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SENSITIVITY OF AGRI-FOOD SECTOR TO THE FINANCIAL CRISIS: EMPIRICAL EVIDENCE FROM A BALKAN COUNTRY

SUMMARY

In post-communist economies, agri-food sector can suffer financial instability in periods of external shocks, such as the global financial crisis of 2008–2010. By applying two different approaches, authors examine the financial response of the listed and unlisted Macedonian agri-food companies to the crisis. The results show that the crisis had no great effects over the Macedonian agri-food companies, except for the reduction of the production volume of the unlisted companies and the decreased investment activities of the listed companies. Finally, this paper suggests an understanding of the financial behaviour of the agri-food companies when faced with systematic risk factors, and sets grounds for further researches in the context of other post-communist economies.

Keywords: Systematic risk, financial behavior, listed and non-listed companies, Republic of Macedonia

INTRODUCTION

Agri-food companies in post-communist economies suffer financial distress in turbulent economic, political and social environments. The most recent external economic shock was the global financial crisis (2008–2010), probably posing significant challenges to the most of the agri-food sectors in the Balkans, such as the Republic of Macedonia.

A number of Macedonian authors have studied the effects of the global crisis on the Macedonian listed companies; however none have portrayed the response of the agri-food companies to this shock. Moreover, there are no empirical evidences on the financial sensitivity of unlisted Macedonian agri-food companies to the financial crisis. In fact, the agri-food sector is predominantly composed of micro, small and medium-sized companies, due to decentralization of the country with the transition process (Simonovska et al., 2014). These are not listed on the stock exchange market, but they play a major role in the Macedonian agri-food sector in terms of overall business activity and especially employment.

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Even a decade after the crisis, the issue of sensitivity of the Macedonian agri-food sector to the global financial crisis remains unclear. Thus, the aim of this study is to examine the financial response of the Macedonian agri-food companies to the financial crisis (2008-2010).

Considering that some of the agri-food companies are stock companies and some are limited liability companies, two objectives underline this research: (1) examining the response of listed Macedonian agri-food companies to the market risk before, during and after the crisis period, and (2) examining if a change has occurred in financial performance of unlisted Macedonian agri-food companies due to the crisis. Since the wine sub-sector is being one of the most prospective agri-food industries in the country, it will represent the case for the unlisted agri-food companies.

The results of this analysis contribute to a better understanding of the financial flexibility of the agri-food companies when faced with systematic risk factors, and set grounds for further national strategic decisions in providing sustainability and development of the agri-food industry. The agricultural sector and the adjacent food industry are very important economic segment of the country, contributing with around 16% to the national GDP (SSO, 2011). Almost 435,500 people, out of a population of 2 million, make whole or part of their income from agri-business activities (EIB, 2016). Finally, the results and analysis may be used as a guideline for related researches in the context of other post-communist economies.

The following section provides description of the materials and methods. The next section presents the results. First, insight in the macroeconomic condition of the country is provided, and second, the underlying results are presented in respect to the objectives. Finally, conclusions are drawn, followed by a short discussion.

MATERIAL AND METHODS

Since the aim of this study is two-fold, two different approaches are applied. First, the level of response of listed companies is assessed by estimation of the systematic risk that each agri-food company faced during this period. The systematic risk (also known as portfolio risk, market risk, or non-diversifiable risk) is the risk that cannot be controlled by company's management, unlike the unsystematic risk that is diversifiable, unique or firm specific risk (Fama and French, 2004). Second, the response of companies with limited liabilities to systematic risk factors is explained through hypotheses testing of the changes in the financial behaviour of unlisted companies (wineries), under the assumption that their financial performance is at certain extent affected by the crisis. Both methods are explained below in a consecutive order.

Measuring the level of systematic risk of listed companies

Beta coefficient (β) measures the sensitivity of stock returns in relation to market returns, which is strongly influenced by the state of the economy. The market model is not based on investment behaviour assumptions, but is examined

as a linear relationship between stock returns and market returns. It has traditionally been estimated by employing a market regression model, thus measuring the level of systematic risk that arises from general factors such as political influences, economic crises, wars, and natural catastrophes, all of which affect every economic entity. In other words, the degree of systematic risk depends on the degree to which a company's revenues are determined by the macroeconomic factors that cannot be controlled by its management.

