Financial Sustainability Analysis of Agri-Food Firms Improving ICRS with an NFP Repayment Approach

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Abstract: The Interest Coverage Ratios (ICRs) are ratios that are applied in various situations of life of the company; these ratios enable to evaluate the payment of the cost of debt and therefore are useful for the assessment of the sustainability of the business cycle and are used as covenants in financing transactions. The objective of this study is to expand the traditional methodology of calculation of ICRs following the recent development of the ICRs calculated by applying the financial approach and then develop ICRs to quantify the ability to repay financial debt (NPF_EICRs and NFP_FICRs). The ratios proposed in the research are applied on a sample of agri-food firms in Italy; in fact, agri-food firms often have high capital intensity. The evaluation of sustainable management is particularly important in particular to test the ability of repayment of the debt. The analysis showed that ICRs and FICRs are not always correlated with ratios NPF_EICRs and NFP_FICRs. This result shows that the assessment of sustainability of management, carried out with traditional ICRs can be integrated effectively with the ratios proposed in the study, particularly with the aim to evaluate firms' ability to repay the debt. The research can be further developed by analyzing in other sectors, firms characterized by lower capital intensity to determine whether the obtained results could be confirmed in such firms.

Key words: Interest Coverage Ratios (ICRs), Financial Interest Coverage Ratios (FICRs), agri-food firms, financial cycle, financial sustainability

INTRODUCTION

Financial ratios have been applied to analyze the performance of companies around the world for more than a century. In fact, financial ratios allow to make comparisons between companies' management efficiency and are often more significant than absolute values. Financial ratios were used by the end of the 19th century to evaluate firms' credit rating and subsequently have been used, since the beginning of the 20th century to evaluate the performance of enterprises according to the traditional approach of DuPont decomposition (Ohlson, 1980; Hillegeist et al., 2004). Subsequently, the financial ratios have also had an application in bankruptcy prediction literature which began with the seminal research by Altman (1968) that tried to explain corporate bankruptcy in the United States applying financial ratios. Among the financial ratios, the Interest Coverage Ratios (ICRs) had developed in particular to quantify the cost of debt. Some studies (Dichev and Skinner, 2002; Gray et al., 2006; Demerjian, 2011) have shown that the ICRs are frequently used as financial covenants in the term sheet of financial operations, expressed as EBIT or EBITDA to Interest Charge (IC) ratio that are the most important financial covenants in terms of frequency. About this topic, many researches were conducted about the theme of firms' capacity to sustain the financial cycle paying IC; traditionally for this purpose, ICRs are applied that express the firm's capacity to pay the cost of debt using profit margins, EBITDA and EBIT in particular. However, this approach does not calculate correctly because EBIT and EBITDA do not directly express Cash Flow (CF) but approximates it. Researchers mean in this case, ICRs calculated with the economic approach (EICRs). It could then be useful to modify the traditional approach to ICR ratios, considering a financial-based approach. In this second approach are applied financial flows such as CF, Operating CF (OCF) and the Unlevered Free CF (UFCF), to calculate the capacity of firms to pay IC. This is referred to ICRs calculated with financial approach (FICRs). However, both approaches, EICRs and FICRs, consider only the payment of the cost of debt (IC) and do not consider the repayment of the Net Financial Position (NFP). It may be useful to also consider the ICRs that

