

Is there a relationship between debt and profitability? Evidence from dairy industry in Serbia

Da li postoji veza između duga i profitabilnosti? Primer industrije mleka u Srbiji

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Abstract

This paper analyzes if there is a relationship between debt and profitability in the dairy sector in Serbia. The research analyzed the period from 2017 to 2021, on a sample of all 16 large and medium dairy companies. Large and medium companies cover around 90% of total dairy production in Serbia. The Generalized Method of Moments (G.M.M.) is used to analyze the effect of debt indicator DR on the profitability ROA. Analyzed is if there is a linear relationship between two indicators and then a nonlinear one. Results showed that there is a linear and negative impact of debt indicators on the profitability of the observed dairy firms. Results showed that the nonlinear relationship is not statistically significant. Both models show the positive impact of company size and growth potential on profitability, while tangibility and inflation do not have a significant impact.

Keywords: debt, profitability, dairy, Serbia, G.M.M.

Sažetak

Rad analizira da li postoji uticaj zaduženosti na profitabilnost preduzeća u industriji mleka Srbije. Istraživanje obuhvata period od 2017. do 2021. godine, a uzorak čine svih 16 velikih i srednjih firmi pomenute industrije. Velika i srednja preduzeća pokrivaju više oko 90% ukupne mlekarske proizvodnje u zemlji. Metod generalizovane metode momenata (G.M.M.) je primenjen za analiziranje uticaja zaduženosti na profitabilnost preduzeća (ROA). Istraženo je da li postoji linearan a potom i nelinearan odnos duga i profitabilnosti. Rezultati istraživanja pokazuju da je uticaj duga na profitabilnost negativan, linearan i statistički značajan dok nelinearan odnos nije statistički značajan. Efekat veličine preduzeća i potencijala rasta prodaje na profitabilnost je pozitivan i statistički značajan, a materijalnost imovine i inflacija nemaju značajan efekat.

Кljučне речи: dug, profitabilnost, mlekarska industrija Srbije, G.M.M.

1. Introduction

Capital structure


Every market-oriented company measure its performance. Management role is to investigate which factors influence on business development and success and to make decisions accordingly. Most used internal indicator for measuring long term performance of company is profitability, in their paper Knežević et al. (2022, p. 66) examined the influence of four profitability indicators. Profitability trends can be useful for the company managers, its owners but also investors (Mitrović et al., 2021, p.121). Many papers are focusing on analysing and

explaining internal and external factors that impact on profitability.

Modigliani & Miller (1958) stated that capital structure is irrelevant as market value of company does not depend on its capital structure. Their theory believes that capital market is perfect so there is no taxation impact on profits and therefore choice between debt or capital funding does not have implications on capital expenses nor firm value. In 1963 they revised the theory by including taxes as there are tax advantages when companies are using debt financing. In revised theory is stated (Modigliani & Miller, 1963) that if interest on debt is tax-deductible, companies can maximize their value by taking loans. In

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pecking order theory (Myers & Majluf, 1984, p196 and p210) is concluded that companies prefer internal source of financing because of existing of asymmetric information (separation of management and ownership) and fact that management acts in interest of passive stockholders. In case external financing is needed companies prefer debt to equity. Decisions depends on minimizing the risk and cost, pointing that managers prefer internal finance instead of external. Myers & Majluf (1984, p.215) stated that in situations when managers have more information than investors "...managers will favour debt over equity financing if external capital is required".

Kraus & Litzenberger (1973) suggests trade-off theory where companies can choose and trade-off between external founding and tax saving on one side and costs related with external founding (costs from additional borrowing) on other side. They imply on existence of optimal (targeted) level of leverage. Taxable companies should rely on increasing debt level till margin value of tax shield is neutralized by financial distress costs.

Agency based theory (Jensen & Meckling, 1976) explains the important relations between agents (company executives) and principals (shareholders). When manager own 100% of equity, the decisions will maximize the utility of the company and his own, when manager does not have full ownership of the company, he will make decisions to maximize his utility portion of ownership (Jensen & Meckling, 1976, p. 8). Principals relies on agents' decision and agency costs are real (Jensen & Meckling, 1976, p72) as any other costs. Agency consists of monitoring expenditures, bonding expenditures, and residual loss (Jensen & Meckling, 1976, p6).

