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Assessing the Interplay between Stock Market Value, Macroeconomic Indicators, and Firm Fundamentals in the European Food Industry

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Abstract

This research examines the dynamic relationship between GDP, net sales, EBITDA, and stock price for the European food industry. Utilizing a VAR framework over the period 2005 to 2025, this study finds that firm earnings (EBITDA and net sales) and stock prices exhibit a strong and positive dynamic relationship. Moreover, GDP exerts a significant positive influence on firm earnings, confirming that macroeconomic conditions affect accounting performance in the food sector. Overall, the findings indicate that the industry's financial and market performance is highly cyclical and sensitive to broader economic fluctuations, though short-term movements remain largely driven by firm-specific factors.

Keywords

GDP, Net Sales, EBITDA, Stock Price, Food Industry

JEL Codes

E00, L66, G30, O14, O40

1. Introduction

This study is motivated by the need to explore the relationship between stock market value, GDP, and accounting performance in the European food industry. The results reinforce the importance of the food sector as a fundamental component of the European economy. As of 2005, it is reported that over 30% of small farms have been lost in Europe. This trend is pushed by the increased production costs, the competition from large-scale agricultural businesses, and the volatility in market prices (Slow Food, 2024).

Consequently, research employs Granger causality tests and the VAR model to

explore the dynamics between GDP, net sales, stock prices, and EBITDA in the European food industry, examining two hypotheses. Overall, the findings accentuate that short-term variations in the European food industry are primarily firm-driven. Still, in the long term, the industry's performance is increasingly affected by macroeconomic cycles. This underscores the industry's dual characteristic of depending on both internal financial health and external economic conditions. By doing so, it classifies itself as a cyclical yet resilient sector within the European economy.

This study is relevant to regulators, researchers, and investors concerned with the European food industry. The significance of the sector to social cohesion and the European economy begs for more sectoral research as well as policy focus. Furthermore, the sector's resilience to exogenous crises (financial crisis, COVID-19, and inflationary pressures) strengthens investor confidence in assessing its financial performance, making it attractive for low-risk investments and generally risk-averse investors. Ultimately, the nature of the industry's products (basic goods with stable demand) creates a timeless relationship between consumption, corporate earnings, and their stock market valuation.

The remainder of the paper is organized as follows. Section 2 describes the food industry in Europe. Section 3 portrays the theoretical framework of the study and the research hypotheses. Section 4 describes the data employed and the research design. Section 5 discusses the empirical findings, and Section 6 provides concluding remarks.

2. Food Industry in Europe

Many developed countries consider the food industry (including food manufacturing, processing, and food-service businesses such as restaurants) as a key driver of their economy, holding multifaceted roles as employer, partner in environmental concerns, and advocate of consumers' well-being. Across the EU, the sector employs about 4.7 million people (≈16% of all manufacturing jobs) and generates €1.2 trillion in turnover, or roughly 1.9% of EU GDP (Food Drink Europe, 2024).

Despite its extraordinary financial resilience during turbulent times (Alam et al., 2021; Song et al., 2021; Tanda, 2018), the realization of risks exogenous by the industry—such as the global health pandemic—could lead to decreased demand for food-industry services (because of the fear of clients eating out) and decreased earnings (Kim et al., 2020). Therefore, it is essential for the food industry to maintain strategic plans to mitigate external shocks beyond its direct control.

Moreover, food waste, access to food, and changes in dietary patterns could affect food demand in various regions of the world (Kim et al., 2020; Smith & Glauber, 2020; Fukase & Martin, 2020; Sandberg et al., 2023), which consequently affects the industry's earnings. Additionally, institutional frameworks are vital to the industry's financial results; strict rules, such as those in Europe, lower the probability of product recalls and, therefore, the probability of lower earnings (Sandberg et al., 2023).

