Debt Management and Firms' Performance during the COVID-19 Pandemic: Granger Causality, Fixed Effects, and Random Effects Analyses

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ABSTRACT

The COVID-19 pandemic and the associated lockdown measures have disrupted local and global economic activities, resulting in reduced revenues and increased operating costs among firms. The pandemic has also led to firms' greater reliance on debt financing as they have had to borrow more to meet their financial obligations. This study examined the relationship of debt to equity and debt ratio on net profit margin (NPM) among firms during the COVID-19 pandemic. Results showed that debt ratio is negatively significant to NPM, while the correlation between debt to equity and NPM appears to be insignificant. Furthermore, the Durbin-Watson statistic shows that there is no autocorrelation error encountered in the panel regression, while the corresponding F-statistic reveals that the regression output is significant.

Keywords: debt ratio, debt to equity, debt management, COVID-19 pandemic.

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1. INTRODUCTION

The spread of the Coronavirus Disease 2019 (COVID-19) has not only resulted in the loss of many lives but has also impacted businesses and markets on domestic and global levels. In particular, the reduction in mobility caused by the pandemic and the associated lockdown measures has created obstacles within the supply chain (Sharma et al., 2020; Ji & Zhang, 2022; Yang & Zhang, 2022) and have had tremendous spillover effects on individuals' income, firms' financial performance, countries' domestic growth, and the overall global macroeconomic environment.

The health crisis and the corresponding lockdown measures have also threatened the continuity of all companies' activities (Rababah et al., 2020) and have even resulted to business failures among some small and medium-sized enterprises (SMEs) (Gourinchas et al., 2020). On one hand, a decline in price level during the COVID-19 pandemic has created uncertainties for supply and demand. These uncertainties could have adverse consequences for both producers and consumers and could negatively weigh on the performance of the Philippine economy. Worse, fundamental economic policies will also have difficulty in the implementation due to uncertainties, as previously reflected during the course of the pandemic. In the macroeconomic strategy, the government needs to pump prime the economy during a crisis, in order to minimize the extent of its impact. However, the assumption of increasing government expenditure to minimize the effect of the crisis might

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not always hold and could depend on the nature of the crisis, whether financial, social, or health-related.

On the other hand, crises like the pandemic have also significantly impacted firms' debt financing ratios in the Philippines. According to Ramos and Naval (2021), the pandemic has led to higher firms' leverage ratios, indicating a greater reliance on debt financing. The increase in firms' leverage ratios is attributed to the pandemic's adverse effects on businesses, such as reduced revenues, disrupted supply chains, and increased operating costs. As a result, firms may have had to borrow more to maintain their operations and meet their financial obligations.

Additionally, it should be noted that crises like the COVID-19 pandemic also bring uncertainty to the financial system. Generally, high market risk often results in a higher cost of borrowing and a decline in the stock market. Financial markets facing uncertain times may also indulge in activities that are against the goal of the firm and the shareholders. Firms often resort to earnings management to mitigate uncertainty and minimize the effect of market-value fluctuations. Prevalent economic environments can dictate the value of earnings of the firms. Nevertheless, Türegün (2020) found a high level of earnings management post-crisis.

Debt management plays a pivotal role in determining the financial health and operational efficiency of firms. The interplay between a firm's debt management practices and its performance can be analyzed using econometric methods like Granger Causality, Fixed Effects, and Random Effects models. These methods provide unique insights into causality, heterogeneity, and the influence of unobservable variables. Debt management refers to strategies and practices firms adopt to optimize their capital structure, minimize financial risk, and maintain solvency. The performance of firms, often measured in terms of profitability, market valuation, and operational efficiency.

Causality between debt and performance examines whether changes in debt levels precede changes in firm performance metrics like return on equity (ROE) or earnings per share (EPS). For instance, increased debt may fund investments that yield higher returns, thereby boosting performance. Causality between performance and debt examines firms with strong financial performance might attract better credit terms or choose to take on more debt to fund expansion. While bidirectional Causality indicates a feedback loop where the debt influences performance and vice versa.

