

Forecasting of Operating Cash Flow: Case of the Tunisian Commercial Companies

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Abstract

This article aims to determine the ability of three different models in terms of forecasting future cash flow. This study was conducted from a representative sample of Tunisian commercial companies. The results introduce that the forecasting model more effective in the context of Tunisia is the one based on the timely debt collection, gross commercial margin, timely flow of stock and timely debt payment. The predictive power of this model was shown at the horizon of one, two and three years. The past cash flow presents also a good predictor of future operating cash flow; but with a lower predictive power compared to that of the elements related to the operating cycle. In the other side, the results show that the model based on past earning is defective in terms of forecasting future cash flow.

Keywords: Operating cash flow, Operating cycle, Earnings, Forecasting, Commercial companies

1. Introduction

Considering the importance and the utility of information based on operating cash flow, much research was evoked in order to forecast this variable. In this regard, it is to remember that the FASB (Financial Accounting Standard Board) affirmed in 1978 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) Farshadfar and al. (2008)... and on the other hand, confirmed by other studies such as Rayburn (1986), Murdoch and Krause (1989, 1990), Dechow (1994), Dechow and al. (1998)... Therefore, we can conclude that the former studies could not judge with certainty in favour of any explanatory variable (cash-flow, earnings, accrual...), to forecast the future operating cash flow.

Dechow et al. (1998), recommended 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... For this, Telmoudi et al. (2010) have tried to put this variable in relation with the factors related to the operating cycle. Their work demonstrated the importance of these factors on the behavior of operating cash flows. They established a causal relationship between operating cash flows and four explanatory variables namely the timely debt collection, the gross commercial margin, the timely flow of stock and the timely debt payment. These results were obtained from a significant sample of Tunisian commercial companies.

The objective of this paper is to identify explanatory variables most efficient in terms of forecasting future cash flows. The first model is based on the timely debt collection, the gross commercial margin, the timely flow of

stock and the timely debt payment, the second on past earnings and the third on past operating cash flows. This study was conducted from a representative sample of Tunisian commercial companies.

The organisation of this work is as follows: In section 2, we present a general review of literature relating to forecasting operating cash flows. The third section is devoted to the formulation of hypotheses. The fourth describes the methodology. Results and interpretations will be presented in the fifth section.

2. Review of the literature

Having the objective of forecasting future cash flow, a lot of studies have been conducted by several researchers in several different economic. These earlier studies focused on prediction of future cash flows have not shown any superiority of cash flows at the expense of accounting results or vice versa.

These studies were initiated following the assertion of the FASB (Financial Accounting Standards Board) in the statement of "objectives annual accounts published by companies" made in 1978. The FASB said in the statement that past accounting results provide a better basis for estimating future cash flows than the amount of cash flows in the past. The results of these studies have not confirmed the position of the FASB as several researchers have shown that cash flows are the most useful basic and most important for predicting future cash flows.

In this regard Bowen et al. (1986) studied the various measures of cash flows, and their ability to predict future cash flows. The results showed that the current operating cash flows better predict future cash flows from operating current accounting results. Similarly, the study by Finger (1994) aimed to compare the ability of operational cash flows from operations to accounting results in terms of respective abilities to predict future cash flows. His study has focused on several U.S. firms from 1935 until 1987 and the results showed that cash flows have an earlier predictor of future cash flows over the accounting results of operations. This superiority was also confirmed by this study to the horizon one and two years. However, over longer horizons, the variable operating cash flow has almost the same significance and the same predictive ability. Therefore we can conclude that the horizon of the forecast is a determinant of the quality prediction.

The study by Krishnan and Largay (1997) had a huge contribution on the relevance of the direct method of calculating cash flow towards the indirect method. According to this study, the direct method of determining cash flows, based on receipts and disbursements, is more relevant in predicting future cash flows towards accounting results. The merit of this direct method has been demonstrated through the study of Sidhu and Clinch (2000). On the one hand, this study showed that the components of operating cash flows provided by the direct method have additional predictive power to those calculated using the indirect method. On the other hand, this study also showed that these components provide a higher predictive power than the aggregate cash flows in predicting future cash flows.

