

EMPIRICALLY TESTING THE “FLEURIET’S MODEL”: Evidences of Brazilian Market

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ABSTRACT

Introduced in Brazil in the end of 1970's, the Advanced or Dynamic Working Capital Analysis, or simply, Fleuriet's Model, came with the proposal to provide a simple and objective methodology of financial evaluation of Brazilian firms, focused essentially on the analysis of current accounts (working capital management). This study aims to empirically test the assumption of the Fleuriet's Model of segregation of the current in operating and financial accounts (assets – OCA or FCA and liabilities – OCL or FCL) and its relation with the firms' operations. We assume that the financial accounts are not directly associated to the firms' operations, or if they are, it is a minor scale than the operating accounts. In the empirical analysis we use annual data from a balanced panel of 197 Brazilian firms between 2007 and 2012. We conclude that the most firms in the sample present financial equilibrium (64.4%), it has the solid as predominant financial profile (44.2%), but worsened this condition in the period. Contrary the assumptions of the model, we found a relationship between the financial current accounts with the firms' operations, but the results were inconclusive to the targeted sample sectors.

Keywords: *working capital, empirical analysis, financial equilibrium*

1. INTRODUCTION

The conventional financial analysis, known as Balance Sheet Analysis is the relevant theme in Finance and in Accounting, because it is important source of information to the decision-making in the firms. It is structured on three fundamental pillars: liquidity analysis, debt and profitability. Through the calculation and analysis of several indexes that compose these pillars it is possible to identify the retrospective results of the financial decisions by the firm. The downside of this analysis is the large number of indexes that it presents, making the analysis complicate due to the conflicting situations that could be generated.

Contrasting with this conventional analysis, in the end of 1970's, it was developed a method named Advanced or Dynamic Working Capital Analysis, known in Brazilian market as Fleuriet's Model, in reference to the precursor in the Brazilian market, the French researcher Michel Fleuriet. As own Fleuriet (2005) claims, it is a method of corporate management dynamic and operating and not a model of financial balance. The main attribute of this method was the great emphasis given to the liquidity and to the management of operating cash flow, based on the segregation of the current accounts. Despite the argumentation of Fleuriet (2005), that it is a method, in this research it was chosen to keep the name that it is known in the Brazilian corporate and academic fields, Fleuriet's Model.

The proposal of this new methodology was provide a simple and objective methodology of financial evaluation of Brazilian firms, based essentially in the analysis of the working capital management. It is structured in the segregation of the balance sheet, specially, the current accounts, which is reclassified according the association or not with the firms' operations. Thus, the financial current accounts are associated to the treasury (cash cycle), the operating accounts are linked to the firms' operations (operating cycle), while the long term or permanent; both asset and liability are strategic accounts (investment cycle).

The Fleuriet's Model allows viewing of the firm as a whole, in financial perspective of liquidity, providing a systemic view of the impact of several areas of decision in the firm and its interdependencies. From calculation and analysis (of the sign) of only three variables: working capital (WC), working capital requirement

(WCR) and treasury balance (T), it is possible to trace a diagnostic with reasonable accuracy of the firms' financial situation, which can be classified in 6 analysis structures or financial profiles (BRAGA, 1991; SILVA, 2010, MARQUES, 2002). Thus, the model expands the concept and scope of the net working operational capital (NWOC) and the indexes of liquidity of the Balance Sheet Analysis, providing parameters that have a certain degree of sensibility of changes in financial position, so, beyond allowing diagnostic more objective and precise of the firm financial performance (THEISS JR. and WILHELM, 2000).

However, despite the dissemination of Fleuriet's Model in the Brazilian academia, it is observed that practically there are no researches aimed to test the assumptions on which the model is structured. From the analysis made in the national literature, were found two researches with conflicting results. The first of them, developed by Medeiros and Rodrigues (2004), aimed empirically test the assumption of Fleuriet's model that there is no association between the financial current assets (FCA) and liabilities (FCL) with the firms' operations. They concluded the FCA and FCL are not erratic, because they present a significant association with the firms' operations. In this direction, the research developed by Starke Júnior, Freitag and Cherobim (2008), aimed test the hypothesis of financial current accounts are erratic over the Brazilian firms' operations. They concluded the FCA and FCL present linearity with the net operating revenue (NOR) and the operating current asset (OCA) is strongly correlated with the same proxy of firms' operations.

In this way, this paper aims to empirically test the existence or not of association between the FCA and FCL with the firms' operating, and to propose a refinement of research by Medeiros and Rodrigues (2004), analyzing a sample segmented by sectors, because the differences in working capital investments (WCI) by sectors of economy. For example, it is not possible to compare the WCI dynamic on the quick spin retail sector (drug stores or supermarkets) with the WCI dynamic of the sectors with more investments in non-current assets (industries, public utilities, mineral extraction, etc).

Furthermore, considering the period analyzed, 2007 to 2012, we start with the premise that the convergence of Brazilian accounting standards with international standards – International Financial Reporting Standards – IFRS), set by Law 11.368/07 and implemented from 2010, had caused some impact in the financial situation of Brazilian firms, in the Fleuriet's Model perspective. Specifically, such changes introduced in the Brazilian accounting brought great challenges to everyone involved with financial information in the country. Brazil joined the "official route" of IFRS since 2008, because, in total, there were already 48 pronouncements issued, besides 11 interpretations and 6 technical orientations, that deal with the recognition, measurement and disclosure of various elements considered in the dynamics of WCI.

The study is divided into four sections beyond this introduction. In the first of them, it is outlined the theoretical background, presented the Fleuriet's Model and its variables. Following, it is presented the methodological procedures, the hypothesis and its variables, which the results are exhibited in the next section. Finally, it is shown the final considerations and the theoretical and practical implications of the study, as well as the suggestions to future studies.

2. THEORETICAL FRAMEWORK

2.1 The Fleuriet's Model or Dynamic Working Capital Analysis

According to Fleuriet (2005), the Dynamic Working Capital Analysis theoretical argument was given by Hicks (1974), who considered the existence of two possible standards in the balance sheet analysis, one with positive cash balance (firms with liquidity reserve) and one with negative cash balance (firms that relies on credit of institutions to finance activities). From this idea, Fleuriet (1980) structured, based on French management, the scope of the new methodology, to provide the diagnostic of financial situation, focused on working capital management and corporate liquidity of firm.

