Investment-Cash Flow Sensitivity versus Cash-Cash Flow Sensitivity: What Really Matters for Tunisian Firms

Ezzedine, Abaoub and Salma, Bejar

Department of Finance, Faculty of Economics and Management of Tunisia (FSEGT)
University of Tunis El Manar

Laboratory of Finance, Accounting and Financial Intermediary, LAFICOIF

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# Corresponding authors: Department of Finance, Faculty of Economics and Management of Tunisia. Laboratory of Finance, Accounting and Financial Intermediary: LAFICOIF.
Email: salmabejar@yahoo.fr; Tel: 00216-21704210.

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Abstract

Since the seminal paper of Fazzari, Hubbard and Petersen (FHP, 1988), several works identify investment-cash flow sensitivity as a good measure of financial constraints. Some other papers refute this evidence. This paper empirically investigates a model for an unbalanced sample of 39 non financial Tunisian firms over the period 2000-2006. Empirical results support the standard theory that firms having severe financial constraints exhibit a higher sensitivity of investment to cash flow than their counterparts having few financial constraints according to different classification schemes. Also, it appears that the higher is the investment-cash flow sensitivity, the lower is the cash-cash flow sensitivity.

I/ Introduction

Financial constraints models explain how information asymmetry between lenders and borrowers can result in underinvestment problem, which is to not exploit some NPV projects. Information asymmetry in capital markets imply that firms are in possession of some private information that cannot be observed freely by external lenders; The seminal work of Fazzari, Hubbard and Petersen (1988) report that such firms are confronted to costlier external finance than internal funds. In Financial constraints models, the high cost of external finance encourages firms to turn toward internal funds. Firms having low degree of information asymmetry and thus low cost of information access are not constrained by internal funds to finance their investment activities.

Financial constraints theory focuses on impact of information asymmetry on investment behaviour. The main work of Fazzari, Hubbard and Petersen (1988), report that a high investment to internal cash flow sensitivity put in evidence the presence of financial constraints. Several studies support this evidence. But, some studies including those of Kaplan and Zingales (1997), Clearly (1999) and Gilchrist, Himmelberg (1995) contradict this point of view, since not financially constrained firms have the higher investment to cash flow sensitivity.

Recent theory examines financial market frictions impact on corporate investment by studying the relation between investment and cash flow. As well theory as empirical studies on relation between investment and cash flow reveal that investment to cash flow sensitivities don't necessarily increase with financial market frictions; another possible mean to analyse the effects of financing constraints on

investment policies is to examine relation between cash detentions and internal cash flow. In this spirit, Keynes (1936) develops his argument which is extended by Almeida, Campello and Weisbach (2004) and Chang et al. (2006).

According to Keynes (1936) argument, capital market ability to provide financing for investment's projects can affect financial policies of the firm (p. 196). If the firm can always have access to external capital markets, it needn't to detent cash liquidities. Alternatively, if external financing is costly for the firm, it is possible for it to create value by maintaining much more liquid assets in the balance sheet. Keynes focus on cash policies, but the argument is much more general: Any decision which can affect firm capacity to finance projects is affected by the distribution of financing demand and costs across the time.

Almeida, Campello and Weisbach (2004) suggest that financing constraints increase the probability to save liquidities out of internal cash flow: "The cash to cash flow sensitivity". Their empirical results show that cash-cash flow sensitivity is high for firms having severe financing constraints to be able to finance future investments (precaution motive). Alternatively, firms facing low financing constraints don't have significant cash to cash flow sensitivity since they have easily access to capital markets to finance their projects.

Chang, Tang, Wong and Zhang (2006) examine conjointly the impact of financing constraints on investment and cash decisions of Australian firms. Their results show that financing constraints not only reduce investment to cash flow sensitivity but also increase cash to cash flow sensitivity. It is obvious that these results are inter-related since investment and cash changes are the major uses of funds.

Two explanations are possible for theses last results. The first explanation is valid for firms achieving positive cash flow. For these firms, investments are less sensitive to positive cash flow changing to insure sufficient funds for future investment. Thus, firms having financing constraints exhibit low investment-cash flow sensitivity and high cash-cash flow sensitivity. A second explanation holds during negative cash flow years. According to Allayannis and Mozumdar (2004), constrained firms are more likely to reduce their investment in negative cash flow years to restore their financial slack. They are likely to compensate the shortfall of funds needed for capital expenditures with funds obtained from cash reserves. Thus, the response to positive changes in cash flow will be an increase in cash balances. Thus "higher cash-cash flow and lower investment-cash flow sensitivities can coexist in financially constrained firms"[1].

Studies exposed above on effects of financial constraints are investigated in American and Australian contexts. By doing this research, we are concretely motivated by detecting the existence and measuring the impact of financial constraints in the context of an emerging market: Tunisia. If financial constraints play a marginal role in investment and cash decisions, the difference in investment-cash flow sensitivities and cash-cash flow sensitivities will not be significant across Tunisian firms. On the one hand, we tend to explain how investment to cash flow sensitivity is a good measure of financial constraints. On the other hand, we try to explain how investment to cash flow sensitivity attenuates cash to cash flow sensitivity in the Tunisian context.

[1] Chang, Tang, Wong et Zhang, (2006) : « The effects of financial constraints on corporate policies in Australia", working paper; University of Melbourne, Monash University, Australia; p 7.

An empirical investigation basing on Chang and al. model (2006) shows that investment-cash flow sensitivity of constrained firms is higher than investment-cash flow sensitivity of non constrained ones, according to firm's grouping by payout ratios, quotation on the stock exchange, and financial statue score Z_{FC}. This sensitivity varies between 0.31 and 0.70 according to classification scheme. Our findings corroborate those of FHP (1988) but are in contrast with those of Kaplan and Zingales (1997), Clearly (1999) and Chang and al. (2006), who put forward that constrained firms exhibit a lower investment to cash flow sensitivity than their non constrained counterparts. In addition, we report that the omission of negative cash flow from the sample increase the investment-cash flow sensitivity coefficient, which confirm the financial distress argument of Allayannis and Mozumdar (2001, 2004).