Incentive-Signalling Approach was introduced by Ross (1977) stating that when financial leverage increases the value of companies grows, too. Regardless the asymmetric information any issue of debt will be perceived positively on the market. Creators of market timing theory (Baker & Wurgler, 2002, p.27) stated that capital structure of company is "cumulative outcome of past attempts" at stock market. According to this theory companies issue new stock when price is high (overvalued) and repurchase once is low (undervalued), resulting in price variations of stock and companies' capital structures. This theory stated high effect of leverage on profitability and company value but is relevant only for companies which are publicly traded.

Capital structure theories imply existence of relations between capital structure and company value and profitability. Many research papers have studied the mentioned relations and theories through sets of variables in many different areas.

Dairy industry

Agricultural sector benefits to national economy through production contribution. Production of food on domestic market reduces importing and ensures availability of food. It has impact on economy by being connected to different

sectors (Dašić et al, 2022) and contributes to foreign trade, rural development, and employment (Dašić et al, 2022).

Serbian agricultural sector reports cumulative growth of 10.1% in 10-year period (2011-2021) according to the Statistical Office of the Republic of Serbia (Economic accounts for agriculture in the Republic of Serbia, 2022), but in 2021 is reported decline in agricultural gross value added by 6.2%. Agricultural sector in Serbia is very important for national economy as it contributes around 8% of total Gross Domestic Product (GDP), which is more than in EU. According to Eurostat statistics on Performance of agricultural sector (Eurostat, 2022) agricultural contributed 1.3% to the EU's Gross Domestic Product (GDP) in 2021. The value of produced output was EUR 449.5 billion and 12.9% of output came from milk.

Yearly on 25.000 farms in Serbia is produced 1.5 million tonnes of milk according to the National program for agriculture (Ministry of agriculture, forestry, and fishing, 2022) and 97% is cow milk. Milk production has decreasing tendency in last 10 years. In 2021 milk participates 4.8% in total agricultural output at current prices, comparing to 6-7% in previous 10-year period. Only 57% of produced milk is distributed to dairy factories and the rest is used for own consumption and production on farms or for sale on non-formal market.

The dairy processing industry in Serbia is highly concentrated due to fact that 10% of producers (large and medium processors) cover around 90% of production capacities (National program for agriculture, 2022, p.39). In 2020 in Serbia were active 139 small dairy processors (155 in total) according to Serbian Business Registers Agency (SBRA). Expected is further decrease in number of small processors as they will not be able to meet required quality standards and/or meet profitability.

According to the European Dairy Association report for 2021 and outlook for 2022 (European Dairy Association, 2022) supply of dairy products decreased but prices have risen to highest level since 2007. Dairies in EU27 delivered around 145 million tonnes of cow milk in 2021 and 2022. The limited supply may have impact on a further increase in prices of milk and dairy products. However, consumption is expected to decrease due to high-cost increase, including energy.

Leading by research conducted by Blazková & Dvouletý (2018) goal of this research is to confirm if there is linear or non-linear impact of debt to profitability of dairy industry in Serbia. Statistically significant relation of debt to profitability of dairy sector in Serbia is analysed with generalized method of moments estimation model (GMM).

The paper is organized as follows: Section 2 presents a brief theoretical and empirical review of capital structure and impact on profitability, Section 3 the research data, methodology and variables description, Section 4 presents model results and discussion, and last Section presents conclusion.