The Fleuriet's Model was developed and introduced in Brazil by Fleuriet (1980) and Fleuriet, Kehdy and Blanc (2003). Afterwards, authors like Brasil and Brasil (2002), Silva (2010) and Braga (1991) conferred important enhancements to the original model, aiming to apply it to the Brazilian corporate reality, besides add to the dissemination in the academia.

This is a model that can be used both in analysis of working capital management, as financial corporate analysis and bankruptcy prediction, because it allows measure the impact of changes in the firm financial structure. This is therefore, a simple and objective model to perform performance analysis (focused on variables analysis and financial profiles) or analysis of the working capital of the firm (focused on liquidity and firm solvency), with which reaches satisfactory results, when compared with the Balance Sheet Analysis.

As mentioned in the introduction, the model simplicity and objectivity are in the fact it is structured in the calculation and analysis of only three variables signal. As regards calculation, it is assumed a reclassification in the balance sheet, according to the dynamic (cycles) of the several accounts and subgroups that compose it, coming up to the functional balance. According to Silva (2010), the basic concern in this reclassification is to relate the multiple accounts not only the temporal dimension, as well as the relationship with the firms' operations. In this reclassification, initially the current accounts are separated from the ones named permanent or non-current. The model focus is in the separation of the current assets and liabilities associated to the firm operations (operating or cyclic), from the ones associated to the financial decisions (financial or erratic). From the interaction of these subgroups is possible to calculate the variables of the model as shown in the table 1.

Variable	Calculation	Theoretical Interpretation
Working Capital Requirement (WCR)	$WCR = OCA - OCL$	Shows the gap of time and value between the operational current assets and operational current liabilities. Shows then, the gap between the accounts of Asset and Liability, linked with the firms' operations, being thus, directly related with the cycle of operations and the cash conversion cycle (CCC).
Working Capital (WC)	$WC = SE + NCL - NCA$	Represents the difference between the non-current accounts of Liability and non-current accounts of Asset, which in general, are renewed at maturity. Under the point of view of financial equilibrium, it is intended to finance the NCA and part of the WCR.
Treasury Balance (T)	$T = FCA - FCL$ or $T = WC - WCR$	It is measured from the confrontation between the financial current assets (FCA) and liabilities (FCL), and also able to be obtained from the difference between the working capital (WC) and working capital requirement (WCR). Shows the dependence of the firm in relation to financial institutions (when negative) or the firms' liquidity gap (when positive).

OCA = Operational Current Assets; OCL = Operational Current Liabilities; SE = Stockholders' Equity; NCL = Non-Current Liabilities; NCA = Non-Current Assets; FCA = Financial Current Assets; FCL = Financial Current Liabilities.

BOARD 1: Fleuriet's Model's Variables

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The WCR results of the fact that, in general, in the firms, the cash outflows occur before the cash inflows, establishing, that way, a permanent requirement of operating funds application, situation known as positive cash conversion cycle (MACHADO *et al.*, 2006). The possible signals of WCR and their interpretations are presented in table 2.

Signal	Asset/Liability	Theoretical Interpretation	Classification	Situation
WCR ₊	$OCA > OCL$	The firm requires resources to finance its operations.	WCR is an application of resource (in current assets)	Undesirable
WCR ₋	$OCA < OCL$	The firm finances its operations with short-terms non-onerous resources and has resources to financial applications. Operational applications < operational funds and CCC is negative.	WCR is a source of funds (in current liabilities)	Desirable
WCR ₀	$OCA = OCL$	The operational funds are enough only to fund operational applications	Balance (theoretical situation)	Neutral

BOARD 2: WCR signals interpretation

SOURCE – Created by the authors.

To Fleuriet, Kehdy and Blanc (2003), the WC is an economic-financial term, being a source of permanent financial funds used in the applications, also permanent, and to satisfy the firms' WCR. According to Braga (1991), it can be visualized as a process of planning and control of the financial funds invested on the current asset. The possible signals of WC are presented at table 3.

Signal	Asset/Liability	Theoretical Interpretation	Classification	Situation
WC ₊	(SE + NCL) > NCA	The permanent funds are enough to fund the permanent applications and still finance the operational requirements or perform short-term application.	Source of Funds (presente in the Liability)	Undesirable
WC ₋	(SE + NCL) < NCA	The permanent funds are insufficient to fund the permanent applications. The firm has part of these applications financed with short-term resources (operational or financial).	Funds application (present in the Asset)	Desirable
WC ₀	(SE + NCL) = NCA	The permanent funds only finance the permanent applications.	Theoretical situation.	Neutral

BOARD 3: WCR signals interpretation

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If the WC does not positively respond to the variations on the demand for capital (working and permanent), it could lead to an unbalanced situation, culminating in the scissor effect, considering a long-term perspective. This effect happens when the firm sales and, thereafter, the WCR has a percentage increase over the self-financing and the working capital, these are insufficient to support their growth (BRASIL and BRASIL, 2002 and FLEURIET, KEHDY and BLANC, 2003). Thus, this wrong sizing of resources will force the firm appeal to the onerous short-term capital, committing your liquidity, especially, when the financial institutions do not renew the loans, due to the firm financial deterioration.

Regarding the third variable of the Model, Machado et al. (2006) point out that the treasury balance (T) shows the degree of use of short-term debt capital, in other words, onerous liability, financing the WCR. About it, Marques and Braga (1995) also add firms with financial administration problems, insufficient self-financing, WC wrong sizing, besides the cash mismanagement, appealing to short-term onerous capital. These situations of unbalance are shown by the signals analysis of the T. Table 4 presents the possible signals of treasury balance (T):

Signal	Asset/Liability	Theoretical Interpretation	Classification	Situation
T ₊	FCA > FCL	The firm not requires onerous short-term resources to finance its operations, while maintaining investments in short-term funds (reserve liquidity).	Resource Application (CA)	Undesirable
T	FCA < FCL	The firm finances part of its operations (WCR+) or permanent assets with onerous short-term resources.	Funds Source (CL)	Desirable
T ₀	FCA = FCL	The onerous short-term resources are enough only to perform financial short-term assets.	Theoretical situation	Neutral

BOARD 4: T signals interpretation

SOURCE – Created by the authors.

