results of Fazzari *et al.* (1988); Mills *et al.* (1995) and Gautam *et al.* (2014) among others. They have shown that the investment-cash flow sensitivity is higher for companies that face a larger gap between the costs of internal and external funds. These findings support the evidence of a difference between the costs of internal and external capital. Financial constraints hamper the ability of companies to invest effectively. Then companies with limited access to funding markets are more dependent on internal financing. Our results show in general that constrained companies use internal funds to finance investments, present high cash flow investment sensitivity compared to unconstrained. Companies with a low dividend payout ratio, classified as financial constrained, have shown greater investment cash flow sensitivity compared to companies with a high dividend payout ratio. The estimated coefficients of the control variables have the following signs. In the first LEVI coefficient (company leverage) is positive and significant for both classification systems. This result suggests that when companies increase their investments they make use of debt. This is consistent with the findings made on the behavior of Tunisian companies. In Tunisia, companies are not going to see the stock market to finance themselves but prefer to turn to banks. The coefficients of the variable VENT show that the sales ratio has a positive but not significant impact on the investments. The variable LIQI has a negative but insignificant effect on investment. To better understand the levels of sensibilities between investment and cash-flow in what follow we opted to take into account the conditions of the occurrence of the revolution in 2011on corporate investment decisions. The main results for the period before and after the revolution are presented in table n°4.

Table-4. Investment-cash flow sensitivities before and after the revolution

Variables INVS	**(1) 2008_2010**	**(2) 2008-2010**	**(3) 2011_2013**	**2011-2013**
CFLO	0.6255631	1.010012	0.4731706	1.27135
	(1.02)	*(2.32)****	*(1.87)***	*(5.50)****
FC	-0.1366834	-0.197061	-0.1905419	-0.04541
	(-1.41)	*(-2.89)****	*(-4.81)****	*(-0.91)*
FC*CFLO	1.272783	0.9474018	1.697219	1.643896
	(1.75)**	*(1.74)***	*(3.38)****	*(3.20)****
CROI	0.0346363	0.0391938	-0.0134884	-0.0221385
	(1.07)	*(1.39)*	*(-0.94)*	*(-1.61)*
LEVI	1.314534	1.339097	0.0243964	0.1374771
	(10.60)***	*(12.16)****	*(0.52)*	*(2.39)****
$LIQI_{t-1}$	0.1440671	0.2297415	-0.0338386	-0.1143308
	(0.63)	*(1.14)*	*(-0.25)*	*(-0.89)*
VENT	0.0002637	0.0346461	-0.0109196	0.1427338
	(0.01)	*(0.90)*	*(-0.29)*	*(0.98)*
C	0.1800074	0.1299138	0.0795489	0.0073953
	(0.92)	*(0.85)*	*(1.59)*	(0.18)
	R-sq : 0.9355654	R-sq : 0.94811808	R-sq : 0.5048376	

Source: Author's Estimations using STATA.

With LIQI: cash ratio: cash and marketable securities to assets. INVS: investment measured by capital expenditures reported to the stock of capital. FC: binary variable that takes 1 if the firm is constrained 0 otherwise. LEVI: leverage measured by total debt divided by total assets. CFLO: is the cash flow: net income plus depreciation and amortization and provisions. The size is equal to the natural log of total assets. CROI: measure the growth opportunities: the ratio-to-Market book. VENT: measures sales equal to the amount of sale on total assets. Significance levels are respectively 1% ***, 5% ** 10% *

We note at the Table 4 that all β3 coefficients are positive and significant. The sensitivity (β1 +β4) show a higher value after the revolution. The increase in the investment-cash flow sensitivity after the revolution is explained by the increase in the difference between the external and internal costs of capital. Constrained companies, more sensitive to changes in financial conditions, will be forced to invest less. The lack of liquidity in the Tunisian market and the reluctance of banks to granted new loans due to the unstable situation in the country make access to the external financing more expensive and difficult and result in higher investment-cash flow sensitivity after the revolution for the constrained companies. In further analysis, to better disentangle the sensitivity levels of investment cash flow and cash-flow cash, we will consider in our analysis the impact of the economic situation of negative cash flow years like Chang *et al.* (2007) throughout the study period.

Table-5. Investment-cash flow sensitivities: negative cash flow years

Variables INVS	**(1)**	**(2)**
CFLO	0.6375478	0.6220867
	(3.97)***	*(5.46)****
FC	-0.0152664	-0.0833342
	(-0.53)	*(-3.88)****
FC*CFLO	0.1575737	0.3940995
	(0.71)	*(1.85)***
FC*CFLO*NEG	*-1.043587*	-1.321053
	(-4.06)***	*(-4.65)****
CROI	0.0014924	0.0018989
	(0.18)	*(0.24)*
LEVI	0.1276326	0.1682939
	(5.57)***	*(7.11)****
$LIQI_{it}$	0.0173824	0.0314421
	(0.34)	*(0.63)*
VENT	0.0051155	0.0022636
	(0.44)	*(0.20)*
C	-0.084535	-0.0937352
	(-2.48)***	(-3.77)***
	R-sq : 0.25031766	R-sq : 0.31129468

Source: Author's Estimations using STATA.

