Factors Determining Operating Cash Flow: Case of the Tunisian Commercial Companies

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Abstract

In this article, we studied the problem of the determination of operating cash flows. On the basis of a sample representative of the Tunisian commercial companies, we determined the explanatory power of the operating cycle components on the behaviour of the operating cash-flows.

The results of this study prove that our dependent variable, operating cash-flow, is significantly given by the means of four factors dependent on the operating cycle: the timely debt collection, the timely debt payment, the timely flow of stock and the gross commercial margin. However, our dependent variable varies independently of two factors: Earnings and Variation of turnover.

Keywords: Operating cash flow, Operating cycle, Explanatory power, Commercial companies

1. Introduction

The FASB (1978) (Financial Accounting Standard Board) recognized that the fundamental objective of countable information is the forecast of the operating cash-flows. Indeed, the current or potential shareholders are interested in priority in the aptitude of the company to release cash flow so that it is capable to concretize its capacity of profit in dividends put in payment. The importance and the utility of this information based on the cash-flows find their justification within the limits of traditional countable information founded on the principles of historical cost and the fastening of the loads to the products. In this connection, the deficiency of traditional countable information compared to that based on data of cash flows was confirmed by several studies concerning:

- The forecast of bankruptcy: Gombola (1987), Aziz and Lawson (1989), Fedhila (1998)…
- The forecast of stock exchange courses: Livnat and Zarowin (1990), Wang and al. (1998)…
- The forecast of the future cash-flows: Finger (1994), Brath and al..(2001)…

Considering the importance and the utility of this information based on operating cash flow, much research was evoked in order to lay down this variable. It is to be recalled to this level that in the statement of annual financial objective published by the companies carried out in 1978, the FASB affirms that the last earnings provide a better base for the estimate of future operating cash flow than the data based on last cash flows. This assertion, on the one hand, was cancelled by several studies such as Finger (1994), Krishnan and Largay (1997), Barth and al.. (2001), Hussain and al. Attar (2003)… and on the other hand, confirmed by other studies such as Rayburn (1986), Murdoch and Krause (1989, 1990), Dechow (1994), Dechow and al. (1998)… Consequently, one can conclude that the former studies could not judge with certainty in favour of any explanatory variable (cash-flow, earnings, accrual…), to predict the future operating cash flow.

To this end Dechow et al. (1998), suggested that the cash-flows forecasts exactitude is a function of the operating cycle characteristics. This last, in its turn, is often a function of the several elements such as, the timely debt collection, the timely debt payment, the timely flow of stock, the gross commercial margin, the variation of turnover… It is not thus without interest to examine the elements determining operating cash flow. In this paper, our question research consists on identifying the operating cycle variables affecting the operating cash flow.

The objective of this study is to determine the explanatory capacity of the operating cycle components on the behavior of the operating cash flows.

This study showed that the operating cash-flow is significantly given by the means of the four explanatory variables: the timely debt collection, the timely debt payment, the timely flow of stock and the gross commercial margin. However it varies independently of two variables: earnings and Variation of turnover.

The continuation of this study is organized in four parts: the first presents a review of the literature relating to the utility and the importance of operating cash the flows, followed by the formulation of our assumption. The second part specifies methodology. The results obtained thus that their interpretations will be the subject of a third part. Lastly, one will formulate the conclusion, the limits, and the ways of future research.

2. Review of the literature

Within the framework of our review of the literature, three research orientations are evoked. The first axis relates to the definition of the operating cash flow. The second axis stresses the importance and the utility of cash flows compared to the accounting incomes. The last is interested in the importance of the elements related to operating cycle in the forecast of future cash flow.

2.1 Various definitions allotted to operating cash flow by the researchers

- The first definitions considered the cash-flow as the account result withdrawn depreciations and provisions (self-financing capacity): Beaver (1966), Ball and Browen (1968), Kaplan and Pattel (1980), Fulman and al. (1984)…

- Gombola and Ketz (1983) introduced a definition taking account of the elements of working capital need, such as variations of the commercial debts, the stocks, the operating liabilities …

- Several researchers operated then with the adjustments of the net result by the elements of work capital need.

This measure was adopted by Wilson (1986), Rayburn (1986), Stober and al. (1989), Finger (1994), Lorek and Willinger (1996)…

- Much more recent research such as Livnat and Zarowin (1990), Dechow and al. (1988) is referred to the modes of calculation recommended by the SFAS n°95 (Statements of Financial Accounting Standards) to measure the variable operating cash-flow.

