Impact of Selected Firm-specific and Macroeconomic Indicators on the Food Industry of Bangladesh

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Abstract: *The purpose of this paper is to analyze the impact of firm-specific and macroeconomic variables on the profitability of the food industry in Bangladesh. It examines the impact of selected variables on companies listed in the food and allied sector of the Dhaka stock market over a five-year period from July 2013 to June 2018. The firm-specific factors include debt-to-equity ratio, asset tangibility and size, and the macroeconomic factors include interest rate, exchange rate and food inflation. Findings in this study reveal positively significant relationships between asset tangibility and profitability and between size and profitability when net income ratio is used as a measure of profitability. The other variables, including all three macroeconomic variables, have statistically insignificant impacts on profitability. As a result, profitability of food firms in Bangladesh is determined by firm-specific factors and not by macroeconomic factors. This study provides an understanding of the dynamics of profitability in the food industry of Bangladesh and helps in making optimal decisions concerning resource allocation to ensure long-term sustainability of the industry.*

Keywords: *Bangladesh; Firm-specific Factors; Food Industry; Macroeconomic Factor; Profitability.*

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I.   Introduction

The food industry of Bangladesh is a thriving sector in the country which grew at an average annual rate of 7.7% from 2004 to 2010 owing largely to the country's rapidly growing consumer market and large population base. Moreover, according to (Bangladesh Bureau of Statistics, 2013), it makes significant contributions to employment, employing around 8% of the total manufacturing labor force in Bangladesh. Its share in the GDP was 2.01 percent in 2010.

So, it is obvious that the food industry of Bangladesh has been playing a pivotal role in the country's economic development and therefore, its long-term sustainability is crucial.

According to (Maverick, 2019), profitability is one of the key factors to assess the success and sustainability of any industry. High profitability indicates that a company is able to procure sufficient capital to sustain itself for a considerable period of time.

Studies on factors determining the profitability of the food industry in several parts of the world had been done in the past by (Bhutta and Hasan, 2013) and (Mutunga, 2014). However, to this day, there has not been any comprehensive research on the food industry of Bangladesh.

This paper, therefore, aims to analyse the effects of selected factors on the profitability of the food industry in Bangladesh. This study will help provide a more comprehensive understanding of how both internal firm-specific and external macroeconomic forces determine capital structure within the country's food industry. Firm-specific factors, for the purpose of this study, include debt-to-equity ratio, asset tangibility and size while macroeconomic factors include interest rates, exchange rates and food inflation.

II.   Literature review

There had been a few papers on factors affecting profitability in the past. (Athanasoglou, Brissimis, and Delis, 2008) investigated the effects of bank-specific, industry-specific and macroeconomic determinants on bank profitability. They used two alternative measures: the return on assets (ROA) and the return on equity (ROE). They also used capital, credit risk, productivity, expenses management and size as bank-specific determinants, industry concentration and ownership status of banks as industry-structure determinants and, finally, cyclical output and expected inflation as explanatory macroeconomic variables.

They took data from the Greek banking sector over a 16-year period from 1985 to 2001. Profit persistence in the model was accounted for by applying a GMM technique to an unbalanced panel of Greek banks.

They referred to an earlier study by (Berger et al., 2000) where it was assumed that bank profits had a tendency to last over time and therefore, adopted a dynamic specification of the model by including a lagged dependent variable along with the independent variables.

According to the empirical findings, both capital and credit risk are important in explaining bank profitability. Increased credit risk leads to lower profits. Additionally, the relationship between labor productivity growth and profitability is positive and significant while the relationship between operating expenses and profitability is strongly negative.

However, both industry-structure determinants of ownership status of the banks and industry concentration are insignificant in explaining profitability.

Finally, macroeconomic control variables, such as inflation and cyclical output, clearly affect the performance of the banking sector. Overall, these empirical results provide evidence that the profitability of banks is shaped by bank-specific and macroeconomic factors.