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consider the ability of firms to reduce debt; these ones have particular importance in the case of firms where it is over-indebted or in which there is an interest in reducing the financial debt or where researchers are forced to reduce financial debt on the basis of contracts with banks (typically mortgage amortization). In the case of NFP target, still established as optimal in terms of the ratio between debt and equity (DER), there is no need to reduce NFP with repayments because NFP has already reached its optimum value and then there is no utility in calculating the here proposed ratios. Therefore, research has been developed in the first place, addressing the perfection of some ratios, ICRs that can be applied also to evaluate the ability to repay NFP and not only to pay IC. The ratios developed in the research are then applied to a sample of firms operating in the agro-food sector in Italy. The sample is composed of 500 companies on a series of 5 years for a total of 2,500 observations. The application to the agri-food firms is particularly interesting because these types of firms are characterized by high capital intensity (Iotti and Bonazzi, 2014a). About this topic in recent years, several studies have already been conducted to quantify the cost-effectiveness of agro-food firms' management, particularly for firms of typical production in Italy (Tudisca *et al.*, 2013, 2014a, b; Sgroi *et al.*, 2014; Tudisca *et al.*, 2014a, b; Iotti and Bonazzi, 2014b, c). Often in these firms investments are determined by the biological cycle of production which requires large investments in building, machinery and equipment, even to ensure the processing of raw material. Again, the agro-food firms often have difficulties in working capital cycle; the expansion of the working capital cycle is in fact often determined by the needs of capital for the aging cycle of the agro-food products, particularly for cold cuts, cheese and wine firms. This increase in working capital need is also due to the long duration of the cycle of trade receivables with respect to the large retail chains. Again, the agro-food firms in Italy are often Small and Medium-sized Enterprises (SMEs) which often have limited access to financial market as shown by several studies (Grablowsky, 1984; Dunn and Cheatham, 1993; Peel and Wilson, 1996; Molina and Preve, 2009). These firms suffer by difficulties in varied order; first, firms in the sector often do not control the market price of the finished product, even if the manufacturing market is often highly fragmented and the production is sold to the final consumer via retail chains. Rare are the cases in which manufacturers sell directly their production on the market. These companies diner difficulty to control production costs; in fact, the relevant cost of supply of raw materials and the variability of the market price are critical elements of the management.

Firms' management must then assess the firm's performance to quantify whether these are sufficient to ensure the sustainability of the business cycle in terms of payment of cost of debt. In agro-food firms, this assessment is even useful because of the time lag that exists between the economic cycle and the financial cycle which can lead to strategically wrong decisions with the risk of firms' default, particularly if firms operate in a cooperative form (Chaddad *et al.*, 2005; Bonazzi and Iotti, 2014).

MATERIALS AND METHODS

The approach to the sustainability evaluation of the investment is a synthesis of the economic approach and financial approach as it aims at quantifying the project's ability to operate during a long time. Moreover, the approach to the assessment of sustainability of the business cycle is also important in evaluating creditworthiness, since the possibility of a firm to have credit access is based on the ability of this to persist over time, honoring the financial commitments generating positive CFs; this flow needs to be higher than the absorption of liquidity during management cycle and because of debt service. This consideration starts the relevance of financial evaluation of sustainability; it is an approach that aims (among others) to evaluate the right balance between cash inflow and outflow. The approach moves from the cash principle which states that the variable under investigation is not the creation of value over time (in accordance with the accrual principle) but the time of entry and exit money, applying cash-based approach. The approach to the sustainability of debt service, therefore has the objective to quantify the ability of the business cycle to generate positive CFs to sustain the burden of financial debt so it is possible to ensure that the positive CFs are able to provide time over time of the payment of interest expense on debt and repayment of maturing debt. The assessment of sustainability of debt service was also held as part of the assessment on the credit risk; the possibility of access to credit is based in fact also on a firm's ability to meet its financial commitments with generation of positive CFs determined by the higher absorption of liquidity management and debt service. The assessment of sustainability of debt servicing has therefore been analyzed with particular emphasis in the business plans when high investments are central to assessing the financial ability to repay the borrowed debt.

In the qualification of sustainability ratios, the assessment proposes ratios with an income-based approach (economic approach) and others with financial

approach (CF approach); the less the differences between the economic cycle and financial cycle are the more congruent the performance will be alternately, either by using one of the two approaches. It is necessary to consider that the ratios calculated with reference to the income approach considers a value creation approach according to the principle of accounting accrual while the ratios calculated with reference to the financial methodology have liquidity creation as central interest as the principle of the generation of financial CFs. The basis for the assessment of sustainability with economic approach is the analysis of intermediate profit margin level, analyzing the income statement EBITDA and EBIT are particularly considered to quantify the sustainability; EBITDA is operating income excluding noncash costs (depreciation and amortization) and expresses an operating income margin that is often used as a proxy corporate liquidity as it is net of depreciation and amortization in this way, EBITDA is frequently used as a margin that approximates the firm's liquidity, even as a covenant in bank financing operations moreover, this situation needs stability in the relationship between economic cycle and financial cycle having that a change in the level of production and a change in the policy of inventories, receipts and payments may also determine a significant difference between EBITDA and OCF. Even EBIT (i.e., operational income inclusive of nonmonetary costs, expressing total operating income margin) is frequently used in the calculation of the sustainability ratios for the business cycle. About this point, we have to consider first that both ratios are affected by the absorption or release of liquidity due to the cycle of working capital and therefore are also used in the calculation of sustainability that other ratios calculated, deriving from CF statements as expressing directly the financial liquidity generated by the firm in order to apply this approach, financial margins as CF, OCF and UFCF are directly considered.