In a second time, we empirically investigate the cash-cash flow sensitivity of Tunisian firms. In our knowledge, this is the first paper which empirically investigates conjointly investment to cash flow sensitivity and cash to cash flow sensitivity across sub-samples having different degrees of financial constraints in the context of an emerging market. The estimation of the cash-cash flow sensitivity across all the sub samples shows that this sensitivity is not significant. Thus, our findings are in contrast with those of Chang and al. (2006) and Almeida and Weisback (2004) since the authors show that constrained firms exhibit higher cash-cash flow sensitivity than non constrained ones.

Overall, the inverse relation between investment-cash flow sensitivity and cash-cash flow sensitivity is confirmed another time, but in favour of investment –cash flow sensitivity. One argument supporting this relation is the following: firms facing severe financial constraints are exposed to high costs of external finance, which induce the

"transaction motive" (Keynes; 1936) of cash detentions, implying to use cash reserves to face current expenditures, in opposition with precaution motive to save cash out of cash flow to be able to finance future investments. This reasoning results on a high investment to cash flow sensitivity and low cash to cash flow sensitivity.

To control the impact of negative cash flow on investment to cash flow sensitivity, we include the interaction term of Chang and al. (2006) between cash flow and a dummy variable relative to the negative cash flow. Empirical results show that the investment-cash flow sensitivity coefficient is higher.

Thus, we can conclude that the high sensitivity of investment-cash flow and the low sensitivity of cash to cash flow are more visible in positive cash flow years, since in negative cash flow years, firms use positive cash flow changes to restore the financial slack rather than to increase investments.

The rest of the paper is organised as following: In ***Section 2***, we elaborate our empirical methodology; ***Section 3*** presents sample and descriptive statistics; Empirical results and interpretations are presented in ***Section 4***. Finally, in ***Section 5***, in ***Conclusion***, we present principle testable predictions of empirical models, principles results and research limits.

II Methodology

Basing on Chang and al. (2006) models, we test financial constraints hypothesis in the Tunisian context.

2-1 Financial Constraints criteria

Empirical studies investigating the impact of financial constraints on corporate financial decisions always segregate sample in sub-samples basing on some financial

constraints criteria and compare investment-cash flow or cash-cash flow sensitivities of different sub samples. Financial markets frictions imply that high costs of external finance constraint firms to finance projects by internal funds.

The question which arises is to find classification schemes which capture the main characteristics of financial constrained firms. Standard corporate finance suggests that firms facing financial constraints are smaller or non profitable, have higher growth opportunities and are more levered and thus have lower debt capacity, than non constrained firms. We use 4 classification schemes to segregate samples in constrained and non constrained firms.

Firstly, we classify firms by size. Firms are classified in two groups basing on the median of the total assets. This approach is similar to that of Gilchrist and Himmelberg (1995), Almeida, Campello and Weisbach (2004), Chang and al, (2006). We hypothesise that small firms are typically younger, face high information asymmetry and high agency problems.

Secondly, we classify firms basing on payout dividends. Thus, we obtain two groups of firms; those which distribute dividends at least during one year of the period of study and those which never distribute dividends[2]. Firms having severe financial constraints are likely to payout low dividends to insure sufficient funds for future investment.

Thirdly, we suggest a new criterion to classify firms according to quotation or not on the Tunisian stock exchange. This grouping criterion is interesting since quoted firms have easily access to external finance than firms just doing "public call on

[2] We decide to not choose the median of payout ratio since firms don't distribute dividends at 30/06/N (data are half-yearly).

saving"[3]. Thus, these firms have more financial constraints than firms listed on the stock exchange. Basing on the introduction date on the stock exchange, we create a dummy variable which equals to one if firm is quoted and zero if otherwise.

Quarterly, we classify firms in two groups according to final-of-period median of the financial score indicator (Z_{FC}) of Clearly (1999). The score is determined basing on the discriminant analysis over a set of variables influencing financial constraints.

Let's remember that multiple discriminant analysis rely on a set of corporate specific variables which establish a function best distinguishing between two mutual exclusive groups. Clearly (1999) report that changes in payout dividend are good measures of financial constraints. The methodology consist of devising the sample in three categories: firms increasing payout dividends, firms decreasing payout dividends and firms maintaining payout dividends in the same level. The discriminant analysis estimate coefficients which best distinguish between firms increasing dividends and firms decreasing dividends. The Z_{FC} scores are calculated using the estimated coefficients and are assigned to all firms of the sample for the regression analysis.

We use the same set of ending-of-period variables[4] used by Clearly (1999) and Chang and al. (2006) which improve the explaining power of the model compared to the beginning-of-period variables. The current ratio (*Current*) and the financial slack (*Slack*) are included to control liquidity; the debt ratio and the coverage ratio (*FCCov*) capture leverage effect; Net income (*NI*) measures profitability and sales growth

[3] In Tunisia, the term of the "public call on saving" is assigned to firms which will be introduced on the stock exchange and those which emit a public loan.

[4] Clearly (1999) and Chang and, al. (2006) use the beginning-of-period variables. We choose the ending-of-period variables because the investment decision is adjusted quickly in the Tunisian context especially after cash and debt decisions in comparison with Australian case. Also the ending-of period cash and debt variables significantly improve the explaining poser of the subsequent model.

(*Growth*) control growth opportunities. The discriminant score (Z_{FC}) is calculated for every firm-year as:

$$Z_{FC} = 0.2398 \times Current - 0.0193 \times FCCov + 0.7519 \times Slack + 7.7615 \times NI + 0.7519 \times Growth - 4.1121 \times Leverage \quad 1.$$

2.2 Financial constraints and investment

In absence of financial frictions, firms have free access to capital markets and investment is only driven by expected future investment opportunities. However, in presence of imperfect financial markets, firms are constrained to finance investments by internal cash flows.