Even though the study was crucial to determining factors affecting profitability, it was done on the banking sector. (Bhutta and Hasan, 2013) worked on the impact of firm-specific and macroeconomic factors on the profitability of the food sector in Pakistan. The firm-specific factors used were debt-to-equity ratio, tangibility, growth and size. Meanwhile, the only macroeconomic factor included food inflation.

For their sample, they selected companies listed in the food sector of the Karachi stock market for the period of 2002-2006. They then employed a multivariate regression analysis in common effect setting.

Findings of study revealed the presence of a significant negative relationship (with a p-value of 0.0141) between size and profitability. However, tangibility, growth of the firm and food inflation were found to have a positive but insignificant relationship (with p-values of 0.4212, 0.96 and 0.1196 respectively) to profitability. Similarly, the relationship between debt to equity ratio of firm and its profitability was insignificantly negative. The findings were contradictory to the study by (Athanasoglou, Brissimis, and Delis, 2008), which revealed positive and significant relationship between expected inflation rate and profitability.

The study helped provide significant insight into the dynamics of the food sector of the Karachi-based equity market contributed to the way resources should be allocated in the food industry. One crucial limitation of study, however, was that it considered food inflation as the one and only macroeconomic factor.

Addressing that limitation, (Mutunga, 2014) conducted a study on the effects of certain macroeconomic factors on the food and beverage sector in Kenya. Similar to the (Bhutta and Hasan, 2013) study, that study also relied on a multivariate linear regression analysis. However, unlike the (Bhutta and Hasan, 2013) study, that study focused on the broader sense of inflation (not only food derived) and used two additional macroeconomic factors of exchange and interest rates. It also used various indicators of sustainable competitive advantage besides profitability.

Samples were collected from 95 of the 138 food and beverage firms located in the two cities of Nairobi and Mombasa. Most of the firms were privately owned.

Top executives of the 95 firms were surveyed for their perception of the effects of the selected macroeconomic factors on their firms' competitive advantage. Out of them, only 32 responded, hence a response rate of only 33.7 percent.

The findings of the study revealed that the effects of the selected macroeconomic factors on sustainable competitive advantage of food and beverage firms in Kenya were not statistically significant. Inflation had a p-value of .142, exchange rate had a p-value of .767 and interest rates had a p-value of .086 at 95 percent confidence interval. Moreover, the findings also revealed the presence of multicollinearity among the variables (a tolerance factor of 10).

It could thus be implied from the findings that the macroeconomic factors of inflation, exchange rate and interest rate have not had an adverse effect on the sustainable competitive advantage of food and beverage processing firms in Kenya.

The study, however, had two limitations with the first being in the sample. The lack of adverse effects of exchange or interest rate fluctuations on competitive advantages of the firms could have been due to most of firms surveyed being privately owned. As they were family businesses, they were not much involved in the export and import trades that could have exposed them further to the macroeconomic variable fluctuations.

The second limitation was the multi-collinearity in the findings. As a result, the estimates of relationships turned out to be biased. There was distortion in the findings.

III.   Data and Methodology

Hypotheses

For the sake of this paper, some hypotheses have been formulated to test whether results of past studies concerning industry profitability can be applied in the context of food companies in Bangladesh. For the dependent variables, the paper will focus on three different measures of profitability: the net income ratio which was used in the (Bhutta and Hasan, 2013) study and return on assets and return on equity, both of which were used in the (Athanasoglou, Brissimis, and Delis, 2008) study.

This paper focuses on the impacts of three of the four firm-specific variables (debt-to-equity, asset tangibility and size) on profitability that were tested in the (Bhutta and Hasan, 2013) study. As for the

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macroeconomic variables, it focuses on food inflation which was used in the Bhutta and Hasan, 2013) study along with exchange rates and interest rates which were used in the (Mutunga, 2014) study.
Accordingly, the following hypotheses were tested.