The basis for the assessment of sustainability with income approach is the analysis of intermediate profit margins level, analyzing the income statement to quantify the sustainability, EBITDA and EBIT are particularly considered; EBITDA is operating income excluding noncash costs (depreciation and amortization) and expresses an operating income margin that is often used as a proxy corporate liquidity as it is net of depreciation and amortization. In this way, EBITDA is frequently used as a margin that approximates the firm's liquidity, even as a covenant in bank financing operations moreover, this situation needs stability in the relationship between economic cycle and financial cycle having that a change in the level of production and a change in the policy of

inventories, receipts and payments may also determine a significant difference between EBITDA and OCF. Even EBIT (i.e., operational income inclusive of nonmonetary costs), expressing total operating income margin is frequently used in the calculation of the sustainability ratios for the business cycle. The ratios most frequently used for assessing the sustainability of the business cycle as ICRs with the economic approach (EICRs) are calculated by taking EBIT or EBITDA in the numerator as an intermediate income margin available for the payment of the cost of debt in terms of IC; the formula is as follows:

$$EICR_1 = \frac{EBITDA}{IC}; EICR_2 = \frac{EBIT}{IC} \qquad (1)$$

In Eq. 1, we call $EICR_1$ the ratio between EBITDA and IC and applying a more conservative approach, thus, it is EBITDA≥EBIT; $EICR_2$ is the ratio between EBIT and IC; then it is $EICR_1≥EICR_2$. The ICR has as a bottom line the unit value, then the equilibrium condition in the sustainability of the business cycle has as a necessary condition that $EICR_1$, $EICR_2>1$. However, the necessary condition is also not a sufficient one; in fact, since (D+A)≥0≥EBITDA≥EBIT, at least, it is necessary to make the necessary condition as follows: $EICR_1≥EICR_2>1$. In addition, because the company also has to cover the payment of taxes (T) and the payment of the debt principal (K), it is required that the minimum value of $EICR_1$ and $EICR_2$ takes into account these financial commitments. About this point, we have to consider first that both ratios are affected by the absorption or release of liquidity due to the cycle of working capital and therefore are also used in the calculation of sustainability that other ratios calculated as expressing directly, deriving from the CF statement, the financial liquidity generated by the firm. In order to apply this approach, financial margins such as CF, OCF, UFCF and Free CF to Equity (FCFE) are directly considered. It is necessary to remember that the application of the statutory annual account which considers accounting principles, requires the adoption of accounting rules as the cost's principle in the assessment of investment. The same effects occur because of tax law interference on the formation of balance sheet values. Even for these aspects, it could be preferable to calculate ICRs applying a financial approach. The ratios calculated considering an income approach (thus having income values as scope for the sustainability of the business cycle such as EBITDA and EBIT) are used much more often in operative applications in banking and financial sustainability ratios with income approach. Again, if we would apply a financial approach, thus considering financial margins instead of economic margins, it is

necessary to consider margins that directly express the source of cash available, calculated using the financial statement. These ratios are called Financial ICRs (FICRs) and have CF, OCF and UFCF in the numerator; the equation is as:

$$FICR_1 = \frac{CF}{IC}; FICR_2 = \frac{OCF}{IC}; FICR_3 = \frac{UFCF}{IC} \quad (2)$$

In Eq. 2, we call $FICR_1$ the ratio between CF and IC and again, if we would consider Net Working Capital (NWC) absorption, it is to apply and approach as $FICR_2$ in which the numerator is a financial margin as OCF that takes into account the variation of Net Working Capital (NWC) (in fact, we have $CF \pm \Delta NWC = OCF$ in a given period). At the end, if the firm is capital intensive, particularly in Fixed Asset (FA) value, we could consider a third $FICR_3$ that considers capital absorbed or generated in FA investment (NFA), comparing UFCF with IC (in fact, we have $OCF \pm \Delta NFA = UFCF$ in a given period). If these three FICRs have a minimum value that is the unit value, then the equilibrium condition in the sustainability of the business cycle has as a necessary condition that $FICR_1$, $FICR_2$, $FICR_3 \geqslant 1$ but the necessary condition is not also a sufficient condition because as the company is facing even the payment of taxes and the payment of the principal of the debt (K), it could be required that the minimum value of FICRs takes into account these financial commitments.