The model and its interpretation

Risk, as approached herein, equals the variance of historical rates of return in relation to the average rate of return (Hotvedt and Tedder, 1978). In the standard financial literature, the beta value is derived from the CAPM (Capital Asset Pricing Model) or the Sharpe-Lintner-Black model (Sharpe, 1964; Lintner, 1965; Black, 1972). It is expressed as in the following equation (1):

$$\beta_j = \frac{\sigma_j \rho_{jM}}{\sigma_M} \quad (1)$$

Where $\sigma_j \rho_{jM}$ is the systematic risk of company j , and σ_M is the total market risk. Hence, the beta value of company j 's shares is an index of the amount of the company's systematic risk relative to the risk of the market portfolio.

To derive β_i , we constructed a monthly return series for both the stock and the market index, as suggested by Shalit and Yitzhaki (2002). We then used standard regression formula for each agri-food company in the sample. The main equation (2) is:

$$R_i = a_i + \beta_i R_m \quad (2)$$

Where R_i is the return on a stock; a_i is the component of security i 's return that is independent of market performance – a random variable; R_m is the rate of return on the market index – a random variable, and β_i is a constant that measures the expected change in R_i given a change in R_m .

Alternatively, Hotvedt and Tedder (1978) define the intercept α_i as the rate of return of an asset given a stationary market, and β_i as a measure of the volatility of the rate of return of an asset in relation to the rate of return of the market, i.e., it is reflected by the slope of the regression line.

This equation divides the return on a stock into two components: one component is related to the market and is referred to as β_i (the part of the return that is sensitive to market movements), while the other is independent of the market (company specific) and is referred to as α_i (the part of the return that is insensitive to the market returns)

Sample selection of listed companies

The study focuses on the period from June 2007 to June 2010, the time of the financial crisis. Shorter time series give more accurate results for this kind of research; Bradfield (2003) considered that estimates based on many years of historical data may be of little relevance, because the nature of the business risks taken by companies may have changed significantly over a long period.

The sample consists of Macedonian agri-food companies that are listed on the Macedonian stock exchange. Since the Macedonian stock exchange, being an emerging market, is volatile, it was difficult to extract larger sample with continuous series during the estimation period. Some of the listed Macedonian agri-food companies were considered as outliers and were excluded from the analysis. Therefore, the sample consists of the three largest food processing companies and the three largest beverage industries in the country. In addition, two large companies engaged in agri-food processing and trading activities were included in the sample, having been consistently listed on the stock exchange during the whole estimation period. All these companies are dominant in the Macedonian agri-food sector.

Hypotheses testing of the financial behaviour of unlisted companies

The wineries' profitability, liquidity, activity and debt situation is assessed and hypotheses are tested so to observe the change in their financial behaviour, which was affected by the crisis.

Hypotheses setting and statistical tools

The main *alternative* hypothesis is set as follows: 'There is a significant difference in the financial performance of the wineries (more precisely, in their profitability, liquidity, activity and debt condition) before and after the crisis period'. The rejection of the *null* hypothesis confirms an existing change in the financial behaviour of the wineries. This hypothesis is tested through sub-hypotheses testing of the entire set of financial performance indicators (profitability, liquidity, activity, and debt ratios). For this reason, we observed the same sample of wineries for each financial performance indicator during two time periods, i.e. for the year 2008, which determines the pre-crisis period, and for the year 2010 that represents the post-crisis period (the 2009 is the crisis period since the major macroeconomic effects from the crisis were reflected during this year, confirmed with data presented in Table 1).

We conducted the paired *t*-test in Stata 12.0 (StataCorp, 2011) to examine the null hypothesis that there is no difference between the financial condition of the wineries before and after the crisis period. The paired *t*-test is used to compare two population means of two samples in which observations in one sample can be paired with observations in the other sample (Boslaugh, 2012). For those variables with too many outliers, the nonparametric Wilcoxon matched-pairs-ranks test was run, again in Stata 12.0. With this, we tested the equality of matched pairs of observations. We have decided upon this approach due the small sample size.