Fleuriet, Kehdy and Blanc (2003) and Braga (1991) presented the six structures or financial profiles of a firm financial situation analysis are disposal in table 5.

Situation / Financial Profile	Variable's signals	Sheet Balance	
		Application	Source
Excellent (1)	WC+, WCR -, T+, LT = T+/WCR-	T+	WCR- and WC+
Solid (2)	WC+, WCR +, T+, LT = T+/WCR+	T+ and WCR+	WC+
Unsatisfying (3)	WC+, WCR +, T-, LT = T-/WCR+	WCR +	T- and WCR+
High Risk (4)	WC-, WCR -, T+, LT = T+/WCR-	T+ and WC-	WCR-
Too Bad (5)	WC-, WCR -, T-, LT = T-/WCR-	WC-	T- and WCR -
Bankruptcy (6)	WC-, WCR+, T-, LT = T-/WCR+	WCR+ and WC-	T-

LT = liquidity thermometer

BOARD 5: Financial profiles of Fleuriet's Model

SOURCE – Created by the authors.

In on hand, the Fleuriet's Model developed and effective simplification in the financial analysis, through the study of only three variables (WC, WCR and T), that represent the financial situation of a firm, obtaining due to it, acceptance in the corporate and academic context; in other, it is important to consider the fact that it is structured in a few variables, make it restrictive to some sort of analysis which are only feasible using Balance Sheet Analysis indicators, therefore, these continue to have their validity and space in the corporate financial analysis.

3. METHODOLOGY

3.1 Research's Hypothesis

In this research the proposition of Fleuriet's Model of segregation of current in operation (OCA and OCL) and financial accounts (FCA and FCL) and its relation with the firms' operations is empirically tested. We assume the financial current accounts are not related directly with the firms' operations, and if they are, it is in a smaller scale than the operating current accounts. Besides that, it is expected the analysis of data in samples segmented by sectors that presents difference in the demand of working capital requirement can confirm more effectively this assumption.

According to the description above, of accounts segregation of current in the financial and operating, it suggests the following premises are valid:

P1 = the financial current asset (FCA) and the financial current liability (FCL) are erratic accounts, in other words, they depend on the changes in the variables WC and WCR, not presenting, therefore, directly relation with the firms' operations.

P2 = the operating current asset (OCA) and operating current liability (OCL) are directly related with the firms' operations.

P3 = the type of activity or sector that firm works, demands more or less intensive demand of current resources, either in investments (CA) or financing (CL).

P4 = the type of activity or sector that firm works, leading it to a bigger or smaller rate of immobilization of non-current resources, and consequently, releasing less or more long-term resources for current financing.

Based on literature and in the assumptions presented above the following theoretical hypothesis were tested in order to validate the Fleuriet's Model:

H1: FCA and FCL **are not** directly related with the Brazilian firms' operations, and therefore, erratic accounts.

H2: OCA and OCL **are not** directly related with the Brazilian firms' operations, and also erratic accounts.

H3: CA and CL **are not** directly related with the Brazilian firms' operations, and also erratic accounts.

H4: the sectors of activities that the firms work, demanding more or less intensive current resource, either investments (CA) or financing (CL) **do not present** difference in the relation with current variables (OCA, OCL, FCA, FCL, CA and CL) with the two proxies variables of firms' operations (Net Operational Revenue - NOR and Earnings Before Interest and Taxes - EBIT).

H5: the changing in the Brazilian accounting standards (International Financial Reporting Standards – IFRS) **do not** caused impact in the financial situation and in the firm' average profile.

As well as proceeded Starke Júnior, Freitag and Cherobim (2008) and Medeiros and Rodrigues (2004), as proxy of firms' operations, it was used the Net Operating Revenue (NOR), aware the best proxy would be the gross operating revenue, that would present closer relation with the current accounts. However, after the implementation of new accounting standards since 2010 (IFRS), the firms are no longer presenting this account in their financial statements, fact that prevented its utilization in the research. Beside it, the operating profit (EBIT) was used, in the perspective that this level of profit in the exercise result demonstrates synthesizes spending (costs and expenses) and short-term funds (sources) the firm's operations for a certain period. To empirically test this theoretical hypothesis we used panel data model, described in the next section.

3.2 Econometric Model

According to Wooldridge (2006) and Greene (2008) panel data presents the following characteristics: 1. they have observations in two dimensions (time and space, in most of cases); 2. they have information which allows better investigation of the variables changes dynamic, allowing consider the effect in the variables not observed; and 3. Improvement in the inference of studied parameters, when it allows more liberty degrees and more variability in the sample when matching data in cross-section or temporal series, which refines the efficiency in the econometric estimators.

Aiming empirically test the assumptions of Fleuriet's Model it was used the panel data model balanced with 1.182 observations during the analyzed period. The empiric model estimated to test the theoretical hypothesis presented above were:

$$Y_{it} = \beta_1 + \beta_2 \cdot X_{it} + \beta_3 \cdot X_{it} + \alpha_i + \varepsilon_{it}$$

where: Y_{it} = signaling variables of the firm's activity level (NOR or EBIT) of the firm i in the year t ; β_1 = model constant; X_{it} = model variables calculated for the firm i in the year t (FCA, FCL, OCA, OCL, CA, CL); α_i = fix effect or random eliminated when the difference is made; ε_{it} = term of error which gets the non-systemic component, portion of Y_{it} not explained in the model.

The research models were estimated by Ordinary Least Squares (OLS) and by the procedures of Random Effects (RE) and Fixed Effects (FE). To each dependent variable, it is necessary the Hausman test to verify which model (RE or FE) would be more appropriate to the analysis. According to Johnston and Dinardo (1997),

the Hausman test verifies the properties of estimators depending of the correlation between α_i and the regressors. In another words, it tests the null hypothesis where the estimator in random effect is correct, once:

1. the effects are not correlated, the Random Effect (RE) is consistent and efficient. The estimator in Fixed Effect (FE) is consistent, but not efficient.
2. the effects are correlated, the estimator of Fixed Effect (FE) is consistent and efficient, but the Random Effect (RE) is inconsistent.