In order to quantify firms' capacity to pay the cost of debt, even repaying loans' principle, the so-called Debt Service Coverage Ratios approach (DSCR) is sometimes applied, particularly in Project Financing operations (PFs); this last approach puts as numerator economic (EBITDA or EBIT) or financial (generally OCF or UFCF) flows to quantify firms to pay cost of debt (IC) plus debt repayment contractually defined by bank contracts in the given period (K). However, to calculate DSCR ratios, it is necessary to perfectly know contracts between firms and banks and even have available loans mortgage plans. This condition is rarely verified in research plans, particularly when the database covers only public data, deriving from annual budget filled in the company register. In fact, the DSCR is particularly applied in analyzing PF operations with ex ante approach on business plan documents, then perfectly having the availability of loans mortgages. In the research, researchers would then extend the exposed approach suggesting that it could be useful not only to quantify interest coverage but also to quantify NFP repayment's capacity. To achieve this goal, we would suggest a new class of ICRs that we call NFP_CRs that is NFP coverage ratios, thus expressing firms' capacity to repay NFP, after IC payment. In fact, ICRs, both EICRs and FICRs do not quantify NFP repayment but only IC coverage. We then suggest (Iotti and Bonazzi, 2012) these two following ratios:

$$NFP\_EICR_1 = \frac{EBITDA\text{-}IC}{NFP}; NFP\_EICR_2 = \frac{EBIT\text{-}IC}{NFP} \quad (3)$$

In Eq. 3, we call NPF_EICR_1 the ratio between EBITDA net of IC and NFP; applying a more conservative approach, NPF_EICR_2 is the ratio between EBIT net of IC and NFP. NPF_EICR_1 and NPF_EICR_2 express, respectively which part of NFP could be freely paid in a given year using economic margins (EBITDA and EBIT) net of IC. We can express the same concept applying financial flows as follows:

$$NFP\_FICR_1 = \frac{CF\text{-}IC}{NFP}; NFP\_FICR_2 = \frac{OCF\text{-}IC}{NFP};$$
$$NFP\_FICR_3 = \frac{UFCF\text{-}IC}{NFP} \quad (4)$$

In Eq. 4, we call NPF_FICR_1, NPF_FICR_2, NPF_FICR_3, respectively the ratio between CF, OCF and UFCF net of IC and NFP. These three ratios express, respectively which part of NFP could be freely paid in a given year using financial margins (CF, OCF and UFCF) net of IC.

RESULTS

The analysis was conducted on a sample of 500 agri-food firms in accordance with the classification of the National Institute of Statistics of Italy (ISTAT); sample firms' are active in the form of a corporation and have a seat in Italy in eight regions of Northern Italy (Valled'Aosta, Liguria, Piemonte, Lombardia, Emilia-Romagna, Veneto, Trentino-Alto Adige and Friuli-Venezia Giulia). Annual budget data were randomly extracted from the annual accounts in the AIDA database; time series covers the 5 years period from 2009-2013 and uses the annual accounts filed by companies' register each year. We consider a total of 2,500 firm-year observations. The data analysis was performed using the SPSS Statistical Package Issue 19. All extracted firms are limited company as defined in the Italian Civil Code (in the sample, cooperative firms are not included). The descriptive analysis considers the annual account of the firms in the financial reclassified form. Average data show that firms have high investment in FA for €875,992 which is 62.12% of Total Asset (TA) while NWC is €322,845 which is 26.93% of TA. The balance sheet of the sample firms evidences an undercapitalization, so that Equity capital (E) is €258,663 that is 21.58% of Total Source (TS) while NFP 78.42% of TS as €940,174.

In Table 1, we expose descriptive statistics of economic margins (EBITDA and EBIT) and financial margins (CF, OCF and UFCF), then calculate considered ICRs (EICRs, FICRs, NFP_EICRs and NFP_FICRs). The analysis of the firm's sample shows that the intermediate income margins (EBITDA and EBIT) have average values higher than the financial margins (particularly in respect to UFCF). Only CF is higher than economic margins EBITDA and EBIT. The analysis shows that the application of intermediate margins (EBITDA) could overevaluate available financial margins. In particular, the investment in FA as expressed by UFCF, absorbs a substantial amount of liquidity of the sample firms as it is expressed by negative median value of UFCF (-€2632) while OCF and EBIT have positive median values (+€145,294 and +€112,351, respectively). The analysis confirms that firms operating in the agri-food system are characterized particularly by investment in FA, so that UFCF median is negative, expressing the inability of firms to cover debt service. This is a typical situation for companies characterized by high capital requirement in which the evaluations of sustainability could not be done applying income margins (EBITDA and EBIT) but it could be more correct to apply financial margins directly.