Hypothesis 1
H_1: Debt-to-equity has an impact on profitability.
H_{01}: Debt-to-equity does not have an impact on profitability.
Hypothesis 2
H_2: Asset tangibility has an impact on profitability.
H_{02}: Asset tangibility does not have an impact on profitability.
Hypothesis 3
H_3: Size has an impact on profitability.
H_{03}: Size does not have an impact on profitability.
Hypothesis 4
H_4: Food inflation has an impact on profitability.
H_{04}: Food inflation does not have an impact on profitability.
Hypothesis 5
H_5: Exchange rate has an impact on profitability.
H_{05}: Exchange rate does not have an impact on profitability.
Hypothesis 6
H_6: Interest rate has an impact on profitability.
H_{06}: Interest rate does not have an impact on profitability.

Data

This paper examines the effects of selected firm-specific and macroeconomic factors on the profitability of public-limited firms in the food industry of Bangladesh.

It makes use of the accounting data of the firms and available economic data of Bangladesh during a 5-year period starting from July 2013 and ending in June 2018. The asset tangibility ratio was expressed as tangible assets (cash, inventory and tangible fixed assets) to total assets and size was expressed as the natural logarithm of sales.

In case of exchange rate, the average annual Bangladesh Taka to US Dollar exchange rates were used and in case of interest rate, 5 years of 10-year BGTB rates from July 2013 to June 2018 were used as proxies.

All available accounting data were obtained from publicly available financial statements. Data for interest rates, exchange rates and food inflation, meanwhile, was obtained from the websites of CEIC, Trading Economics, and Bangladesh Bank respectively. Any missing data was compensated for using the multiple imputation approach. In total, 60 company-years of data were used.

Outline of Model

The general model to be estimated is of the following linear form:

$$\pi_{it} = c + \sum_{j=1}^{J} \beta_j X_{it}^j + \sum_{l=1}^{L} \beta_l X_{it}^l + \varepsilon_{it}$$

Where,
π_{it} = profitability of company i at time t,
c = constant term,
X_{it}^j = firm-specific explanatory variables,
X_{it}^l = macroeconomic explanatory variables, and
ε_{it} = error

IV. Findings and Discussion

Descriptive Statistics of Industry

The table below shows the descriptive statistics of both the dependent and independent variables for the food industry in Bangladesh. Using a sample of 12 companies, the industrial mean average values of all the variables per year over a 5-year period from July 2013 to June 2018 were derived.

Table 1: Industry average over a 5-year period

Variables	Year				
	2017-2018	2016-2017	2015-2016	2014-2015	2013-2014
Net income ratio	11.015	12.971	5.105	3.559	11.321
Return on assets	7.280	8.535	10.167	11.174	11.798

Return on equity	17.073	24.155	30.377	25.594	26.755
Debt-to-equity	1.012	1.489	1.144	6.458	-3.464
Asset tangibility	0.692	0.643	0.670	0.718	0.726
Size	20.441	20.422	20.067	19.808	20.022

From Table 1, it can be observed that the net income ratio seemed to follow a cyclical trend with the industry falling to its minimum at 3.559 in the 2014-15 period and then rising back up to its maximum at 12.971 in the 2016-17 period before falling back down again. However, the return on assets and return on equity fell steadily over the last four years. Those could indicate a potentially worrying prospect for the long-term sustainability for the country's food industry.

Meanwhile, the negative debt-to-equity ratio in the 2013-14 period followed by a large debt-to-equity ratio in the 2014-15 period suggests that the industry was most probably recovering from a crisis. The ratio remained more or less stable afterwards. Asset tangibility and size, meanwhile, remained more or less stable throughout the five years.

Industry average tells how the industry in general is performing. However, it does not clearly tell how the individual companies in the industry are performing. The standard deviations of the variables in Table 2 give a clearer picture of whether some companies were performing far better or worse than others.

Table 2: Industry standard deviation over a 5-year period

Variables	Year				
	2017-2018	2016-2017	2015-2016	2014-2015	2013-2014
Net income ratio	11.399	10.153	31.311	27.074	17.979
Return on assets	10.873	11.375	13.537	15.737	13.404
Return on equity	23.735	31.202	43.240	36.438	36.909
Debt-to-equity	3.280	5.195	4.594	22.108	13.156
Asset tangibility	0.174	0.185	0.204	0.173	0.161
Size	1.807	1.782	2.038	2.326	2.115

From Table 2, it can be seen that standard deviations for all six variables were at their highest from July 2014 to June 2016. Standard deviations for return on assets, debt-to-equity and size were at their highest in the 2014-15 period while standard deviations for net income ratio, return on equity and asset tangibility were at their highest in the 2015-16 period. Afterwards, the standard deviations all the variables followed a downward trend, indicating that companies were moving closer toward the industry average.