The paired *t*-test was conducted for the gross profit margin – GPM, the asset turnover ratio – AT, the days in inventory – DI, the inventory turnover ratio – IT, and the debt-to-assets ratio – DTER. Those variables that were not normally distributed were not tested with the paired *t*-test, but with the nonparametric Wilcoxon matched-pairs-rank test (such as, the net profit margin – NPM; the return on assets – ROA; the return on equity – ROE; both liquidity ratios – CLR and QLR; the receivables turnover ratio – RT, and for the debt-to-equity ratio – DTER).

Sample selection of unlisted companies

The sample consists of not listed Macedonian wineries, legally registered as a limited liability companies. The sample was randomly selected and it represents a major part of small and medium sized wineries.

The official financial records on wineries, i.e. the balance sheets and income statements, are provided by the Central Register of the Republic of Macedonia (CRM, 2012). The data are grouped in a panel-database with a total of 45 observations, including nine wineries analysed during the period of five years (2006–2010). The small sample size hindered application of advanced econometric methods of panel data analysis. However, it does not limit application of traditional hypothesis tests.

RESULTS AND DISCUSSION

Macroeconomic overview of the Macedonian economy

The financial crisis first struck the United States of America in 2007, encompassing only one region and one specific financial market at the time. The crisis expanded internationally during 2008 and caused a deceleration in global economic growth (NBRM, 2009). Although the Macedonian economy was not directly affected by the crisis, the country indirectly felt its negative effects, mainly during the last quarter of 2008 and the beginning of 2009. This came as a result from the crisis induced in neighbouring countries, which experienced a decrease in economic activity and consumption (NBRM, 2010). Since Macedonia and its neighbours are traditional trading partners, this situation caused a decrease in export consumption and deterioration in the international position of Macedonian companies. Several macroeconomic indicators confirm the halt in economic performance during 2009 (Table 1).

The crisis that evolved in the economies of Macedonia's trading partners evidently discouraged investment in its private sector. Faced with an insecure export market, investors were not inclined to risk their money. At the same time, bank credit suffered appallingly low annual growth (only 3.5%), a decline of 30.9 percentage points since 2008. However, the banking sector has remained stable during the global financial crisis and the overall negative effects of the crisis were decreased volumes of trade, foreign direct investments and remittances (Rahkola *et al.*, 2009).

In the financial sector, the negative effects of the crisis were most visible in the Macedonian stock market (MSE). Macedonia is an emerging economy and

established the Macedonian Stock Exchange (MSE) four years after gaining its independence, in 1995 (MSE, 2010). The first index (MBI) was introduced in 2001. Since then, the country has gradually introduced market indices weighted with market capitalization. In 2005, the index MBI10 was introduced, which is a price index weighted with market capitalization and refers to companies quoted on the official market. As such, it is suitable for assessment of systematic risk (Bradfield, 2003). In 2007, MSE started to calculate a new index of publicly held companies – MBID, i.e., for companies quoted on the regular market.

Table 1. Macroeconomic indicators of RM, 2005–2009 (www, NBRM, 2009)

Macroeconomic indicator	Units	2005	2006	2007	2008	2009	2010
GDP annual real growth rate	%	4.7	5.1	6.5	5.5	-0.4	3.4
Inflation, end of period (yearly basis)	%	1.2	2.9	6.1	4.1	-1.6	3.0
Unemployment rate	%	37.3	36.0	34.9	33.8	32.2	32.1
Bank credits in private sector (yearly rate of change)	%	21.0	30.5	39.2	34.4	3.5	7.1
Weighted average active interest rates	%	12.1	11.3	10.2	9.7	10.1	9.5
Exchange rate (1 EUR=)	MKD	61.30	61.19	61.18	61.27	61.27	61.51
Trade balance	mil. EUR	-961.1	-1062.2	-1356.5	-1966.9	-1699.8	-1602.2

MSE experienced a sharp decline in both prices and trading volumes (Filipovski, 2008), starting in October 2007, continuing throughout 2008, and reaching its lowest point at the beginning of 2009 (MSE, 2010) (Figure 1). Evidently, the MSE followed developments in the global economy during the crisis period.

In summary, three main factors emerged in this period: (1) the MSE has been to a large extent dependent on the liquidity provided by foreign portfolio investments, (2) the policy of strengthening credit conditions has lowered the available capital for investment in the stock market; and (3) investors did not react to the government's anti-crisis measures.