The data in Table 1 also show that the EICRs have similar values compared with $FICR_1$ and $FICR_2$; EIC_1 and FICR1 have values >3 while $EICR_2$ and $FICR_2$ have values around 2, even if $FICR_2$ is lower in the media and in the median, compared with $EICR_2$. However, $FICR_3$ is <1 as a mean value and thus shows that the financial flow UFCF is not able to pay the cost of debt while $FICR_3$ median is negative. In general, the analysis showed that sample firms have difficulty in paying the cost of debt. In fact, on a sample of 2500 observations, $EICR_1$>1 in 2,127 cases,

$EICR_2$> in 2,008 cases, FCR_1>1 in 2,229 cases, FCR_2>1 in 1,501 cases and FCR_2>1 in 908 cases. To analyze the ability to repay the debt were calculated NFP_EICRs and NPF_FICRs; these ratios show that NFP_EICR_1 and NPF_FICR_1 overestimate this capacity; NFP_EICR_1 has in fact, mean values 0.147 and 0.146 while the median value NFP_FICR_1 has a mean value of 0.139 and a median of 0.160. The application of these ratios indicates that the sample firms are able to repay NFP in 7 years or so but this result certainly overestimates the repayment capacity of the sample firms.

In fact, the NFP_EICR_2 has mean values 0.074 and 0.100 while the median value NFP_FICR_2 has a mean value of 0.061 and a median of 0.057. The values of the two ratios appear different and NFP_EICR_2 is higher than NFP_FICR_1; the application of these ratios indicates that the sample firms are able to repay NFP in about 10 years, calculating with NPF_EICR_2 whereas it takes >16 years according to the indication of NFP_FICR_2. Finally, NFP_FICR_3 has negative data, both in the mean value (NFP_FICR_3) and the median value (NFP_FICR_3); the consideration of UFCF and net of IC for the reimbursement of NFP is the application of the calculation researchers consider the most correct and the specific results are very different than the other four ratios. researchers would remember that ICR>1 ensures firms' capacity to pay cost of debt (IC) while NFP_ICR>0 ensures firms' capacity to repay NFP after cost of debt payment.

In Table 2, we calculate the correlation between the ICRs applying a parametric approach (Pearson correlation). Kolmogorov-Smirnov D statistic on normality of distribution showed that all distributions of the ICRs follow the normal, so it was not considered necessary to apply a non-parametric approach such as Spearman's Rho test. We consider a total of 45 correlations of which 10 are highly correlated (correlation significant at 0.01 level applying a 2-tailed test) while four are moderately correlated (correlation significant at 0.05 level applying a 2-tailed test); 31 correlations are not statistically significant. Researchers note in particular, significant correlations between $EICR_2$, $FICR_2$ and other financial ratios; the correlations between the ratios NFP_EICRs, NFP_FICRs and other financial ratios and EICRs FICRs are not very significant. In fact, out of a total of 25 correlations, only seven are significant, affecting in particular NFP_EICR_2, NFP_FICR_2 and NFP_FICR_3.

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Table 1: Descriptive statistics of annual account values and ICRs ratios

Parameters	N. Stat	Val.			
		Mean	SD	Median	SD
EBITDA	2500	208220	24558	185221	34558
EBIT	2500	137665	32486	145294	31864
CF	2500	200330	34850	196542	68544
OCF	2500	124552	32168	112351	42957
UFCF	2500	62099	24553	-2632	4864
IC	2500	65114	12854	60122	3105
NFP	2500	970174	351984	851022	21656
$EICR_1$	2500	3.198	0.898	3.081	0.124
$EICR_2$	2500	2.114	0.568	2.417	0.455
$FICR_1$	2500	3.077	0.221	3.269	0.122
$FICR_2$	2500	1.913	0.549	1.869	0.845
$FICR_3$	2500	0.954	0.288	-0.044	0.652
NFP_EICR_1	2500	0.147	0.157	0.146	0.124
NFP_EICR_2	2500	0.074	0.965	0.100	0.258
NFP_FICR_1	2500	0.139	0.122	0.160	0.364
NFP_FICR_2	2500	0.061	0.045	0.057	0.197
NFP_FICR_3	2500	-0.003	0.095	-0.073	0.312