2.2 Utility and importance of cash flows compared to the accounting incomes.

The utility and the importance of operating cash flows compared to the accounting incomes were confirmed by several researchers concerning:

- The forecast of the stock exchange courses: Beaver and Dukes (1972), Pattel and Kaplan (1977), Rayburn (1986), Bowen and al.. (1987), Wilson (1986, 1987), Bernard and Stober (1989), Popes (1995), Wang and al. (1998), Saïd and al.. (2001)…

- The forecast of future cash flows: Bowen and al.. (1986), Finger (1994), Krishnan and Largay

(1997), Barth and al. (2001), Hussain and al. Attar (2004)…

2.3 Importance of operating cycle elements in the forecast of future cash flows.

The importance and the utility of the elements related to the operating cycle will be shown through the study of the informational and estimated contents existing in the accruals. These accruals include/understand inter alia the variation of working capital need elements such as the variation for stocks, the variation of the credits and variation of the debts…

- Hussain et al. Attar (2003), showed the importance and the utility of the accruals in the forecast of operating cash flows especially when they are disaggregated. This importance is translated by the components determining this variable and especially the operating elements such as the variation of the debt, credits and stocks.

- Dechow et al.. (1998) showed that the benefit constitute good preachers of future cash flows. This superiority compared to cash the flows is due to the accruals. The latter comprise inter alia the variation of operating cycle elements.

- These results are in coherence with several preceding studies in the United States and the United Kingdom such that Mc Leay and al. (1997), Guay and Sidhu (2001), Barth et al. (2001)…

2.4 Formulation of the hypothesis

Former research could not release a well defined process of the future cash flows generation and of the future accounting incomes. For operating cash flow, this variable constitutes a more direct and objective measure of the liquidity. It can be neither to direct nor to handle. This variable depends, in fact, on the company economic reality. Its behaviour is generally related to the characteristics of operating cycle such as the timely debt collection, the timely debt payment, the timely flow of stock ….

In the objective to appreciate the importance of these operating elements on the determination of operating cash flow, this study formulates the following hypothesis:

Hypothesis (H 1): Operating cash flow varies depending on timely debt collection

Hypothesis (H 2): Operating cash flow varies depending on timely debt payment

Hypothesis (H 3): Operating cash flow varies depending on timely flow of stock,

Hypothesis (H 4): Operating cash flow varies depending on gross commercial margin

Hypothesis (H 5): Operating cash flow varies depending on variation of turnover

Hypothesis (H 6): Operating cash flow varies depending on earnings

3. Methodology

3.1 Definition and measurement of the variables

3.1.1 Operating cash-flow: (dependent variable)

The operating cash-flow was generally approximated by the accounting result withdrawn depreciations and provisions: capacity of self-financing. This traditional definition of operating cash flow, used in several studies of bankruptcy and stock exchange market (Beaver (1966), Ball and Browen (1968)), was criticized by more recent studies which called upon more elaborate measurements of cash-flow. These studies referred to the modes of calculation recommended by the SFAS n° 95 to measure the variable cash-flow (Livnat and Zarwin (1991), Dechow and al. (1998), Fédhila (1998)). Two methods were planned for the determination of operating cash-flow:

- Indirect method: (as inspired by the SFAS n° 95 (1987)):

Operating cash flow = Earnings

+ Depreciations and provisions

+ Adjustment for:

- variation of the stocks accounts
- variation of the credits accounts
- variation of prepaid loads
- variation of operating suppliers debts
- variation of loads to be paid

- Direct method: (as inspired by the SFAS n°95)

Operating cash flow = cash inflow received from the customers – cash outflow liquidated to the suppliers – cash outflow of operating loads

Epstein and Pava (1992) affirm that this method is the simplest and most objective. Also, it clearly reflects the independence of operating cash flows from any notion tainted by the effect of the evaluation accounting methods. But within the framework of our research, we will choose the two methods according to the layout grid of the cash flow state chosen by the company.

3.1.2 Timely debt collection: (explanatory variable)

This variable is expressed in a number of days.

$$Timely\ debt\ collection = \frac{credits\ and\ attached\ counts}{Turnover\ (All\ Taxes\ Included)} \times 360\ days$$

3.1.3 Timely debt payment: (explanatory variable)

This variable is also expressed in a number of days**.**

$$Timely\ debt\ payment = \frac{\text{suppliers}\ and\ attached\ counts}{Purchases\ (All\ Taxes\ Included)} \times 360\ \ days$$

3.1.4 Timely flow of stock: (explanatory variable)

This time is calculated as follows:

$$Timely\ flow\ of\ stock = \frac{stock\ (selling\ price\ excluding\ tax)}{Turnover\ (excluding\ tax)} \times 360\ days$$