With LIQI: cash ratio: cash and marketable securities to assets. INVS: investment measured by capital expenditures reported to the stock of capital. FC: binary variable that takes 1 if the firm is constrained 0 otherwise. NEG: binary variable that takes 1 if the cash-flow is negative 0 otherwise. LEVI: leverage measured by total debt divided by total assets. CFLO: is the cash flow: net income plus depreciation and amortization and provisions. The size is equal to the natural log of total assets. CROI: measure the growth opportunities: the ratio-to-Market book. VENT: measures sales equal to the amount of sale on total assets. Significance levels are respectively 1% ***, 5% ** 10% *

Table 5 show our results of estimating equation 3 with an additional term of interaction between cash flow and variable (NEG) which separates the investment-cash flow sensitivities of years with positive cash-flow and those of

years with negative cash flow. The coefficient β1 has a significant value at 1%. The unconstrained companies have significant sensitivity cash flow investment. This sensitivity is higher for the constrained companies who have a higher value in both classification systems. The coefficient (β1 + β4) captures the impact of years of negative cash flow on sensitivity investment-cash flow. We note that the β4 coefficient is negative for both classifications systems. It shows that the constrained companies have cash flow-investment sensitivity lower than those unconstrained for negative cash flow years. Capital expenditures are maintained at minimum levels. The same is determined for enterprises classified by the dividend rate. The difference in sensitivity is equals -1.321 significant at 1% (the t-statistic is equal to -4.56). Companies can't handle any further declines in level of cash flow and will show a low sensitivity investment-cash flow during negative cash flow years (Chang *et al.*, 2007). They will present a precautionary motive to hold more cash from internal funds. Since the cash holding and investment represent two contradictory uses of the cash flow (Chang *et al.*, 2007) low investment cash flow sensitivity is associated with higher cash flow cash holding sensitivity. In the following we present an analysis of the cash flow cash sensitivity on the total period of the study, before and after the revolution and for years with negative cash flow.

5.2. Analysis of the sensitivity cash flow liquidity

The following table presents the regression of model N°3.

Table-6. Cash flow-cash sensitivities

Variables ΔLIQI	(1)	(3)
CFLO	0.0026487	0.0415878
	(0.03)	*(0.58)*
FC	-0.000078	-0.0015
	(-0.01)	*(-0.13)*
FC*CFLO	0.0365686	0.03234
	(0.39)	*(0.35)*
CROI	-0.0116815	-0.0105121
	*(-1.90)***	*(-1.77)***
TAIL	0.0203426	0.0087417
	(0.71)	*(1.05)*
EXPE	0.0203426	0.018971
	(0.96)	(0.90)
ΔALIQ	-0.039449	-0.0369712
	*(-2.24)***	*(-2.10)***
ΔDECT	*0.04153*	*0.037061*
	*(1.73)***	*(1.54)*
C	-0.0542415	*-0.072512*
	(-0.47)	*(-0.83)*
	R-sq : 0.22710275	R-sq : 0.23434663

Source: Author's Estimations using STATA.

With LIQI: cash ratio: cash and marketable securities to assets. INVS: investment measured by capital expenditures reported to the stock of capital. FC: binary variable that takes 1 if the firm is constrained 0 otherwise. CFLO: is the cash flow: net income plus depreciation and amortization and provisions. TAIL: The size is equal to the natural log of total assets. CROI: measure the growth opportunities: the ratio-to-Market book. Aliq: Other liquid assets are net working capital minus the amount of cash to assets. EXPE: Capital expenditure is the CAPEX. DECT: short debt: measured by short debt to total assets. Significance levels are respectively 1% ***, 5% ** 10% *

At the table 6 the different coefficients of cash flow cash sensitivity for the two columns have non-significant values. The signs of the coefficient suggest that cash-cash flow sensitivity of constrained firm is higher than firms

without constraints. However the non-significance of the coefficients does not allow us to confirm these conclusions. The sign of the coefficients does not confirm our hypothesis which stipulates that companies with more investment cash flow sensitivity present less cash flow-cash sensitivity. The coefficients of the size of companies and the investment spending are positive and non-significant. As expected, the increase in other liquid assets (ΔALIQ) has a considerable and negative impact on the corporate cash holding. The significant positive coefficient (ΔDECT) suggests that the Tunisian companies use short-term debt financing to build liquidity reserves.

