EFFECTS OF FINANCIAL AND MACROECONOMIC FACTORS ON THE FINANCIAL PERFORMANCE OF A COMPANY

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ABSTRACT

In this study, we investigated the relationships between financial performance of a company (as measured by return on assets (ROA)) and its financial ratios as well as macroeconomic variables that impact the national economy. The financial ratios used were debt-to-equity ratio (DER), free cash flow per share (FCFSH), price-to-book ratio (PB), and current ratio (CR). The macroeconomic variables were inflation (CPI), unemployment rate (Unempl), GDP, and bond rate (Bond). The data considered were over the period 2005 to 2019 for the companies listed on the Dow Jones Industrial Average. Results showed that GDP and DER were major contributors to financial performance. GDP had a positive relationship with the financial performance of a company and DER had a negative relationship. DER can be viewed as a key indicator of a firm's financial performance.

INTRODUCTION

Financial performance of a company is of importance to investors, analysts, and lenders. It reveals the economic health of the company and how well it is managed. Also, it can be used to compare similar firms across the same industry. Investors are not the only ones who care about financial performance. Analysts use financial performance data to forecast future earnings and growth. Also, lenders use this information to assess whether a company is creditworthy.

Return on assets (ROA) is the most often used measure of financial performance in the literature. Also, some studies used return on equity (ROE) as a measure of financial performance. ROA is calculated by dividing a company's net income by its total assets. On the other hand, ROE is calculated by dividing a company's net income by its assets minus its debt. The two measures are related. It is recognized that ROA is a better measure than ROE for the simple reason that ROE does not consider debt in its assets (the denominator in the ROE formula is total assets minus debt). The higher ROA, the better the company's performance. However, this is not the case with ROE. A higher ROE does not necessarily mean better financial performance of the company, since a high ROE can be caused by high debt, in which case the company may not be in good financial health because of its high debt burden and its effect on a company's solvency. In this study, we use ROA as a measure of financial performance.

Analyses in the literature use least squares regression on time series data grouped over companies. Since the seminal study of Granger and Newbold (1974), it is known that the residuals in regression on non-stationary time series are often auto correlated and renders the F test for model significance invalid, which gives rise to spurious regression. Furthermore, time series data used in least squares regression is often non-stationary with a trend. Non-stationary data are unpredictable and cannot be modeled or forecasted. Hence, results obtained from analysis on non-stationary time series may be spurious. In order to receive consistent, reliable results, the non-stationary data needs to be transformed into stationary data as in time series analysis (Nason, 2006).

For investment purposes, it is more useful for the investor to gain information about individual companies rather than a group of companies. Also, from the analysis on individual companies one can gain information with regard to the group of companies. Hence, a proper approach using time series non-stationary data is to use time series methodology on individual companies that remedies the effects of autocorrelation and non-stationarity and gives reliable results. The literature on factors affecting financial performance deals mostly with emerging markets and is lacking in its treatment of the relationships between financial performance and financial ratios as well as macroeconomic variables.

In this study, we use the appropriate time-series analysis, with regard to individual companies listed on the Dow Jones Industrial Average, DJIA, to determine the effects of financial ratios and macroeconomic variables on a company's financial performance as measured by ROA. The interest in these companies stems from the fact that they are of economic importance in that they determine the DJIA index, which has a long-term positive equilibrium relationship with the GDP. These DJIA stocks reflect the U.S. economy and stock market as a whole.

REVIEW OF LITERATURE

Rababah et al. (2020) studied the effect of COVID-19 pandemic on the performance of Chinese companies. Return on assets was used to represent a company's performance. The authors used pooled ordinary least square (OLS) regression. ROA was the dependent variable. The independent variables were company size, industry, year, debt-to-equity ratio, growth rate of the income of the company, and total revenue of the company. Results showed that COVID-19 pandemic had a negative effect on ROA or company financial performance. Also, the debt-to equity ratio had a negative effect on financial performance.

Nguyen et al. (2022) investigated the effect of corporate strategic initiatives relating to Environment, Social, and Governance (ESG) on firms' financial performance measured by ROA, return on equity (ROE), and Tobin Q. The analysis utilized the two-stage least squares (2SLS). Results showed that ESG was positively related to financial performance as measured by ROA, ROE, or Tobin Q. This indicates that having a better practice of ESG enhances firms' financial performance.