In summary, the food industry is essential for the economy and society, representing a significant portion of economic activity. These characteristics, along

with the sector's regulated environment and rising challenges, motivate our examination of whether fundamental performance (earnings, sales) is reflected in stock valuations (H1) and how broader economic growth, captured by GDP, translates into firm performance (H2) across listed European food companies. The theoretical underpinnings of these explorations are presented in the next section.

3. Theory and Hypothesis Development

3.1. Market Value: Interplay of Stock Price with Earnings (Fundamentals)

A prevalent argument is that fundamentals like earnings and market prices have lost their former correlation (Barth et al., 2023). Literature provides two main explanations for this phenomenon. The first explanation is the rise of the new economy, a phenomenon defined by heavy investment in intangible assets that creates a timing mismatch between expenses and revenue, thus weakening the earnings-price correlation. The second explanation relates to the growing share of firms reporting losses, undermining the link by making such fundamentals a weaker signal of value (Barth et al., 2023).

Despite the above, most empirical studies find that the relationship between earnings and market prices still remains positive (Berggrun et al., 2020; Fu et al., 2021; Qiu et al., 2020). In particular, the food industry seems to exhibit resilience during turbulent times, as implied by its comparatively stable stock-price behavior (Alam et al., 2021; Song et al., 2021; Tanda, 2018). Because this sector relies on tangible assets and steady demand, we expect that traditional fundamentals will continue to drive valuations.

From the above, it is suggested that earnings and stock prices in the food industry are significantly and positively correlated. This paper, therefore, contributes to the value-relevance literature in the food sector by formulating and testing the following directional hypothesis:

H1 (positive): There is a significant and positive relationship between stock-price movements and reported earnings in the European food industry.

3.2. GDP and Financial Performance

Literature suggests that the current state of the economic cycle is intertwined with firm performance (Baptista and Preto, 2011; Ben Jabeur et al., 2021; Grammatikos and Vermeulen, 2014; Arslan-Ayaydin et al., 2014). Financial flexibility is observed to be regionally dependent because different areas often follow diverse macro-policy paths (Arslan-Ayaydin et al., 2014; Ben Jabeur et al., 2021). Moreover, crises adversely affect firms' financial health through aggregate demand shocks (Grammatikos and Vermeulen, 2014; Ben Jabeur et al., 2021).

Literature also shows that aggregate food demand is influenced by income distribution (Fukase and Martin, 2020; Cirera and Masset, 2010). Most global inequality exists between countries rather than within them, so changes in cross-country income distribution are expected to exert greater effects on world food

demand. Under neoclassical growth theory, income convergence across countries arises through technology adoption and sectoral development (Fukase and Martin, 2020). In practice, however, overall GDP growth is the broadest and most tractable proxy for these macroeconomic forces.

From the above, we expect that macroeconomic expansion (as captured by aggregate GDP growth) will raise food demand and, in turn, firm earnings. This paper, therefore, extends the macro-factor literature in the food industry by testing the following directional hypothesis:

H2 (positive): Macroeconomic conditions—captured by GDP—positively influence reported earnings in the European food industry.

4. Methods and Sample Selection

The initial sample consists of 153 listed firms operating in the food industry in 25 European countries. Financial-statement variables (net sales, EBITDA) and monthly closing stock prices were retrieved from Refinitiv Eikon, while seasonally-adjusted GDP for the EU-27 was obtained from Eurostat (Refinitiv Eikon, 2024; Eurostat, 2024). Data were collected monthly and cover the period 2005 to 2024. Countries represented in the initial sample are Austria, Belgium, Bulgaria, Croatia, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Romania, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom.

To build an industry-level time series, we calculate the simple arithmetic mean of each firm-level variable for every calendar year, then take first differences of the natural logs. Therefore, the final dataset consists of 20 annual observations (2005-2024) that represent the European food industry as a whole. Descriptive checks show mean annual EBITDA growth of 3.4% (σ = 6.1%) and mean stock-price growth of 5.2% (σ = 12.7%).