The research of Barth et al. (2001) showed that the variable cash flow from operations remains the most relevant variable in the prediction of future cash flows. Moreover each component of accruals reflects relevant information on future cash flows. This study was focused on a large number of U.S. firms over a period from 1987 to 1996.

The study of Hussain and Al Attar (2004) confirmed the results generated by Barth et al. (2001). This study has presented an extension of the work of Barth et al. (2001). It was conducted on a sample containing British firms listed on the London Stock Exchange (LSE) over a period from 1991 to 2000.

The study of Farshadfar et al. (2008) also showed the superiority of the operating cash flow towards the accounting results in predicting future cash flows. This research was conducted in Australia and it has examined 323 listed companies (The Australian Stock Exchange) between 1992 and 2004. In addition, the study showed that the predictive power of operating cash flow increased significantly with the size of the company. However, the superiority of operating cash flows in terms of predicting future cash flows is also found in small and medium enterprises.

These studies have provided evidence of the importance and relevance of cash flows from operations towards the accounting results in terms of forecasting future cash flows. But it should be noted that under the same objective, several other studies have shown the opposite namely, the superiority of accounting results in forecasts of future cash flows and that in accordance with FASB statement. Among these studies, particularly we recall the studies of Greenberg et al. (1986), Rayburn (1986), Murdoch and Krause (1989, 1990), Dechow (1994), Dechow et al. (1998).

Dechow et al. (1998) showed that the operating cash flows are better provided by the accounting results by using two different methodologies. This research has advanced a predictive model based on accounting results. This

model was criticized by Barth et al. (2001) in stating that this model was based on assumptions suffering from serious limitations.

The importance and usefulness of the elements related to the operating cycle in predicting future cash flows has been demonstrated through the information content and forecast continued in accruals. Indeed, the accruals are the products or charges that did not generate cash flows during the period for which they were recorded. These accruals include depreciation, amortization and provisions, revenue and expenses to stabilize and the change in working capital needs, which includes changes in inventories, the change in accounts receivable, and changes in debt.

In order to predict future cash flows. Subramanyem (1996) has shown that accruals are informative about the value of firms and therefore, they present a superior measure of enterprise performance than cash flows because they reduce the time and problems of disparity in the measure of cash flow. The study of Subramanyem (1996) tested single and multiple regressions using a sample of 211,350 observations. It has also shown that accruals are relevant in terms of forecasting future cash flows discounted.

As part of their study to show the superiority of earnings relative to operating cash flows in predicting future cash flows, Dechow et al. (1998) showed that earnings are the best predictors of future cash flows and whether this alone or combined with cash flow. The superiority of the predictive power of accounting results is due to accruals that are the difference between earnings and cash flows from operations (earnings = cash flow + accounting Accruals). These accruals include among others the change in operating items.

The study of Barth et al. (2001) has highlighted the role of accruals in predicting future cash flows. This study demonstrated in a first step that the simple regression method based on operating cash flows provides the best basis for predicting future cash flows than those based on earnings. In a second step this study has shown that predictions of cash flows by the accounting results are improving by the decomposition of the latter in operating cash flows and accruals totals. This advantage improves explanatory power by decomposing total accruals into their main components namely:

- variation in accounts receivable,
- variation in accounts payable,
- variation in inventories,
- variation in accounts receivable,
- variation of debts,
- depreciation and provisions.

Thus, the variable cash flow from operations remains the most relevant variable in this model and each component of accruals reflects a significant and relevant information on future cash flows.

The study of Hussain and Al-Attar (2004) examined the behavior of aggregated and disaggregated accruals in predicting future cash flows. This study also showed that the disintegration of the earning in cash flow and accrual aggregate improves the predictive power of future cash flows. These findings are confirmed in horizon of one, two and three years. Similarly, the disintegration of the aggregate accrual into its components further improves the predictive power of cash flow and this is in horizon of one, two and three years. These results are significant and they are also confirmed by several statistical tests are not used by Barth et al. (2001).

These results confirm several previous studies in the U.S. and the United Kingdom as Guay and Sidhu (2001), Board et al. (1989); Mc Leay et al. (1997) despite the different methodologies adopted. Moreover, these results are not in agreement with other previous results such as Rayburn (1986), Dechow (1994), Dechow et al. (1998).