Firm data and researchers' elaboration

Table 2: Correlation between ICRs (EICRs, FICRs, NPF_EICRs and NFP_FICR$_2$), parametric approach (Corr. Pearson)

ICRS (EICRs, FICRs, NFP_EICRs and NFP_FICRs)	EICR$_1$	EICR$_2$	FICR$_1$	FICR$_2$	FICR$_3$	NFP_EICR$_1$	NFP_EICR$_2$	NFP_FICR$_1$	NFP_FICR$_2$	NFP_FICR$_3$
EICR$_1$										
Corr. Pearson	1									
Sig. (2-tailed)										
EICR$_2$										
Corr. Pearson	2.001*	1								
Sig. (2-tailed)	0.048									
FICR$_1$										
Corr. Pearson	2.221*	0.676	1							
Sig. (2-tailed)	0.027	0.511								
FICR$_2$										
Corr. Pearson	0.844	3.354**	1.230	1						
Sig. (2-tailed)	0.412	0.001	0.211							
FICR$_3$										
Corr. Pearson	0.755	1.640	1.646	0.332	1					
Sig. (2-tailed)	0.562	0.118	0.110	0.855						
NFP_EICR$_1$										
Corr. Pearson	1.961*	0.680	0.675	0.845	1.645	1				
Sig. (2-tailed)	0.049	0.501	0.500	0.395	0.099					
NFP_EICR$_2$										
Corr. Pearson	1.644	3.332**	0.754	3.377**	0.842	0.012	1			
Sig. (2- tailed)	0.196	0.001	0.442	0.001	0.400	0.985				
NFP_FICR$_1$										
Corr. Pearson	1.778	0.059	0.840	0.322	0.333	0.732	3.357**	1		
Sig. (2-tailed)	0.851	0.901	0.392	0.869	0.859	0.455	0.001			
NFP_FICR$_2$										
Corr. Pearson	1.288	2.807*	0.751	3.001**	0.660	0.122	3.775**	0.752	1	
Sig. (2-tailed)	0.975	0.005	0.552	0.003	0.536	0.853	0.001	0.439		
NFP_FICR$_3$										
Corr. Pearson	0.665	2.994**	0.601	0.851	3.112**	.098	2.889**	0.544	4.551**	1
Sig. (2-tailed)	0.522	0.004	0.534	0.387	0.002	0.877	0.004	0.579	0.001	

**Value significant at the 0.01 level (2-tailed); *Value significant at the 0.05 level (2-tailed); the processing of directly collected data

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DISCUSSION

In Italy, the agri-food firms are characterized by a high absorption of capital, particularly due by investments in FAs and working capital. The necessary source of capital are retrieved with direct contribution of the entrepreneur as equity capital or applying to debt capital market. The cost of debt can be implicitly onerous as in the case of trade payables or explicitly onerous as in the case of financial debt. It is therefore necessary to evaluate the CFs generated from operations to quantify whether it is sufficient to ensure the sustainability of the business cycle. This need of evaluation is especially relevant in SMEs which are disadvantaged in the capital market access. Small firms have difficulty in acquiring capital by banks because they are characterized by less transparency of information and even because bank analysis has an excessive cost in relation to the return on capital loaned. To achieve this goal in the analysis, ratios based on income margins and ratios calculated considering various CF measures were applied. This