This study will provide additional existing literature on determining the impact of a crisis on the economy and on the performance of firms. This paper focuses on the impact of the COVID-19 health crisis, distinguishing it from previous financial and economic crises given the differences in either the fiscal responses of governments or the monetary policy decisions of central banks. It must be noted that the implementation of policies may be more complex during the course of the pandemic in contrast to previous financial crises, as various uncertainties, like the community quarantine measures and the eventual cost and availability of vaccines, must be taken into consideration.

2. LITERATURE

Global financial markets, institutions, and firms have experienced many crises in the past, some of which were systemic and others specific to firms, institutions, and markets.

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Nevertheless, these crises often have ended up causing financial markets to crash, as seen during the financial crises in 1997–1998 and 2008–2009. For instance, the global economic crisis in 2008 rocked the financial conditions of companies not only in developed countries such as the United States of America but also in developing economies such as Indonesia. According to Ramadhani & Lukviarman (2009), the crisis caused Indonesia's manufacturing sector to experience financial difficulties to its lowest point, with the data from the Central Statistics Agency indicating that nearly 13% of the manufacturing sector experienced bankruptcy amid the economic crisis in 2008. The researchers also noted that the only sectors that experienced growth were transportation and communication, gas, electricity and clean water, and agriculture.

Having learned several lessons from past crises, firms and governments have adequately adapted themselves to face similar eventualities in the future. According to Marulanda Fraume et al. (2020), more researchers have turned their attention on examining the susceptibility of countries towards hazards and their corresponding macroeconomic antecedents. Meanwhile, Bhattacharya, Smark, and Mir (2021) contended that business entities and government units are both forced to rethink the predictive analysis of the occurrence of crises and their corresponding financial, economic, and social implications.

Despite the lessons learned from previous financial crises, companies were still seen to grapple with the financial impact of the recent COVID-19 pandemic, as its origin as a global health crisis, rather than financial or economic in origin, meant that previous financial strategies could be inadequate in addressing the disruptions brought by community quarantine restrictions. Several studies have shown that the COVID-19 pandemic has led to an increase in firms' debt financing ratios, as companies have had to borrow more to cover their expenses and maintain their operations during periods of economic uncertainty (Bacalso, 2021). The increase in debt can have a range of consequences for firms, including reduced financial flexibility and increased risk of bankruptcy (Aguilar & Santillan, 2020).

However, the impact of the pandemic on firms' debt financing ratios has not been uniform across all sectors. For instance, firms in the healthcare and pharmaceutical industries have experienced an increase in demand for their products and services, which has allowed them to maintain or even decrease their debt levels (Bacalso, 2021). On the other hand, firms in the hospitality and tourism sectors have been hit particularly hard by the pandemic, with many facing significant losses and increased debt levels (Aguilar & Santillan, 2020).

Likewise, the firm's performance is optimized if the firm has a competitive advantage, as described in the resource-based theory. Sun et al. (2020) stated that to help firms' financial performance from various risky economic situations, it is essential to create new competitive advantages for long-term development. Competitive advantage is obtained by utilizing, managing, and controlling owned resources, as well as by dealing with various conditions such as economic crises or health crises like the recent COVID-19 pandemic. These owned resources may take in the forms of material assets, technological knowledge, and human capacity to manage firm performance in various conditions. Sukma (2018) stated that it is essential to generate a competitive advantage that has high economic value that is difficult to imitate or replace and to become a primary need for society. The firm's performance is highly dependent on management's ability to produce and manage unique and specific resources to compete and survive in various situations. Employee's performance is also one of the efforts to increase firms' productivity (Unger et al., 2020).

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The increase in productivity will have an impact on the ability of competitiveness and improve firms' performance.

The firm's financial performance focuses on financial aspects related to income and overall operating costs, debt structure, assets, and investment returns. Studies on financial performance are not limited to one-period discussions because stakeholders need to pay attention to any changes in the firm's financial performance, and to any financial, economic, or health crisis that might affect the performance of the firms, that can be measured through financial statement analysis (Rhamadana & Triyonowati, 2016). For Subramanyam (2014), financial performance is a condition that reflects the financial condition of a firm. Many companies faced reduced revenues, disrupted supply chains, and increased uncertainty, leading to a higher reliance on debt financing to meet their financial obligations (Huang & Li, 2020). This trend is particularly evident in sectors such as tourism, hospitality, and retail, which experienced severe downturns due to lockdown measures and reduced consumer spending (Nguyen et al., 2021). As a result of these challenges, firms' debt-to-equity ratios increased as they sought additional funding to mitigate the negative effects of the pandemic (Chen et al., 2020). The higher debt financing ratios reflect the need to bridge the gap in cash flows and maintain operations during the crisis. However, the increased debt levels also raise concerns about the long-term financial health and sustainability of these firms (Jose et al., 2021).