To test H1 and H2, a vector autoregressive model (VAR) is employed to jointly analyze the logarithmic changes of the variables *EBITDA*, *Stock price*, and *GDP*, and, in a second specification, *Net sales*, *Stock price* and *GDP*. Augmented Dickey-Fuller tests confirm that each series is integrated of order 1, so differencing ensures stationarity. A lag length of two years was selected using the Schwarz (BIC) criterion, balancing explanatory power against the limited sample size (T = 20). The VAR approach allows for the examination of bidirectional causal relationships and dynamic responses of variables to exogenous shocks.

$$\begin{bmatrix} \mathrm{dlog}(EBITDA)_t \\ \mathrm{dlog}(Stock\ price)_t \\ \mathrm{dlog}(gdp)_t \\ \mathrm{dlog}(Net\ sales)_t \end{bmatrix} = A_1 \begin{bmatrix} \mathrm{dlog}(EBITDA)_{t-1} \\ \mathrm{dlog}(Stock\ price)_{t-1} \\ \mathrm{dlog}(gdp)_{t-1} \\ \mathrm{dlog}(Net\ sales)_{t-1} \end{bmatrix} + A_2 \begin{bmatrix} \mathrm{dlog}(EBITDA)_{t-2} \\ \mathrm{dlog}(Stock\ price)_{t-2} \\ \mathrm{dlog}(gdp)_{t-2} \\ \mathrm{dlog}(Net\ sales)_{t-2} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{bmatrix}$$

where:

A_1 and A_2 refer to coefficient matrices (3 × 3) corresponding to the first and second lags, respectively.

ε_{it} refers to the error terms of the equations.

5. Results and Discussion

In this study, the main research objective is to examine the relationship between stock market value, GDP, and accounting performance in the European food industry. To derive the results, the study employs the Vector Auto Regressive econometric estimation technique. The discussion commences with the presentation of the unit root test that provides the necessary information on the stationarity properties of the time series. Specifically, the study employs Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. Next, the study employs the cointegration test to determine the existence of a long-run stable relationship between the dependent and explanatory variables. To further examine the short-run dynamic properties of the accounting performance of the European food industry, the study employs forecast error variance decomposition and generalized impulse response analysis. Further, the study employs Stata as a tool of the econometric estimation process.

Literature suggests that most of the time, financial and macroeconomic time series variables are non-stationary, something that leads to spurious regression (Granger, 1969). The study employs a unit root test to examine whether EBITDA, Net Sales, and gross domestic product (GDP) time series are stationary and to determine their order of integration.

Table 1 below presents the results for the unit root test for the variables using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests.

Table 1. Unit root test results (ADF, PP).

Variable	ADF (Level)	ADF (1st Diff.)	PP (Level)	PP (1st Diff)	Order of Integration	Remarks
log_stock	−0.173	−3.302**	−0.348	−3.345	I (1)	Stationary after 1st diff
Log_gdp	−2.612	−5.115***	−2.917*	−5.008***	I (1)	Stationary after 1st diff
Log_net_sales	1.007	−2.964*	0.978	−3.878***	I (1)	Stationary after 1st diff
Log_ebitda	−1.199	−4.530***	−1.490	−4.695***	I (1)	Stationary after 1st diff

Notes: *, **, and *** denote statistical significance at the 10, 5, and 1 percent level, respectively. Source(s): Author's calculation via Stata Software.

The results of the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests consistently suggest that all the variables of the model (stock prices, GDP, net sales, and EBITDA) are non-stationary in their levels. This is because none of the level series reject the null of a unit root at the 5% significance level. However, after taking first differences, the test statistics for all series are significant, indicating a rejection of the null hypothesis of a unit root under both ADF and PP tests,

which confirms stationarity.

Consequently, all variables present integration of order one, I (1). This result validates the first step of the Engle & Granger (1987) methodology.

The next step in the econometric procedure is to determine the existence of a long-run equilibrium relationship between the model variables. To do so, the econometric process employs the residuals of the OLS equation of level variables.