Prior studies on investment-cash flow sensitivity usually use cash flow and Tobin Q to control the changes in investment. Several other variables having an impact on the changing of investment in term of fixed assets (*CapExp*) are proposed by Chang and al. (2006).

Following Chang, Tang, Wong and Zhang (2006) we employ the following empirical model to estimate investment cash flow sensitivity of Tunisian Firms[5]:

$$CapExp_{i,t} = \alpha_1 CashFlow_{i,t} + \alpha_2 FC_{i,t} + \alpha_3 FC_{i,t} \times CashFlow_{i,t} + \alpha_4 Q_{i,t-1} + \alpha_5 Leverage_{i,t} + \alpha_6 Cash_{i,t} + \alpha_7 Saleses_{i,t} + \sum_i firms_i + \sum_t year_t + \varepsilon_{i,t} \quad 2.$$

Where (*CapExp*) is the ratio of capital expenditures to beginning-of-period fixed assets. (*CashFlow)* is defined as earning before extraordinary items and depreciation divided by the beginning-of-period fixed assets. We use Tobin Q to control investment

[5] In Chang and al. (2006) model, the authors use the beginning-of-period variables relative to leverage and cash, but we choose to use the ending-of-period variables since they significantly improve the explaining power of the model (2).

opportunities. (*Q)* is defined as the ratio of market value of assets to book value of assets. This definition hold for firms listed on the stock exchange but our sample contains non listed firms. To resolve the problem, we construct mean sector-based Tobin Q. Thus, we devise activity sectors into two groups according to the median of the mean sector-based Q: sectors above the median are considered as having high investment opportunities (HIOS) and sectors below the median are considered as having low investment opportunities (LIOS). The classification of sectors is presented in table 1:

Thus, it is possible to create a dummy variable which equals to one if the firm belongs to a high investment opportunities sector and zero otherwise. But Q doesn't reflect the increasing demand. This last is captured by the net sales to total assets ratio (Sales).

FC is a dummy variable which takes a value of one if a firm is financially constrained, and zero otherwise. The model has the advantage to compute simultaneously the investment-cash flow sensitivity of contained (α_1) and non constrained firms ($\alpha_1+\alpha_3$). The difference in investment-cash flow sensitivity between constrained and non constrained firms is captured by the coefficient (α_3). A positive and significant estimated coefficient, (α_3), indicates that investment of financial constrained is more sensitive to internal funds than investments of non constrained ones. Firms Cash holding (*Cash*) is included to capture the effect of corporate liquidity on investment. Leverage is defined as total liabilities[6] to total assets ratio. The control of leverage is suggested by Lang, Ofek, and Stulz (1996), who report a negative relationship between

[6] We define the leverage ratio as total liabilities to total assets instead of total debt to total assets ratios. This definition is always the most suitable in the Tunisian case.

investment and leverage. *firm* and *year* are included to control firm-and year-specific effects, respectively.

2.3 Financial constrains and cash holdings

Financial constraints increase the propensity to save liquidities out of internal cash flow. Thus, in presence of severe financial constraints, firms exhibit a high cash-cash sensitivity to be able to face futures financing needs (Almeida, Campello and Weisback, (2004)).

Following Chang, tang, Wong and Zhang (2006) we estimate the following empirical model basing on the prior literature on investment supply[7] and on cash management[8]:

$$\begin{aligned}\Delta Cash_{i,t} &= \alpha_1 CashFlow_{i,t} + \alpha_2 FC_{i,t} + \alpha_3 FC_{i,t} \times CashFlow + \alpha_4 Q_{i,t-1} \\ &+ \alpha_5 Size_{i,t} + \alpha_6 CapExp_{i,t} + \alpha_7 \Delta NWC_{i,t} + \alpha_8 \Delta ShortDebt_{i,t} \\ &+ \sum_i firm_i + \sum_t year_t + \varepsilon_{i,t}\end{aligned} \qquad 3.$$

Where, *Cash* is defined as the ratio of the sum of cash and marketable securities to beginning-of-period book value of assets. Firm size *(Size)* is the natural log of total book value of assets. The inclusion of firm size is motivated by the prior literature arguing that larger firms can better manage their cash detentions. Q is the proxy of future investment opportunities. This variable is suggested by Kim, Maynard and Sherman (1998) and Opler and all. (1999). (*ΔNWC)* and (*ΔShortDeb*t), are respectively change in net working capital and change in short-term debt. The expected sign of the estimated coefficient α_7 is negative since NWC is composed of assets which can substitute cash liquidities. However the relationship between change in cash detentions

[7] Fazzari, Hubbard and Petersen (1988), Fazzari and Petersen (1993) and Calorimis and al. (1995)
[8] Kim and al. (1998), Opler and al. (1999) and Harford (1999), Almeida and al. (2004).

and change in short-term debt is positive since firms can use short-term debt to provision cash reserves.

2.4 The impact of negative cash flow

To test above hypothesis for positive and negative cash flow years, we augment above models by adding an additional interaction term between cash flow sensitivity and a dummy variable indicating negative cash flow, (NEG).

Following, Chang and al. (2006), we estimate the following empirical models:

$$\begin{aligned} CapExp_{i,t} &= \alpha_1 CashFlow_{i,t} + \alpha_2 FC_{i,t} + \alpha_3 FC_{i,t} \times CashFlow_{i,t} \\ &+ \alpha_4 FC_{i,t} \times CashFlow_{i,t} \times NEG + \alpha_5 Q_{i,t-1} + \alpha_6 Leverage_{i,t-1} \\ &+ \alpha_7 Cash_{i,t-1} + \alpha_8 Sales_{i,t} + \sum_i firms_i + \sum_t year_t + \varepsilon_{i,t} \end{aligned} \quad 4.$$

$$\begin{aligned} \Delta Cash_{i,t} &= \alpha_1 CashFlow_{i,t} + \alpha_2 FC_{i,t} + \alpha_3 FC_{i,t} \times CashFlow_{i,t} \\ &+ \alpha_4 FC_{i,t} \times CashFlow_{i,t} \times NEG + \alpha_5 Q_{i,t-1} + \alpha_6 Size_{i,t} \\ &+ \alpha_7 CapExp_i + \alpha_8 \Delta NWC_{i,t} + \alpha_9 \Delta ShortDebt_{i,t} + \sum_i firms_i + \sum_t year_t + \varepsilon_{i,t} \end{aligned} \quad 5.$$

III/ Data

3.1 The sample

We construct a sample of 46 non financial firms over the period 2000-20006. The sample is composed of 26 firms listed on the Tunisian stock exchange and 20 non listed firms. Data are half-yearly and are collected from Tunisian stock exchange (TSE) and from financial market council (FMC) (internet sites, financial states, activity reports, official bulletins, issuing prospectus etc.).