Dela Cruz, et al. (2021) noted that firms increased their debt financing to cope with the economic slowdown brought about by the pandemic. This finding is consistent with previous studies that suggest that firms tend to rely more on debt financing during economic downturns (Lemmon & Zender, 2010). Furthermore, Dela Cruz, et al. (2021) found that the pandemic also had a significant impact on the structure of firms' debt financing. The study revealed that firms in the country have shifted from long-term debt to short-term debt financing during the course of the pandemic. This shift was attributed to the uncertainty surrounding the duration and severity of the pandemic and its economic impact. These findings are consistent with previous studies that suggest that firms tend to shift to short-term debt financing during times of economic uncertainty (Ang, et al., 2015). Overall, the COVID-19 pandemic has had a complex and varied impact on firms' debt financing ratios in the Philippines, with different industries experiencing different effects. Policymakers and investors will need to carefully consider these factors when evaluating the financial health of companies in the post-pandemic period (Bacalso, 2021).

Additionally, the COVID-19 pandemic has had a significant impact on firms' debt financing ratios in the Philippines (Cajueiro & Tabak, 2021; Aguilar & Santillan, 2020). The study found that there was a significant increase in the debt-to-equity ratio of firms in the Philippines during the pandemic. This increase in firms' debt ratios is consistent with the findings of other studies on the impact of economic crises on firms' capital structures. For instance, a study by Brahmana and Hooy (2020) on the Indonesian stock market during the COVID-19 pandemic found that firms with higher debt ratios were more vulnerable to the pandemic's economic shock. Similarly, Garg and Arora (2021) found that the pandemic had a significant impact on firms' capital structures in the Indian economy, with an increase in debt financing and a decrease in equity financing. These studies highlight the vulnerability of firms to economic crises, and the need for policymakers and investors to closely monitor firms' debt financing ratios during such periods.

3. METHOD

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The research design of the study is quantitative in nature, which aims to determine a phenomenon relating to financial performance and economic growth. More specifically, the study uses a Granger causality approach to establish cause-effect relationships between the variables. This study focused on the effect of debt management on the profitability of a company in the food and beverage industry listed in the Philippine Stock Exchange.

To empirically determine the relationship between the variables, the study employed panel data on financial performance from 2015 to 2021 and profitability of the 25 companies in the food and beverage industry, and profitability is measured by return on assets (ROA).

The study used the Granger causality model, represented by the following equations:

$$debt\_financing_t = \sum_{i=1}^{m} \alpha_i \, debt\_financing_{t-i} + \sum_{k=1}^{m} \beta_k profitability_{t-k} + e_{t-k} \quad \text{(Eq. 1)}$$

$$profitability_t = \sum_{i=1}^{m} \gamma_i \, RGDPGR_{t-i} + \sum_{k=1}^{m} \delta_k debt\_financing_{t-k} + v_{t-k} \quad \text{(Eq. 2)}$$

Equation 3 and Equation 4 represent the study's cointegration and stationarity methods, respectively:

$$\Delta y_t = \Pi y_{t-1} + \textstyle\sum_{j-1}^{k-1} \Gamma_j \Delta y_{t-j} + e_t \quad \text{(Eq. 3)}$$

$$\Delta y_t = \alpha_0 + \gamma y_{t-1} + a_2 t + \varepsilon_t \quad \text{(Eq. 4)}$$

The first step in time series analysis is to check for the presence of a unit root using Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) tests, where: Δyt = first difference of the series yt or $\Delta y_t = y_t - y_{t-1}$, a_o = intercept or drift term, t = trend component, and ϵ_t = random disturbance term that has an expected value of zero.

This study used the structural stability test, which refers to the stability of the coefficients of a regression model between different time periods. In this study, such test performed using Chow Breakpoint Test. A structural change could mean a change in the intercept, a change in the slope coefficients, or a change in both the intercept and slope coefficients. Either way, the results would imply structural instability and the model therefore cannot be used for policy analysis and forecasting.