The responsiveness of agri-food companies to systematic risk

The Macedonian Stock Exchange (MSE) experienced a sharp decline during the financial crisis period, starting in the end of 2007 and reaching its lowest point at the start of 2009. Thus, we portray the response of the listed Macedonian agri-food companies to systematic risk before, during and after the crisis period in a single-country context.

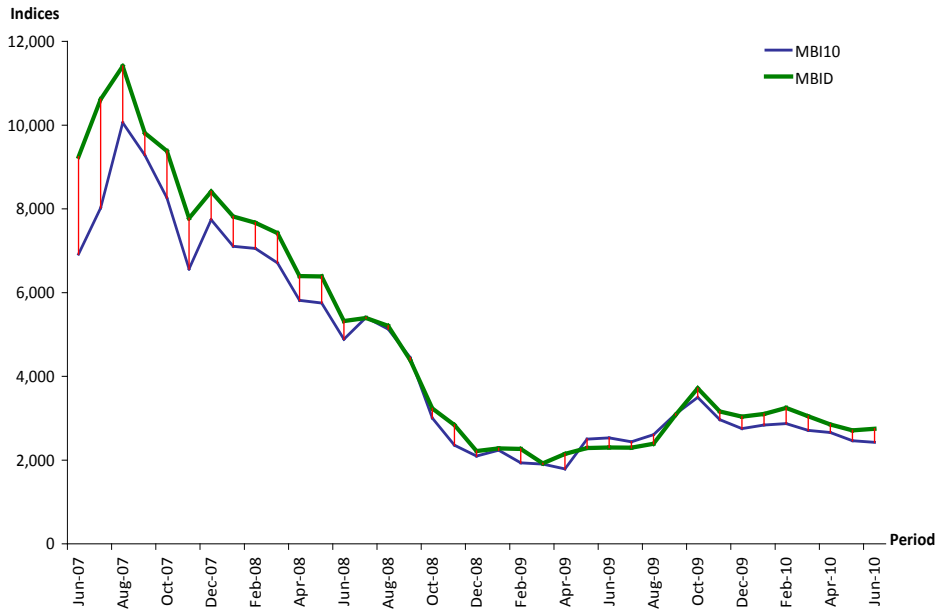


Figure 1. Macedonian stock exchange development, 2007–2010 (www, mse, 2010)

To depict the response of the Macedonian listed agri-food companies in relation to the market during the period of the financial crisis, we used a financial approach to evaluate the level of systematic risk. The theory suggests that the level of the systematic risk depends on macroeconomic factors including crises; therefore, we chose this approach as applicable and relevant to this type of analysis. This model was developed by Sharpe (1964), Black (1965), Lintner (1965), Treynor (1965) and Mossin (1966). Beta coefficient has been widely used by many authors in the financial literature, among them Pogue and Solnik (1974), Blume (1975), Roll (1977), Basu (1977), Banz (1981), Brown *et al.* (1983), Eubank and Zumwalt (1979), Fama and French (1992), Corhay (1992), Bruner *et al.* (1996), Arsov (2008), and Kapusuzoğlu (2008). They all consider that a correlation between security returns is a common response to market changes. For this reason, beta has been and still is considered a useful measure to relate the return on stocks to the return on the stock market index. Accordingly, we emphasized the value of β as a core contributor to fulfilling this aim, while not neglecting the other regression components.

In order to interpret beta, Ross *et al.* (2008) give the following example: ‘If beta of a company is 1.5, means that the returns of this company are magnified 1.5 times over those of the market’. Thus beta expresses a positive value, which means that there is a positive correlation between the company’s shares and the market; so if the market return moves up by 1, the return on the company’s

shares will move by 1.5. On the other hand, if beta is negative, then the correlation is negative, and the return on the market will go in an opposite direction from the return on shares.

Lumby and Jones (2003) explained beta in terms of a share's risk premium, that is, the excess return that must be paid to compensate for the uncertainty of the return's being achieved (Vessey *et al.*, 2006). Following their reasoning, we have set the following 'benchmarks' of companies' beta: $\beta > 1$ if movements in the share's risk premium are likely to be greater than movements in the market portfolio's risk premium, $\beta \approx 1$ if the movements in the shares' risk premium tend to be the same as movements in the market portfolio's risk premium, and $\beta < 1$ if the share's risk premium under-responds to movements in the market portfolio's risk premium.