Firms with available data on fewer than 3 successive periods (half-years or years)[9] are excluded from the sample. Thus, the final obtained sample is composed of 39 firms (25 listed firms and 14 non listed firms) over the period from the first semester 2000 to the second semester 2006. Thus, the number of observations is 13 per firm that is a total of 336 observations. The classification of firms according to the activity's sector is described in Tables 2. We report that the sample of the study is dominated by the "Travels and Hobbies" sector (25%), followed by the "Food-Processing and drinks" sector (15%).

3.1.1 Descriptive statistics

Correlations among variables

The correlation matrix displays correlations among variables used in the subsequent regression analysis, as well as those used in the estimation of our discriminant scores (Z_{FC}).

Both dependant variables (*CapExp)* (Capital Expenditures/ Fixed assets) and Cash are positively correlated with (*Cash Flow)* (Cash flow/Fixed Assets) (0.27*/0.01), lowly correlated with *(Q)* and significantly and negatively correlated with leverage (-0.17*/-0.10*). The discriminant scores (Z_{FC}) are significantly and positively correlated with *NI*, *Slack*, *Current*, *FCCov* and *Growth* ratios. The correlation between (Z_{FC}) and (*Leverage*) (Total liabilities/ Total assets) is negative and significant (-0.88*). Overall, discriminant scores appear to well measure financial statue of firms, that is

[9] The construction of variables of rate change for firms having successive annual data (absence of half-yearly data) is made basing on annual rate change.

high scores are associated with good financial health firms and low scores are associated with bad financial health firms[10].

Constrained versus unconstrained firms

Table 4 (Column I) reports means and standard deviations of the financial variables for the whole sample. According to the 4 classification schemes (size, payout ratios, listing on the stock exchange and discriminant score (Z_{FC})), a typically non constrained Tunisian firm in each year increase capital expenditures by 6%, have a leverage ratio (*Leverage*) of 0.37/0.55%, generate 39% of cash flow through the capital expenditures, payout out 42% of net income as dividends and hold 11% of total assets as cash.

Columns (II)-(III) display statistics for constrained and non constrained Tunisian firms of the sample, respectively. In one hand, according to the 4 grouping criteria, a typically unconstrained Tunisian firm, each year, has a leverage ratio of 0.37/0.55%, increases investment by 5/8%, generate a cash flow of 34/51%, achieves a net income margin of 1.8/15% and holds 8-14% of total assets as cash. In the other hand, a typically constrained firm is more leveraged, has lower investments, achieves a lower profit, generates lower cash flow and holds lower cash liquidities. Overall, descriptive statistics indicate that chosen classification schemes successfully captured the desired cross-sectional characteristics, since the financial ratios are higher for unconstrained firms, and lower for constrained ones.

[10] Table 3 reports that correlations among variables used in the subsequent regression analysis are relatively low since correlations coefficients are inferior to 0.5. But, some exogenous variables are significantly correlated among them which can reveal a multi-collinearity problem. To detect a potential multicallinearity problem in the above models, we do the VIF test, which reveals the absence of such problem.

IV/ Empirical Findings

4.1 Investment-cash flow sensitivity and Financial constraints

Investment-cash flow sensitivity versus cash-cash flow sensitivity

Table 5 displays empirical results for the subsequent regression (2) according to the 4 classifications schemes. In general, results show that firms classified as financially constrained exhibits an investment-cash flow sensitivity ($\alpha_1 + \alpha_3$) higher than that of unconstrained firms, excepting small firms for which investment to cash flow sensitivity is inferior than that of large ones. This investment to cash flow sensitivity of constrained firms varies from 0.31 to 0.70 according to classification scheme. We note that it is clearly superior compared to prior study's results in the American and Australian context[11].

Column (I) of the Table 4 reports empirical results, basing on firm size as grouping criterion. Large firm's investment is more sensitive to cash flow than small firm's one, a result already expected by descriptive statistics above. Sensitivity's coefficients are of 0.74 and 0.31 (0.74-0.43) for large and small firms, respectively. In addition to that, difference in investment-cash flow sensitivities between small and large firms, captured by the interaction coefficient, (α_3), is statistically significant at 1% level. This result refute those of Gilchrist et Himmelberg (1995) but corroborate the international evidence validated by Kadapakkam, Kumar et Riddick (1998) who report that small firm's investments are less sensitive to cash flow in Canada, France, Germany, Japan, U.K, and U.S.A over the period 1982-1991. Chang, Tang, Wong and Zhang (2006) find the same result for Australian firms.

[11] Prior studies report investment-cash flow sensitivities of ranging from0.10 to 0.25.

When examining empirical results for classification by payout ratios, listing on the stock exchange and discriminant score Z_{FC}, we detect that unconstrained firms have a higher investment-cash flow sensitivity than unconstrained ones.

Overall, empirical findings are in contradiction with those of Chang and al. (2006), Kaplan and Zingales (1997) and Clearly (1999), but they confirm the prior evidence reported by Fazzari, Hubbard et Petersen (1988). To summarise, Tunisian firm's investment are very sensitive to internal cash flow, but investment's decisions of constrained firms are clearly more sensitive to the availability of internal funds.