2. Theoretical and empirical background

Research papers that are analysing relationship between debt and profitability do not have consistent results. Some research demonstrate **negative relationship** between indebtedness and profitability like Czech food processing industry, highlighting that companies should concentrate to debt policy to avoid worsening the competitive position and declining credibility (Blazková & Dvoutely, 2018, p.41); food processing (meat and milk) industry in Serbia (Dakić et al., 20219, p.498), emphasizing that results can be used by wide range of stakeholders for creating strategy; agricultural companies in Nigeria (Dioha & Kamaluga, 2019); listed agricultural companies in China (Liu et al, 2020) and Swedish dairy farm industry (Bergmark & Dahlber, 2015). Milošev (2021) confirms negative relationship of leverage and profitability on example of large companies in Serbia. Negative impact of debt on ROE is confirmed by Stryckova (2017, p.106) in six business sectors in Czech, including Agriculture, fishery, and forestry.

Baum et al., (2014, p.12) show that increase in reliance on short-term debt has **positive impact** and is leading to an increase in profitability of German manufacturing companies from Bundesbank database. Liu et al., (2020, p.309) on example of 39 listed agricultural companies in China showed that long term debt has positive impact on profitability, but leverage (total debt in total asset) has negative impact indicating that long term liability can improve, and debt ratio can hinder profitability in agricultural sector in China. Mijić & Jakšić (2017) show positive impact of leverage to profitability of agricultural firms in Hungary, Romania and Bosnia and Herzegovina. Singh & Bagga (2019) show positive impact on 50 listed companies in India.

Optimal debt level or nonlinear (concave) relationship is showed in papers by Margaritis & Psillaki (2007) on example on New Zealand firms; Ngo et al., (2020, p.840) on listed companies in Vietnam, showing that linear negative effect exists and even stronger non-linear effect. Basdekis et al. (2020, p.123) showed that leverage at low level has positive impact and after optimal level negative. Research was made on EU automobiles and parts sector and optimal level of debt is calculated at 47.3%. Raharja & Mranani (2019, p.8) showed positive quadratic impact of listed companies in Indonesia and Jaisinghani & Kanjilal (2017, p.163) for manufacturing companies in India.

3. Research methodology

Data

This paper analysis if there is linear and nonlinear impact of debt management indicators to profitability of dairy industry in Serbia for five-year period 2017-2021. Selection is based on following criteria:

- Main activity is C10.5 – Manufacture of dairy products (Regulation of Classification of Economic Activities, Sl. glasnik RS, 2010).

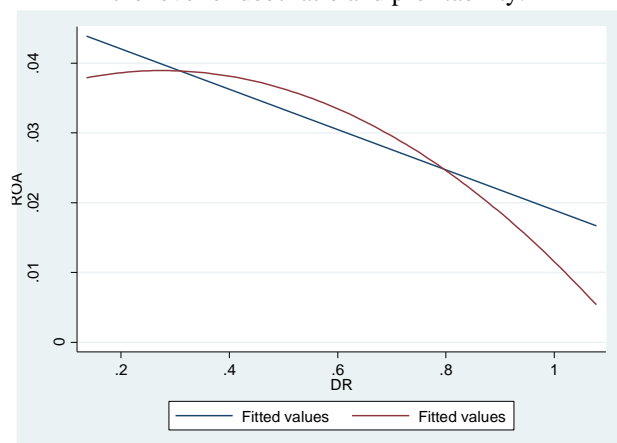
- Large and medium size companies in 2020 according to article 6 Accounting Law (Accounting Law, Sl. glasnik RS, 2021) as they cover 90% of total dairy production in Serbia.
- Active companies.

Data were collected from Serbian Business Registers Agency and 16 companies met required criteria. The final database was prepared by author, including manual calculation of ratios. Sample consist of 16 companies (N=16) and time is five (T=5) which provides 80 company-year observations.

Variables

The selection of all variables in this paper was made on the basis on literature review. For **dependent variable** in chosen profitability which can be calculated in different ways. In this research, Return on Assets (ROA) is used. As **independent variable** is used Debt ratio (DR). The Curve estimation regression model is presented in Figure 1. showing non-linear relationship between the level of debt and profitability. Hence, independent variable DR quadratic (DRsq) is included in the model, same as in papers from Raharja & Mranani (2019), Kebewar (2013), Ngo et al. (2020), Basdekis et al. (2020), and Milošev (2021).

Figure 1. Curve estimation regression model between the level of debt ratio and profitability.