Findings from regression analysis

Table 3 shows the coefficients attached to the indicators of net income ratio and their respective standard errors; along with their respective t-values, p-values and 95% confidence interval to illustrate statistical significance.

Table 3: Regression results for Net Income Ratio

Variables	Coefficient	Standard Error	T statistics	P>|t|	[95% Conf. Interval]	
Debt-to-equity	-0.01065	0.21142	-0.05037	0.960014	-0.4347	0.413405
Asset tangibility	35.90797	15.94856	2.251487	0.028524	3.919212	67.89673
Size	3.79314	1.626555	2.332008	0.023532	0.530683	7.055597
Interest rates	-3.32893	3.288162	-1.0124	0.315947	-9.92415	3.266285
Exchange rates	-2.41968	3.10575	-0.7791	0.439388	-8.64902	3.809665
Food inflation	4.51183	4.354455	1.03614	0.304841	-4.22211	13.24576
Constant	97.19584	250.0423	0.388718	0.699042	-404.326	598.7172

It can be observed in Table 3 that none of the variables, except for asset tangibility and size, have statistically significant coefficients.

Debt-to-equity ratio has a negative but insignificant coefficient. The coefficient of -0.01065 means that a 1 unit decrease in debt-to-equity ratio will increase net income ratio by roughly 1 percentage point. However, its t-value is -0.05 against a p-value of 0.96. This means that the hypothesis that debt-to-equity has an impact on profitability cannot be proven using net income ratio as a proxy for profitability.

Asset tangibility has a positive and significant coefficient. The coefficient of 35.90797 for asset tangibility means that an increase in asset tangibility by 1 percentage point will lead to an increase in net profit as a percentage of sales by 35.9 percentage points. It has a t-value of 2.251 against a p-value of 0.029. So, this proves the hypothesis that asset tangibility has an impact on profitability.

Size also has a positive and significant coefficient. The coefficient of 3.79314 means that an increase of 1 percentage point in size will lead to an increase of 3.79 percentage points in net income ratio. The positive relationship could be explained by the fact that larger companies are able to better exploit economies of scale. It

also has a t-value of 2.332 against a p-value of 0.024. Hence, this proves the hypothesis that size has an impact on profitability.

Interest rate has a negative but insignificant coefficient. The coefficient of -3.32893 means that a 1 percentage point decrease in interest rate will increase net income ratio by roughly 3.33 percentage points. However, its t-value is -1.01 against a p-value of 0.316. This means that the hypothesis that interest rate has an impact on profitability cannot be proven with net income ratio as a measure of profitability.

Exchange rate also has a negative but insignificant coefficient. The coefficient of -2.41968 for exchange rate means that for every 1 percentage point decrease in exchange rate, net income ratio will increase by 2.41 percentage points. It has a t-value of -0.779 against a p-value of 0.439. This means that the hypothesis that exchange rate has an impact on profitability cannot be proven with net income ratio as a proxy for profitability.

Finally, food inflation has a positive but insignificant coefficient. The coefficient of 4.51183 for food inflation means that for every 1 percentage point increase in food inflation, net income ratio will increase by 4.51 percentage points. It has a t-value of 1.036 against a p-value of 0.305. This means that the hypothesis that food inflation has an impact on profitability cannot be proven with net income ratio as a measure of profitability.

Table 4, meanwhile, shows the coefficients attached to the indicators of return on assets and their respective standard errors; along with their respective t-values, p-values and 95% confidence interval to illustrate statistical significance.