Impact of the other exogenous variables

Empirical results reveal a negative and significant relationship at 1% level between investment and leverage ratio according to the 4 groups, which put in evidence the underinvestment problem. This result is also confirmed by Lang, Ofek and Stulz (1996).

The estimated coefficients associated to *Cash* are negative and non significant excepting for the grouping by payout ratios (Table 5). This suggests that there is no link between investment and corporate cash decisions. This negative and significant relationship between Cash and Investment according to classification by payout ratios suggests that firms can draw from their cash reserves to face current expenditures of investments.

The variable *Sales* has a negative coefficient, but is significant only through classification by size and discriminant score. Such a negative significant relationship suggests a negative impact of the increasing supply on investment.

4.2 Cash-Cash Flow sensitivity and comparison with Investment-Cash Flow sensitivity

Table 6 displays empirical findings[12] of cash-cash flow sensitivities through the classification by size, payout ratio, quotation and discriminant score. Not only the cash-cash flow sensitivity is very low (-0.6%/1.2%), but also the difference in cash-cash sensitivity appears to be not significant between constrained and unconstrained firms through the four groups. We report also positive and significant at 1% level of the estimated coefficients relative to change in short-term debt, *ΔDCT,* which suggests that firms are likely to use shot-term debt to increase cash reserves.

The expected impact of investment (*CapExp*) on cash is validated, but the relationship is not significant. We detect also that coefficients of change in net working capital don't have the negative expected sign, thus, Tunisian firms don't finance net working capital by cash detentions, but probably with short-term banking debt.

Overall, it appears that financial constraints of Tunisian firms are more putted forward by investment-cash flow sensitivity than by cash-cash sensitivity. But this result must be checked by the investigation of negative cash flow's impact on investment-cash flow sensitivity. The above result is in contradiction with that of Chang and al. (2006) who detect higher cash-cash flow sensitivity for constrained firms.

[12] The Fisher homogeneity test rejects the existence of specific effects for the 4 regressions. Thus, models are estimated by OLS method.

A question arise concerning cash detentions of Tunisian firms; Why constrained Tunisian firms don't hold enough cash (7%-8%) of total assets? Probably, because they face severe asymmetric information and agency problems which make cash detentions useless (Dittmar and Mahrt-Smith (2006) and Pinkowitz, Stulz and Williamson (2006)) or which incite entrenched managers to expend rapidly their cash reserves (Dittmar and Mahrt-Smith (2006) and Harford, Mansi and Maxwell (2006)).[13]

4.3 The impact of negative cash flow on investment-cash flow sensitivities.

Table 7 reports empirical results of the augmented model of investment-cash flow sensitivities. We decide to not report empirical results relative to the impact of negative cash flow on cash-cash sensitivity since the lowliness of the cash-cash sensitivity[14].

The estimated coefficient, α_3, relative to *FCxCashFlow* measuring the difference in sensitivities between constrained and unconstrained firms during positive cash flow years is more positive and significant. We report also negative and significant at 1% level coefficients of the new interaction terms, *FCxCashFlowxNEG* through the 4 classification schemes. This finding indicates that prior detected disparities between constrained and unconstrained firms are mainly driven by the fact that constrained firms don't use positive cash flow changes to increase investment during negative cash flow years. This result gives a possible explanation for contradictory results of prior studies (Fazzari, Hubbard and Petersen (1988) and Kaplan and Zingales (1997) etc.).

[13] Thus, the inclusion of an adequate variable proxy of information asymmetry can improve the explaining power of the model. We checked to introduce such a variable but the impact on empirical estimations wasn't significant.

[14] We report that the low cash-cash sensitivity is not driven by negative cash flow.

Overall, Tunisian constrained firm's investments, during negative cash flow years[15], aren't very sensitive to cash flow change. Their investment-cash flow sensitivities is even lower that their unconstrained counterparts. One possible explanation is that, in negative cash flow years, financially constrained firms use positive cash flow changes rather to restore their financial situation (for example, to payback their debts) than to increase their investments (Clearly, (1999), Allayannis and Mozumdar, (2001, 2004)).

V/ Conclusion

The impact of financial constraints on investment policy can be investigated just as well by the response of investment to internal cash flow as by the response of cash to cash flow. This paper jointly investigates investment-cash flow sensitivity and cash-cash flow sensitivities on an unbalanced panel data for Tunisian non financial companies over the period 2000-2006.

Empirical findings put forward a high investment-cash flow sensitivity of constrained firms comparing to unconstrained ones according to classification by payout ratio, quotation on the stock exchange and discriminant score, Z_{FC}. We report also that cash-cash flow sensitivity is very low for theses constrained firms. This Tunisian evidence strongly supports the standard theory of Fazzari, Hubbard and Petersen (1988), but is in contradiction with several prior empirical results. This result is interesting since private investment is one of the major components of total gross

[15] Allayannis and Mozumdar (2001, 2004) chose negative cash flows realizations to proxy financial distress.

domestic product in Tunisia.[16] It is also an important measure of economic performance and has major implications for future productive capacity.

In one hand, investment is very sensitive to internal funds for heavily constrained firms. In the other hand, liquidity demand in not sensitive to internal cash flow for these constrained firms. Taking in consideration these two results, what will be the implication for the Tunisian economic policy in micro and macro economic levels?

We also investigate the impact of negative cash flow on investment-cash flow sensitivities, by separating the investment to negative cash flow sensitivities in the subsequent regression. Empirical results report higher investment-cash flow sensitivities in positive cash flow years. This result suggests that Tunisian constrained firms, in years of financial distress (negative cash flow years), use positive cash flow changes rather to improve their financial situation than to increase investments.

To summarize, we find strong evidence that financial constraints do affect Tunisian investment's decisions, mainly in positive cash flow years. However, financial constraints are found to not affect investment's decisions in negative cash flow years. Thus, the disparity between investment-cash flow sensitivities and cash-cash flow sensitivities is likely to be higher in positive cash flow years.