Through these various previous studies, it is difficult to conclude in favour of cash flows, earnings or accruals to forecast operating cash flows. Besides, Beth (1993) found that neither earnings nor cash flows of operations constitute a good basis for forecasting future cash flows. This diversity of results leads us to conduct research efforts to better predict the variable cash flow from operations.

We will try to show the importance of elements related to the operating cycle in terms of forecasting future cash flows. It should be noted that the study of Telmoudi et al. (2010) showed the importance of these operating cycle elements for the determination of cash flows. This study focused on a representative sample of Tunisian commercial companies.

3. Formulation of hypotheses

To explain cash flow from operations, Telmoudi and al. (2010) showed that variables, timely debt collection, timely debt payment, timely flow of stock and gross commercial margin have a significant and important explanatory power. In this article we will test the ability of these variables related to the operating cycle in terms of predicting future cash flows in the Tunisian context:

Hypothesis (H 1): Future operating cash flow varies depending on timely debt collection, timely debt payment, timely flow of stock and gross commercial margin

Several researchers have shown the relevance of earnings in terms of predicting future cash flows, such as studies Rayburn (1986), Dechow (1994), Dechow et al. (1998). That is why we will also test the ability of this variable in terms of forecasting future cash flows in the Tunisian context:

Hypothesis (H 2): Future operating cash flow varies depending on earnings

It is also noteworthy that several previous studies have demonstrated the relevance of data based on operating cash flows in terms of forecasting future cash flows, such as studies of Bowen et al. (1986); Finger (1994), Barth et al. (2001), Hussain and Al Attar (2004) and Farshadfar et al. (2008). For this reason, we will also test their predictive power in the Tunisian context:

Hypothesis (H 3): Future operating cash flow varies depending on past operating cash flow

4. Methodology

4.1 Definition and measurement of the variables

4.1.1 Operating cash-flow: OCF (dependent variable)

The operating cash-flow was generally approximated by the earning 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 Brown (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.

4.1.2 Timely debt collection: TDC (explanatory variable)

This variable is expressed in a number of days.

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

4.1.3 Timely debt payment: TDP (explanatory variable)

This variable is also expressed in a number of days.

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

4.1.4 Timely flow of stock: TFS (explanatory variable)

This time is calculated as follows:

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

4.1.5 Gross commercial margin: GCM (explanatory variable)

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

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

4.1.6 Earnings: E (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.

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

4.2 Selection of the sample

Our sample is composed of 52 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.

4.3 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 1998 to 2008. 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. The table (1) summarizes information concerning dissolved companies studied

4.4 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:

- μ_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.

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

$SCR_{1,e}$: 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 ($\text{cov}(x_{it}, \mu_i) = 0$), we choose (random effect model).
- If not, the fixed effects model is chosen.

So, we test the two following hypothesis:

$$H_0: \text{cov}(x_{it}, \mu_i) = 0$$

$$H_1: \text{cov}(x_{it}, \mu_i) \neq 0$$

The regression models are as follows:

Forecast models at the horizon of one year:

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

$$\text{Model (2): } OCF_{it} = \beta_0 + \beta_1 E_{it-1} + \varepsilon_{it-1},$$

$$\text{Model (3): } OCF_{it} = \beta_0 + \beta_1 CF_{it-1} + \varepsilon_{it-1},$$

Where ε_{it-1} it means an error term.

Forecast models at the horizon of two year:

$$\text{Model (1a): } OCF_{it} = \beta_0 + \beta_1 TDC_{it-2} + \beta_2 GCM_{it-2} + \beta_3 TDP_{it-2} + \beta_4 TFS_{it-2} + \varepsilon_{it-2}$$

$$\text{Model (2a): } OCF_{it} = \beta_0 + \beta_1 E_{it-2} + \varepsilon_{it-2},$$

$$\text{Model (3a): } OCF_{it} = \beta_0 + \beta_1 CF_{it-2} + \varepsilon_{it-2},$$

Where ε_{it-2} it means an error term.