The analysis unities are Brazilian firms listed in BM&FBovespa, while the unity of observation are their financial statements (FS's). The data and information about quotation and FS's were obtained from the database Economática®, while the information about the sample firms' segments were obtained from the BM&FBovespa site.

3.3 Sample Selection Criteria

The data used in this research compose an annual data panel of non-financial firms listed in BM&FBovespa from 2007- 2012. The initial idea was work the most firms as possible in the sample. From the available firms in the database of Economática® were excluded: 1. firms from financial sector (due to the specificities presented in the financial statements); 2. firms that became open market during the analysis period; 3. firms that did not present all data. The final sample includes 197 firms, separated in all stock exchange sectors (except financial sector).

4. RESULTS AND DISCUSSION

4.1 Analysis of Firms' Financial Equilibrium

Despite the contested by Fleuriet (2005), in this research the treasury balance (T) was used as reference of condition of a firm's financial balance or unbalance. Thus, starting point was the assumption that the variable T results from two other variables in the model ($T = WC - WCR$), the first analysis was identify for each year, the percentage of firms that present positive value (balance) and negative (unbalance) in this variable. According to table 1, most firms of the analyzed sample present a situation of financial equilibrium in the analyzed period (64,4%), but, it is noted, however, a tendency of decrease of this condition, because the percentage of firms decrease from 80,2% in 2007 to the 50,35% in 2012. A possible explanation, would be the international financial crisis accentuation that affects Brazilian big firms, mainly the exportation ones.

Stands out the average percentage of firms in the triennium 2007-2009 of 76,13%, and it decreases to 52,63% in triennium 2010-2012, notably from 2009 to 2010 (from 75,1% to 54,3%) signaling a possible break in the convergence of Brazilian accounting standards with the international standards (IFRS). Thus, a possible explanation to this decrease of 24 % in the volume of firms with financial equilibrium in both trienniums can be attributed to this convergence to IFRS from 2010, because a convergence to international standards could lead

many firms in the sample to present higher levels of debts, besides the decrease in the debt composition caused by the imposition of firms to present higher debts' acknowledgement, decreasing the off balance sheet items. The higher levels of debts can be related to the acknowledgment of recurring obligation in the statements, for example, the applications of IAS 17, IAS 37 and IFRS 13, and the terms of converged accounting procedures, respectively, CPC 06, CPC 25 and CPC 46. However, it should be noted that these are preliminary results and the analysis requires development, so it can be confirmed in future researches.

Table 1 – Firms' situation regarding the Dynamic Working Capital Analysis

Sign /Year	2007	2008	2009	2010	2011	2012	Mean
T > 0	80.2%	73.1%	75.1%	54.3%	53.3%	50.3%	64.4%
T < 0	19.8%	26.9%	24.9%	45.7%	46.7%	49.7%	35.6%

SOURCE - Created by the authors.

When the financial equilibrium is analyzed using the Net Working Capital (NWC), which in traditional perspective, when positive reflects a financial balance situation, with the assets and short-term rights (CA) surpassing the obligations, also short-term (CL), it is observed a similar result to the treasury balance variable. The most firms present a financial equilibrium situation, but in this variable case, without present a definitive tendency.

Table 2 – Firms' situation regarding the conventional financial equilibrium

Sign /Year	2007	2008	2009	2010	2011	2012	Mean
NWC > 0	81.7%	75.6%	83.2%	82.7%	78.7%	78.7%	80.1%
NWC < 0	18.3%	24.4%	16.8%	17.3%	21.3%	21.3%	19.9%

SOURCE - Created by the authors.

An outstanding fact is the contrast noted between the results from Medeiros and Rodrigues (2004) and the results found in this research for the variable T. While in the authors research 74% of the analyzed firms present financial unbalance ($T < 0$), the results found in this research, on the contrary, shows 64,4% of the 197 analyzed firms present the financial balance condition ($T > 0$). Thus, in the opposite direction to the stated by these authors, the financial equilibrium diagnostic based on Fleuriet's Model is valid and consistent with the same situation observed in the NWC of conventional analysis.

4.2 Evolution Analysis of Firms' Financial Profile

According Fleuriet, Kehdy and Blanc (2003) and Braga (1991), from the analysis of signals and the interaction with the three variables from Fleuriet's Model, we can obtain their financial structures or profiles. These provide a view of the firm's financial situation. Passing from the scenario where the three variables present desirable signal ($T < 0$; $WCR < 0$ and $WC > 0$), signaling a strong condition of operating and financial equilibrium of the firm, until the scenario where the three variables present undesirable signal ($T < 0$; $WCR > 0$ and $WC < 0$), which reflects a firm with financial and operating unbalance, whose medium-term permanence can lead to financial insolvency condition.

On table 3, profile 1 would be the firm classified by model with excellent, while the profile 6, would be the firm presenting bankruptcy financial situation.

Table 3 – Financial profile from firms in the sample

Financial Profile	2007	2008	2009	2010	2011	2012	Total	%
1	24.9%	20.3%	25.4%	12.7%	12.2%	11.2%	210	17.8%
2	47.7%	46.2%	43.7%	42.6%	43.7%	41.1%	522	44.2%
3	10.2%	11.7%	15.7%	29.4%	26.9%	29.4%	243	20.6%
4	9.6%	7.1%	7.1%	2.0%	2.5%	3.0%	62	5.2%
5	4.6%	9.1%	6.1%	8.6%	7.6%	9.1%	89	7.5%
6	3.0%	5.6%	2.0%	4.6%	7.1%	6.1%	56	4.7%
Mean	2.30	2.55	2.31	2.64	2.71	2.76	1.182	100.0%

SOURCE - Created by the authors.

The prevalent financial profile is the solid (2), with 44,2 % of the total, following by the unsatisfying profile (3), with 20,6% and by excellent profile (1), with 17,8%. If considered that the firms with desirable financial balance would present the profiles 1 and 2, 65% of the firms in the analyzed period would be on these conditions. What go towards the analysis done with variables T and NWC. Another observation we can do with

the data on table 3 is that the profile in the period would be between 2 and 3, but with a slight worsening from the first to the last year. What reinforces this evidence is the firm average percentage with profile 1 (excellent) and 2 (solid) decreases from 23,53% and 45,87% in the triennium of 2007-2009 to 12,03% and 42,47% in the triennium 2010-2012, respectively. In parallel to that, the profile 3 (unsatisfying) went from 12,53% to 28,57% in the same period. This apparent fall in the firms' profile quality during the analyzed years, could be assigned in one hand, to the international financial crisis, and possibly, also to the convergence of the accounting standards to the international standards (IFRS) since 2010.