[16] The private investment averages actually about 13.5% of total GDP, which is too low comparing to other emerging markets (Korea, Ireland etc.) for which GDP is over than 25% according to Tunisian National Institute of Statistics (T.N.I.S)website, 2007, http://www.ins.nat.tn. Also, one of the government's objectives, actually, is to attend a private investment of 25% of GDP in 2011, according to T.N.I.S website, 2007. In Australia, as reported by Chang and al. (2006), corporate capital expenditure averages between 10 and 12 percent of GDP over the period 1994-2004 according to Reserve Bank of Australia website, 2004, http://www.rba.gov.au.

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Table 1 : Classification of sample's sectors

We use Tobin Q to control investment opportunities. Q is defined as the ratio of market value of assets to book value of assets. This definition hold for firms listed on the stock exchange but our sample contains non listed firms. To resolve the problem, we construct mean sector-based Tobin Q. Thus, we devise activity sectors into two groups according to the median of the mean sector-base Q: sectors above the median are considered as having high investment opportunities and sectors below the median are considered as having low investment opportunities.The following table displays the classifications of the sample's sectors into high investment opportunities sectors (HIOS) and low investment opportunities sectors (LIOP). This classification enables us to create a dummy variable Q which takes the value of one if the firm belong to a (HIOS) and zero if the firm belongs to a (LIOP).

High investment opportunities sectors (HIOS)	***Low investment opportunities sectors (LIOP)***
Food-processing and drinks	Buildings et construction's materials
Cars and Equipments	Distribution
Industrial goods and services	Domestic Products and cares
Chemistry	Health
Petroleum and Gas	Travels and Hobbies
Telecom	

Table 2: Sample structure

Data are half-yearly and are collected from Tunisian stock exchange (TSE) and from financial market council (FMC). Firms with available data on fewer than 3 successive periods (half-years or years) are excluded from the sample. Thus, the final obtained sample is composed of 39 firms (25 listed firms and 14 non listed firms) over the period from the first semester 2000 to the second semester 2006. We report that the sample of the study is dominated by the "travels and hobbies" sector (25%), followed by the "food-processing and drinks" sector (15%).

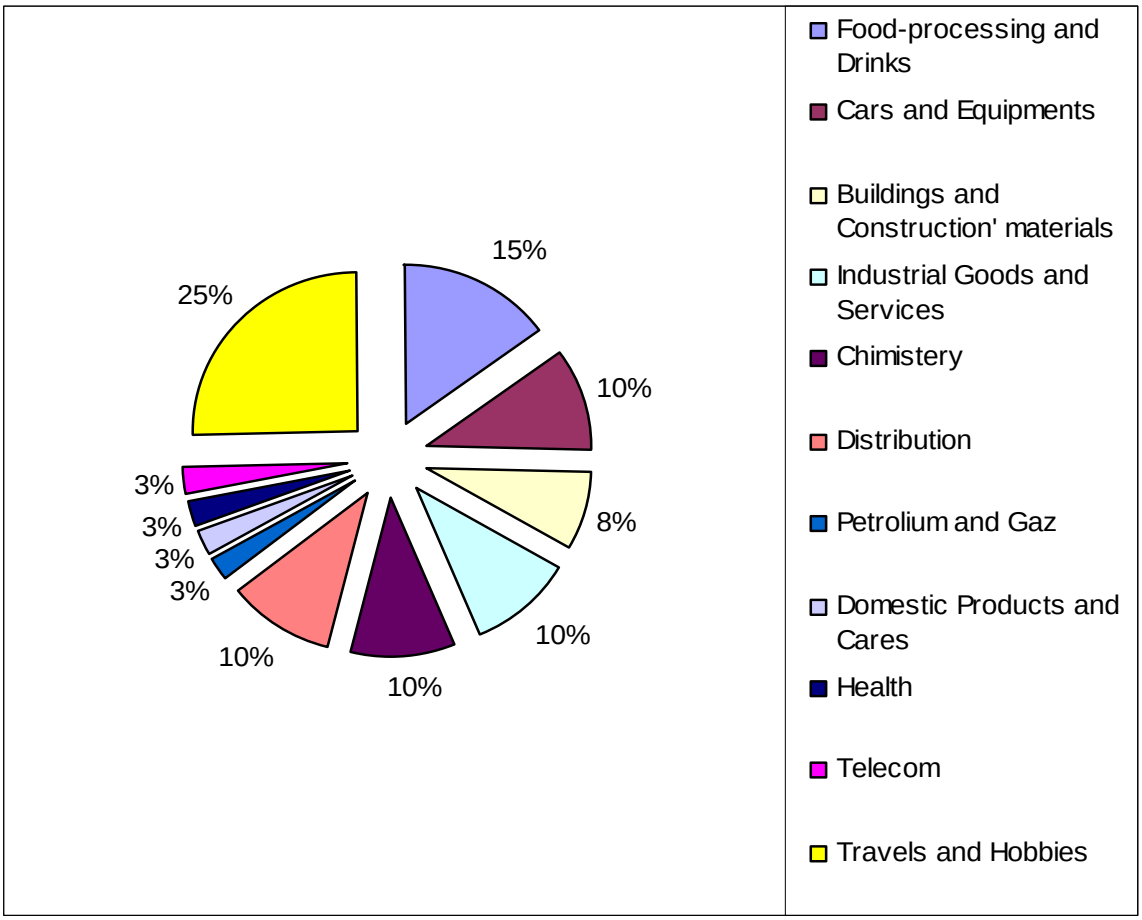

Table 3: Correlation among variables (2000-2006)

Investment is the difference between sale and purchase of property, plant and equipment scaled by lagged stock of property, plant and equipment (PPE).
Tobin's *Q* is equal to one if the firm belongs to (HIOS) and zero if the firm belongs to (LIOS). *CashFlow* is net profit after tax before abnormals plus depreciation and amortization scaled by lagged property, plant and equipment. *CashHolding* is the ratio of holdings of cash and marketable securities to total assets. *Leverage* equals total liabilities divided by total assets. *Current ratio* is equal to current assets divided by current liabilities. *Net Income Margin* equals net income deflated by sales. *Sales Growth* is the change in net sales divided by sales lagged one period. *Financial Slack* equals *CashHolding* plus inventory and account receivables minus short-term debt scaled by net PPE. *Fixed Coverage Ratio* equals EBIT plus fixed charge expenses divided by the sum of fix charge expenses and interest expenses. Discriminant score (Z_{FC}) is calculated using discriminant analysis according to equation (1). Correlations significant at 5% level are marked with * in superscripts.