3.1.5 Gross commercial margin: (explanatory variable)

The variable gross commercial margin is calculated according to the ratio:

$$Gross\ commercial\ \text{margin} = \frac{selling\ price\ (All\ taxes\ included) - purchase\ price\ (excluding\ tax)}{selling\ price\ (All\ taxes\ included)} \times 100$$

3.1.6 Variation of turnover: (explanatory variable)

For this variable we adopt the following measure:

$$Variation\ \text{of turnover} = \frac{turnover\ (excluding\ tax)_{t+1} - turnover\ (excluding\ tax)_{t}}{turnover\ (excluding\ tax)_{t}} \times 100$$

3.1.7 Earnings: (explanatory variable)

Dechow (1994), De Angelo, De Angelo and Skinner (1992) showed through their studies that this variable is the best preacher of operating cash flow to the detriment of the former cash flow, although they took account of the elements except exploitation. In our study, we will test the explanatory capacity of this variable on the behavior of operating cash-flow.

If the loads and the products are presented according to their sources or destinations (method of reference), the earnings would be given as follows:

Earnings = Income – Cost of the sales + other products from operating activities – (Expenses of distribution + Administrative expenses + other loads from operating activities).

If the loads and the products are classified according to their nature (authorized method), the earnings are equal to the difference between the operating products and the operating loads:

Earnings = operating products - operating loads

3.2 Selection of the sample

Our sample is composed of 25 Tunisian companies belonging to the commercial sector. This choice was adopted considering the existing differences between this sector and the others, on the level of the variables which constitute the models of our study. In the same way the banks, the insurance companies, the leasing companies and the financial investment companies are excluded from the sample considering the specificity of the countable and economic regulations to which they are subjected.

3.3 Collection of data

Data were collected from the Financial Market Council Tunisia (FMC): The Official Bulletin of the FMC and prospectuses issued by companies using public offering.

Information used in order to carry out the study is the financial statement composed of the balance sheet, state of result, state of cash flow and notes to the financial statements. The period of study is spread out from 1996 to 2002. However, the number of the companies varies from one year to another in such a way that certain companies were not represented in the sample for each year. Thus it is a no-rolled panel.

3.4 Econometric models applied

In the case of a modeling data panel, three procedures are used to estimate coefficients:

- Procedure of Ordinary Least Squares (OLS): this procedure of regression is generally used for individual data (cross section) or temporal data. It can be also used for panel data. But for this type of the data it presents a bad way of doing things, it ignores the double dimension.
- The Fixed Effect Model: this model of regression is frequently applied for panel data. It takes into account the heterogeneity of the companies presented in the sample.

- The Random Effect model: this regression model is often applied to panel data. This model takes into account any risk of heterogeneity influence in the behaviour by breaking up the error into two components: $\varepsilon_{it} = \mu_I + v_{it}$

with **:**

- $\mu_{i:}$ random variable specific to the company, it takes into account any risk of heterogeneity influence in the behavior, it is invariable over time.
- v_{it}: new term of error**.**

It is noted that the last two models take into account heterogeneity between the companies of the sample. But, before thinking of taking into account heterogeneity, it was first of all necessary to be ensured of the need for introducing a heterogeneous dimension into the estimate.

Constants homogeneity test:

When considering a sample panel data, the first thing to check is the homogeneous or heterogeneous specification of process data generator. The test is formulated in the following way:

$H_0 : \beta_i = \beta$;

$H_1 : \beta_i \neq \beta$

The acceptance of H_0 confirms the absence of a specific effect. Hence all firms are assumed homogeneous. Contrary to that the confirmation of H_1 provides evidence of the presence of heterogeneity among firms. It is a test of Fisher with N-1 and N(T-1)-k degrees of freedom.

$$F = \frac{(SCR_{1.e} - SCR_{1.e'}) / N - 1}{SCR_{1.e'} / N(T-1) - k}$$ with :

$SCR_{1.e}$: the residues squares sum of individual effect model;

$SCR_{1.e'}$: the residues squares sum of common effect model;

N : number of companies

T : period of observation

k : number of explanatory variables.

If calculated F is lower than tabulated F (p-values< 0.05), H_0 is rejected. Otherwise, H_0 is accepted. Once the null hypothesis is rejected (so we must take into account the heterogeneity). At this level we have to choose between the fixed effect model and the random effect model.

Hausman test.

The choice between the fixed effect model and the random effect model is carried out through the test of Hausman. In general, the random effect model is the best when the hypothesis posed on μ_I and v_{it} is respected strictly. This model goes bad when the narrower term μ_i is correlated with the explanatory variables. Thus our choice will be such as:

- If there is not correlation between μ_i and explanatory variables (cov (x_{it}, μ_i)=0), we choose (random effect model).
- If not, the fixed effects model is chosen.