Co-integration among time series could indicate that the series may behave differently in the short term but will converge towards a common behavior in the long term. Co-integration among time series requires stationary residuals (Engle and Granger, 1987). **Table 2** shows the cointegration test results for the model adopted in this study.

Table 2. Cointegration test.

Variables	ADF	ADF lag	95% Critical Value	Order of Integration	Remarks
Residuals	−1.513	1	−3.000	I (1)	Non-stationary

Source(s): Author's calculation via Stata Software.

Table 2 presents the ADF test statistics, which are lower in absolute terms than the 95% critical ADF. This result indicates that the residuals are non-stationary, meaning that the dependent and independent variables are not co-integrated. Specifically, the absence of cointegration suggests that while macroeconomic shocks proxied by GDP may influence EBITDA and Net Sales in the short term, long-term dynamics appear to be driven more by industry-specific fundamentals and firm-level characteristics rather than by aggregate macroeconomic trends.

Consequently, there is a need to further examine the short-run dynamic properties of EBITDA and Net Sales. To do so, the study employs the forecast error variance decomposition (VDC), which shows the proportion of forecast error variance for each variable attributable to its own shocks and to shocks in the other endogenous variables. Moreover, the forecast error variance decomposition (VDC) identifies the causal relationships among the variables in a VAR by explaining how shocks influence each variable across the entire system.

This method provides supplementary information on the dynamic behavior of the variables in the system, as it can decompose the forecast error variance into the contributions of the different shocks. The forecast error variance decomposition test results for the four variables are presented in the tables below.

Table 3 below presents the variance decomposition of the European food industry market value. Particularly, the table reflects the proportion of forecast error variance in stock price attributed to its own innovations, as well as innovations in real gross domestic product, net sales, and EBITDA. Since the data are monthly, and one horizon refers to one month in the future, stock shocks-innovations are mostly explained by the shocks-innovations in GDP and net sales over time. Specifically, it is clear that short-run (1 horizon to 5 horizons) stock price

Table 3. Variance decomposition for variable Δlog_stock.

Horizon	Δlog_stock	Δlog_gdp	Δlog_net sales	Δlog_ebitda
1	1.0000	0.0000	0.0000	0.0000
2	0.5954	0.1190	0.2855	0.0001
5	0.5090	0.2455	0.2356	0.0098
10	0.4557	0.3033	0.2116	0.0293
20	0.4150	0.3403	0.1897	0.0550
30	0.3811	0.3734	0.1722	0.0732
40	0.3493	0.4126	0.1556	0.0825
50	0.3267	0.4333	0.1432	0.0968

Source(s): Author's calculation via Stata Software.

fluctuations are due largely to "own shocks" (1 percent to 51 percent), while GDP and net sales predict 12 percent to 24 percent and 28 percent and 23 percent, respectively. However, as time approaches 10 months to 50 months (10 to 50 horizons), the proportion of forecast error variance in stock price is increasingly attributed to GDP (30 percent to 43 percent) and net sales (21 percent to 14 percent). In summary, in the short run, stock shocks-innovations are explained mainly by their own stock shocks-innovations, while in the long run, stock shocks-innovations are explained mainly by shocks-innovations in gross domestic product, net sales, and EBITDA. This means that innovations-shocks in gross domestic product, net sales, and EBITDA also predict the variance in the degree of share prices over time in the European food industry.

Table 4. Variance decomposition for variable Δlog_gdp.

Horizon	Δlog_stock	Δlog_gdp	Δlog_net sales	Δlog_ebitda
1	0.2452	0.7548	0.0000	0.0000
2	0.1177	0.8420	0.0206	0.0197
5	0.1641	0.7263	0.0367	0.0729
10	0.1710	0.6976	0.0472	0.0842
20	0.1646	0.6908	0.0474	0.0972
30	0.1624	0.6722	0.0476	0.1178
40	0.1576	0.6614	0.0467	0.1343
50	0.1538	0.6637	0.0464	0.1361

Source(s): Author's calculation via Stata Software.