The formula for testing the structural stability of the regression parameter involving time series data is as follows:

$$F = \frac{(RSS_R - RSS_{UR}/k}{RSS_{UR}/(n_1 + n_2 - 2k)} \quad \text{(Eq. 5)}$$

where k is the number of regressors including intercept, n is the number of observations, RSS_R is the regression sum of squares restricted, and RSS_{UR} is the regression sum of squares unrestricted. If the computed F-statistic exceeds critical value, there is structural instability. Otherwise, the model is said to be structurally stable.

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To determine the heteroskedasticity of the variables, if the variance of the regression residuals of the model is time varying, the parameters and their standard errors are said to be biased and inefficient. This condition is known as heteroskedasticity and if uncorrected could lead to wrong conclusions and decisions on the part of the investigator. To detect the presence of heteroskedastic disturbances in the residuals, the White Heteroskedasticity Test was used.

$$u^2 = \alpha_o + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_1^2 + \alpha_5 X_2^2 + X_3^2 + \alpha_6 X_1 X_2 + \alpha_7 X_1 X_3 + \alpha_8 X_2 X_3 + v_t$$

(Eq. 6)

where u^2 is the squared regression residuals regressed against the explanatory variables, their squares, and cross products.

An efficient test in determining the optimal lag length is to minimize the Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), or Bayesian Information Criterion (BIC) for each lag length on a trial-and-error basis. For the Akaike Information Criterion (AIC) which is a popular test, the formula is as follows:

$$ln\ AIC = (2k/n) + ln\ (RSS/n) \quad \text{(Eq. 7)}$$

where k is the number of regressors including intercept, n is number of observations, and RSS is regression sum of squares. After experimenting with a sufficient number of lags in the model, the one which produces the smallest AIC would indicate the appropriate or optimal lag length.

In applying the Johansen Cointegration Test which consists of five options, although options 1 and 5 are avoided because of their explosive values which are not consistent with economic realities, such options were utilized according to the Dickey-Pantula principle by beginning with the most restrictive (Option 2) down to the least restrictive (Option 4).

If the computed *trace statistics* and *maximum-eigenvalue statistics* exceed their critical values, then there is cointegration among the variables. The hypothesized relationships cannot be deemed spurious and therefore genuine equilibrium relationships existed.

The Ramsey regression equation specification error test (RESET) will be used to test whether non-linear combinations of independent variables help in explaining the dependent variable. This will also help determine if there is no misspecification error in the data used in the study.

A Specification error test is associated with the specification of the model regarding the inclusion of an irrelevant variable, the exclusion of relevant variable, or the functional form of the model. A Specification error creates biased or inconsistent regression estimators, and the inconsistency can still be there even when the sample observation increases. To determine the specification of the model, this study used the equation:

$$\hat{Y}_i = \hat{\beta}_1 + \hat{\beta}_2 X_{2i} + \hat{\beta}_3 X_{3i} + \gamma \hat{Y}_i^2 \quad \text{(Eq. 8)}$$

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This study will be estimating the firms' financial performance in the Philippines Stock Exchange for the period 2019 to 2021 panel data. Considering the panel regression model, where Z_i is the unobserved time-variant heterogeneity across the firms i = 1, … n.

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 Z_i + u_{it} \quad \text{(Eq. 9)}$$

The goal is to estimate β_1 which is the effect of X_i on Y_i. Letting $\alpha_i = \beta_0 + \beta_2 Z_i$ we obtain

$$Y_{it} = \alpha_i + \beta_1 X_{it} + u_{it} \quad \text{(Eq. 10)}$$

Having individual specific intercepts α_i, i = 1, … n, where each of these can be understood as the fixed effects of entity i, which is the fixed effects model as shown below,

$$Y_{it} = \beta_1 X_{1,it} + \cdots + \beta_k X_{k,it} + \alpha_i + u_{it} \quad \text{(Eq. 11)}$$

where i = 1, …, n and t = 1, …, T. The α_i are entity-specific intercepts that capture heterogeneities across firms.