So, we test the two following hypothesis:

H_0: cov (x_{it},μ_i) = 0

$H_{1:}$ cov (x_{it},μ_i) $\neq$ 0

At this level, it is to explain our approach. First of all, as we have no idea about the explanatory power of variables determining operating cash-flow, we will proceed by the introduction of six models. Each model will comprise the dependent variable (operating cash-flow) and an explanatory variable. The regression models are as follows:

Model (1): $OCF_{it} = \beta_0 + \beta_1 TDC_{it} + \varepsilon_{it}$

Model (2): $OCF_{it} = \beta_0 + \beta_1 TDP_{it} + \varepsilon_{it}$

Model (3): $OCF_{it} = \beta_0 + \beta_1 TFS_{it} + \varepsilon_{it}$

Model (4): $OCF_{it} = \beta_0 + \beta_1 GCM_{it} + \varepsilon_{it}$

Model (5): $OCF_{it} = \beta_0 + \beta_1 \Delta Turn_{it} + \varepsilon_{it}$

Model (6): $OCF_{it} = \beta_0 + \beta_1 E_{it} + \varepsilon_{it,}$

Where ε_{it} it means an error term.

For these models, we start, first, by estimating β_0 and β_1; test, then the significance of these two factors through the test of Student and finally calculating the explanatory power of each model. In fact we will calculate R^2 and R^2 adjusted.

Having an idea on the most determining variable of operating cash-flow, we will try to build other models in two explanatory variables including:

- The most relevant and most determining variable of operating cash-flow : V_1
- A second variable among the five remaining ones : V_j where $j = 2, 3, 4, 5, 6$.

The five regression models are as follows:

Model (1a): $OCF_{it} = \beta_0 + \beta_1 V_{1it} + \beta_2 V_{2it} + \varepsilon_{it}$

Model (2a): $OCF_{it} = \beta_0 + \beta_1 V_{1it} + \beta_2 V_{3it} + \varepsilon_{it}$

Model (3a): $OCF_{it} = \beta_0 + \beta_1 V_{1it} + \beta_2 V_{4it} + \varepsilon_{it}$

Model (4a): $OCF_{it} = \beta_0 + \beta_1 V_{1it} + \beta_2 V_{5it} + \varepsilon_{it}$

Model (5a): $OCF_{it} = \beta_0 + \beta_1 V_{1it} + \beta_2 V_{6it} + \varepsilon_{it.}$

The same tests and same calculations will be evoked. The model having the most significant factors and which improves the explanatory power of operating cash-flow will be retained. But before making a final decision, a test of Fisher seems necessary. This test is obvious to ensure that the introduction of the new variable adds enough explanatory power. Indeed the introduction of one or more variables results in a loss at the level of freedom degree. This loss is compensated by the increase in the explanatory power which absorbs it. To ensure that the addition of one or more variables to improve significantly the explanatory power in the population of the new model, we must go through the variables addition test.

Variables addition test (the F test).

To carry out this test should be put in place the following two models (constrained model and unconstrained model):

M1 (constrained model): $OCF_{it} = \beta_0 + \beta_1 V_{1it} + \varepsilon_{it}$

M2 (unconstrained model): $OCF_{it} = \beta_0 + \beta_1 V_{1it} + \beta_2 V_{jit} + \varepsilon_{it}$

where :

$V_{1it:}$ the initial variable

V_{jit}: the added variable.

For each model, we calculate the explanatory powers R_1^2 and R_2^2 and we test two following hypotheses:

$H_0 : R_1^2 = R_2^2$

$H_1 : R_1^2 \neq R_2^2$.

This is a F test (Fisher). Under H_0:

$F = [(RSS_c - RSS_{nc}) / q] / [RSS_{nc} / fd] \rightarrow F(q, fd)$.

q: number of constraints (number of variables added).

fd: unconstrained model freedom degree.

RSS_c: the residual sum of squares of the constrained model.

RSS_{nc}: the residual sum of squares of the unconstrained model.

If calculated F is higher than tabulated F, H_0 is rejected, if not it is accepted.

Once the null hypothesis is rejected, we can conclude that the added variable significantly improves the explanatory power and consequently this variable would be retained. This test will be reproduced every time we introduced a new variable.

Once the model is chosen, we try to build other models at three explanatory variables including:

- The two most relevant variables and most determining of operating cash-flow: V_1 and V_2.
- A third variable among the four remaining ones: V_j with j = 3, 4, 5, 6.