Source: Authors' calculation in STATA

Control variables are included to improve model. The tangibility of assets (Tang) explains if there is impact of tangible assets on profitability. Negative impact show authors Stančić et al., (2016) only in production firms and not in firms engaged in services and Gharaibeh, & Khaled (2020) on service companies listed on the ASE, indicating that investing in tangible assets decreases profitability. The Size (Size) is company assets indicator and explains if asset size has influence on profitability. In their research Basdekis et al. (2020) showed no relationship and on other hand Gharaibeh, & Khaled (2020), and Bergmark & Dahlberg (2015) showed positive relationship and Dakić et al. (2019) showed negative relationship. Jaisinghani & Kanjilal (2017, p 159) showed that companies with higher size have positive and with lower size negative impact. Blažková & Dvoutely (2018) and Dakić et al. (2019)

showed in their research that sales growth (Salesgr) has positive impact on profitability in Czech food processing industry and Serbian processing industry respectively. To consider the macroeconomic impact variable is inflation (Inf) is included in the model, source is the report from National Bank of Serbia (NBS, 2022). Research results on

inflation effect on profitability are not consistent. No impact of inflation to profitability is showed in paper Milošev (2021) and positive impact is shown in paper Pervan et al. (2019).

Table 1. Selected variables

Variables	Measurement	Reference
Return on Asset (ROA) (dependent variable)	Net profit / Total asset	Blažková & Dvouletý (2018); Bergmark & Dahlberg (2015); Dakić et al., (2019); Singh & Bagga (2019).
Debt Indicator (DR) (independent variable)	Total long- and short-term debt / Total assets	Singh & Bagga (2019); Ngo et al., (2020); Dakić et al., (2019); Raharja & Mranani (2019); Milošev (2021), Dioha & Kamaluga, (2019);
Debt Ratio squared (DRsq) (independent variable)	The quadrate of total debt	Kebewar (2013); Ngo et al., (2020); Basdekis et al., (2020); Raharja & Mranani (2019); Milošev (2021).
Tangibility (Tang) (control variable)	Ratio of tangible assets to total asses	Stančić et al., (2016); Gharaibeh, & Khaled (2020); Singh & Bagga (2019).
Size (Size) (Control variable)	Natural logarithm of Total asset	Jaisinghani & Kanjilal (2017), Basdekis at al. (2020), Gabrijelčić at al. (2013), Ngo et al., (2020); Bergmark & Dahlberg (2015).
Sales growth (Salesgr) (control variable)	(Sales _{i,t} - Sales _{i,t-1}) / Sales _{i,t-1}	Blažková & Dvouletý (2018); Dakić, et al., (2019).
Inflation (Inf) (control variable)	Official data from National Bank of Serbia	Milošev (2021); Pervan et al. (2019).

Source: Author illustration (based on Singh & Misra, 2019 and Dakić et al., 2019)

This research explores the influence which debt ratios have on profitability of the observed companies. Following hypotheses are defined:

H1: Correlation between debt ratio and profitability is a linear and negative.

H2: Correlation between debt ratio and the profitability is nonlinear. There is optimal level on which firms maximizes profitability.

Dynamic model is used in this research as dependent variable (ROA) is depending on its past's values. The following empirical model is formulated for H1:

$$ROA_{i,t} = \beta_0 + \beta_1 DR_{i,t} + \beta_2 Tang_{i,t} + \beta_3 Size_{i,t} + \beta_4 Salesgr_{i,t} + \beta_5 Inf_{i,t} + \beta_6 ROA_{i,t-1} + \sum_{n=1}^5 \beta_n dum_{tn} + \eta_i + \varepsilon_{i,t} \quad (1)$$

where i means the amount of studied dairy companies ($i=1...16$) and t is period 2017-2021 (5 years). Profitability (ROA) is dependent and debt ratio is independent variable, tangibility, size, sales growths, and inflation are control variables. Control of bias and inconsistency in dynamic model is assured with presence of the independent variable $ROA_{i,t-1}$ (dependent variable from the previous period). The time dummies (y^*) variable is included in the model to consider the specific

year effect. β are the regression coefficients by independent variables, ε represents a random error.