To calculate the return on the official market, we used the Macedonian stock exchange index MBI10 in a regression relationship with the security returns of the companies listed on this market (Appendix 1). The return on the regular stock exchange was calculated using the index of publicly held companies – MBID (Appendix 2).

The results for both exchange markets are summarized in Table 2. The value of the beta coefficient showed high variations, ranging from 0.26 for Co. 6 to 1.79 for Co. 1, indicating different levels of response by individual companies to market movement during the crisis period. Only one company (Co. 1) over-responded to market movements during this time. This company produces bread and pastry, for which demands is inelastic. On the other hand, demand for the products of the company with the lowest beta (Co.6), mainly confectionery, is more elastic. In the case of Co. 3 and Co. 8, the risk premium moved in parallel with the market portfolio's risk premium; thus they did not achieve excess returns during the crisis in relation to the non-diversifiable risk measured by beta. These companies differ in their core activity, the first being mainly engaged in agri-food trade and retail, the second in the beverage industry. The remaining companies moved more slowly than the market; thus their low level of beta contributed to low stock returns during the crisis period. The beta indicator is suited for analysis of individual cases and comparison between cases, but cannot yield a general conclusion for the whole sector.

The alpha coefficients indicated different levels of non-systematic risk in the market, ranging from -0.01 for Co. 6 to 0.16 for Co. 1. This indicator represents the average return on shares when the market on average does not move; thus investors endeavour to minimize this risk through optimum diversification, which is one of the basic objectives of portfolio management (Kapusuzoğlu, 2008). However, as negative alpha reduces the level of stock returns, buying shares in a company with negative alpha could be considered as a bad investment and could impel shareholders to sell the shares they own (Lumby and Jones, 2003). This situation occurred in four cases (Co. 4, 6, 7, and 8) during the crisis period.

Table 2. Summary of results from the regression estimates on the level of systematic risk

Case	β -value	α -value	R^2
Co.1 (food processing: bread and pastry)	1.7927	0.1612	0.0447
Co.2 (agriculture production and feed processing)	0.7754	0.0115	0.3403
Co.3 (retail and trade in agri-food industry)	0.9489	0.0258	0.3743
Co.4 (processing and wholesale: feed, flour, pastry)	0.4726	-0.0078	0.2426
Co.5 (processing and trade: wine and beverages)	0.5968	0.0291	0.2581
Co.6 (agri-food processing and confectionery industry)	0.2575	-0.0136	0.2234
Co.7 (wine production and local tourism)	0.4886	-0.0295	0.2101
Co.8 (beverage industry: beer and soft drinks)	0.9110	-0.0061	0.4316

The coefficient of determination (R^2), being a measure of the percentage of total risk accounted for by the non-diversifiable, systematic risk, ranged from 0.04 for Co. 1 to 0.43 for Co.8. The share of the systematic risk within the total risk is usually found to be lower than the share of the diversifiable unsystematic risk (Hotvedt and Tedder, 1978; Bradfield, 2003), as revealed in the case of the Macedonian agri-food companies. It is important to stress that in this type of analysis there is no direct relation between beta and R^2 ; hence, high beta does not necessarily produce a high coefficient of determination.

The financial flexibility of the wine sector to economic crisis

The global financial crisis posed significant challenges to the wine industry, considering that wine is an elastic product. For instance, the global financial crisis affected the Greek consumption of wine that went down by 5–20% (Palate Press, 2010). The micro, small and medium sized wineries in emerging countries are more vulnerable to external shocks since their small size and limited resources constrain their financial flexibility in uncertain economic conditions (Skorvagova and Pasztorova, 2014). Understanding the level of their financial stability during some volatile times may contribute to limit the risk of bankruptcy in future uncertainties.

Since the Macedonian agri-food sector was faced with significant challenges due to economic crisis, this section attempts to provide an assessment of the financial performance of Macedonian wineries during the period of 2005–2010, capturing the period before, during and after the crisis (Appendix 3).