Forecast models at the horizon of three year:

$$\text{Model (1b): } OCF_{it} = \beta_0 + \beta_1 TDC_{it-3} + \beta_2 GCM_{it-3} + \beta_3 TDP_{it-3} + \beta_4 TFS_{it-3} + \varepsilon_{it-3}$$

Model (2b): $OCF_{it} = \beta_0 + \beta_1 E_{it-3} + \varepsilon_{it-3}$,

Model (3b): $OCF_{it} = \beta_0 + \beta_1 CF_{it-3} + \varepsilon_{it-3}$,

Where ε_{it-3} it means an error term.

For these models we will estimate β_0 , β_1 , β_2 , β_3 and β_4 . Subsequently we will test the significance of each factor through the Student test and calculate the explanatory power of each model (R^2 and adjusted R^2)

5. Interpretations of results and statistical tests

We will interpret so the different results obtained by accepted statistical tests applied.

5.1 Estimation results of forecasting models at the horizon of one year

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

Model (2): $OCF_{it} = \beta_0 + \beta_1 E_{it-1} + \varepsilon_{it-1}$,

Model (3): $OCF_{it} = \beta_0 + \beta_1 CF_{it-1} + \varepsilon_{it-1}$,

Where ε_{it-1} it means an error term.

For all three models forecast at the horizon of one year, the results of homogeneity test constants show that it is obligatory to take into account the heterogeneity between firms because the null hypothesis is rejected in the three models. All p-values are below 5%. It is therefore necessary to choose between fixed effect model and random effect model. This choice is made by applying the test of Hausman. The results of this test are summarized in table (2).

The Hausman test results show that random effect model will be selected for the estimation of three models (1), (2) and (3). The value of p-values is greater than 5% for the three models. So there is no correlation between explanatory variables and firm-specific effects.

Table (3) provides the estimation results of the first three forecasting models at the horizon of one year.

We note first that the number of observations is 360 observations. For each company, we ignored the first year because we don't have the information of the year (t-1). From table (3) showing the estimation results of forecasting dependent variable OCF at the horizon of one year, we can see that the models (1) and (3) have, each, high predictive power. By cons, results show that the model (2) is characterized by a relatively low predictive power. For model (1), we recall that this model is based on four variables namely timely debt collection, gross commercial margin timely flow of stock and timely debt payment. These variables have already shown considerable effectiveness in determining operating cash flow (Telmoudi and al. (2010)). This time, based on a sample of Tunisian firms, these variables have shown, once again, their effectiveness in predicting future operating cash flows. Statistically, the model (1) has coefficients β_i significant at 1%. The predictive power of this model is 72.40%. These results confirm the importance of elements related to the operating cycle in forecasting future operating cash flows.

Model (3), based on past cash flows, has also shown considerable effectiveness in terms of forecasting future cash flows at the horizon of one year. The predictive power of this model exceeds 44% and the coefficient β_1 is significant at 1% (t-statistic = 3.359). These results obtained in the context of Tunisia are in confirmation with several earlier studies in the United States, Great Britain and New Zealand as the work of Barth et al. (2001), Hussain and Al Attar (2004) and Farshadfar et al. (2008). But these results, partly, contradict the assertion of the FASB in 1978, since the U.S. accounting body, stated that the future operating cash flows are better predicted by the earnings.

The estimation results of model (2), applied on a representative sample of Tunisian firms, totally contradict the assertion of FASB in 1978. The explanatory variable, earning, showed a deficiency in terms of predicting future operating cash flow. This model has a relatively low predictive power not exceeding 11%. Similarly, the t test shows that the β_1 coefficient of the variable earning was not significant (t = 1.732). Thus, it seems clear superiority of data based on cash flows relative to the data based on the accounting results in terms of predicting future operating cash flows.

However, the results show that the model (1), based on elements related to the operating cycle, is more relevant to predicting the dependent variable operating cash flow. Hence, we can conclude that the predictive power of the elements related to the operating cycle, namely timely debt collection, gross commercial margin, timely flow of stock and timely debt payment, is more important compared to operating cash flow and earning.