Mukaddam and Sibindi (2020) studied the effects of debt-to equity ratio (DOE) and debt-to capital ratio (DDE) on financial performance, measured by ROA and ROE, of 18 South African retail

firms listed on the Johannesburg Securities Exchange. The data were over a ten-year period, from 2010 to 2019. Panel regression was used to conduct the analysis. Results showed a negative relationship between DOE and DDE and financial performance. It was noted by the authors that ROA had a higher correlation with DOE and DDE, which meant that ROA was better than ROE as a performance variable.

Osamor and Adebanjo (2020) investigated the effects of financial variables on financial performance of seven oil and gas firms in Nigeria over the years 2007-2018. Multiple linear regression for the pooled data was used for the analysis. Return on assets was the financial performance dependent variable and fixed asset ratio, proprietary ratio, debt ratio, and equity ratio were the independent variables. Results showed that only the debt ratio was significant, and it was negatively related to financial performance.

Pasaribu et. al. (2021) studied the effects of gender diversity, debt-to-equity ratio, interest coverage ratio, CEO business expertise, and debt ratio on the financial performance (represented by ROA) of transport and hospitality companies in Indonesia, Malaysia, and Thailand for the period 2015-2020. The sample consisted of 25 companies over the 6-year period. The authors used multiple regression analysis on the pooled data of 150 observations. Results of the analysis showed that gender diversity, debt-to-equity ratio, and interest coverage ratio had significant positive relationships with financial performance. On the other hand, the CEO's Business Expertness and debt ratio were negatively related to firm financial performance.

Shatnawi et al. (2022) investigated the effect of audit committee (AC) on financial performance of firms listed on the Amman Stock Exchange. The study sample consisted of 92 firms over the period 2009 to 2017. Multiple linear least square regression was used on the pooled data. Financial performance as the dependent variable was measured by ROA, ROE, and Tobin's Q. Firm Size, Firm Age, and Leverage ratio were used as control variables. The interaction of enterprise risk management (ERM) and audit committee was introduced in the regression model to test for moderating effect. Regression results showed that AC and firm size had positive relationships with ROA, ROE, and Tobin's Q, while leverage and firm age had negative relationships with ROA, and Tobin's Q. Also, ERM had a positive moderating effect on the relationships between AC and ROA and ROE.

Abu-Abbas et al. (2019) reported on the relationship between financial performance (ROA) and financial leverage with regard to 56 firms for the period 2011 to 2014 on the Amman stock exchange. The authors used least squares multiple linear regression on the data, pooled over time and firms. The study showed that financial leverage was negatively related to financial performance.

Olaniyi et al. (2017) studied the causal relationship between CEO pay and firm's performance. The sample consisted of 63 non-financial firms in Nigeria for the period 1998-2010. The authors used the Granger test to determine the causal relationship. The Granger test results showed a bi-directional relationship between CEO pay and performance. CEO pay Granger-caused performance and performance Granger-caused CEO pay.

Maqbool and Sheikh (2022), using path analysis, investigated the relationship between performance and financial decisions of the firms listed on the Pakistan stock exchange. ROA was used for financial performance and Tobin's Q for market performance. The sample consisted of 292 non-financial firms. Results of the path analysis showed that debt financing (ratio of total liabilities to the total assets) and investment (ratio of operating fixed assets to total assets) had a negative impact on financial performance. However, dividend (ratio of total dividends paid to the total number of shares outstanding) had a positive relationship with financial performance. On the other hand, dividend and debt financing were positively related to Tobin's Q and investment was negatively related.

Olayiwola and Okoro (2021) examined the impact of tax planning and corporate governance on the financial performance (ROA) of 50 non-financial companies in Nigeria for the period 2007 to 2018. Multiple linear regression was used on the pooled data. Results showed that ownership structure and capital intensity had a significant positive relationship with return on assets. However, board diversity and tax planning (total debt/total equity) had a significant negative relationship with return on assets.