Model (1b): $OCF_{it} = \beta_0 + \beta_1 V_{1it} + \beta_2 V_{2it} + \beta_3 V_{3it} + \varepsilon_{it}$

Model (2b): $OCF_{it} = \beta_0 + \beta_1 V_{1it} + \beta_2 V_{2it} + \beta_3 V_{4it} + \varepsilon_{it}$

Model (3b): $OCF_{it} = \beta_0 + \beta_1 V_{1it} + \beta_2 V_{2it} + \beta_3 V_{5it} + \varepsilon_{it}$

Model (4b): $OCF_{it} = \beta_0 + \beta_1 V_{1it} + \beta_2 V_{2it} + \beta_3 V_{6it} + \varepsilon_{it}$

Afterwards, we build three new models and carry out this approach until we obtain a regression model allowing an appropriate measure of our dependent variable, operating cash-flow, with the following characteristics:

- The maximum of the explanatory variables having significant coefficients.
- An explanatory power so high and we can not improve it by introducing new variables.

The model retained would be presented as follows:

Final model: $OCF_{it} = \beta_0 + \beta_1 V_{1it} + \beta_2 V_{2it} + \ldots + \beta_j V_{jit} + \varepsilon_{it}$

4. Interpretations of results

4.1 The results of estimating first six models (1, 2, 3, 4, 5 and 6)

For these six models, the test results of homogeneity constants show the necessity of taking into account the heterogeneity among firms (H0 is rejected in all models, all p-values are less than 5%). A test of Hausman was then carried out for each model. The test results of Hausman lead us to retain the fixed effect model for models 3 and 4 and the random effect model for models 1, 2, 5 and 6. Once that choice is made, we go to the interpretation of coefficients β i and R^2.

The results obtained indicate that the coefficients β_i of variables: timey debt collection and timely flow of stock (models 1 and 3) are negative ($\beta i < 0$). This proves that these two variables have a negative sense in explaining the dependent variable, operating cash flow. On the other hand the variables timely debt payment, gross commercial margin, variation of turnover and earnings have a coefficient β_i higher than zero ($\beta_I > 0$). This proves that these last variables (models 2, 4, 5 and 6) have a positive direction in explaining the dependent variable, operating cash-flow.

The examination of the results shows that the three explanatory variables timely debt collection, timely flow of stock and gross commercial margin have significant coefficients βi with the threshold of 1% in explanation of the operating cash-flow g (models 1, 3 and 4). This is not true for the three other variables namely timely debt payment, variation of turnover and earnings (models 2, 5 et 6) which have non significant coefficients βi. For the moment, we retain the first three variables.

In referring to the explanatory power of models 1, 3 and 4, we notice that the explanatory power of the model based on the variable timely debt collection, model (1), is higher than the models using the timely flow of stock and the gross commercial margin, models (3) and (4). The explanatory power of three models is 29,38%; 25,24% and 20,90% respectively.

Following the results, we retain the variable timely debt collection (TCD) as variable which determines best the operating cash-flow among the six studied variables. Thereafter the five following models are reconstituted:

Model (1a) : $OCF_{it} = \beta_0 + \beta_1 TDC_{it} + \beta_2 TDP_{it} + \varepsilon_{it}$

Model (2a): $OCF_{it} = \beta_0 + \beta_1 TDC_{it} + \beta_2 TFS_{it} + \varepsilon_{it}$

Model (3a): $OCF_{it} = \beta_0 + \beta_1 TDC_{it} + \beta_2 GCM_{it} + \varepsilon_{it}$

Model (4a): $OCF_{it} = \beta_0 + \beta_1 TDC_{it} + \beta_2 \Delta Turn_{it} + \varepsilon_{it}$

Model (5a): $OCF_{it} = \beta_0 + \beta_1 TDC_{it} + \beta_2 E_{it} + \varepsilon_{it}$

Where ε_{it} indicates a term of error

4.2 The results of estimating models with two variables (1a, 2a, 3a, 4a and 5a)

For this category of the models, the test results of homogeneity constants show the necessity of taking into account the heterogeneity among firms (H_0 is rejected in all models, all p-values are lower than 5%). The test results of Hausman show that models (1a), (3a), (4a) and (5a) must be treated according to the random effect model, while the fixed effect model will be chosen for the model (2a).

The examination of results estimation shows that the five models surveyed have an explanatory power higher than that found for the models to one explanatory variable. This proves that adding the five explanatory variables (timely debt payment, timely flow of stock, gross commercial margin, variation of turnover and earnings), in our first variable selected (timely debt collection), each apart, improves the explanatory power of these models.

The results obtained indicate that the model (3a) has the highest explanatory power ($R^2 = 38.53\%$). This model, employing the two explanatory variables timely debt collection and gross commercial margin, still has two coefficients β1 and β2 significant threshold of 1%. Similarly, the test Wald $\chi 2_{(2)}$ is significant at the threshold of 1%.