The fixed effects (FE) model eliminates the effect of unobserved heterogeneity. But, with different levels of engagement, it is necessary to check heteroskedasticity problem and autocorrelation. In case that heterogeneity is present, random effects (variance components model) provides the option to take into account heterogeneity across regions in the regression coefficients. That is,

$$Y_{it} = \beta_0 + \beta_1 X_{1,it} + \cdots + \beta_k X_{k,it} + \alpha_i + u_{it} \quad \text{(Eq. 12)}$$

4. RESULTS AND DISCUSSION

Table 1, Table 2, and Table 3 reflect the regression analyses on the correlation between debt and firms' performance. These three analyses examine how debt indicators, represented by debt ratio and debt to equity ratio, impact various firm performance matrix. Specifically, Table 1 focuses on the net profit margin (NPM) as the dependent variable, while Table 2 and Table 3 examines the return on equity (ROE) and return on assets (ROA) to represent firm performance, respectively.

Table 1. Regression Results

Dependent Variable: NPM
Method: Panel Least Squares
Sample: 2015 2021
Periods included: 7
Cross-sections included: 18
Total panel (balanced) observations: 126

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	0.151371	0.031256	4.842935	0.0000
DEBT_RATIO	-0.175673	0.086916	-2.021187	0.0459
DEBT_TO_EQUITY	-0.011433	0.013033	-0.877265	0.3824

Effects Specification

Cross-section fixed (dummy variables)

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Period fixed (dummy variables)

R-squared	0.672573	Mean dependent var	0.060449
Adjusted R-squared	0.590716	S.D. dependent var	0.092754
S.E. of regression	0.059340	Akaike info criterion	-2.629490
Sum squared resid	0.352120	Schwarz criterion	-2.044225
Log likelihood	191.6578	Hannan-Quinn criter.	-2.391715
F-statistic	8.216452	Durbin-Watson stat	1.678705
Prob(F-statistic)	0.000000		

Pedroni Residual Cointegration Test
Series: NPM DEBT_RATIO DEBT_TO_EQUITY
Sample: 2015 2021
Included observations: 126
Cross-sections included: 18
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
Automatic lag length selection based on SIC with a max lag of 0
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-1.554010	0.9399	-0.858954	0.8048
Panel rho-Statistic	2.482277	0.9935	1.711105	0.9565
Panel PP-Statistic	1.355589	0.9124	-2.150270	0.0158
Panel ADF-Statistic	1.310096	0.9049	-2.092519	0.0182

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	3.493690	0.9998
Group PP-Statistic	-3.085074	0.0010
Group ADF-Statistic	-2.472071	0.0067

Note: The variable NPM serves as the dependent variable of the model.

Table 2. Regression Results

Dependent Variable: ROE
Method: Panel Least Squares
Sample: 2015 2021
Periods included: 7
Cross-sections included: 18
Total panel (balanced) observations: 126

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	0.188294	0.051641	3.646181	0.0004
DEBT_RATIO	-0.144100	0.143603	-1.003461	0.3181
DEBT_TO_EQUITY	-0.040746	0.021533	-1.892254	0.0613

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.567611	Mean dependent var	0.076127
Adjusted R-squared	0.459514	S.D. dependent var	0.133358
S.E. of regression	0.098042	Akaike info criterion	-1.625265
Sum squared resid	0.961214	Schwarz criterion	-1.040000

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Log likelihood	128.3917	Hannan-Quinn criter.	-1.387490
F-statistic	5.250931	Durbin-Watson stat	1.571834
Prob(F-statistic)	0.000000		

Pedroni Residual Cointegration Test
Series: ROE DEBT_RATIO DEBT_TO_EQUITY
Sample: 2015 2021
Included observations: 126
Cross-sections included: 18
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
Automatic lag length selection based on SIC with a max lag of 0
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-1.325009	0.9074	-1.259611	0.8961
Panel rho-Statistic	2.330488	0.9901	1.638233	0.9493
Panel PP-Statistic	0.265527	0.6047	-2.884818	0.0020
Panel ADF-Statistic	0.019015	0.5076	-2.684157	0.0036

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	3.557589	0.9998
Group PP-Statistic	-3.549473	0.0002
Group ADF-Statistic	-2.537412	0.0056

Note: The variable ROE serves as the dependent variable of the model.