Pandey and Diaz (2019) investigated the effects of firm-specific factors on the financial performance (ROA) of U.S. technology and financial firms listed on the New York Stock Exchange from 2014–2017. The authors used ordinary least squares multiple linear regression on the data, pooled over firms and time. Results showed that return on equity was negatively related to ROA, while return on sales had a positive relationship with ROA for both technology and financial firms. On the other hand, current ratio had a positive relationship with ROA of financial firms, while the relationship was negative for the technology firms. Firm size was positively related to ROA for the technology firms.

Almehdawe et al. (2020) studied the effects of certain factors on the financial performance (ROA) of credit unions in Canada. The sample consisted of 189 credit unions for the period 2007-2017. Panel regression was used for the analysis. Results of the least squares regression analysis showed that total assets, income diversification, capital adequacy ratio, market penetration, and inflation were positively related to ROA. On the other hand, membership size, unemployment rates and provincial GDP were negatively related to performance.

Kinyua et al. (2022) investigated the effect of internal equity capital on the lower-tier commercial banks in Kenya. The sample for the study included 26 commercial banks from 2016 to 2020. Using least squares hierarchical regression, it was determined that internal equity had a positive and significant impact on the financial performance (net profit margin) of lower-tier commercial banks. Bank size had no effect on the relationship between net profit margin and internal equity.

Elmghaamez and Olarewaju (2022) examined the effect of corporate social responsibility (broken into Environmental, Social, and Governance score) on the financial performance of firms listed on the London Stock Exchange. The study used data for 50 firms for the period 2008- 2017. Results, using the least squares analysis on the pooled data, showed that environmental performance had a positive impact on stock price of both product and service-based firms. On the other hand, it enhanced the return on capital for product-based firms while reducing it for service-based firms. However, social activity had a significant negative impact on stock price of product and service-

based firms. Also, it had a negative effect on the return on capital of service-based firms. Governance disclosure was not significantly related to stock price or the return on capital for both product and service-based firms.

Alketbi et al. (2022) investigated the moderating effect of sustainability performance on the relationship between firm strategy and financial performance of banks on the UAE financial markets from 2009 to 2019. Control variables used were type of bank (Islamic or commercial), leverage measured by total debts/total assets, size of the bank measured by logarithm of total assets, and age of the bank. Results of the regression analysis on the pooled data showed that bank strategy had a positive impact on financial performance, which was measured by return on equity. However, it was found that sustainability performance moderated the relationship between strategy and financial performance. When sustainability performance was high, bank strategy was not related to bank performance.

Jung and Im (2022) studied the mediating effect of social responsibility on the relationship between country-level social trust and firm financial performance. It was hypothesized that country trust has a positive impact on corporate social responsibility, which in turn has a positive impact on firm financial performance. ROA and ROE were used for financial performance and Tobin's Q was used for market performance. The study analyzed firms from 34 countries for the period 2006 to 2015. Results from the regression analysis showed that corporate social responsibility mediated the relationship between country trust and firm-level financial performance.

METHOD

Data

Quarterly data (using Macrotrends) of free cash flow per share (FCFSH), debt-to-equity ratio (DER), price-to-book ratio (PB), current ratio (CR), and return on assets (ROA) were obtained for companies on the Dow Jones Industrial Average (DJIA) for the period 2009 to 2019. Quarterly data of inflation (CPI), unemployment rate, GDP, and bond rate were also obtained for these companies using the Saint Louis Federal Reserve economic database. The interest in studying these companies was because of their economic importance and of the DJIA positive long-term relationship with the GDP. In this case, the companies can be considered to be the population (Zar, 1984). From the statistical point of view, this is a fixed model in the sense that conclusions drawn are applicable to the companies under study and not beyond. The statistical analysis utilized for this study included time-series regression analysis using the transfer function approach which corrected for non-stationarity and autocorrelation in the time series data (Wei, 2006).

Time series analysis

In this study, we use the transfer function approach in time series to relate stationary input time series (independent variables) to a stationary output time series (dependent variable). We

demonstrate the model for one input series. The model relating a stationary output series y_t to a stationary input series x_i is expressed as

$$y_t = v(B)\, x_t + a_t, \qquad (1)$$

where a_t, is the residual and

$v(B) = w(B)B^c/d(B)$.