analysis in particular is useful for agri-food firms of the sample because of their balance characteristics, namely, high capital investment in FA, difference between income and financial margins and reduced CF after FA capital expenditure. The sample data show that the economic margins (EBITDA and EBIT) and primary financial margins (CF and OCF) are often considered to be similar in enterprises; mainly, EBITDA is coupled to CF while EBIT is coupled to OCF. The analysis shows that UFCF does not fit any margin. This result is very significant because it shows that the sample firms in the evaluation of the sustainability of the financial cycle conducted with traditional economic margins, EBITDA and EBIT are not significant as these margins differ from UFCF. In the same way, however, even the financial margins CF and OCF differ significantly from UFCF. This difference is necessarily determined by the absorption of capital for investment in FAs; then the study has confirmed that the agri-food businesses, even according to the research data have high investment in FAs and firms in the sample have the characteristic of being capital intensive. Sustainability evaluation, for these companies should therefore only be conducted using UFCF as other economic (EBITDA and EBIT) and financial (CF and OCF) margins are significantly different and higher, than UFCF. Research data show that on 2,500 observations, EBITDA>0 in 2,290 observations, EBIT>0 in 2,181 observations, CF>0 in 2,343 observations, OCF>0 in 1,755 observations while UFCF>0 in 1,178 observations; the research has then shown that a sustainability analysis, carried out by applying economic margins as a proxy of financial margins does not correctly fit but rather overstates the cash generation. However in the same way, even the financial margins, OCF and CF do not quantify correctly, overestimating the generation of CF because of the high absorption of capital investment in FAs. Only UFCF then correctly quantifies the absorption of capital. This finding is significant because the firms in the sector evaluate financial sustainability applying income margins and rarely use CF statement for the analysis. The analysis of sample firms shows a low correlation between EICRs ratios (EICR$_1$ and EICR$_2$) and FICRs (FICR$_1$, FICR$_2$ and FICR$_3$). This result confirms the descriptive statistics because it shows that positive income margins do not lead to equally positive financial result and even between these two approaches, there is no correlation of results. Moreover, the analysis of the sample data has allowed us to make some important reflections which can even be deepened in future research. In fact, research has shown that EICR$_1$ is poorly correlated with other ICRs (0.05 correlated level (2-tailed) with EICR$_2$ and FICR$_1$) while it is not correlated with FICR$_2$ and FICR$_3$ which are the most important ICRs. It is then clear that EICR$_1$, very often applied in the covenants of the banks for the formation of the term sheet is an index that is not reliable. EICR$_2$ is strongly correlated with FICR$_2$, even if it is not correlated with FICR$_3$. This result requires a more detailed study as EBIT and OCF have been considered for many years as reliable indicators of cash generation of the firms; the outcome of the research indicated that it seems that even these last two margins are however an imperfect indicator of financial sustainability of the management cycle. The application research of ratios NFP_EICRs NFP_FICRs allows some further reflections. First, we would remember that these ratios express how much of the debt (NFP) can be repaid in a given year after the cost of debt (IC) is paid. This information may not be necessary where the company has already reached an optimal financial structure in terms of relationship between NFP and equity. However, this analysis is relevant if the company has a sub-optimal financial structure as what often happens in SMEs and capital-intensive enterprises. On this point, we must consider the fact that a correlation between EICRs/FICRs and NFP_EICRs/NFP_FICRs does not necessarily exist; in fact, EICRs/FICRs express the ability to pay the cost of debt while NFP_EICRs and NFP_FICRs express the ability to repay NFP once the cost of debt is paid. Sometimes in fact, there are situations in which the company is able to pay the cost of debt but the available CF is very low to repay NFP. The research, about this topic has shown an interesting result, namely, that of the 25 correlations between EICRs (two ratios)/FICRs (three ratios) and NFP_EICRs (two ratios)/NFP_FICRs (three ratios), only seven are statistically significant.

CONCLUSION

The research aimed to apply ICRs to a sample of agro-food firms operating in the Northern part of Italy; these firms are characterized by high level of investment in FAs often financed with financial debt. The goal of the research is to quantify the ability to pay the cost of debt by applying even useful ratios to quantify firms' capacity to repay NFP, then suggesting a new approach to ICRs analysis. In the research, two approaches have been applied on a sample of 2,500 observations (series of 5 years of 500 enterprises), even applying analysis of correlation. First, the research shows that agro-food firms have often difficulties to cover the cost of financial debts.

This difficulty emerges clearly by applying the calculation of FICRs. Among all ICR ratios, FICR$_3$ appears to be preferable as the only ratio that correctly quantify firms' capacity to pay the cost of debt; this ratio has UFCF as numerator, then correctly considers the CF

absorption in the cycle of the FA investment. The analysis shows that $EICR_1$ and $EICR_{,2}$ although, very common in business practice and bank analysis, overestimate the sustainability of the business cycle; these EICRs provide higher results compared with real data. The application of ratios NFP_EICRs NFP_FICRs has shown that of the 25 correlations between EICRs (two ratios)/FICRs (three ratios) and NFP_EICRs (two ratios)/NFP_FICRs (three ratios), only seven are statistically significant. This lack of correlation shows that NFP_EICRs and NFP_FICRs are relevant and necessary on their calculation, even when firms already calculated EICRs and FICRs. In fact, even if the companies are able to pay the cost of debt from the calculation of EICRs and FICRs, we have no sufficient information about the ability to repay NFP. Such, information can be obtained only by calculating NFP_EICRs and NFP_FICRs and among these indices, the calculation NFP_FICR_3 is surely preferable. The assessment of ability to pay NFP has shown that $FICR_3$ and NFP_FICR_3 in addition to being highly correlated are also characterized by greater reliability in the assessment of the sustainability of the management cycle in capital-intensive firms such as firms in the sample of agro-food firms as analyzed.