Quadratic model is formulated to calculate squared debt indicator as effect of nonlinearity formulated by H2.

$$ROA_{i,t} = \beta_0 + \beta_1 DR_{i,t} + \beta_2 DR^2_{i,t} + \beta_3 Tang_{i,t} + \beta_4 Size_{i,t} + \beta_5 Salesgr_{i,t} + \beta_6 Inf_{i,t} + \beta_7 ROA_{i,t-1} + \sum_{n=1}^5 \beta_n dum_{tn} + \eta_i + \varepsilon_{i,t} \quad (2)$$

4. Analysis, results, and discussion

The period from 2017 to 2021 is covered in this paper and data are obtained from Official Financial statements retrieved from the Serbian Business Registry Agency. The final database and ratio analysis was prepared manually.

The Table 2 shows descriptive statistics. Presented are data from 80 observations for large and medium dairy companies in Serbia. Dairy companies have low profitability as an average profitability if 3.15% (5-year period) and most theories believe ROA should exceed 10% and high debt ratios, over 50% (56.36% with a standard deviation 0.2450). The average tangibility of the observed companies is 48.62%, size, is 14.14%, year on year sales growth is 12.13% and inflation is 3.19%.

Table 4. The tendency in paid ad clicking by age
Table 2. Descriptive statistics of dairy industry in Serbia

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	80	.0315282	.0425043	-0.0656838	0.2061711
DR	80	.5635611	.2450016	0.1362107	1.077497
Tang	80	.4861987	.1733787	0.2124391	0.8607304
Size	80	14.1442	1.130972	12.53532	17.88309
Salesgr	80	.1213408	.2302696	-0.1827396	1.078784
Inf	80	.0319476	.024105	0.012514	0.0785101

Source: Authors' calculation based on STATA

The Pearson correlation matrix is presented in Table 3. Matrix shows that there are high and positive correlations between inflation and debt (0,8970), and tangability and sales growth (0,8119) and negative between inflation and tangibility (0,9898), but all relations are not statistically significant. Matrix shows that profitability has negative

and low correlation with debt ratio and inflation, and positive, statistically significant, and low correlation with tangibility, statistically significant and moderate correlation with size and positive and weak with Sales growth.

Table 3. Results of Pearson correlation analysis of dairy industry in Serbia

	ROA	DR	Tang	Size	Inf	Salesgr
ROA	1.0000					
DR	-0.1664	1.0000				
Tang	0.2828*	0.3750*	1.0000			
Size	0.5210*	0.1102	0.2803*	1.0000		
Inf	-0.1000	0.0147	-0.0015	0.0657	1.0000	
Salesgr	0.1652	0.0840	0.0270	-0.1939	-0.0805	1.0000
	0.1431	0.4587	0.8119	0.0848	0.4778	

* Statistical significance at 5% level. *Source:* Authors' calculation based on STATA

Pearson correlation matrix showed absence of multicollinearity between independent variables. Variance Inflation Factor (VIF) is also conducted in STATA. Results (Table 4) presents that there is no multicollinearity problem as results are below 10.

Table 4. Results of VIF multicollinearity test

Variable	VIF	1 / VIF
Tang	1.29	0.773551
DR	1.17	0.858025
Size	1.16	0.861240
Salesgr	1.09	0.918804
Inf	1.01	0.994657
Mean VIF	1.14	

Source: Authors' calculation based on STATA

Further calculations in STATA are showing the problems of heteroskedasticity and the endogeneity:

- serial correlation (DW=1.254515) and
- heteroskedasticity (BP Prob > F= 0.0118 and F (5, 74) = 3.18).

The work around HAC (heteroskedasticity and autocorrelation) GMM was applied. As suggested by Roodman (2009, p.102 and p.129) to work around endogeneity problem is to instrument variable ROA_{i,t-1}.