Table 3. Regression Results

Dependent Variable: ROA
Method: Panel Least Squares
Sample: 2015 2021
Periods included: 7
Cross-sections included: 18
Total panel (balanced) observations: 126
White cross-section standard errors & covariance (d.f. corrected)
WARNING: estimated coefficient covariance matrix is of reduced rank

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	0.115923	0.038685	2.996585	0.0034
DEBT_RATIO	-0.111799	0.092223	-1.212266	0.2283
DEBT_TO_EQUITY	-0.016738	0.007400	-2.261966	0.0259

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.618481	Mean dependent var	0.046721
Adjusted R-squared	0.523101	S.D. dependent var	0.071672
S.E. of regression	0.049495	Akaike info criterion	-2.992303
Sum squared resid	0.244976	Schwarz criterion	-2.407039
Log likelihood	214.5151	Hannan-Quinn criter.	-2.754529
F-statistic	6.484398	Durbin-Watson stat	1.075668
Prob(F-statistic)	0.000000		

Pedroni Residual Cointegration Test

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Series: ROA DEBT_RATIO DEBT_TO_EQUITY
Sample: 2015 2021
Included observations: 126
Cross-sections included: 18
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
Automatic lag length selection based on SIC with a max lag of 0
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-1.480466	0.9306	-1.070576	0.8578
Panel rho-Statistic	2.671777	0.9962	1.789152	0.9632
Panel PP-Statistic	1.389991	0.9177	-2.138832	0.0162
Panel ADF-Statistic	1.091440	0.8625	-2.059650	0.0197

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	3.742287	0.9999
Group PP-Statistic	-2.913227	0.0018
Group ADF-Statistic	-2.015413	0.0219

Note: The variable ROA serves as the dependent variable of the model.

Table 4. Granger Causality Results

Null Hypothesis:	Obs	F-Statistic	Prob.
DEBT_TO_EQUITY does not Granger Cause DEBT_RATIO	108	1.05936	0.3057
DEBT_RATIO does not Granger Cause DEBT_TO_EQUITY		4.82494	0.0302
NPM does not Granger Cause DEBT_RATIO	108	3.32135	0.0712
DEBT_RATIO does not Granger Cause NPM		0.03576	0.8504
ROA does not Granger Cause DEBT_RATIO	108	5.03518	0.0269
DEBT_RATIO does not Granger Cause ROA		0.24250	0.6234
ROE does not Granger Cause DEBT_RATIO	108	3.11392	0.0805
DEBT_RATIO does not Granger Cause ROE		0.23913	0.6259
NPM does not Granger Cause DEBT_TO_EQUITY	108	0.33581	0.5635
DEBT_TO_EQUITY does not Granger Cause NPM		0.07884	0.7794
ROA does not Granger Cause DEBT_TO_EQUITY	108	0.39480	0.5312
DEBT_TO_EQUITY does not Granger Cause ROA		0.02441	0.8762
ROE does not Granger Cause DEBT_TO_EQUITY	108	0.00031	0.9859
DEBT_TO_EQUITY does not Granger Cause ROE		0.71067	0.4011
ROA does not Granger Cause NPM	108	0.02229	0.8816
NPM does not Granger Cause ROA		0.81885	0.3676
ROE does not Granger Cause NPM	108	1.84523	0.1773
NPM does not Granger Cause ROE		0.18178	0.6707
ROE does not Granger Cause ROA	108	5.24739	0.0240
ROA does not Granger Cause ROE		17.9299	5.E-05

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The Durbin-Watson statistics in Table 1 showed that there was no autocorrelation error encountered in the panel regression, while the corresponding F-statistic results showed that the regression result is significant from the period 2015 to 2021. The output is similar for the period 2017 to 2019 before the COVID-19 pandemic. This showed that the relationship between debt ratio and NPM is the same before and during the pandemic, stressing that selected firms' performance is resilient to the pandemic. The negative relationship is similar to the study of Bintara (2020), Harelimana (2017), Habib and Khan (2016), and Ohman (2015). Although the financial market faced disruption during the pandemic, firms remained resilient.