The results also show that the model (1a), based on two variables timely debt collection and the timely debt payment has an explanatory power so high that other models (except the model (3a)) and coefficients β1 and β2 significant threshold of 1%. This threshold of significance is also achieved by the χ2 test Wald (1) (F = 23.24).

The model (2a) using two variables within the timely debt collection and timely flow of stock have two coefficients β1 and β2 significant threshold of 1%. To test the F significance threshold is 5%. The explanatory power has improved slightly and it reached 30.51%.

For both models (4a) and (5a), the results suggest that there is a very slight improvement in the explanatory power which passed from 29.38% (model 1) to 29.80% (model 4a) and 29.81% (model 5a). But the coefficients of two variables, variation in turnover and operating result is still not significant. The Student t indicates respectively 0,457 and 0,291. The test Wald χ2 (2) is significant at the 5% threshold.

In conclusion, we note that the coefficient β_1 of the first variable selected timely debt collection (TDC), remains significant with the threshold of 1% in all models. Following the results we see that the model (3a) improves the greatest explanatory power model (1) (R^2 (model 1) = 29.38% → R^2 (model 3a) = 38.53%) and has coefficients β1 and β2 significant threshold of 1%, what about the test F added variables. The examination of the results ensuing from this test shows that the introduction of the new variables significantly improves the explanatory power of the constrained model (1) and this for the unconstrained models (1a), (2a) and (3a). On the other hand the same test F shows that the two variables, variation turnover and earnings do not add significantly to the explanatory power of the model (1). We can, at this level, give up these two variables Δturn and E. But this judgement must be taken with precaution. This decision will be confirmed or cancelled at the end of this process of selection of explanatory variables. For the moment we can retain the variable gross margin as a variable providing a more level explanatory power.

For this category of models we choose, then, for the model (3a) and as a consequence, we retain in addition to the variable timely debt collection (TDC), the variable gross commercial margin (GCM).

At this level, we reconstitute the four models, each with three explanatory variables:

Model (1b): $OCF_{it} = \beta_0 + \beta_1 TDC_{it} + \beta_2 GCM_{it} + \beta_3 TDP_{it} + \varepsilon_{it}$

Model (2b): $OCF_{it} = \beta_0 + \beta_1 TDC_{it} + \beta_2 GCM_{it} + \beta_3 TFS_{it} + \varepsilon_{it}$

Model (3b): $OCF_{it} = \beta_0 + \beta_1 TDC_{it} + \beta_2 GCM_{it} + \beta_3 \Delta Turn_{it} + \varepsilon_{it}$

Model (4b): $OCF_{it} = \beta_0 + \beta_1 TDC_{it} + \beta_2 GCM_{it} + \beta_3 E_{it} + \varepsilon_{it}$

Where ε_{it} indicates a term of error

4.3 The results of estimating models with three variables (1b, 2b, 3b and 4b)

For this category of the models, the test results of homogeneity constants show the necessity of taking into account the heterogeneity among firms (H_0 is rejected in all models, all p-values are lower than 5%). The test of Hausman indicates that all the models (1b), (2b), (3b) and (4b) must be treated according to the random effect model. The probability of no correlation between μ_i and the explanatory variables exceeds in all the models 5%.

The results of estimate show that the explanatory capacity of the studied models still improves. This indicates that the addition of the four explanatory variables timely debt payment, timely flow of stock, variation of turnover and earnings, each one separately, makes it possible to better determine our variable dependent operating cash-flow. This improvement of the explanatory power was notable concerning the two models (1b) and (2b) (timely debt payment and timely flow of stock), whereas it was very light for the two models (3b) and (4b) (variation of turnover and earnings).

As far as the coefficients β1, β2 and β3 are concerned, the results indicate that these factors are significant threshold of 1% for the first two models: the model (1b) based on the timely debt collection, the gross commercial margin and the timely debt payment and the model (2b) employing the timely debt collection, the

gross commercial margin and the timely flow of stock. On the other hand, in the two models (3b) and (4b), the two coefficients β_1 and β_2 (relating to the variables TDC. and GCM) have retained their significance at the threshold of 1%, while the two variables variation of turnover (3b) and earnings (4b) still have no significant coefficients. The values of the test of Student are respectively 0.527 and 0.154.