Table 4: Regression results for Return on Assets

Variables	Coefficient	Standard Error	T	P>|t|	[95% Conf. Interval]	
Debt-to-equity	-0.01381	0.135143	-0.10221	0.918974	-0.28488	0.257249
Asset tangibility	5.80843	10.19455	0.569758	0.571249	-14.6393	26.2561
Size	0.24692	1.039718	0.237489	0.813193	-1.83849	2.332331
Interest rates	0.19543	2.101841	0.092979	0.926271	-4.02033	4.411185
Exchange rates	-0.61204	1.98524	-0.30829	0.759068	-4.59392	3.369852
Food inflation	-0.13003	2.783431	-0.04671	0.962916	-5.71288	5.452829
Constant	47.83036	159.8307	0.299256	0.765915	-272.749	368.4101

It can be observed from Table 4, however, that none of the variables have statistically significant coefficients.

Debt-to-equity ratio has a negative but insignificant coefficient. The coefficient of -0.01381 means that a 1 unit decrease in debt-to-equity ratio will increase return on assets by roughly 1 percentage point. However, its t-value is -0.10 against a p-value of 0.92. This means that the hypothesis that debt-to-equity has an impact on profitability cannot be proven using return on assets as a proxy for profitability.

Asset tangibility has a positive but insignificant coefficient. The coefficient of 5.80843 for asset tangibility means that an increase in asset tangibility by 1 unit will lead to an increase in return on assets by 5.81 units. However, it has a t-value of 0.57 against a p-value of 0.571. Therefore, the hypothesis that asset tangibility has an impact on profitability cannot be proven with return on assets as a proxy for profitability

Size has a positive but insignificant coefficient. The coefficient of 0.24692 means that an increase of 1 unit in size will also lead to an increase of 0.25 units in return on assets. However, it has a t-value of 0.237 against a p-value of 0.813 and so, the hypothesis that size has an impact on profitability cannot be proven with return on assets as a proxy for profitability.

Interest rate also has a positive but insignificant coefficient. The coefficient of 0.19543 means that an increase in interest rate by 1 unit will lead to an increase in return on equity by roughly 0.19 units. However, its t-value is 0.093 against a p-value of 0.926. Therefore, the hypothesis that interest rate has an impact on profitability cannot be proven with return on assets as a measure of profitability.

Exchange rate has a negative but insignificant coefficient. The coefficient of -0.61204 for exchange rate means that for every 1 unit decrease in exchange rate, return on assets will increase by 0.612 units. However, it has a t-value of -0.308 against a p-value of 0.759. This means that the hypothesis that exchange rate has an impact on profitability cannot be proven with return on assets as a proxy for profitability

Finally, food inflation also has a negative but insignificant coefficient. The coefficient of -0.13 for food inflation means that for every 1 unit decrease in food inflation, return on assets will increase by 0.13 units. However, since it has a t-value of -0.047 against a p-value of 0.963, the hypothesis that food inflation has an impact on profitability cannot be proven with return on assets as a measure of profitability.

Table 5, finally, shows the coefficients attached to the indicators of return on equity and their respective standard errors; along with their respective t-values, p-values and 95% confidence interval to illustrate statistical significance.

Table 5: Regression results for Return on Equity

Variables	Coefficient	Standard Error	T	P>|t|	[95% Conf. Interval]	
Debt-to-equity	0.601278	0.383501	1.567864	0.122865	-0.16793	1.370484
Asset tangibility	43.16463	28.92958	1.492059	0.141613	-14.8607	101.19
Size	1.855302	2.950458	0.628818	0.532169	-4.06257	7.773172
Interest rates	-1.32477	5.964497	-0.22211	0.825082	-13.288	10.63849
Exchange rates	-4.42515	5.633614	-0.78549	0.435664	-15.7247	6.87445
Food inflation	2.209151	7.898679	0.279686	0.780807	-13.6336	18.05189
Constant	305.1986	453.5594	0.672897	0.503937	-604.526	1214.923

Like in Table 4, it can also be observed in Table 5 that none of the variables have statistically significant coefficients.