	CapEx	*CF*	*Q*	*Size*	*Div*	*Cur*	*NI*	*Fccov*	*Lev*	*Slack*	*Cash*	*Zfc*
CapEx	1											
CF	0.27*	1										
Q	0.002	0.02	1									
Size	-0.04	-0.13*	-0.19*	1								
Div	-0.03	-0.00	0.07	-0.09	1							
Cur	-0.01	0.07	0.04	-0.13*	0.06	1						
NI	0.09	0.25*	0.16*	-0.09	0.05	0.31*	1					
Fccov	0.14*	0.45*	0.04	-0.14*	0.05	0.21*	0.46*	1				
Lev	-0.17*	0.25*	-0.06	0.02	-0.08	-0.23*	-0.07*	-0.19	1			
Slack	0.15	-0.14	-0.06	0.01	0.04	0.07	0.01	0.11*	-0.82*	1		
Cash	-0.01	0.01	-0.07	0.05	-0.03	0.63*	0.26*	0.07	-0.10*	0.00	1	
Zfc	0.17*	-0.14*	-0.04	-0.00	0.05	0.15*	0.12*	0.17*	-0.88*	0.98*	0.05	1

Table 4: Summary of descriptive statistics

Means and standard deviations (in parentheses) of financial variables are reported for the sample of 39 firms in Column (I). In Column (II)-(III), firms are sorted to sub-groups according to they are being constrained or none, respectively. We report the range of financial variables means according to different classification schemes. Variables are defined in Table 1.

	Typical Tunisian Firm(I)	***Typical Constrained Firm (II)***	***Typical Non constrained Firm (III)***
CapExp	6% (45%)	3%-8%	5%-8%
CashFlow	39% (49%)	24%-44%	34%-51%
Payout	42% (89%)	0-42%	42%-60%
Leverage	59% (97%)	62%-96%	37%-55%
Cash	11% (16%)	7%-14%	8%-14%
NI	5.6% (34%)	-5%-9.5%	1.8%-15%
Size	94241.35 (228861.6)	29413.4-199066.3	44504.1-155668.5

Table 5: Financial Constraints and Investment-cash flow sensitivities of Tunisian firms

Firms are categorized as being financially constrained and unconstrained according to their book value of assets, dividend payout ratio, quotation on the stock exchange and discriminant scores (*ZFC*), respectively. The following regression is estimated:

$$CapExp_{i,t} = \alpha_1 CashFlow_{i,t} + \alpha_2 FC_{i,t} + \alpha_3 FC_{i,t} \times CashFlow_{i,t} + \alpha_4 Q_{i,t-1}$$
$$+ \alpha_5 Leverage_{i,t} + \alpha_6 Cash_{i,t} + \alpha_7 Sales_{i,t} + \sum_i firms_i + \sum_t year_t + \varepsilon_{i,t}$$

Investment is the difference between sale and purchase of property, plant and equipment scaled by lagged stock of property, plant and equipment Tobin's *Q* is equal to one if the firm belongs to (HIOS) and zero if the firm belongs to (LIOS). *CashFlow* is net profit after tax before abnormals plus depreciation and amortization scaled by lagged property, plant and equipment. Financial constraint dummy variable *FC* equals 1 (0) if firms are financially constrained (unconstrained). *Leverage* equals total liabilities divided by total assets. *Cash* is the ratio of holdings of cash and marketable securities to total assets. *Sales* is defined as operating revenue deflated by total assets. The regression equation is estimated with fixed *firm* and *year* effects, excepting for payout grouping model for which we use OLS estimation method. Coefficients significant at 10%, 5% and 1% levels are marked with *,**, *** respectively in superscripts. *t*-statistics are reported in parentheses.

	Size grouping(I)	***Payout ratio grouping(II)***	***Quotation grouping(III)***	***Zfc Score grouping(IV)***
CashFlow	0.74*** (4.93)	-0.001 (-0.01)	0.31*** (2.79)	0.43*** (4.27)
FC	0.27** (2.52)	-0.05 (-0.71)	-0.15 (-0.92)	0.17* (1.69)
FCXCashFlow	-0.43*** (-2.60)	0.41*** (3.25)	0.23* (1.78)	0.27* (1.74)
Q	-0.15 (-0.34)	-0.01 (-0.22)	-0.29 (-0.60)	-0.16 (0.74)
Leverage	-0.17*** (-2.76)	-0.14*** (-5.68)	-0.18*** (-2.88)	-0.23*** (-3.58)
Cash	-0.33 (-1.33)	-0.26* (-1.82)	-0.29 (-1.15)	-0.26 (-1.06)
Sales	-0.14** (-1.99)	-0.02 (-0.55)	-0.09 (-1.28)	-0.13* (-1.80)
Constant	0.06 (0.23)	0.12* (1.73)	0.31 (1.06)	0.11 (0.42)
Ajusted-R²	0.12	0.18	0.12	0.17
Observations	336	336	336	336
Specific effects	Fixed effects (Within)	NON (MCO)	Fixed effects (Within)	Fixed effects (Within)

Table 6: Financial Constraints and Cash-Cash flow sensitivities

Firms are categorized as being financially constrained and unconstrained according to their book value of assets, dividend payout ratio, quotation on the stock exchange and discriminant scores (Z_{FC}), respectively. The following regression is estimated:

$$\Delta Cash_{i,t} = \alpha_1 CashFlow_{i,t} + \alpha_2 FC_{i,t} + \alpha_3 FC_{i,t} \times CashFlow + \alpha_4 Q_{i,t-1} + \alpha_5 Size_{i,t} + \alpha_6 CapExp_{i,t} + \alpha_7 \Delta NWC_{i,t} + \alpha_8 \Delta ShortDebt_{i,t} + \sum_i firm_i + \sum_t year_t + \varepsilon_{i,t}$$