The model that predicts, more significantly, the cash flow from operations at the horizon of one year, with the highest predictive power is the model (1):

$$OCF_{it} = \beta_0 + \beta_1 TDC_{it-1} + \beta_2 GCM_{it-1} + \beta_3 TDP_{it-1} + \beta_4 TFS_{it-1} + \varepsilon_{it-1}$$

Analytically, this model is written as follows:

$$OCF_{it} = -22.798 - 0.512 TDC_{it-1} + 1.919 GCM_{it-1} + 0.231 TDP_{it-1} - 0.104 TFS_{it-1}$$

5.2 Estimation results of forecasting models at the horizon of two years

$$\text{Model (1a): } OCF_{it} = \beta_0 + \beta_1 TDC_{it-2} + \beta_2 GCM_{it-2} + \beta_3 TDP_{it-2} + \beta_4 TFS_{it-2} + \varepsilon_{it-2}$$

$$\text{Model (2a): } OCF_{it} = \beta_0 + \beta_1 E_{it-2} + \varepsilon_{it-2},$$

$$\text{Model (3a): } OCF_{it} = \beta_0 + \beta_1 CF_{it-2} + \varepsilon_{it-2},$$

Where ε_{it-2} it means an error term.

For all three models forecast at the horizon of two years, the results of homogeneity test constants show that it is obligatory to take into account the heterogeneity between firms because the null hypothesis is rejected in the three models. All p-values are below 5%. So the Ordinary Least Squares procedure is not effective in estimating our models. We must therefore proceed to choose between the fixed effect model and the random effect model. This item is recommended by the Hausman test. The results of this test are summarized in table (4). The Hausman test results show that random effect model will be selected for the estimation of three models (1a), (2a) and (3a). The value of p-values is greater than 5% for the three models. So there is no correlation between explanatory variables and firm-specific effects.

Table (5) provides the estimation results of the three forecasting models at the horizon of two years.

From this table we can see that this empirical study was conducted on a sample containing 308 observations. It is, in fact, an estimate of predictive models at the horizon of two years. Each firm is observed from the third year. So in order to estimate the dependent variable operating cash flow of each company at the horizon of two years, we must eliminate the data for this variable during the first and second year. Similarly, data from two years of each firm, referring to the explanatory variables aren't, in turn, used in the estimation of these models.

The results concerning the estimation of forecasting models at the horizon of two years show, once again, the robustness of the elements related to the operating cycle in terms of forecasting future cash flows. We can notice that the variables timely debt collection, gross commercial margin, timely flow of stock and timely debt payment, are so important predictors of the variable operating cash flow from at the horizon of two years. However, the predictive power of these explanatory variables (Model 1a) marked a decrease from that provided by the model (1) from 72.4% to 60.22%. However, this decrease can be explained by two reasons. On the one hand the number of observations was reduced from 360 observations to 308 observations. On the other hand the forecast horizon is important in predictive ability. The latter decreases with as the forecast horizon increases.

The model (1a) has, therefore, an important predictive power above 60%. In addition, results show that the coefficients of the explanatory variables β_1 , β_2 , β_3 and β_4 relating to timely debt collection, gross commercial margin, timely flow of stock and timely debt payment are significant at the 1 % with t-statistics which are respectively 5.866, 5.438, 4.761 and 3.104.

The results of regression model (3a) based on cash flows earlier, show that this model has a predictive power that exceeds 38%. This proves that the past cash flows are also a good basis for predicting future operating cash flows even at the horizon of two years. The coefficient β_1 is significant at 1% with a value of t-statistic that rises to 3.02.

The results also show that the model (2a) based on the variable, earning, doesn't present a significant predictive ability of our dependent variable future operating cash flow. We find that the predictive power is so low ($R^2 = 6.26\%$) and the coefficient β_1 is not significant. This proves once again that earning is a poor preacher's cash flow from operations in the Tunisian context even at the horizon of two years.

In general, the estimation results of forecasting models at the horizon of two years show the superiority of data based on elements related to the operating cycle compared to data based on past cash flows and earnings.