Table 4 above presents the variance decomposition of the gross domestic product. Particularly, the table reflects the proportion of forecast error variance in the gross domestic product that is attributed to its own innovations and innovations in stock prices, net sales, and EBITDA. Given the fact that data are monthly and

one horizon refers to one month in the future, as months go by, gross domestic product shocks-innovations are mostly explained mainly by their own shocks-innovations. Specifically, it is clear that short-run (1 horizon to 5 horizons) gross domestic product fluctuations are mainly due to "own shocks" (75 percent to 72 percent), while stock prices and EBITDA predict 24 percent to 16 percent and 0 percent to 7 percent, respectively. However, as time approaches 10 months to 50 months (10 to 50 horizons), the proportion of forecast error variance in gross domestic product remains strongly attributed to its own shocks-innovations (69 percent to 66 percent). In summary, GDP is mostly explained by its own shocks-innovations; however, in the long run, stock prices and EBITDA seem to slightly contribute to the explanation of gross domestic product shocks-innovations. This means that accounting performance and financial performance of the European food industry do contribute, though moderately, to the variability of GDP of the countries in which they operate.

Table 5. Variance decomposition for variable Δlog_ebitda.

Horizon	Δlog_stock	Δlog_gdp	Δlog_net sales	Δlog_ebitda
1	0.0116	0.6036	0.2300	0.1548
2	0.0821	0.5260	0.1973	0.1945
5	0.1471	0.5862	0.1410	0.1258
10	0.1515	0.5718	0.1287	0.1480
20	0.1421	0.6048	0.1013	0.1518
30	0.1447	0.6105	0.0877	0.1571
40	0.1439	0.6042	0.0795	0.1723
50	0.1411	0.6161	0.0727	0.1700

Source(s): Author's calculation via Stata Software.

Table 5 above presents the variance decomposition of the EBITDA. Particularly, the table reflects the proportion of forecast error variance in the EBITDA that is attributed to its own innovations and innovations in stock prices, net sales, and GDP. Since the data are monthly and one horizon refers to one month in the future, as months go by, EBITDA shocks-innovations are mostly explained by the shocks-innovations of GDP. Specifically, short-run (1 horizon to 5 horizons) gross domestic product fluctuations are due largely to GDP shocks (60 percent to 58 percent), while stock prices and EBITDA itself predict 1 percent to 14 percent and 15 percent to 12 percent, respectively. Moreover, as time approaches 10 months to 50 months (10 to 50 horizons), the proportion of forecast error variance in gross domestic product remains strongly attributed to the shocks-innovations of GDP (57 percent to 61 percent). In summary, EBITDA is mostly explained by the shocks-innovations in GDP. This means that the accounting performance of the European food industry is highly cyclical.

Table 6. Variance decomposition for variable Δlog_net_sales.

Horizon	Δlog_stock	Δlog_gdp	Δlog_net sales	Δlog_ebitda
1	0.0056	0.0073	0.9871	0.0000
2	0.0625	0.2433	0.6216	0.0726
5	0.1466	0.2758	0.5047	0.0729
10	0.1411	0.3236	0.4515	0.0838
20	0.1422	0.3830	0.3780	0.0968
30	0.1430	0.4096	0.3320	0.1153
40	0.1409	0.4404	0.2943	0.1244
50	0.1415	0.4709	0.2597	0.1279

Source(s): Author's calculation via Stata Software.

Table 6 above presents the variance decomposition of the net sales. Particularly, the table reflects the proportion of forecast error variance in net sales attributed to its own innovations, as well as innovations in stock prices, EBITDA, and GDP. Given that the data are monthly and one horizon refers to one month in the future, as months go by, net sales shocks-innovations are mostly explained by their own shocks-innovations. Specifically, it is clear that short-run (1 horizon to 5 horizons) net sales fluctuations are primarily due to its own shocks (98 percent to 50 percent), while stock prices and GDP predict 0 percent to 14 percent and 0 percent to 27 percent, respectively. Moreover, as time approaches 10 months to 50 months (10 to 50 horizons), the proportion of forecast error variance in net sales is strongly attributed to the shocks-innovations of GDP (32 percent to 47 percent). In summary, net sales are explained mainly by the shocks-innovations in GDP. This means that the accounting performance of the European food industry is highly cyclical.