The research, however has some limitations; in fact, the analysis was conducted on a relatively small sample of firms and it should be noted moreover that in Italy, companies active as sole proprietorships or nonlimited companies are not required to file in the register of companies the annual budget and for this reason were not included in the sample. It would then be useful to extend the analysis to these forms of firms. Again, the suggested methods could be applied to other countries even in developing countries in order to understand if the theme of the ICRs and NFP_ICRs is important even in countries characterized by nonmature financial market and even by market fragmentations.

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REFERENCES

Altman, E.I., 1968. Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. J. Finance, 23: 589-609.

Bonazzi, G. and M. Iotti, 2014. Agricultural cooperative firms: Budgetary adjustments and analysis of credit access applying scoring systems. Am. J. Applied Sci., 11: 1181-1192.

Chaddad, F.R., M.L. Cook and T. Heckelei, 2005. Testing for the presence of financial constraints in US agricultural cooperatives: An investment behaviour approach. J. Agric. Econom., 56: 385-397.

Demerjian, P.R., 2011. Accounting standards and debt covenants: Has the balance sheet approach led to a decline in the use of balance sheet covenants? J. Account. Econ., 52: 178-202.

Dichev, I.D. and D.J. Skinner, 2002. Large-sample evidence on the debt covenant hypothesis. J. Account. Res., 40: 1091-1123.

Dunn, P. and L. Cheatham, 1993. Fundamentals of small business financial management for start up, survival, growth and changing economic circumstances. Managerial Finance, 19: 1-13.

Grablowsky, B.J., 1984. Financial management of inventory. J. Small Bus. Manage., 22: 59-65.

Gray, S., A. Mirkovic and V. Ragunathan, 2006. The determinants of credit ratings: Australian evidence. Aust. J. Manage., 31: 333-354.

Hillegeist, S.A., E.K. Keating, D.P. Cram and K.G. Lundstedt, 2004. Assessing the probability of bankruptcy. Rev. Account. Stud., 9: 5-34.

Iotti, M. and G. Bonazzi, 2012. EBITDA/EBIT and cash flow based ICRs: A comparative approach in the agro-food system in Italy. Financial Asset Investing, 2: 19-31.

Iotti, M. and G. Bonazzi, 2014a. Tomato processing firms' management: A comparative application of economic and financial analyses. Am. J. Applied Sci., 11: 1135-1151.

Iotti, M. and G. Bonazzi, 2014b. The application of Life Cycle Cost (LCC) approach to quality food production: A comparative analysis in the parma PDO ham sector. Am. J. Applied Sci., 11: 1492-1506.

Iotti, M. and G. Bonazzi, 2014c. Comparative analysis of return on equity and cash flow generation in the parma PDO ham sector. J. Applied Sci., 14: 2460-2475.

Molina, C.A. and L.A. Preve, 2009. Trade receivables policy of distressed firms and its effect on the costs of financial distress. Financial Manage., 38: 663-686.

Ohlson, J.A., 1980. Financial ratios and the probabilistic prediction of bankruptcy. J. Account. Res., 18: 109-131.

Peel, M.J. and N. Wilson, 1996. Working capital and financial management practices in the small firm sector. Int. Small Bus. J., 14: 52-68.

Sgroi, F., A.M. Di Trapani, R. Testa and S. Tudisca, 2014. Strategy to increase the farm competitiveness. Am. J. Agric. Biol. Sci., 9: 394-400.

Tudisca, S., A.M. Di Trapani, F. Sgroi and R. Testa, 2013. The cost advantage of Sicilian wine farms. Am. J. Applied Sci., 10: 1529-1536.

Tudisca, S., A.M. Di Trapani, F. Sgroi and R. Testa, 2014a. Organic farming and economic sustainability: The case of Sicilian durum wheat. Quality-Access Success, 15: 93-96.

Tudisca, S., A.M. Di Trapani, F. Sgroi and R. Testa, 2014b. Economic evaluation of PDO introduction in Sicilian orange farms. Quality-Access Success, 14: 99-103.