Two models (H1 and H2) were used to assess if there is impact of debt to profitability and if impact is linear or nonlinear. The models (Table 5 and Table 6) show that G.M.M. estimator is valid: the Hansen test and that second order of autocorrelation is excluded (AR (2) is not statistically significant).

Hypothesis 1 is confirmed, and we can conclude that debt has statistically significant, negative and linear impact on profitability ROA. The same results are shown in paper Dakić et al. (2019) on example of Serbian food processing (meat and milk) companies, Czech food processing industry (Blazková & Dvoulety, 2018), 14 companies from agricultural sector in Indonesia (Hifayat et al., 2020), agricultural firms in China (Liu et al., 2020), 300 large

firms in Serbia (Stančić et al., 2016), six business sectors in Czech, including Agricultural (Stryckova, 2017) and trade firms in France (Kebewer, 2013).

Quadratic model (Table 6) shows nonlinear connection DR and ROA as debt ratio coefficient β_1 is positive 0.045355 (profitability with small values of debt is increasing) and squared debt ratio coefficient β_2 is negative -0.1060428 (profitability for high values of debt is decreasing), but as data are not statistically significant hypothesis 2 cannot be confirmed. The result is in line with Kebewer (2013) research where nonlinear connection was not found within large trade firms, only with small and medium.

Both models show positive and significant effect of dairy firm size and sales growth on profitability. Liu et al., (2020) also confirm that company size has positive influence on example of agricultural firms in China. Blazková & Dvoulety (2018) and Dakić et al., (2019) show that increase in sales growth influence on higher profitability on example of Czech and Serbian food processing companies respectively.

5. Conclusion

All large and medium dairy companies in Serbia were analysed in this paper as they cover around 90% of total dairy production in Serbia. Results of this research showed that average profitability of dairy sector in Serbia is only 3.15% and that there was linear and negative impact of debt indicators (calculated as ratio of total long term and short-term debt in total assets) to the profitability (measured by return on asset) in period from 2017 to 2021. The research determined that any increase of debt in dairy firms leads to lower profitability. The results support pecking order theory that companies should first use retained earnings as internal financing of business activities and not external debt to reduce indebtedness and increase profitability. In addition, the results showed that nonlinear relationship is not statistically significant. Both models showed positive impact of company size and

potential of growth to the profitability, while tangibility and inflation do not have a significant impact.

The limitation of this study can be selected sample i.e., dairy industry which has its specifics as part of

agricultural sector, due to depending on nature. Further research might take into consideration other sectors or longer time periods to explain trends.

Table 5. The influence of debt on profitability– linear model

Variables	ROA	Model two step system GMM	
	Coefficient	Corrected Std. Err.	P> t
ROAI	-.3935259	.294992	0.202
DR	-.0758205	.0229474	0.005**
Tang	.0849532	.0407669	0.055
Size	.0252969	.0077289	0.005**
Salesgr	.1287434	.1480245	0.001***
Inf	-.2452969	.1480245	0.118
No of observations	64	F (8,15)	7.32
No of groups	16	Prob > F	0.001
No of instruments	12	AR (2)	0.492
Year Dummies	Yes	Hansen test	0.453
Obs per group	4		

Note *, ** and *** show statistically significance at the level of 5%; 1% and 0.1%, respectively.

Source: Authors' calculation based in STATA

Table 6. The influence of debt on profitability– nonlinear model

Variables	ROA	Model two step system GMM	
	Coefficient	Corrected Std. Err.	P> t
ROAI	-.3474396	.2760543	0.227
DR	.0405355	.1480753	0.788
DR ²	-.1060428	.1176631	0.382
Tang	.0759754	.0463781	0.122
Size	.0248027	.0078933	0.007**
Salesgr	.1196362	.0362712	0.005**
No of observations	64	F (9,15)	5.10
No of groups	16	Prob > F	0.003
No of instruments	13	AR (2)	0.614
Year Dummies	Yes	Hansen test	0.391
Obs per group	4		

Note *, ** and *** show statistically significance at the level of 5%; 1% and 0.1%, respectively.

Source: Authors' calculation based in STATA

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