In summary, the variance decomposition results suggest that while in the short-term fluctuations in the European food industry are mainly attributed to firm-specific factors, in the long term, macroeconomic forces (GDP shocks) are the main reason for the fluctuations observed in the European food industry. This finding corroborates the fact that the industry's financial and market performance is highly cyclical and closely related to aggregate economic activity. Our results are in line with the literature that suggests the economic cycle is intertwined with firm performance (Baptista and Preto, 2011; Ben Jabeur et al., 2021; Grammatikos and Vermeulen, 2014; Arslan-Ayaydin et al., 2014) and particularly with the literature that suggests that aggregate food demand is influenced by income distribution (Fukase and Martin, 2020; Cirera and Masset, 2010).

The Impulse Response function detects interaction among variables. It traces out the response of the dependent variable in the VAR system to the shocks in the error term. Specifically, it traces out the reaction of each variable to a particular shock at a specific time *t*. For computing the Impulse Response functions, it is a

prerequisite that the variables in the system are in order and that a moving average process represents the system.

Table 7. Generalized IRFs to one S.E. shock in the equation for Δlog (Stock).

Horizon	Δlog (Stock)	Δlog (GDP)	Δlog (Net Sales)	Δlog (EBITDA)
0	0.0594	−0.0158	0.0023	−0.0104
5	0.0125	−0.0078	0.0026	0.0026
10	0.0058	−0.0039	0.0040	−0.0160
20	−0.0061	−0.0021	−0.0002	−0.0120
30	−0.0080	0.0037	−0.0032	0.0061
40	−0.0025	0.0063	−0.0033	0.0189
50	0.0058	0.0028	−0.0001	0.0139

Source(s): Author's calculation via Stata Software.

The results from Table 7 present the impulse response functions of share prices against their "own shocks" and shocks in real domestic product, net sales, and EBITDA over the time horizons. The result shows that initially, share price shocks are mainly explained by their own shocks, with initial positive responses that diminish over time. In the case of the response of share price to GDP shocks, it seems that the relationship is negative initially, becomes positive at the 30th to 50th horizons (30 to 50 months ahead). The response of share price shocks to net sales shocks reveals a positive relationship in the short run (up until the 10th horizon), but a negative one at the 20th to 50th horizons. Finally, in the case of the response of share price shocks to EBITDA shocks, it seems that the relationship is mostly negative in the short run, but it becomes positive at the 30th to 50th horizons.

Table 8. Generalized IRFs to one S.E. shock in the equation for Δlog (GDP).

Horizon	Δlog (Stock)	Δlog (GDP)	Δlog (Net Sales)	Δlog (EBITDA)
0	0.0000	0.0277	−0.0026	−0.0750
5	−0.0228	0.0053	−0.0105	0.0276
10	0.0019	0.0064	−0.0055	0.0409
20	0.0165	−0.0008	0.0039	0.0085
30	0.0131	−0.0116	0.0078	−0.0282
40	−0.0029	−0.0113	0.0045	−0.0396
50	−0.0173	0.0003	−0.0035	−0.0126

Source(s): Author's calculation via Stata Software.

The results from Table 8 present the impulse response functions of GDP against its "own shocks" and shocks in stock price, net sales, and EBITDA over

the time horizons. The result shows that initially, GDP is mainly explained by its own shocks, with initial positive responses that become negative. In the case of the response of GDP shocks to stock shocks, it seems that the relationship is mostly positive, especially in the medium run (10^{th} to 30^{th} horizons). The response of GDP shocks to net sales shocks reveals a negative relationship in the short run (up until the 10^{th} horizon), but positive at the 20^{th} to 50^{th} horizons. Finally, regarding the response of GDP shocks to EBITDA shocks, it seems that the relationship is mostly negative in the long run.