Debt-to-equity ratio has a positive but insignificant coefficient. The coefficient of 0.601278 means that a 1 unit increase in debt-to-equity ratio will also increase return on equity by roughly 60.128 percentage points. However, its t-value is 1.568 against a p-value of 0.123. This means that the hypothesis that debt-to-equity has an impact on profitability cannot be proven using return on equity as a proxy for profitability.

Asset tangibility has a positive but insignificant coefficient. The coefficient of 43.16463 for asset tangibility means that an increase in asset tangibility by 1 unit will lead to an increase in return on equity by 43.165 units. However, it has a t-value of 1.492 against a p-value of 0.142. Therefore, the hypothesis that asset tangibility has an impact on profitability cannot be proven with return on equity as a proxy for profitability

Size also has a positive but insignificant coefficient. The coefficient of 1.855302 means that an increase of 1 unit in size will also lead to an increase of 1.855 units in return on equity. However, it has a t-value of 0.629 against a p-value of 0.532 and so, the hypothesis that size has an impact on profitability cannot be proven with return on equity as a proxy for profitability.

Interest rate has a negative but insignificant coefficient. The coefficient of -1.32477 means that an increase in interest rate by 1 unit will lead to a decrease in return on equity by roughly 1.32 units. However, its t-value is -0.222 against a p-value of 0.825 and so, the hypothesis that interest rate has an impact on profitability cannot be proven with return on equity as a measure of profitability.

Exchange rate also has a negative but insignificant coefficient. The coefficient of -4.42515 for exchange rate means that for every 1 unit decrease in exchange rate, return on equity will increase by 4.425 units. However, it has a t-value of -0.785 against a p-value of 0.436. This means that the hypothesis that exchange rate has an impact on profitability cannot be proven with return on equity as a proxy for profitability.

Finally, food inflation has a positive but insignificant coefficient. The coefficient of 2.209 for food inflation means that for every 1 unit increase in food inflation, return on equity will increase by 2.209 units. However, since it has a t-value of 0.28 against a p-value of 0.781, the hypothesis that food inflation has an impact on profitability cannot be proven with return on equity as a measure of profitability.

V.   Discussion and recommendations
Discussion

The aim of this paper was to understand the significance of the impacts of selected firm-specific and macroeconomic indicators on the profitability of the food industry in Bangladesh. For that, an empirical framework was specified in order to investigate the impact of the determinants on the profitability of the industry within a five-year period from 2013 to 2018. The appropriate econometric methodology was then used to estimate the model.

A total of six explanatory variables were selected to evaluate their effect on profitability. Three of them were firm-specific variables and the other three were macroeconomic variables. Only two out of the six variables were statistically significant and both of them, asset tangibility and size, were firm-specific variables. Therefore, only the 2nd hypothesis that asset tangibility has an impact on profitability and the 3rd hypothesis that size has an impact on profitability could be accepted. The other four variables, including all three macroeconomic variables, were unable to explain the profitability in Bangladesh firms.

These findings have indicated that larger firms and firms that have more tangible assets as a proportion of total assets are more likely to be profitable and, hence, sustainable in the food industry of Bangladesh.

This study bears a few similarities with the (Bhutta and Hasan, 2013) study which was conducted on the Pakistani food sector. Both studies found positive and statistically significant impacts of size on the profitability of the food industry in their respective countries. Both studies also failed to find any significant impacts of macroeconomic factors on the profitability of the food industries of their respective countries. However, unlike the (Bhutta and Hasan, 2013) study, which confirmed a negative but insignificant impact of asset tangibility on profitability of the Pakistani food industry, this study found a positive and significant impact of asset tangibility on profitability of the Bangladeshi food industry.

Recommendations

Managers in the food sector of Bangladesh must focus particularly on asset tangibility and firm size when planning sustainability goals for their respective companies. Investors should also consider asset tangibility and firm size when making investment decisions regarding the food industry of Bangladesh. The government must also keep the food industry in check so that companies strictly abide by BAS (Bangladesh Accounting Standards) 38 and do not artificially inflate their intangible assets in order to seem more profitable than they really are.

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