To confirm the hypothesis, we intended to perform a test of difference of the trienniums 2007-2009 and 2010-2012 average. Because the data from both trienniums does not present normality, it is only possible to gather evidences to confirm this hypothesis, according to the table 4 below.

Table 4 – Financial profile firms' comparison before and after the implementation of IFRS

Period	n	Mean	standard deviation
2007-2009	591	2.3892	1.3009
2010-2012	591	2.7073	1.3112

SOURCE - Created by the authors.

In summary, the above results, do not allow reject the hypothesis 5 (H5), as they do not present normality, but provide suspicions that the convergence of the accounting standards to the international standards (IFRS) caused impact (slight worsening) in the firm's profile after its implementation. As previously mentioned the firm's profile may be impacted by recognition in the statements of obligations, for example, the application of IAS 17, IAS 37 and IFRS 13 and, in terms of converged account procedures, respectively, CPC 06, CPC 25 and CPC 46. We reiterated here that the confirmation of this hypothesis requires the improvement of the analysis undertaken in this research.

4.3 Correlation analysis of the Fleuriet's Model variables and the NOR and EBIT

Initially it was analyzed the correlation between each current variable (FCA, FCL, OCA, OCL, CA and CL) and the two dependent variables in the model, NOR and EBIT. Because the analysis was performed with panel data, we chose to calculate the correlation coefficient (Pearson) to all the analysis period, instead of doing it early. It is note that all the correlations presented significance to 5%.

Table 5 – Correlation coefficients between the variables of the models

Correlation	OCA	FCA	OCL	FCL	CA	CL
NOR	0.94015	0.89189	0.96077	0.92176	0.95139	0.96348
EBIT	0.84936	0.82176	0.87601	0.85721	0.86925	0.86682

SOURCE - Created by the authors.

According to what we observed on table 5, the two dependent variables resent direct relation with the current subgroup variables, with correlation between 89% and 96% to the variable NOR and between 82% to 87% to the variable EBIT, signaling that both are proxies appropriate with the firm's operations.

It is note that the coefficients of operating variables (OCA and OCL) are greater in the two dependent variables over the financial variables (FCA and FCL). These results provide evidences that all the current variables (OCA, OCL, FCA, FCL, CA and LC) have direct relation with the firms' operations.

4.4 Analysis of the relationship of the Fleuriet's Model variables and the NOR and EBIT

With the aim to confirm the evidences, we proceeded with testing the relationship between the Fleuriet's Model variables and the dependent variables of the model by regression with the panel data. First, we performed the Hausman test in the dependent variables to identify if the appropriate model would be Random Effects (RE) or the Fixed Effects (FE). According to (GREENE, 2008) the hypothesis of this test are:

$$H_0 : \alpha_i \text{ is not correlated with the explanatory variables (Random Effects - RE)}$$

$$H_1 : \alpha_i \text{ is correlated with the explanatory variables (Fixed Effect - FE)}$$

The test was done in both panels (NOR and EBIT) and the null hypothesis was rejected in both, indicating the model of fixed effects is the best appropriate panel model. Beside this test, it was done the Test F, indicated to identify which method is more appropriate to estimate regression: a multiple linear regression model estimated

via Ordinary Least Squares (OLS) or a model of fixed effects estimated via OLS in differences. The null hypothesis admits homogeneity in the constant (pool hypothesis) and the alternative hypothesis, the heterogeneity in the constant (fixed effects).

$$H_0 : \alpha_1 = \alpha_2 = \dots = \alpha_i \text{ (multiple linear regression)}$$

$$H_1 : \alpha_1 \neq \alpha_2 \neq \dots \neq \alpha_i \text{ (fixed effects)}$$

This test was also done in the two panels and the null hypothesis was rejected, confirming the fixed effects model was more appropriate, with this, continuing with the data panel characteristics. The econometric tests were performed in the Stata software. To facilitate the analysis we chose to present the data to each hypothesis and the dependent variables.

Table 6 presents the results of the test of hypothesis 1 (H1), which aims to identify if the financial current assets and liabilities are related or not with the firm's operations. The statistical significance of both financial variables (FCA and FCL) with the proxies of the firm's operations (NOR and EBIT) leads to this hypothesis rejection, signaling these variables are related with the firm's operations. A factor to be considered, is the low power of explanation of the dependent variables, when it is observed R² (intra) which is appropriate when it is worked with panel data estimated with fixed effects. According to the observation, 25,91% and only 6,55% variability of the net income and from EBIT respectively, are explained by the current financial variables.

Table 6 – Panel Data Results with fixed effects for CFA and CFL

NOR				EBIT			
Variables	Coefficient	Standard Error	p> z	Variables	Coefficient	Standard Error	p> z
Constant	2,134,988	184,453.1	0.000	Constant	756,688.2	63,182.89	0.000
ACF	0.41931	0.08456	0.000	ACF	-0.19493	0.02896	0.000
PCF	3.40877	0.20683	0.000	PCF	0.43386	0.07085	0.000
R ²	0.2591 (intra); 0.9219 (between); 0.8703 (total)			R ²	0.0655 (intra); 0.0782 (between); 0.0431 (total)		
Obs.	1,182			Obs.	1,182		
Prob. > F	0.0000	F(196-983)	12.51	Prob. > F	0.0000	F(196-983)	9.23

Notes: 1. p>|z| matches the probability value associated with statistical Z of each estimated coefficient.; 2. The R-square is subdivided into intra and between firms and total; 3. Prob. > F when < 0,05 indicates the appropriate model is the FE; 4. F-Statistic – test if all $\alpha_i = 0$, in other words, if there is no fixed effect, compared with the pool hypothesis.