Table 9. Generalized IRFs to one S.E. shock in the equation for Δlog (Net Sales).

Horizon	Δlog (Stock)	Δlog (GDP)	Δlog (Net Sales)	Δlog (EBITDA)
0	0.0000	0.0000	0.0306	0.0463
5	0.0092	−0.0044	0.0013	0.0037
10	0.0036	−0.0016	0.0025	−0.0097
20	−0.0038	−0.0010	−0.0003	−0.0062
30	−0.0044	0.0023	−0.0019	0.0043
40	−0.0011	0.0035	−0.0018	0.0109
50	0.0036	0.0013	0.0001	0.0072

Source(s): Author's calculation via Stata Software.

The results from Table 9 present the impulse response functions of net sales against its "own shocks" and shocks in stock price, GDP, and EBITDA over the time horizons. The result shows that initially, net sales exhibit positive responses to their own shocks, which then become negative. In the case of the response of net sales shocks to stock shocks, it seems that the relationship is positive in the short run (0^{th} to 10^{th} horizons) and negative in the long run. The response of net sales shocks to GDP shocks reveals a negative relationship in the short run (up until the 20^{th} horizon), but positive at the 20^{th} to 50^{th} horizons. Finally, in the case of the response of net sales shocks to EBITDA shocks, it seems that the relationship is mostly positive except in the mid-run.

Table 10. Generalized IRFs to one S.E. shock in the equation for Δlog (EBITDA).

Horizon	Δlog (Stock)	Δlog (GDP)	Δlog (Net Sales)	Δlog (EBITDA)
0	0.0000	0.0000	0.0000	0.0380
5	0.0126	0.0008	0.0046	−0.0044
10	0.0070	−0.0046	0.0041	−0.0134
20	0.0005	−0.0065	0.0029	−0.0205
30	−0.0078	−0.0014	−0.0009	−0.0107
40	−0.0090	0.0053	−0.0042	0.0107
50	−0.0014	0.0073	−0.0036	0.0231

Source(s): Author's calculation via Stata Software.

The results from Table 10 present the impulse response functions of EBITDA against its "own shocks" and shocks in stock price, GDP, and net sales over the time horizons. The result shows that EBITDA exhibits mostly negative responses to its own shocks. In the case of the reaction of EBITDA shocks to stock shocks, it seems that the relationship is positive in the short run (0^{th} to 20^{th} horizons) and negative in the long run. The response of EBITDA shocks to GDP shocks reveals a negative relationship in the mid-run (10^{th} to 20^{th} horizon), but positive in the short run and long run. Finally, in the case of the response of EBITDA shocks to net sales shocks, it seems that the relationship is positive initially and negative in the long run.

Overall, the impulse response results further reaffirm the variance decomposition results and confirm that the European food industry in the short term is sensitive to firm-level dynamics but in the long term becomes increasingly driven by macroeconomic conditions. The alternating signs of responses observed accentuate the cyclical and adaptive nature of the sector, where initial market or operational shocks are often corrected or reversed as the system stabilizes. These findings are consistent with the variance decomposition results, supporting the view that the industry's financial and market performance is highly cyclical and sensitive to broader economic fluctuations. However, short-term reactions remain dominated by firm-specific factors.

Ultimately, to further explore the short-term causal relationships between the variables of interest, the study employs the Granger causality test. The benefit of using the Granger causality test is that it indicates whether one series can forecast the other series (Khan, 2023).

Table 11. Granger causality results.

Null hypotheses	Chi^2	*p*-value	Result
Net sales granger cause Stock Prices	14.50	0.001	Significant
Stock prices granger cause Net sales	14.497	0.001	Significant
EBITDA granger cause Stock Prices	8.95	0.011	Significant
Stock prices granger cause EBITDA	8.9503	0.011	Significant
GDP granger cause EBITDA	15.698	0.000	Significant
EBITDA granger cause GDP	17.47	0.000	Significant
GDP granger cause Stock Prices	9.1849	0.001	Significant
Stock prices granger cause GDP	13.057	0.001	Significant

Source(s): Author's calculation via Stata Software.