Investment is the difference between sale and purchase of property, plant and equipment scaled by lagged stock of property, plant and equipment Tobin's *Q* is equal to one if the firm belongs to (HIOS) and zero if the firm belongs to (LIOS). *CashFlow* is net profit after tax before abnormals plus depreciation and amortization scaled by lagged property, plant and equipment. Financial constraint dummy variable *FC* equals 1 (0) if firms are financially constrained (unconstrained). *Leverage* equals total liabilities divided by total assets. *Cash* is the ratio of holdings of cash and marketable securities to total assets. *ΔNWC* is the change in net working capital. *ΔShortDebt* is the change in short-term debt. The regression equation is estimated with OLS estimation method since Fisher Homogeneity test reveal the absence of fixed effects.Coefficients significant at 10%, 5% and 1% levels are marked with *,**, *** respectively in superscripts. *t*-statistics are reported in parentheses.

	Size grouping	***Payout ratio grouping***	***Quotation grouping***	***Zfc Score grouping***
Constant	0.006 (0.38)	0.004 (0.19)	0.009 (0.58)	0.02 (1.10)
CashFlow	0.012 (0.34)	0.012 (0.35)	0.001 (0.08)	-0.006 (-0.35)
FC	0.005 (0.28)	0.006 (0.27)	0.0006 (0.03)	-0.018 (-0.98)
FCXCashFlow	-0.014 (-0.37)	-0.01 (-0.37)	-0.002 (-0.08)	0.001 (0.04)
Q	-0.01 (-0.68)	-0.009 (-0.66)	-0.01 (-0.68)	-0.01 (-0.77)
Sales	-0.005 (-0.43)	-0.004 (-0.36)	-0.005 (-0.39)	-0.001 (-0.09)
CapExp	-0.01 (-0.63)	-0.009 (-0.55)	-0.01 (-0.60)	-0.007 (-0.44)
ΔNWC	0.04 (0.71)	0.04 (0.78)	0.046 (0.77)	0.045 (0.75)
ΔShotDebt	0.14*** (3.07)	0.15*** (3.18)	0.15*** (3.17)	0.15*** (3.24)
Adjusted-R²	0.02	0.02	0.02	0.02
Specific Effects	Non (MCO)	Non (MCO)	Non (MCO)	Non (MCO)
observations	336	336	336	336

Table 7: Impact of negative cash flow on investment-cash flow sensitivities

Firms are categorized as being financially constrained and unconstrained according to their book value of assets, dividend payout ratio, quotation on the stock exchange and discriminant scores (*ZFC*), respectively. The following regression is estimated:

$$CapExp_{i,t} = \alpha_1 CashFlow_{i,t} + \alpha_2 FC_{i,t} + \alpha_3 FC_{i,t} \times CashFlow_{i,t} + \alpha_4 FC_{i,t} \times CashFlow_{i,t} \times NEG_{i,t} + \alpha_5 Q_{i,t-1} + \alpha_6 Levier_{i,t-1} + \alpha_7 Cash_{i,t-1} + \alpha_8 Ventes_{i,t} + \sum_i firms_i + \sum_t year_t + \varepsilon_{i,t}$$

Investment (CapExp) is the difference between sale and purchase of property, plant and equipment scaled by lagged stock of property, plant and equipment Tobin's *Q* is equal to one if the firm belongs to (HIOS) and zero if the firm belongs to (LIOS). *CashFlow* is net profit after tax before abnormals plus depreciation and amortization scaled by lagged property, plant and equipment. Financial constraint dummy variable *FC* equals 1 (0) if firms are financially constrained (unconstrained). Negative cash flow dummy variable (NEG) takes a value of one if cash flow is negative and zero otherwise. *Leverage* equals total liabilities divided by total assets. *Cash* is the ratio of holdings of cash and marketable securities to total assets. *Sales* is defined as operating revenue deflated by total assets. The regression equation is estimated with fixed *firm* and *year* effects, excepting for payout grouping model for which we use OLS estimation method. Coefficients significant at 10%, 5% and 1% levels are marked with *, **, *** respectively in superscripts. *t*-statistics are reported in parentheses.

	Size grouping (I)	***Payout ratio grouping (II)***	***Quotation grouping (III)***	***Zfc Score grouping (IV)***
CashFlow	0.74*** (4.99)	-0.002 (-0.02)	0.32*** (2.89)	0.43*** (4.35)
FC	0.24** (2.22)	-0.08 (-1.26)	-0.18 (-1.11)	0.11 (1.14)
FCXCashFlow	-0.40** (-2.39)	0.45*** (3.62)	0.26** (2.04)	0.39** (2.37)
FCXNEGXCashFlow	-3.88** (-2.57)	-2.49*** (-3.17)	-2.59** (-2.39)	-2.43** (-2.67)
Q	-0.15 (-0.34)	-0.02 (-0.56)	-0.31 (-0.65)	-0.22 (-0.51)
leverage	-0.18*** (-2.93)	-0.14*** (-5.97)	-0 .18*** (-2.97)	-0.25*** (-3.90)
Cash	-0.34 (-1.39)	-0.23 (-1.64)	-0.31 (-1.24)	-0.28 (-1.17)
Sales	-0.15** (-2.10)	-0.02 (-0.52)	-0.09 (-1.22)	-0.13* (-1.91)
Constant	0.07 (0.27)	0.13* (1.86)	0.31 (1.08)	0.16 (0.61)
Adjusted-R²	0.15	0.20	0.14	0.18
Observations	336	336	336	336
Specific effects	Fixed Effects **(**Within**)**	Non (MCO)	Fixed Effects **(**Within**)**	Fixed Effects (Within)