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Table 7 presents the results of the test with hypothesis 2 (H2), which aims to identify if the operating current assets and liabilities are related or not with the firm's operations. Similarly to the variables of financial nature, the statistical significance of the two operating variables (OCA and OCL) with the two proxies of the firm's operations (NOR and EBIT) also leads to the rejection of this hypothesis, signaling that these variables have direct relation with the firm's operations. It is note the power of explanation of NOR variable, when it is observed the R² (intra), of 70,05%. But when it is observed the EBIT variable, only 5,98% of its variability is explained by the OCA and OCL variables.

Table 7 – Panel data results with fixed effects for ACO and ACL

NOR				EBIT			
Variables	Coefficient	Standard Error	p> z	Variables	Coefficient	Standard Error	p> z
Constant	1,146.283	127.110,2	0,000	Constant	433,694,3	68,689,42	0,000
ACO	1.42434	0,06705	0,000	ACO	0,07576	0,03624	0,037
PCO	1.61011	0,16540	0,000	PCO	0,27253	0,08938	0,002
R ²	0,7005 (intra); 0,9558 (between); 0,9340 (total)			R ²	0,0598 (intra); 0,8721 (between); 0,7764 (total)		
n	1,182			n	1,182		
Prob. > F	0,0000	F(196-983)	16,11	Prob. > F	0,0000	F(196-983)	7,78

Notes: 1. p>|z| matches the probability value associated with statistical Z of each estimated coefficient.; 2. The R-square is subdivided into intra and between firms and total; 3. Prob. > F when < 0,05 indicates the appropriate model is the FE; 4. F-Statistic – test if all $\alpha_i = 0$, in other words, if there is no fixed effect, compared with the pool hypothesis.

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With regard the hypothesis 3 (H3), which aims to identify if the current assets and liabilities are related or not with the firm's operations. Just as the financial and operating variables, the statistical significance of the current asset and liability (CA and CL) with the two proxies variables of the firm's operations (NOR and EBIT) also leads to the rejection of this hypothesis, signaling that these variables are directly related with the firm's operations. According to what is observed in table 8, the power of explanation of NOR variable, when it is observed the R² (intra) is 60,23%. But when it is observed the EBIT variable, only 5,32% of its variability is explained by the CA and CL variables.

Table 8 – Panel Data Results with fixed effects for CA and CL

NOR				EBIT			
Variables	Coefficient	Standard Error	p> z	Variables	Coefficient	Standard Error	p> z
Constant	304,522.9	149,263.9	0.042	Constant	424,824.1	70,247.28	0.000
AC	0.71623	0.04324	0.000	AC	-0.06074	0.02035	0.003
PC	1.61037	0.09882	0.000	PC	0.33248	0.04651	0.000
R ²	0.6023 (intra); 0.9570 (between); 0.9377 (total)			R ²	0.0532 (intra); 0.8579 (between); 0.7658 (total)		
n	1,182			Obs.	1,182		
Prob. > F	0.0000	F(196-983)	11.23	Prob. > F	0.0000	F(196-983)	6.88

Notes: 1. p>|z| matches the probability value associated with statistical Z of each estimated coefficient.; 2. The R-square is subdivided into intra and between firms and total; 3. Prob. > F when < 0,05 indicates the appropriate model is the FE; 4. F-Statistic – test if all $\alpha_i = 0$, in other words, if there is no fixed effect, compared with the pool hypothesis.

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The results found in this research allow state that both operational and financial current accounts are related with the firm's operations. However, apparently the operational accounts present greater power of explanation of variability of the firm's operations proxies.

The results found in this research go towards the results of Medeiros and Rodrigues (2004), suggesting the nonexistence of distinction between financing and operation assets and liabilities, assumed by Fleuriet's Model. However, according to Michel Fleuriet's argument (2005), the model developed by him aims the operating and financing (liquidity) performance management and that such differentiation stems from corporate cycles, in other words, the different sectors of the firms' activities. In this direction, recent researches like the Costa and Garcias (2009) – pulp and paper industry; Guimarães and Nossa (2010) – health insurance providers, Machado et al. (2010) – dairy industries; Silva et al. (2012) – firms from commercial sector and Nascimento et al. (2012), reiterated the power of the model to an effective WC management of the firms.

4.5 Sector analysis of the relationship between the Fleuriet's Model and the NOR and EBIT

In this section the results that aim confirm or refute the hypothesis 4 (H4) are presented, that the Fleuriet's Model assumptions are supported when segments the analysis by sectors. For this, the sample of 197 firms was divided in 15 sectors, some of which were grouped according to their similarities as regards the undertaken analysis (table 9).

Table 9 – Sample sectors

Sectors	Number of firms	Dummy
Eletric Power	19	DS_1
Food	11	DS_2
Construction / Engineering	23	DS_3
Textile, Clothing, Shoes	18	DS_4
Industries (Several)	36	DS_5
Metallurgy / Iron / Mining	12	DS_6
Oil / Petrochemical / Chemical	7	DS_7
Retail	11	DS_8
Properties / Highways Exploration	13	DS_9
Telecommunication / TI	10	DS_10
Transport / Logistics	8	DS_11
Holding	5	DS_12
Various Services	15	DS_13
Wood / Pulp and Paper	5	DS_14
Sugar / Alcohol / Agribusiness	4	DS_15
Total	197	

Due to the problem of space and as in most of the models the Hausman test was indefinite, in other words, it did not point which estimation procedure was more appropriate, if fixed effects or random effects, we chose to present the results of this analysis in aggregate. Table 10 summarizes the sectors in which the Hausman test identified the fixed effect as the most appropriate procedure.