Table-7. Cash-cash flow sensitivities: negative cash flow years

Variables ΔLIQI	**(1)**	**(3)**
CFLO	0.0652743	0.0913673
	(1.21)	*(1.23)*
FC	-0.0094756	-0.0074299
	(-0.95)	*(-0.60)*
FC*CFLO	*0.0050589*	0.0356577
	(0.06)	*(0.35)*
FC*CFLO*NEG	*0.1246901*	*0.0436893*
	(1.08)	*(0.38)*
TAIL	-0.0033339	0.0004726
	(-0.77)	*(0.16)*
EXPE	0.0260509	0.0351957
	(1.28)	*(1.70)***
ΔWRCA	*-0.0400792*	*-0.040131*
	*(-2.26)****	*(-2.25)****
ΔDECT	*0.0331547*	*0.0357861*
	(1.37)	*(1.47)*
C	0.0417787	*(.0088812)*
	(0.81)	*(0.27)*
	R-sq : 0.06027638	R-sq : 0.0541258

Source: Author's Estimations using STATA 10.

With LIQI: cash ratio: cash and marketable securities to assets. INVS: investment measured by capital expenditures reported to the stock of capital. FC: binary variable that takes 1 if the firm is constrained 0 otherwise. NEG: binary variable that takes 1 if the cash-flow is negative 0 otherwise. CFLO: is the cash flow: net income plus depreciation and amortization and provisions. TAIL: The size is equal to the natural log of total assets. CROI: measure the growth opportunities: the ratio-to-Market book. Aliq: Other liquid assets are net working capital minus the amount of cash to assets. EXPE: Capital expenditure is the CAPEX. DECT: short debt: measured by short debt to total assets. Significance levels are respectively 1% ***, 5% ** 10% *

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Table-8. Cash-cash flow sensitivities before and after the revolution

VariablesΔLIQI	(1) 2008_2010	(2) 2011_2013	(1) 2008-2010	(2) 2011-2013
CFLO	0.1054353	0.1628703	0.0886168	0.06788
	(0.71)	(1.27)	(0.81)	(0.68)
FC	-0.0211671	-0.0056353	-0.0899588	-0.0137374
	(-1.07)	(-0.33)	(-3.43)***	(-0.92)
FC*CFLO	0.0300467	0.2561164	0.0768419	0.0503194
	(0.20)	(1.63)	(0.50)	(0.43)
CROI	-0.0020062	0.0043665	-0.0161163	-0.0013446
	(-0.25)	(0.53)	(-1.62)	(-0.31)
TAIL	-0.0063089	0.0002964	-0.0827441	-0.0022983
	(-0.69)	(0.05)	(-3.16)***	(-0.51)
EXPE	0.1137303	0.034707	0.0750014	-0.0147176
	(2.34)***	(0.77)	(2.53)***	(-0.42)
ΔWRCA	-0.1389959	-0.0954584	-0.0946842	-0.0065122
	(-3.55)***	(-2.59)***	(-2.55)***	(-0.14)
ΔDECT	0.1347665	0.1017229	0.0042291	-0.0148613
	(2.66)***	(2.13)**	(0.17)	(-0.43)
C	0.087806	-0.0037606	0.962158	0.0352931
	(0.79)	(-0.06)	(3.24)***	(0.70)
	R-sq : 0.6146607	R-sq : 0.14932397	R-sq : 0.84809285	R-sq : 0.324472

Source: Author's Estimations using STATA 10.

At the table 7 and 8 we present the different results of our analysis of the cash-cash flow sensitivity before and after the revolution and during the years of negative cash flow. The results aren't significant. The sign of different coefficients shows that small companies have cash-cash flow sensitivity higher than those of large companies in negative cash flow years. We note then that constrained companies have cash-cash flow sensitivity higher than unconstrained firms during the negative cash flow years. The coefficient β4 is positive for both classifications systems but not significant. We think that capital expenditures are maintained at minimum levels. The same results are founded for the second classification system (dividend rate). Table 8 shows that cash-cash flow sensitivity level before and after revolution, the results didn't change significantly. We expected cash-cash flow sensitivity higher for constrained firms after the revolution. The economic climate encourages firms to hold cash as a precaution. After the Tunisian revolution companies recorded a large deterioration in operating performance. They found themselves more constrained financially. It is possible that holding more cash reserves beyond the target level after the revolution is not possible for constrained companies who are facing a deceleration in different corporate cycles and operating cycle and a funding problems caused by deterioration in security and the economic conditions in the country (disruption of customer demand, disruption of their supply and production chains).Our results provide no confirmation of such situation. The results are not consistent.

6. CONCLUSION

This study was devoted to the joint analysis of the effects of financial constraints on investment decisions and corporate cash holding. The empirical study is conducted on a panel data for Tunisian companies. The analysis of the effect of financial constraints on investment decision and corporate cash holding shows that the investment decision of financially constrained firms are more significantly sensitive to the availability and the level of internal funds than

unconstrained. This evidence provides support for the results of previous studies as an example of those Fazzari *et al.* (1988) but in contradiction to those provided by Kaplan and Zingales (1997); Cleary (1999) and Chang *et al.* (2007). We found no conclusive results on cash-cash flow sensitivity. Our results suggest that in general financial constraints significantly influence the decisions of Tunisian companies. In particular, we have shown that these financial constraints are more handicapping during negative cash-flow years and after revolution.

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