Table 11 depicts the results of the Granger causality test. In this research study, the Granger causality test is applied to determine whether firm-level fundamentals significantly influence market valuation in the European food industry (H1) and whether macroeconomic conditions shape corporate profitability (H2). The

Granger causality test results indicate a significant *p*-value for EBITDA, Net Sales, Stock prices, and GDP time series, confirming the existence of a bidirectional causality between European industry accounting, market performance, and macroeconomic conditions.

6. Conclusion

The food industry is essential for the economy and society, representing a significant portion of economic activity. These characteristics, along with the sector's regulated environment and rising challenges, motivate the examination of whether fundamental performance (earnings, sales) is reflected in stock valuations (H1) and how broader economic growth, captured by GDP, translates into firm performance (H2) across listed European food companies.

Using a Vector Autoregressive (VAR) framework for the period 2005-2024, the analysis integrated stock prices, GDP, net sales, and EBITDA to capture both firm-specific and aggregate influences on the European food industry performance.

Initially, unit root tests suggest that all variables are integrated of order one, something that validates the use of a Vector Autoregressive (VAR) framework in first differences. However, when it comes to a long-term equilibrium relationship among the variables, the Engle-Granger residual-based tests reject the hypothesis and suggest that firm-level and macro-level forces evolve independently over time, without presenting a stable long-run convergence.

Despite the absence of a stable long-run convergence, short- and medium-run shocks-innovations seem to be significant. The forecast error variance decomposition (VDC) results corroborate the fact that, in the short run, fluctuations in the European food industry are primarily explained by firm-specific shocks, such as those in stock prices or net sales. Over longer horizons, however, GDP shocks seem to increasingly explain the variations observed in EBITDA and net sales. This finding corroborates the fact that the industry's financial and market performance is highly cyclical and closely related to aggregate economic activity. This observation is in line with the literature that suggests the economic cycle is intertwined with firm performance (Baptista and Preto, 2011; Ben Jabeur et al., 2021; Grammatikos and Vermeulen, 2014; Arslan-Ayaydin et al., 2014) and particularly with the literature that suggests that aggregate food demand is influenced by income distribution (Fukase and Martin, 2020; Cirera and Masset, 2010).

Furthermore, to capture the direction and persistence of the above relationships, the study employs the impulse response functions (IRFs). Overall, the impulse response results further reaffirm the variance decomposition results and confirm that the European food industry is sensitive to firm-level dynamics in the short term but becomes increasingly driven by macroeconomic conditions over time in the long term. The alternating signs of responses observed accentuate the cyclical and adaptive nature of the sector, where initial market or operational shocks are often corrected or reversed as the system stabilizes. These findings are consistent with the variance decomposition results, supporting the view that the

industry's financial and market performance is highly cyclical and sensitive to broader economic fluctuations. However, short-term reactions remain dominated by firm-specific factors.

Finally, the Granger causality results confirmed significant bidirectional relationships between key variables.

These results empirically support both hypotheses (H1 and H2). Firm earnings (EBITDA and net sales) and stock prices exhibit a strong and positive dynamic relationship (H1). Also, GDP exerts a significant positive influence on firm earnings, confirming that macroeconomic conditions affect accounting performance in the food sector.

Overall, the findings accentuate that short-term variations in the European food industry are primarily firm-driven, but in the long term, its performance is increasingly influenced by macroeconomic cycles. This underscores the industry's dual characteristic to depend on both internal financial health and external economic conditions. By doing so, it classifies itself as a cyclical yet resilient sector within the European economy.

Therefore, this research is of great importance for business and economic theory and practice in the food sector. Future research could explore the effects of the institutional environment, the differences between countries, and the influence of the supply chain and the energy crisis on the value of businesses in the food industry.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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