With through these results, we note that the model (1b) has the highest explanatory power (R^2 = 47.7%) and β_1, β_2 and β_3 very significant coefficients (with the threshold of 1%). The Student test indicates the values: -5.760, 3.178 and 3.291 respectively. Similarly, the value of Wild $\chi 2$ test is significant at the 1% (Wild $\chi 2$ = 36.29. These so significant results of model (1b), lead us to keep this model to explain our dependent variable operating cash-flow. But, before concluding, what about the test F added variables. The results of this test show that the introduction of new variables significantly improves the explanatory power of the constrained model (3a) and this for unconstrained models (1b), (2b) (the null hypothesis is rejected, hence the explanatory power of unconstrained model is different from that constrained). On the other hand the same test F assure us another time that the addition of two variables, variation of turnover and earnings, significantly does not improve the explanatory power of the model (1b). So we will retain the variable timely debt payment as a third variable providing more about the determination of our dependent variable operating cash flow.

In conclusion, and up to this level, the most powerful explanatory variables in the explanation of operating cash-flow are: the timely debt collection (TDC), the gross commercial margin (GCM) and the timely debt payment (TDP) respectively.

Now, we reconstitute the three models, each with four variables:

Model (1c): $OCF_{it} = \beta_0 + \beta_1 TDC_{it} + \beta_2 GCM_{it} + \beta_3 TDPit + \beta_4 TFS_{it} + \varepsilon_{it}$

Model (2c): $OCF_{it} = \beta_0 + \beta_1 TDC_{it} + \beta_2 GCM_{it} + \beta_3 TDP_{it} + \beta_4 \Delta Turn_{it} + \varepsilon_{it}$

Model (3c): $OCF_{it} = \beta_0 + \beta_1 TDC_{it} + \beta_2 GCM_{it} + \beta_3 TDP_{it} + \beta_4 E_{it} + \varepsilon_{it}$

Where ε_{it} indicates a term of error

4.4 The results of estimating models with four variables (1c, 2c and 3c)

For these four models the test results of homogeneity constants show the need to reflect the heterogeneity among firms (H_0 is rejected in all models, all p-values are less than 5%).

The test result Hausman indicates that all the models (1c), (2c) and (3c) will be treated according to the fixed effect model. P-values exceed in all the cases 5%.

The estimation results show that the explanatory power of both models (1c) and (3c) is improving further, whereas for the model (2c), the addition of the variable, variation of turnover, does not improve any more the explanatory power (R^2 keeps the same value).

For the model (1c) based on the timely debt collection, the gross commercial margin, the timely debt payment and the timely flow of stock, we can notice that the explanatory power has improved considerably from 47.7% to 56.3%. This improvement is due to the addition of the variable timely flow of stock. It is also noticed that coefficients of the explanatory variables (TDC.), (GCM) and (TDP), β_1, β_2 and β_3 are increasingly significant with the threshold of 1%. T of Student respectively reaches -5.772, 4.017 and 3.349. The variable timely flow of stock has also a significant coefficient β_4 with the threshold of 1% (T = -2.739). Also, this model has a value of Wald $\chi 2$ (4) = 46.11 significant threshold of 1%.

For the model (3c), a slight improvement in R^2 was noted, but in terms of explanatory power adjusted**, we** notice that it is a decrease compared to the model (1b). The model (2c) keeps the same value as the model (1b) in terms of explanatory power (R2 = 47.7%), but that is translated into a reduction in term of adjusted explanatory power ($R^2_{ajus.}$ (1b) = 44.5% ➡ $R^2_{ajus.}$ (2c) = 44.46%). For the latter two models (2c) and (3c), the coefficients of two explanatory variables, variation of turnover and earnings are still not significant with a very low t Student.

Following the results, it seems clear that the model (1c) has the higher explanatory power. In addition, this model has explanatory variables with very significant coefficients threshold of 1%. But, before concluding, what about the test F added variables. The results of the test show that the introduction of the variable timely flow of stock significantly improves the explanatory power of the constrained model (1b). On the other hand, the introduction of two variables, variation of turnover and earnings, is not significant for improving the explanatory power of the model (1b). The F test, thus, informs us that the variable timely flow of stock will be retained like fourth determinant variable significantly the operating cash-flow.

In conclusion, we can announce, at the level, that the most powerful explanatory variables in the explanation of operating cash-flow are: the timely debt collection (TDC), the gross commercial margin (GCM), the timely debt payment (TDP) and the timely flow of stock (TFS) respectively. We proceed, now, with the addition of two remaining variables (variation of turnover (ΔTurn) and earnings (E)) to the model (1c), each one with share and both unit. We will have then to consider the models following:

Model (1d): $OCF_{it} = \beta_0 + \beta_1 TDC_{it} + \beta_2 GCM_{it} + \beta_3 TDP_{it} + \beta_4 TFS_{it} + \beta_5 \Delta Turn_{it} + \varepsilon_{it}$

Model (2d): $OCF_{it} = \beta_0 + \beta_1 TDC_{it} + \beta_2 GCM_{it} + \beta_3 TDP_{it} + \beta_4 TFS_{it} + \beta_5 E_{it} + \varepsilon_{it}$