Here, $w(B) = w_0 - w_1B - \ldots - w_sB^s$

$d(B) = 1 - d_1B - \ldots - d_rB^r$.

and c represents the time delay (or lag) until the input variable x_t produces an effect on the output variable y_t.

We assume that the input series follows an ARMA process, $\frac{\varphi(B)}{\theta(B)}\ x_t$. The function v(B) with its lags is determined from the cross correlations between the white noise input series $\frac{\varphi(B)}{\theta(B)}\, x_t$ and the filtered output series $\frac{\varphi(B)}{\theta(B)}\, y_t$ (Wei, 2006).

Once v(B) is identified, one can express a_t in Eq. (1) as

$$a_t = y_t - v(B)\, x_t \qquad (2)$$

and identify the appropriate time series model for Eq. (2). With a_t known, one can determine the final model in Eq. (1).

For this analysis, each dependent and independent variable was tested for stationarity using the Phillips-Perron test and the augmented Dickey-Fuller test. Where a variable was not stationary, we used its first difference, which was stationary. Thus, all variables that entered the model were stationary. The backward elimination variable selection technique (Montgomery et al., 2001) was used so that the final model included only the independent variables that were significantly related to the dependent variable.

RESULTS AND DISCUSSION

Results in Table 1 show that debt-to-equity ratio (DER) is significantly related to company's performance in 62% of the firms on the DOW Industrial average. In all cases (except for Amgen, Home Depot, Walgreen, and IBM) DER was significantly negatively related to performance (ROA). In 24 of the 29 companies (82.8%) DER was negatively related to performance, but the relationship was significant in 14 companies. As such, DER seems to be a major contributor to financial performance and may be considered a key performance indicator. Another financial ratio related to performance was the price-to-book ratio (PB). In 7 firms (24%), the relationship was positive. The current ratio (CR) was significantly elated to performance in 10 firms (34.5). In 6 of these firms, the relationship was positive. Free cash flow per share was positively related to performance in only 3 firms (10%). These ratios (CR, PB, and FCFSH), however, seem to be of less importance than the DER ratio.

The primary macro variable related to performance is the GDP. In 19 (65.5%) of the companies, it was positively related to performance. However, only 10 (34.9%) were significant. Inflation (CPI) was significantly related to performance in 8 (27.6%) of the companies. The relationship was mostly negative. In 6 (20.7%) firms, there was a significant relationship between bond and performance. The relationship was mixed in sign. Unemployment was significantly related (positively and negatively) to performance in 6 (20.7%) of the companies.

It appears that DER and GDP ae the two most important variables that relate to financial performance. As expected, the GDP relationship is positive and that of DER is negative.

The GDP, as a measure of economic growth, has a positive effect on a company's profit, which translates into a higher return on assets. On the other hand, a company with a high DER is risky and might be unappealing to investors and lenders. This can translate into less profitability and a fall in its ROA. For investment purposes, DER seems to be an indicator of a company's financial performance. A high DER could indicate poor financial performance.

TABLE 1. EQUATIONS RELATING THE DEPENDENT VARIABLE (RETURN ON ASSETS, ROA) TO THE INDEPENDENT VARIABLE(S) FOR DIFFERENT COMPANIES

Company	Dependent Variable	Independent Variable(s)	$a_t = f(e_t)$
AMEX	$ROA(1)_t$	Mean $FCFSH_{t-6}$ $FCFSH_{t-7}$ $DER\ (1)_t$ $BOND\ (1)_t$ -0.099 0.064 0.039 -0.834 -0.303 $GDP\ (1)_{t-1}$ 2.24E-6	$a_t = e_t/ (1- ø_2 B2)$ $ø_2 = 0.563$
Amgen	$ROA(1)_t$	Mean $DER\ (1)_{t-3}$ $CPI\ (1)_t$ 0.155 3.80 -0.939	$a_t = et/ (1- ø_1B)$ $ø_1 = =0.139$
Apple	$ROA(1)_t$	Mean $CPI(1)_t$ $GDP(1)_{t-3}$ 0.349 -0.774 1.565E-6	$a_t = e_t/(1- ø_1B)$ $ø_1 = 0.547$
Boeing	$ROA(1)_t$	Mean $PB\ (1)_{t-2}$ $CR\ (1)_{t-3}$ $CPI\ (1)_{t-4}$ $CPI\ (1)_{t-5}$ 0.074 -0.0022 5.915 o.618 -0.749	$a_t = e_t/ (1- ø_1B)$ $ø_1 = 0.625$
Caterpillar	$ROA(1)_t$	Mean $CR\ (1)_{t-5}$ $BOND\ (1)_{t-2}$ $GDP\ (1)_{t-4}$ -0.0428 3.158 0.697 2.306E-6	$a_t = e_t/(1- ø_2 B2)$ $ø_2 = 0.341$
Chase	$ROA(1)_t$	Mean $CPI\ (1)_{t-4}$ 0.0248 -0.031	$a_t = e_t +0.203e_{t-1}$ $+ 0.558e_{t-2}$