In the context of Tunisia, the model that forecasts, most significantly, the cash flow from operations, at the horizon of two years, with the highest predictive power is the model (1a):

$$OCF_{it} = \beta_0 + \beta_1 TDC_{it-2} + \beta_2 GCM_{it-2} + \beta_3 TDP_{it-2} + \beta_4 TFS_{it-2} + \varepsilon_{it-2}$$

Analytically, this model is written as follows:

$$OCF_{it} = -21.931 - 0.504 TDC_{it-2} + 1.896 GCM_{it-2} + 0.223 TDP_{it-2} - 0.101 TFS_{it-2}$$

5.2 Estimation results of forecasting models at the horizon of three years

$$\text{Model (1b): } OCF_{it} = \beta_0 + \beta_1 TDC_{it-3} + \beta_2 GCM_{it-3} + \beta_3 TDP_{it-3} + \beta_4 TFS_{it-3} + \varepsilon_{it-3}$$

$$\text{Model (2b): } OCF_{it} = \beta_0 + \beta_1 E_{it-3} + \varepsilon_{it-3},$$

$$\text{Model (3b): } OCF_{it} = \beta_0 + \beta_1 CF_{it-3} + \varepsilon_{it-3},$$

Where ε_{it-3} it means an error term.

For all three models forecast at the horizon of three years, the results of homogeneity test constants show that it is obligatory to take into account the heterogeneity between firms because the null hypothesis is rejected in the three models. All p-values are below 5%. So the Ordinary Least Squares procedure is not effective in estimating our models. We must therefore proceed to choose between the fixed effect model and the random effect model. This task is performed by the Hausman test. The results of this test are summarized in table (6). The Hausman test results show that random effect model will be selected for the estimation of three models (1b), (2b) and (3b). The value of p-values is greater than 5% for the three models.

Table (7) provides the estimation results of the three forecasting models at the horizon of three years.

This table (7) presents the estimation results of forecasting models, at the horizon of three years. These results were obtained after a multiple regression on a sample of 52 commercial Tunisian companies and 256 observations. The number of observations is again reduced to 52 observations because it is the forecast horizon is three years. Each company was deprived of three observations. For the dependent variable operating cash flow, we considered this variable data from the fourth year. Therefore, data pertaining to the explanatory variables haven't been operated for the last three years, for each company.

The results show that even at the horizon of three years, the elements related to the operating cycle are, again, a good foundation in terms of predicting future cash flows. Model (1b) has an important predictor, which is 46.22%. We also note that the coefficients of variables timely debt collection, gross commercial margin, timely flow of stock and timely debt payment are significant at 1%. Moreover, the Wald χ^2 -test is significant at the 1% (22.14). These results demonstrate the usefulness and importance of elements related to the operating cycle in predicting future cash flow. This model retains its strength even at the horizon of three years of forecast. This shows that managers must take into account the elements of exploitation, to ensure positive cash flows that can be invested in working capital.

The results also show that the past cash flows provide information also significantly on the generation of future cash flows at the horizon of three years. Although the predictive power was reduced to 28.18%, we find that the coefficient of explanatory variable operating cash flow at t-3 is still significant at 1% (model 3b). These results are consistent with the results already obtained at the horizon of one year and two years. These results also support the work of Barth et al. (2001) in the American context and work of Hussain and Al-Attar (2004) in the British context.

For the data based on operating results (model 2b), we can be seen that the estimation results of the forecasting model of future cash flows at the horizon of three years, clearly shows the ineffectiveness of such data. The predictive power of earning don't exceed 3.64%, similarly, the coefficient estimate β_1 is not significant ($t = 0.243$). These results contradict, again, the position of FASB in 1978.

In the Tunisian context, the model that forecasts, most significantly, the cash flow from operations, at the horizon of three years, with the highest predictive power is the model (1b):

$$OCF_{it} = \beta_0 + \beta_1 TDC_{it-3} + \beta_2 GCM_{it-3} + \beta_3 TDP_{it-3} + \beta_4 TFS_{it-3} + \varepsilon_{it-3}$$

Analytically, this model is written as follows:

$$OCF_{it} = -20.455 - 0.499 TDC_{it-3} + 2.014 GCM_{it-3} + 0.230 TDP_{it-3} - 0.099 TFS_{it-3}$$

5. Conclusion

In this paper, we tried to determine the ability of three different models in terms of forecasting future cash flows in the Tunisian context. Our sample included 52 Tunisian commercial companies and model estimates were made at the horizon of one, two and three years.

