EFFECT OF STOCK BUYBACKS ON STOCK PRICE, EARNINGS, AND DIVIDEND: AN EMPIRICAL STUDY

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ABSTRACT

In this study, we use time series analysis to examine the long-term relationships of buybacks and stock price, earnings per share, and dividend payout for individual firms listed on the Dow Jones Industrial average. If a relationship exists, it is expected to be positive for stock price and earnings per share and negative for dividend payout.

Results from the time series models showed that there were few firms with a significant relationship. Only five firms showed a significant positive relationship between share buyback and stock price, and two firms showed a positive relationship between buyback and earnings per share. Furthermore, only two firms showed a negative relationship between buyback and dividend payout. The weak evidence for a long-term impact of buybacks supports the argument that buybacks do not contribute significantly to the financial strength of a firm and to its market performance.

INTRODUCTION

Stock buybacks are increasing being used by companies to boost their stock price and earnings per share on the market. A stock or share buyback takes place when a company buys back its shares from the marketplace. The repurchased shares are absorbed by the company. This will reduce the number of outstanding shares on the stock market, which can lead to an increase in share price. A company might buy back its shares because it believes that the shares are undervalued or to improve its financial ratios. A company can buy the stock on the open market or from its shareholders. Buybacks in recent decades have been preferred to dividends as a way to return cash to shareholders.

There has been an increase in buybacks in recent decades. According to a Harvard Business Review (2020) report, in the year 2019, stock buybacks by U.S. companies totaled $730 billion dollars. Buybacks have been called into question. Some argue that instead of using their excess cash to buy back their own stocks, companies should reinvest to promote growth and job creation.

The salient benefit of buybacks is that they reduce the number of shares on the stock market, which can lead, all things being equal, to an increase in earnings per share and to an increase in stock price based on the fact that stocks trade in part based on supply and demand. However, it should be noted that the effects of buybacks depend, in the final analysis, on the individual investor.

Buybacks have been used, in place of dividends, to distribute cash and compensate shareholders. However, given a choice, most investors will prefer a dividend over a higher-value stock that is short-lived. The disadvantage of buybacks is the fact that a company's increase in its earning per share is based on reducing its outstanding shares and not on gaining a stronger financial position by increasing its earnings.

Buybacks are controversial because any improvement in price or earning per share tends to be artificial and not related to the company's financial ratios. Also, an increase in share price is usually short-lived and soon the price returns to its equilibrium market value when the investors realize that the company has not done anything to increase its actual value. Investors who buy after the short-term price bump can then lose money. Furthermore, it is argued that this short-term increase in stock price allows insiders to profit.

The Institute for New Economic Thinking (Lazonick et al.,2017) reported that share buybacks in pharmaceutical companies were not used to grow the company, and often money spent on buybacks exceeded funds spent on research and development.

As mentioned earlier, buybacks can lead to a short-term increase in a company's stock price and earnings per share. This is, however, artificial in nature and does not reflect the financial strength of a company. Cash spent on buybacks can be better spent on investment that will strengthen the company's financial position.

Analyses in the literature on time series data predominantly utilize least squares regression with no correction for auto-correlations of residuals or for non-stationarity. This is known to cause inaccuracies in the analysis (Granger, 1974; Nason, 2006). Furthermore, most analyses focused on cross-sectional analysis over firms and on short-term effects of buybacks. It is more informative to study individual firms and long-term effects of buybacks. Hence, in this study, we investigate the long-term relationships of buybacks on stock price, earnings per share, and dividend payout of individual firms listed on the Dow Jones Industrial Average using time series analysis in which non-stationarity and auto-correlations are properly addressed.

LITERATURE REVIEW

Gupta (2017) reported on the effect of a buyback announcement on stock price for different industries on the Bombay Stock Exchange (BSE) in India. Data were taken over the years 2000 to 2015. The study looked for abnormal returns considering 20 days before and 20 days after the buyback announcement. Regression analysis was used to determine if there were significant differences among industries with regard to announcement returns. Results showed that buyback

announcements caused abnormal returns, but only for a short period of time. Also, industry did not have a significant effect on returns.

Busch and Obernberger (2017) investigated the effects of a stock repurchase intensity on stock price efficiency and idiosyncratic risk using panel least squares regression on US market monthly data, from January 2004 to December 2010. Repurchase intensity was measured as the percentage of repurchased shares. Stock price efficiency was determined by the effect of the market return on day t on the stock return on day t (base or contemporaneous market return model) in comparison to the model with a contemporaneous market return on day t and lagged returns on day t-n (n= 1, 2,..5), lagged model. Efficiency was measured as 1- (R^2(base model)/R^2(lagged model). Idiosyncratic risk was measured as the correlation between stock return and market return. The analysis indicated that share buybacks reduced the idiosyncratic risk and increased price efficiency. The effects were more prominent when buybacks occurred in down markets.