Table 10 – Panel data results with fixed effects for industries

NOR				EBIT			
Variables	Coefficient	Standard error	p> z 	Variables	Coefficient	Standard error	p> z
ACO_DS1	-----	-----	-----	ACO_DS1	0.16166	0.04181	0.000
PCO_DS1	-----	-----	-----	PCO_DS1	-0.17567	0.07307	0.016
ACF_DS1	0.01195	0.05115	0.816	ACF_DS1	-----	-----	-----
PCF_DS1	0.10041	0.02759	0.000	PCF_DS1	-----	-----	-----
AC_DS1	0.54347	0.15103	0.001	AC_DS1	-----	-----	-----
PC_DS1	0.60274	0.10454	0.000	PC_DS1	-----	-----	-----
ACO_DS2	-----	-----	-----	ACO_DS2	-0.46681	0.06990	0.000
PCO_DS2	-----	-----	-----	PCO_DS2	10.4858	0.10153	0.016
ACO_DS3	0.41999	0.041798	0.000	ACO_DS3	-----	-----	-----
PCO_DS3	0.69384	0.143547	0.000	PCO_DS3	-----	-----	-----
ACF_DS3	1.27034	0.25765	0.000	ACF_DS3	-----	-----	-----
PCF_DS3	1.22650	0.15713	0.000	PCF_DS3	-----	-----	-----
AC_DS3	0.57325	0.05428	0.000	AC_DS3	-----	-----	-----
PC_DS3	-----	-----	-----	PC_DS3	-----	-----	-----
ACO_DS5	1.59623	0.16071	0.000	ACO_DS5	0.11776	0.05351	0.029
PCO_DS5	-0.55331	0.20187	0.007	PCO_DS5	-----	-----	-----
AC_DS5	0.76808	0.08205	0.000	AC_DS5	-----	-----	-----
PC_DS5	-----	-----	-----	PC_DS5	-----	-----	-----
ACO_DS7	1.44702	0.24959	0.000	ACO_DS7	-0.19318	0.10122	0.065
PCO_DS7	2.56744	0.78564	0.003	PCO_DS7	-----	-----	-----
ACF_DS7	0.96831	0.34155	0.008	ACF_DS7	-----	-----	-----
PCF_DS7	7.54452	1.23892	0.000	PCF_DS7	-----	-----	-----
AC_DS7	0.66932	0.56271	0.000	AC_DS7	-----	-----	-----
PC_DS7	2.37180	0.56165	0.000	PC_DS7	-----	-----	-----
ACF_DS9	-----	-----	-----	ACF_DS9	-----	-----	-----
PCF_DS9	1.32800	0.12352	0.000	PCF_DS9	-----	-----	-----
ACO_DS12	-----	-----	-----	ACO_DS12	0.29489	0.08464	0.002
PCO_DS12	-----	-----	-----	PCO_DS12	0.47134	0.18646	0.019
ACF_DS12	-----	-----	-----	ACF_DS12	-0.40605	0.21946	0.077
PCF_DS12	-----	-----	-----	PCF_DS12	-----	-----	-----
AC_DS12	-----	-----	-----	AC_DS12	0.42391	0.08290	0.000

SOURCE - Created by the authors.

Regarding the hypothesis 1 (H1), which aims to identify if financial assets and liabilities are not related with the firm's operations, the results found were inconclusive and signalize the sectors 1 (only FCL), 3 and 7 (proxy NOR) present statistical signification. While the FCA sectors 1 and 9 (proxy NOR) and sectors 7, 12 and 14 (proxy EBIT) and FCL sectors 7, 12 and 14 (proxy EBIT) do not present statistical significance, what allow the H1 to be rejected.

Despite also being inconclusive, the results point to the operating variables (OCA and OCL) are related with the firm's operations (NOR and EBIT), in 6 sectors, the variables OCA and OCL were statistical significant (NOR and EBIT). The results without statistical significance in the sectors 3, 5 and 6 did not allow reject H2.

Similar results were also observed with the variables CA and LC, which presented the significance only in a few sectors, especially to the variable LC, which did not present statistical significance in 4 sectors. Thus, the H2 can not be rejected.

It must be considered that the results presented above are preliminary and must be refined in future research, with the use of other statistical tools to test the theoretical hypotheses placed on the Fleuriet's Model.

5. CONCLUDING REMARKS

In this research we empirically tested the assumptions on which the Fleuriet's Model is supported, and it was proposed a refinement of research by Medeiros and Rodrigues (2004). The empirical research was performed with a sample of 197 Brazilian listed firms, using annual data from 2007 to 2012.

We finding that most sampler firms present a financial balance situation in the analyzed period (64,4% with $T > 0$), similar result that is shown in the analysis of NWC of conventional financial analysis (80,1% with $NWC > 0$) attests, initially, validity of the diagnostic of financial balance that Fleuriet's Model provides. We observed a decrease in the percentage of firms with financial balance in the 2007-2009 to the 2010-2012 triennium (average decreases from 76,13% to 52,63%), specially to the years of 2009 and 2010 (from 75,1% to 54,3%) which signals to a possible break with the convergence of the Brazilian accounting standards with the international standards (IFRS), evidence that deserves to be study in future researches. It is note that the international financial crisis may also have influenced the performance of the firms during this period.

Brazil joined the IFRS in 2008 and this changes introduced in Brazilian accounting are regarding recognition, measurement and disclosure of various elements considered in the dynamics of WC, on which from this paper is to be evolved. The study on the existence of impacts on the assumptions on which the Fleuriet's Model is supported due to the application of sophisticated standards, for example, the IFRS 13 (and in domestic terms, the CPC 46), that measures the fair value, deserves deep studies.

Were gathered suspicions that convergence of accounting standards to international standards (IFRS) impacted the firms' profile, causing, a slight worsening, but without being able to reject the hypothesis 5 (H5), due to the absence of statistical significance. It was considered that the predominant financial profile is solid, with 44,2% of the total and that 65% of the firms during the analyzed period present desirable financial balance (excellent and solid profiles). Worsening similar to the observed in the T variable occurred with the financial profiles during the analyzed period, explained also by the changes in accounting standards and the international financial crisis.

In the test of the assumptions of Fleuriet's Model, that the operational and financial current accounts (CA, CL, OCA, OCL, FCA and FCL) are related to the firms' operations (NOR and EBIT) revealed that all of them are related, but the operational have more power of explanation than financial accounts. These results are similar to Medeiros and Rodrigues (2004). It is note that the analysis of this relationship in sectors was more consistent with the model assumptions because the FCA and FCL variables showed the greatest number without statistical significance (not confirming the relationship with the firm's operations).

Given these findings, the question still remains in an interesting topic and at the same time important for academia and business world. The purpose of this research was not to contes the validity of Fleuriet's Model, but to present new evidence on the subject, proposing improvements in the existing literature. The results presented in this study are preliminary and will be refined to target in future research, both in theoretical terms, as in methodological terms.

The empirical contribution of this study is in the above reported results, while its academic contribution lies in the fact to address a topic that does not have many researches in Brazil, despite the wide dissemination and academic practice model. The doubt on the validity of Fleuriet's Model persists and certainly instigates further research.