The first model was based on elements related to the operating cycle namely timely debt collection, gross commercial margin, timely flow of stock and timely debt payment. This model has shown effectiveness in terms of determining cash flows (Telmoudi and al. (2010)). The second model was based on the explanatory variable

earning; this variable has already shown its deficiency in determining cash flow. Finally, the third model was based on the past operating cash flow.

The results show that the forecasting model more effective in the context of Tunisia is the one based on the timely debt collection, gross commercial margin, timely flow of stock and timely debt payment. The predictive power of this model was shown at the horizon of one year, two years and three years. These results have been approved by the appropriate statistical tests.

The past cash flows are also good predictors of future cash flows at the horizon of one, two and three years; but with a lower predictive power compared to that of the elements related to the operating cycle.

Having a very low predictive power and an insignificant coefficient estimate, earnings are not a good basis in terms of forecasting future cash flows at the horizon of one, two and three years. These results for the Tunisian context show the discrepancy between the earning and the process of generating operating cash flow.

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Table 1. Number of companies observed per year

Year	Number of company
1998	13
1999	15
2000	21
2001	40
2002	52
2003	52
2004	52
2005	52
2006	45
2007	45
2008	25
Total	412 observations

Table 2. The results of the Hausman test for the forecasting models at the horizon of one year

Model	p-values $> \chi^2_{0.05}$	Model chosen
Model (1)	0.4399 > 0.05	Random effect model
Model (2)	0.2231 > 0.05	Random effect model
Model (3)	0.1280 > 0.05	Random effect model

Table 3. The estimation results of forecasting models at the horizon of one year (N = 360)

Model	β_1	β_2	β_3	β_4	R ²	R ² _{adjus.}	Wald χ^2
Model (1)	-0.512387 (-6.244)**	1.91993 (5.988)**	0.83186 (5.219)**	-0.104537 (-3.878)**	0.7240	0.7208	54.28**
Model (2)	0.453876 (1.732)	-	-	-	0.1028	0.1002	2.78
Model (3)	0.653983 (3.359)**	-	-	-	0.4448	0.4432	19.45**

** indicates that the t-statistics in parentheses, and the Wald χ^2 -test are significant at 1%.

Table 4. The results of the Hausman test for the forecasting models at the horizon of two years

Model	p-values > $\chi^2_{0.05}$	Model chosen
Model (1a)	0.4011 > 0.05	Random effect model
Model (2a)	0.2343 > 0.05	Random effect model
Model (3a)	0.1876 > 0.05	Random effect model

Table 5. The estimation results of forecasting models at the horizon of two years (N = 308)

Model	β_1	β_2	β_3	β_4	R ²	R ² _{adjus.}	Wald χ^2
Model (1a)	-0.504433 (-5.866)**	1.996444 (5.438)**	0.223764 (4.761)**	-0.101453 (-3.104)**	0.6022	0.5969	42.54**
Modèle (2a)	0.467887 (1.115)	-	-	-	0.0626	0.0595	2.78
Modèle (3a)	0.768545 (3.02)**	-	-	-	0.3864	0.3844	19.45**

** indicates that the t-statistics in parentheses, and the Wald χ^2 -test are significant at 1%.

Table 6. The results of the Hausman test for the forecasting models at the horizon of three years

Model	p-values > $\chi^2_{0.05}$	Model chosen
Model (1b)	0.3477 > 0.05	Random effect model
Model (2b)	0.2328 > 0.05	Random effect model
Model (3b)	0.1140 > 0.05	Random effect model

Table 7. The estimation results of forecasting models at the horizon of three years (N = 256)

Modèle	β_1	β_2	β_3	β_4	R ²	R ² _{adjus.}	Wald χ^2
Modèle (1c)	-0.499449 (-4.623)**	2.014365 (4.118)**	0.230665 (3.403)**	-0.099454 (3.007)**	0.4622	0.4536	22.14**
Modèle (2c)	0.467887 (0.243)	-	-	-	0.0364	0.0326	1.98
Modèle (3c)	0.768545 (2.97)**	-	-	-	0.2818	0.2789	6.46**

** indicates that the t-statistics in parentheses, and the Wald χ^2 -test are significant at 1%.