The financial performance of wineries is observed through a set of financial indicators. Profitability ratios show how efficient is the company in its operation in relative terms, and higher ratio indicates higher profitability (Arsov, 2008). The gross profit margin (GPM) calculates the share of operating profit to revenue sales. The net profit margin (NPM) represents the share of net profits from revenue sales. If the gross is higher than the net profit margin, indicates that non-operating expenditures or the tax rates have increased for the company (Simonovska, 2014). The return on assets (ROA) measures the rate of return on assets employed by a company and shows how profitably the company is using

its assets. The return on equity (ROE) shows the share of net profit attributable to equity owners for each unit of capital invested in the company. In favourable credit conditions, the amount of ROE should be greater than ROA (Simonovska *et al.*, 2014).

Liquidity ratios show the ability of the company to timely payback its liabilities and it is provided by owning liquid assets or possessing the capacity to borrow additional funds (Barry and Ellinger, 2012). The difference between the current ratio (CLR) and the quick liquidity ratio (QLR) is that the later ratio excludes inventory from current assets, as being low liquid asset (Simonovska *et al.*, 2014).

Activity ratios show how efficiently assets are used, and the higher the ratio is, the more efficiently the assets are used, with an exception of the average payment period (APP) and the days in inventory (DI), where shorter period is related to a greater efficiency (Hunger and Wheelen, 2009). The others in this category are: (1) The asset turnover ratio (AT), (2) The receivables turnover ratio (RT), and (3) The inventory turnover ratio (IT).

Debt ratios show the level of debt that companies have and their capability to service that debt (Huzjan *et al.*, 2015). The debt-to-assets ratio, or total debt ratio (DR) shows the proportion of total assets financed by external sources of capital, and the debt-to-equity ratio (DTER), the proportion between external and internal sources of capital (Simonovska and Gjosevski, 2016).

Generally, the wineries do not represent liquid companies due to the large share of inventories which is within the nature of the wine industry. However, wineries manage to collect their receivables in a relatively short period. In the analysed period, there was a change in the tax policy, as well as changes in the use of non-operating assets, resulting in increased non-operating expenses.

Nonetheless, wineries are profitable, but they operate with low profit margins in the price formation. Their strategy to increase profitability is to hold large turnover of assets. This strategy mainly occurs due to the large production of bulk wine and the low degree of wine differentiation as bottled. Those wineries that work with high profit margins and value-added production, have the capacity to absorb the economic turbulences through their price flexibility. The wineries are highly dependent on debt to finance investments and working capital; however they do not face high financial risk by holding more assets than debt.

Previous studies (Simonovska, 2014; Simonovska *et al.*, 2014; Huzjan *et al.*, 2015; Georgiev *et al.*, 2015; Simonovska and Gjosevski, 2016) analysed the financial condition of the agri-food sector, some including the wine industry in the country. For instance, Simonovska *et al.* (2014) observed the financial condition of agricultural companies and econometrically tested their capital structure strategies in increasing profitability, defining a typical farm company that is a low-levered, relying on assets rather than debt, diversifying production with small inventories, operating at high capital intensity and able to cover current liabilities. Specifically for the wine sector in the country, Huzjan *et al.*

(2015) determined the financial condition of the wineries during the period of 2008–2013 and found out that wineries did not represent liquid companies due to large share of inventories, but they were able to collect receivables in a short period, frequently used debt financing, and operated with low margins and large assets' turnover.

However, none of these previous researches did not provide an understanding of the financial behaviour of the wineries during their exposure to external shocks. Thus, herein, the wineries' profitability, liquidity, activity and debt situation is assessed and hypotheses are tested with the paired *t*-test and nonparametric Wilcoxon so to observe the change in their financial behaviour affected by the crisis. The results presented in Table 3, intend to explain the observed change in the financial condition of the wineries due to the economic crisis.

Before we conducted the paired *t*-test, we have tested the relevant assumptions according to the statistical literature (Risteski and Tevdovski, 2008). The first assumption is about the type of variables included, which should be continuous, i.e. interval or ratio data. The second assumption considers that the dependent variable consists of either two categorical groups, two 'related groups' or two 'matched pairs'. The third assumption is that, there should be no significant outliers in the differences between the two related groups since they can affect the statistical significance of the test. The final assumption is about normality of the distribution of the differences in the dependent variable between the two related groups, which was tested with Shapiro-Wilk test in Stata 12.0 (StataCorp, 2011) (Appendix 4).