It should be noted finally that on the one hand, the analytical contribution of Fleuriet's Model, with its effective simplification in the financial analysis, that through the study of only three variables (WC, WCR and T) provides a relatively accurate diagnostic of the financial situation of a firm, because of this, gaining acceptance in academia and business scenario; on the other hand, it has to be considered that the fact that it manipulates few variables, makes it restrictive for certain types of analyzes that are only possible from balance sheet analysis indicators, continuing those, therefore, to have its validity and space in the financial business analysis.

REFERENCES

- BRAGA, R. Análise avançada do capital de giro. *Caderno de Estudos FIEPECAFI*, São Paulo, n. 3, v. 3, p. 1-34, set. 1991.
- BRASIL, H. V.; BRASIL, H. G. *Gestão financeira de empresas: um modelo dinâmico*. 4. ed. Rio de Janeiro: Qualitymark, 2002.
- COMITÊ DE PRONUNCIAMENTOS CONTÁBEIS (CPC). Pronunciamentos Contábeis. Disponível em: <<http://www.cpc.org.br>>. Acesso em: 25 outubro 2014.
- COSTA, F.; GARCIAS, P. M. Concentração de mercado e desempenho das indústrias brasileiras de papel e celulose – recorrendo à modelagem de Fleuriet para analisar o paradigma ECD. *Revista de Contabilidade e Organizações*, v. 3, n. 6, p. 143-163, mai./ago. 2009.
- FLEURIET, M. *A Dinâmica financeira das empresas*, um novo método de análise, orçamento e planejamento financeiro. 2. ed., Belo Horizonte, Fundação Dom Cabral, 1980.
- _____, M. Fleuriet's rebuttal to "questioning Fleuriet's model of working capital management on empirical grounds". *Social Science Research Network*, Rochester USA: SSRN, Jun. 2005.
- FLEURIET, M.; KEHDY, R.; BLANC, G. *O Modelo Fleuriet: a dinâmica financeira das empresas brasileiras*. Rio de Janeiro: Campus, 2003.
- GREENE, W. H. *Econometric analysis*. 6th. ed. Upper Saddle River, New Jersey: Prentice Hall, 2008.
- INTERNATIONAL ACCOUNTING STANDARDS BOARD (IASB). Disponível em: <<http://www.iasb.org>>. Acesso em: 26 outubro 2014.
- JOHNSTON, J.; DINARDO, J. *Econometrics methods*. 4th ed. University of California, Irvine McGraw-Hill International Editions, Chapter 12, p. 388-411, 1997.
- GUIMARÃES, A. L. S.; NOSSA, V. Capital de giro, lucratividade, liquidez e solvência em operadoras de planos de saúde. *Brazilian Business Review*, v. 7, n. 2, p. 40-63, mai./ago. 2010.
- HICKS, J. R. *The crisis in Keynesian economics*. Oxford: Basil Blackwell, 1974.
- MACHADO, M. A. V.; MACHADO, M. R.; CALLADO, A. L. C.; JÚNIOR, J. B. A. Análise dinâmica e o financiamento das necessidades de capital de giro das pequenas e médias empresas localizadas na cidade de João Pessoa/PB: Um estudo exploratório. *BASE – Revista de Administração e Contabilidade da Unisinos*, v. 3, n. 2, p. 139-149, maio-agosto, 2006.
- MACHADO, E. A.; GARCIAS, P. M.; ALMEIDA, L. B.; MORCH, R. B.; BACARJI, A. G. Desempenho operacional-financeiro e concentração de mercado sob o enfoque do paradigma estrutura-conduta-desempenho: um estudo exploratório na indústria brasileira de laticínios no período de 1997 a 2006. *Brazilian Business Review*, v. 7, n. 1, p. 118-140, jan./abr. 2010.
- MARQUES, J. A. V. C.; BRAGA, R. Análise dinâmica do capital de giro: o modelo Fleuriet. *Revista de Administração de Empresas*, São Paulo, v.35, n.3, p. 49-63, mai./jun. 1995.
- MARQUES, J. A. V. C. Análise financeira das empresas: liquidez, retorno e criação de valor. Rio de Janeiro, Editora UFRJ, 2002, 336 p.
- MEDEIROS, O. R.; RODRIGUES, F. F. Questionando empiricamente a validade do Modelo Fleuriet. *BASE – Revista de Administração e Contabilidade da Unisinos*, v. 1, n. 2, p. 25-32, set./dez. 2004.
- MEDEIROS, O. R. Questioning Fleuriet's Model of working capital management on empirical grounds. *Social Science Research Network*, Rochester, USA: SSRN, Apr. 2005.
- NASCIMENTO, C.; ESPEJO, M. M. S. B.; VOESE, S. B.; PFITSCHER, E. D. Tipologia de Fleuriet e a crise financeira de 2008. *Revista Universo Contábil*, Blumenau, v. 8, n. 4, p. 40-59, out./dez. 2012.
- SILVA, J. P. *Análise financeira das empresas*. 10. ed. São Paulo: Atlas, 2010.
- SILVA, J. O.; SANTOS, V.; HEIN, N.; LYRA, R. L. W. C. Nível informacional entre a análise tradicional e avançada do capital de giro. *Revista Pretexto*, v. 13, n. 2, p. 40-56, abr./jun. 2012.
- STARKE JÚNIOR, P. C.; FREITAG, V. C.; CHEROBIM, A. P. M. S.; A erraticidade das contas circulantes financeiras: uma resposta a questões sobre o Modelo Fleuriet. *RIC – Revista de Informação Contábil*, v. 2, n. 3, p. 43-60, jul./set. 2008.
- THEISS JÚNIOR, F. C.; WILHELM, P. P. H. Análise do capital de giro: modelo Fleuriet versus modelo tradicional. In: ENCONTRO DA ASSOCIAÇÃO NACIONAL DE PÓS-GRADUAÇÃO E PESQUISA EM ADMINISTRAÇÃO, 24., 2000, Florianópolis (SC). *Anais...* Rio de Janeiro: ANPAD, 2000.
- WOOLDRIDGE, J. M. *Introdução à econometria: uma abordagem moderna*. São Paulo: Cengage Learning, 2006, p. 684.