Chevron	$ROA(1)_t$	Mean UNEMPL$(1)_{t-3}$ PB $(1)_{t-1}$ DER $(1)_t$ -0.209 - 0.319 2.245 -11.332	$a_t = e_t/ (1- ø_1B)$ $ø_1 =$ 0.506
Cisco	$ROA(1)_t$	Mean PB$(1)_{t-4}$ GDP$(1)_{t-4}$ DER$(1)_t$ 0.0153 2.757 4.516E-6 -11.367	$a_t = e_t/(1- ø_1B)$ $ø_1 =$ 0.0022
Coca-Cola	$ROA(1)_t$	MEAN -0.185	$a_t = e_t/ (1- ø_4 B^4)$ $ø_4 =$ -0.467
Disney	$ROA(1)_t$	Mean CR $(1)_{t-4}$ GDP $(1)_{t-3}$ 0.0438 -1.178 8.314E-7	$a_t = et/ (1- ø_1B – ø_4B^4)$ $ø_1 =$ 0.421 $ø_4 =$ - 0.727
Goldman Sachs	ROA_t	Mean FCFSH$(1)_t$ DER$(1)_{t-5}$ CR$(1)_{t-3}$ GDP$(1)_{t-2}$ 0.830 0.00131 -0.00523 0.177 9.179E-8	$a_t = e_t – 1.591e_{t-1}$ $-0.591\ e_{t-2}$
Home Depot	$ROA(1)_t$	Mean PB$(1)_{t-2}$ DER$(1)_{t-1}$ Unempl$(1)_{t-1}$ GDP$(1)_{t-2}$ 0.160 0.0058 0.021 -0.239 1.0674E-6	$a_t = e_t/ (1- ø_1B)$ $ø_1 =$ 0.644
IBM	$ROA(1)_t$	Mean DER$(1)_{t-4}$ CR$(1)_{t-1}$Unempl(1) BOND$(1)_{t-5}$ -0.205 0.265 -2.180 0.591 -0.631 GDP$(1)_t$ 3.452E-6	$a_t = e_t/ (1- ø_4B^4)$ $ø_4 =$ -0.560
INTEL	$ROA(1)_t$	Mean CPI$(1)_{t-5}$ GDP$(1)_t$ GDP$(1)_{t-1}$ 0.214 -0.776 2.243E-6 1.482E-6	$a_t = e_t/((1- ø_1B)x (1- Ø_4B^4))$ $ø_1 = 0.501$ $ø_4 = -0.639$
Johnson & Johnson	$ROA(1)_t$	Mean DER$(1)_t$ DER$(1)_{t-3}$ -0.095 -5.796 -2.094	$a_t = e_t/(1- Ø_4B^4))$ $ø_4 = -0.989$
McDonald	$ROA(1)_t$	Mean CR$(1)_{t-1}$ Unempl$(1)_{t-2}$ 0.0869 0.653 0.462	$a_t = e_t/(1- ø_4B^4)$ $ø_4 = -0.606$
Merck	$ROA(1)_t$	Mean DER$(1)_t$ CR$(1)_{t-1}$ CPI$(1)_{t-1}$ CPI$(1)_{t-2}$ -0.311 -6.370 1.991 -1.110 1.906	$a_t = e_t/(1- ø_4B^4)$ $ø_4 =$ -0.360