Model (3d): $OCF_{it} = \beta_0 + \beta_1 TDC_{it} + \beta_2 GCM_{it} + \beta_3 TDP_{it} + \beta_4 TFS_{it} + \beta_5 \Delta Turn_{it} + \beta_6 E_{it} + \varepsilon_{it}$

Where ε_{it} indicates a term of error

4.5 The results of estimating models with five and sex variables (1d, 2d and 3d)

For these three models the test results of homogeneity constants show the need to reflect the heterogeneity among firms (H_0 is rejected in all models, all p-values are less than 5%). The test of Hausman shows that the linear regression of all the models follows the fixed effect model. The probability (P) of nonexistence of correlation between X_{it} and μ_i exceeds in all the cases 5%.

The estimation results show that the addition of two variables, variation of turnover and earnings in each hand or both does not improve the explanatory power achieved by the model (1c) and the F test Added variables confirms these results. In addition, these two variables were not significant factors, their addition has also created a decrease in terms of significance of coefficients (β1, β2, β3 and β4), relating to variable timely debt collection, gross commercial margin, timely dept payment and timely flow of stock.

At the end of these results, we find that the addition of two variables (Turn and E) adds nothing to model (1c). So we maintain the model (1c) with four variables.

The model that determines the most significant cash flow from operations with a higher explanatory power is written in the form below:

$$OCF_{it} = \beta_0 + \beta_1 TDC_{it} + \beta_2 GCM_{it} + \beta_3 TDP_{it} + \beta_4 TFS_{it} + \varepsilon_{it.}$$

Analytically, this model is translated as follows:

$$OCF_{it} = -23.825 - 0.528\ TDC_{it} + 1.862\ GCM_{it} + 0.212\ TDP_{it} - 0.210\ TFS_{it}$$

The results of this study show that our dependent variable, operating cash flow, is determined significantly by four variables: the timely debt collection, the timely debt payment, the timely flow of stock and the gross commercial margin. Therefore, we can conclude that our hypothesis is partially and not entirely confirmed because the operating cash flow varies independently of the remaining two variables, variation of turnover and earnings.

5. Conclusion

In this work, we tried to study the problem of determining operating cash flows. The determination of this variable is still essential for decision-making in different contexts. This study addresses to the managers to give a great importance and to manage well the elements which refer to the operating cycle (elements of working capital need. They participate significantly to the determination of operating cash flows.

The results of this study show that the variables: timely debt collection, timely debt payment, timely flow of stock, gross commercial margin, variation of turnover and earnings do not determine with the same magnitude information on operating cash flows of Tunisian companies examined. On the whole sample studied, results showed that only the first four variables (timely debt collection, timely debt payment, timely flow of stock and gross commercial margin,), significantly determine the cash flow from operations. These results attest that the two variables variation of turnover and earnings have two non-performing indicators for determining the operating cash flows.

The methodology adopted in this study proves that the most determining variable of the operating cash flow is the timely debt collection, comes next the gross commercial margin, followed by the timely debt payment and finally the timely flow of stock. These results are asserted by the various statistical tests adopted in this research.

However, the result of this research should be interpreted with some suspicions. Indeed, like any scientific research, this study has some limitations that can be explained in the following:

- The quality and the not availability of accounting information enough detailed on the studied Tunisian companies can lead, either one under estimation, or one under over estimation of the used variables and consequently to affect the obtained empirical results.
- The accounting information published in the financial status on the basis of which this study is made does not often reflect the reality of the situation of companies and consequently a way is created.
- The reduced number of the years over which the study is made (forced by availability of the data over a long period) also engendered a number of observations so reduced.

The results of this research encourage us to answer our study, according to the availability of the information, on a sample of wider observation. The later works could be engaged to determine the indicators influencing the operating cash flow for the industrial companies.

This study can constitute also a prerequisite for the other empirical works. For that purpose, the future extensions consist in finding the other factors allowing to determine well the operating cash flow; Also it is interesting to study elements or factors allowing to determine cash flows bound to the investment or those bound to the financing**.**

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Table 1. Summary table of the variables and its abbreviations

Type of variable	Variable	Abbreviation
Dependent variable	Operating cash flow	OCF
Explanatory variables	Timely debt collection	TDC
	Timely debt payment	TDP
	Timely flow of stock	TFS
	Gross commercial margin	GCM
	Variation of turnover	Δ Turn
	Earnings	E

Table 2. Numbers of companies observed per year

Year	**Numbers of companies**
1996	**4**
1997	**13**
1998	**13**
1999	**15**
2000	**15**
2001	**12**
2002	**10**
Total	**82 observations**