If any of these four assumptions is not met, the data cannot be analysed with the paired *t*-test. The first two assumptions cannot be statistically tested, hence we used subjective norms to decide whether they are met. They are related to study design and choice of variables. The data are financial ratios, thus the first assumption is satisfied. The assumption that presumes the sample has no significant outliers in the differences between the two related groups is tested with the Q-Q plot. The observed outliers were removed so to meet the third assumption. Otherwise, we run the nonparametric Wilcoxon matched-pairs-ranks test so to examine the equality of matched pairs of observations for those variables with too many outliers.

The results from the paired *t*-test and the Wilcoxon signed-rank test revealed different outcome for a different financial performance ratio (Table 3).

The least differences are observed among the profitability indicators. In fact, the gross profit margin remains almost unchanged before (0.14 ± 0.21) and after the financial crisis (0.14 ± 0.17), and this minor increase in the ratio of 0.004 is not statistically significant (95% CI, -0.12154 to 0.12998), $t(7)=0.0792$, $p>.05$. However, the average net profit margin increased after the crisis period (0.22 ± 0.30), and there are more variations between wineries in the post-crisis period rather than in the pre-crisis period (0.08 ± 0.10). In addition, the results from the Wilcoxon signed-rank test also seem to indicate an increase in the net-

profit margin after the crisis period compared with that before the crisis (average rank of 30 vs. average rank of 15), but the observed difference is not statistically significant. Similar observations are recorded for the return on assets (ROA) and the return on equity (ROE). The average ROA slightly increased after the crisis period (0.07 ± 0.07), compared with that of the pre-crisis period (0.05 ± 0.06); but the Wilcoxon signed-rank test shows an insignificant increase of the ROA after the crisis period (an average rank of 19 vs. average rank of 17). There was an increase in the ROE as well after the crisis period (0.13 ± 0.13) compared with that before the financial crisis (0.08 ± 0.10), but according to Wilcoxon signed-rank test, this increase in profitability (from an average rank of 16 to an average rank of 29) is statistically insignificant. Thus, for all profitability ratios, we can accept the null hypothesis that there is no observed change in the profitability of the wineries before and after the financial crisis.

Table 3. Descriptive statistics, paired *t*-test and Wilcoxon signed-rank results for each financial indicator of the wineries

Group of indicators		2008=Pre-crisis period		2010=Post-crisis period		n	Paired <i>t</i> -test			Wilcoxon signed-rank test	
		M	SD	M	SD		95% CI for Mean Difference	T	df	Adjusted variance	Z
Profitability indicators	GPM	0.14	0.21	0.14	0.17	8	-0.12; 0.13	0.08	7	-	-
	NPM	0.08	0.10	0.22	0.30	9	-	-	-	71.3	0.89
	ROA	0.05	0.06	0.07	0.07	8	-	-	-	51.0	0.14
	ROE	0.08	0.10	0.13	0.13	9	-	-	-	71.3	0.77
Liquidity indicators	CLR	1.58	1.23	2.82	2.75	8	-	-	-	51.0	1.12
	QLR	0.69	0.71	1.62	2.32	9	-	-	-	71.3	0.77
Activity indicators	AT	0.36	0.21	0.25	0.13	8	-0.22; -0.02	-2.75*	7	-	-
	RT	2.85	2.90	1.74	0.79	8	-	-	-	51.0	-0.56
	APP	189.0	114	237.7	145.3	8	-	-	-	71.3	0.53
	DI	218.5	136	344.5	214.7	7	-31.23; 283.3	1.96	6	-	-
	IT	1.31	0.90	0.86	0.55	8	-1.09; 0.18	-1.68	7	-	-
Debt indicators	DR	0.57	0.25	0.46	0.18	8	-0.29; -0.07	-1.45	7	-	-
	DTER	2.22	1.93	1.14	1.00	8	-	-	-	51.0	-1.54

* $p < .05$, the null hypothesis of that no change was observed before and after the crisis is rejected.

Macedonian wineries increased their liquidity during the post-crisis period. In fact, if the inventory is not accounted in the total assets, the wineries seem to be non-liquid before the crisis (0.69 ± 0.71), but liquid after the crisis (1.62 ± 2.32). However, the Wilcoxon signed-rank test shows that this increase in both current and quick liquidity ratios is not statistically significant. The observed increase may be due to the large increase in the liquidity of certain wineries, while others are not liquid. In general, for the both liquidity ratios, we can accept the null hypothesis that there is no change observed in the liquidity of wineries before and after the financial crisis.