Microsoft	$ROA(1)_t$	Mean $DER(1)_t$ -0.026 -4.508	$a_t = e_t/(1- ø_2B^2 - ø_4B^4)$ $ø_2 = 0.356$ $ø_4 = -0.575$
MMM	$ROA(1)_t$	Mean $DER(1)_{t-1}$ $CPI(1)_{t-5}$ 0.137 -1.246 -0.344	$a_t = et/(1- ø_1B – ø_2B^2)$ $ø_1 = 0.625$ $ø_2 = -0.401$
Nike	$ROA(1)_t$	Mean $DER(1)_t$ $PB(1)_{t-2}$ 0.0422 -14.945 1.666	$a_t = e_t/(1- ø_3B^3)$ $ø_3 = -0.379$
Honeywell	$ROA(1)_t$	Mean $PB(1)_{t-1}$ $DER(1)_t$ $CR(1)_t$ $Unempl(1)_t$ -0.314 0.892 -5.981 -3.779 1.407 $FCFSH_t$ 0.182	$a_t = e_t/(1- ø_3B^3)$ $ø_3 = -0.810$
Procter & Gamble	$ROA)1)_t$	Mean $DER(1)_t$ 0.018 -13.658	$a_t = e_t/(1- ø_4B^4)$ $ø_4 = -0.334$
Salesforce	$ROA(1)_t$	Mean $DER(1)_{t-3}$ -0.087 -1.924	$a_t = e_t/(1- ø_1B- ø_2B^2 – ø_3B^3)$ $ø_1 = 0.302$ $ø_2 = 0.228$ $ø_2 = -0.351$
Travelers	$ROA(1)_t$	Mean $DER(1)_t$ $Unempl(1)_{t-1}$ $GDP(1)_{t-2}$ -0.034 -1.455 -0.144 5.890E-7	$a_t = e_t/(1- ø_1B- ø_4B^4)$ $ø_1 = 0.239$ $ø_4 = -0.311$
UnitedHealth	$ROA(1)_t$	Mean $DER(1)_t$ $DER(1)_{t-1}$ $DER(1)_{t-2}$ $DER(1)_{t-3}$ 0.0067 -1.043 -0.839 -0.716 - 1.196 $PB(1)_t$ $PB(1)_{t-1}$ $CR(1)_t$ $CR(1)_{t-1}$ 0.302 0.412 1.801 3.059	$a_t = e_t/(1- ø_5B^5)$ $ø_5 = 0.633$
Verizon	$ROA(1)_t$	Mean $CPI(1)_{t-1}$ $Bond(1)_t$ $PB(1)_{t-3}$ -0.214 0.872 1.467 0.168	$a_t = e_t/(1- ø_4B^4)$ $ø_4 = -0.719$
Visa	ROA_t	Mean $Bond(1)_t$ 10.65 -0.623	$a_t = e_t/(1- ø_1B)$ $ø_1 = 0.871$

Walgreen	$ROA(1)_t$	Mean $PB(1)_t$ $DER(1)_{t-1}$ -0.107 0.449 1.511	$a_t = et/(1- ø_4B^4)$ $ø_4 = -0.467$
Walmart	$ROA(1)_t$	Mean $CR(1)_t$ $BOND(1)_{t-3}$ -0.034 -2.683 -0.305	$a_t = e_t/(1- ø_1B)$ $ø_1 = 0.520$

The symbol (1) refers to the first difference.

CONCLUSION

In this study, we investigated the relationships between a company's financial performance and its financial ratios as well as the macroeconomic variables that may have an impact on the stock market. Time series analysis was used on quarterly time series data, over the period 2005 to 2019, of companies listed on the Dow Jones Industrial Average. The quarterly financial ratios used were free cash flow per share (FCFSH), debt-to-equity ratio (DER), price-to-book ratio (PB), current ratio (CR), and return on assets (ROA). The quarterly macroeconomic variables were inflation (CPI), unemployment rate, GDP, and bond rate. Return on assets was used as a measure of financial performance.

Results showed that of all the variables considered, GDP and DER were most important in their relationship with ROA. GDP had a positive relationship with ROA or financial performance of a company and DER had a negative relationship with ROA. DER seems to be a key indicator of a firm's financial performance. The higher the DER of a company, the lower its financial performance.

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