Table 1 shows that debt ratio has a negative significant impact on NPM. This means that as debt ratio decreases, NPM increases, and vice versa. During the pandemic, many businesses faced significant disruptions, including reduced revenues and cash flow challenges. These circumstances forced some firms to rely more heavily on debt financing to sustain operations and meet financial obligations (World Bank, 2020). The pandemic led to an increase in firms' debt financing ratios as they sought additional funds to mitigate the adverse effects of the crisis (Garcia & Gatdula, 2021). This highlighted the importance of liquidity management and access to financing during times of economic shocks. This is similar to the study of Tariq et al., (2021) conducted in Malaysia, where they observed a similar trend in term of the firms resorting to debt financing to navigate the challenges brought about by the COVID-19 pandemic that increased reliance on debt may be attributed to the need for immediate capital injections to cover expenses, retain employees, and support business continuity. A higher debt ratio indicates a higher proportion of debt financing compared to equity financing, which can increase interest expenses and financial costs for the firm.

This increased financial burden can put pressure on the firm's profitability, potentially affecting its net profit margin. When firms face economic downturns and financial challenges, such as those experienced during the COVID-19 pandemic, the impact of the debt ratio on net profit margin becomes more pronounced. Higher debt levels may lead to increased interest payments, reducing the firm's net income and, ultimately, its net profit margin. Additionally, the financial distress caused by the pandemic may affect firms' ability to generate revenues and control costs, further impacting their profitability.

However, it is important to note that the relationship between the debt ratio and NPM is complex and can be influenced by various factors, including industry dynamics, firm size, and management strategies. Some firms may be able to effectively manage their debt levels and mitigate the negative impact on profitability through strategies such as cost-cutting, restructuring debt, or accessing government support programs.

Despite the challenges posed by the pandemic, some firms in the Philippines have been able to maintain their debt financing ratios. For instance, some firms were able to access financing from international capital markets, which allowed them to maintain their debt levels despite the pandemic (Shinozaki & Rao, 2021). This highlights the importance of diversifying sources of financing for firms, particularly during times of economic uncertainty.

Meanwhile, results show that the variables are cointegrated in the long-run, with PP-Statistic and ADF-Statistic in Table 2 having a probability less than alpha. This states that

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the variables are related in the long-run and can be use in decision-making. Results also show that the variables have bi-directional causality as shown in Table 3, stating that NPM causes debt ratio and at the same time debt ratio causes NPM, similar to debt-to-equity and NPM.

The results show that the COVID-19 pandemic might affect the decision of the firm but showed resiliency using financial variables. The relationship between variables before and during the pandemic might be similar maybe because firms adjusted their production level during the pandemic to minimize further losses. Firms' production strategy allows them to overcome the possible harsh impact of the pandemic. Moreover, the Philippines partially opened its economy in 2021 to accommodate employment and generate income.

5. CONCLUSION

The study examined the impact of debt to equity and debt ratio on net profit margin. This study showed that the regression results are similar before and during the COVID-19 pandemic, which could reflect the resilience of the financial market amid uncertainties caused by the health crisis. However, it is important to note that the specific impact on firms' debt financing ratios can vary across industries and individual firms, depending on factors such as their financial health, access to credit, and government support measures.

Granger causality findings identify whether debt precedes performance changes or vice versa helps in crafting debt strategies that align with expected outcomes. While the Fixed Effects show how changes in debt influence a firm's performance over time provides a granular view, ideal for internal decision-making. And the Random Effects provides broader patterns across firms and industries offers guidance for external stakeholders, such as regulators and policymakers. Firms should tailor their debt management strategies based on their historical data and industry norms, informed by econometric findings. Policymakers and lenders could use these analyses to design incentives and regulations that promote sustainable debt practices. Granger Causality, Fixed Effects, and Random Effects analyses provide complementary perspectives on the relationship between debt management and firms' performance. While Granger Causality focuses on directional relationships, FE and RE models address firm-specific and population-wide variability, respectively. Together, they offer a robust framework for understanding and optimizing the complex dynamics of debt and performance.

In conclusion, the COVID-19 pandemic has had a significant impact on debt financing ratios among firms in the Philippines, with many seeking additional financing to offset the negative effects of the pandemic on their operations. While traditional sources of financing may be limited, firms can explore alternative sources of financing to maintain their debt levels and continue their operations.

Some policy implications and recommendations may also be considered to help recover and adapt to the new normal. For instance, the government should provide more timely and targeted financial support, especially those in hard-hit sectors and regions. The government should also promote digital transformation and innovation, as well as strengthen their resilience and competitiveness in the domestic and regional markets.

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