In regards to activity performance of the wineries, a different situation is observed. The paired *t*-test run for eight wineries shows that the turnover of assets after the financial crisis slightly decreased as opposed to the pre-crisis period (from 0.36 ± 0.21 in 2008 to 0.25 ± 0.13 in 2010), and this decrease of -0.11586 is statistically significant (95% CI, -0.21544 to -0.01630), $t(7)=-2.7518$, $p<.05$. Thus we can reject the null hypothesis that no change was observed in the assets turnover before and after the crisis.

A decrease is observed in other turnover indicators during the post-crisis period, such as the receivables and the inventory turnover ratios, which is not statistically significant. Quite the opposite situation is observed for the average payment period and the days in inventory ratios that increased after the crisis period, however, this change is not statistically significant. Thus, for all activity ratios except for the assets turnover, we can accept the null hypothesis that no change was observed in the activity performance of the wineries before and after the crisis period.

The wineries decreased their level of debt after the financial crisis period; the debt-to-assets ratio decreased from 0.57 ± 0.25 to 0.46 ± 0.18 , and the debt-to-equity ratio from 2.22 ± 1.93 to 1.14 ± 1.00 . However, there are no statistically significant evidences for the difference between these increases. Thus, we can accept the null hypothesis that no change was observed in the debt structure of the wineries before and after the crisis period.

CONCLUSIONS

The global financial crisis posed significant challenges to the agri-food sector in other post-communist economies, but our results show that the Macedonian agri-food sector was quite stable, and generally flexible to cope with the crisis effects. The listed Macedonian agri-food companies were less responsive to movements in the market exhibiting low stock returns, and the unlisted agri-food companies were not financially vulnerable due to crisis. In fact, there was not a statistically significant change in the financial performance of the Macedonian wineries before and after the crisis, except that they decreased their volume of production.

The Macedonian economy was not heavily affected by the crisis so this could be a reasonable explanation on the observed financial stability of the agri-food sector. However, investments were hindered during this period. The agri-food companies did not take excessive risks during the crisis period. Revisiting portfolio theory by Elton et al. (2007) which asserts that investors can expect to receive a return only for holding systematic risk, and given that the majority of cases in the sample had lower returns than the market in the crisis period, it may be deduced that the companies have felt uncertainty about investing. Their unwillingness to invest during a period of market instability is reasonable, because greater risk is not only associated with a greater return, but also with a greater loss.

A decade after the economic crisis of 2008–2010, economic growth remains below the potential of the Republic of Macedonia. Trade is the largest activity and is one of the main drivers of economic growth, however the country has high trade deficit. Despite the substantial foreign trade deficits, the inflation rate has consistently been low. The country has been successful in attracting some FDIs, but backward linkages to drive the development of the agri-food sector are missing.

Further economic reform and development are hindered by a certain level of exhaustion in the EU integration process and national political instability since early 2015. For instance, innovations in the agri-food sector remain low. There are no innovative financing models that relate to the agri-food sector demand. Loans continue to account for the largest part of the formal capital structure in the agri-food sector. Marketing strategies are poorly reached and executed. Agri-food companies need to differentiate themselves in order to sustain profitable. Most export volume is produced by large agri-food companies that add value to production. Increasing branding and marketing differentiation may be a good competitive strategy. Due to their small size, the agri-food companies have difficulty competing in export markets because of inefficiencies and high costs related to customs, logistics, and trade infrastructure. In addition, producer prices are relatively high in comparison with the European Union's (EU) (Erjavec and Salputra, 2012). One way for these companies to reach an economic convergence with the rest of the EU is to introduce innovations. However, they do not invest sufficiently in distinguished quality products and brand equity.

It is evident that many past and future challenges hinder the Macedonian economic growth. Considering that the agri-food sector is a very important part of the Macedonian economy, its development may secure the overall national economy. Since investors expect to receive a greater return only for holding systematic risk, understanding the sensitivity of agri-food companies during fragile periods, such it is the financial crisis, creates basis for identification of future strategic decisions for this sector.

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