Chandren et. al. (2017) studied the effect of accretive share buyback on return on assets (ROA), return on equity (ROE) and Tobin's Q for companies listed on the Bursa Malasia. Least squares regression was used for a sample of 220 companies. The dependent variables were the means over a three-year period of ROA, ROE, and Tobin's Q Accretive buyback was the independent variable, measured as the difference between earnings per share with share buyback and earnings per share without share buyback. Results from the regression analysis indicated that there was a positive relationship between accretive share buyback and ROA, ROE and Tobin's Q over the three-year period.

Evgeniou et. al. (2018), using least squares regression, reported that high stock volatility before a buyback announcement had a positive effect on post-announcement returns for undervalued stocks. The predictability of excess returns after buyback announcements was improved when using undervalued indicators and volatility as predictor variables,

Vafeas et al. (2003) reported on earning management before stock repurchase. The study provided weak evidence of biased accruals reporting by managers before self-tender offers by firms. The evidence came from a comparison of pre-purchase accruals for a sample of self-tendering and matching U.S. firms as a control. Pre-purchase accruals were lower for the self-tendering firms compared to the control. There was also evidence of post-repurchase accrual reversal. The implication was that managers employed earning management, in association with share buybacks, to exploit shareholders.

Gupta (2016) studied the effect of buyback announcements on stock returns, earnings per share (EPS), and return on equity (ROE) for 34 companies on the BSE 500 market index in India during 2010-2014. The analysis, using a t-test, indicated that there was an increase in average returns one day after the announcement and in some cases twenty days after the announcement. EPS increased the first quarter after the announcement and both EPS and ROE annual figures showed an increase one year after the announcement.

Abdoua and Gupta (2019), using multiple regression and multinomial logistic regression, reported on the effect of buyback announcement on cumulative abnormal returns (CAR) over a 3-year

period after the announcement. It was found that the repurchase technique, risk, company size, and revenue affected significantly CAR, while the buyback announcement had no effect on CAR.

Hyderabad (2009) investigated the effect of share buyback announcement in India on the stock price over several days before and after the announcement. Results from the analysis showed that the average abnormal return on the day of announcement was 2.83 percent and the cumulative abnormal returns was 6 percent. The overall cumulative abnormal return was 5.16 percent over a period of 21 days before and after the buyback announcement. Also, it was found that buybacks on the open market had a greater effect on stock price.

Liu et. al. (2016) used a logistic regression model to determine the effect of managerial incentives and overconfidence on the probability of share repurchase. The analysis utilized a panel data of 715 companies listed on the Taiwan Stock Exchange and over the counter for the years 2008 to 2012. Results of the analysis showed that managers who received equity incentives and short-term performance bonuses tend to repurchase shares. In addition, these incentives and bonuses increased when the managers overestimated the prospects of the tender offers.

Stunda (2017) used panel regression to analyze the effect of buybacks on returns for growth and non-growth industries in the US. The analysis was performed over the years 2011-2015 on firms that repurchased shares in the year 2010. Results from the analysis showed that there was a significant relationship between cumulative abnormal returns (CAR) and earnings per year when all the firms were considered in the analysis. Furthermore, it was noted that the relationship between CAR and earnings was stronger for the non-buyback firms than for the buyback firms. This relationship was true for above as well as below average growth industries. In addition, percent-change in stock price was negative, but not significant, for the buyback firms. However, for the non-buyback firms, the percent change in stock price was positive and significant.

Lai et. al. (2017) used regression analysis to investigate the effects of share repurchase and cash dividends on firm's future profitability. The data included the listed companies on the Taiwan Stock Exchange for the years 2002 to 2012. Financial and utility industries were excluded from the data. Results from the analysis showed that share buyback was negatively associated with future earnings. However, this relationship was not significant. On the other hand, cash dividend was significantly and positively associated with future profitability.

Bhargava (2013) in a study of U.S. firms over the period 1996-2005, using panel regression, reported that share buybacks and stock options granted to executives had a negative effect on long-term investments and on expenditure for research and development. This result suggests that share repurchase is unlikely to have a long-term effect on firm's future productivity and profitability.

Keasler and Byerly (2015) studied the long-term effect of stock buybacks on market capitalization. The authors considered three, five-year reference periods (2006-2010, 2007-2011, and 2008-2012). and three, ten-year reference periods (2001-2010, 2002-2011, and 2003- 2012). A t-test was performed to test for significance of the mean difference between beginning and ending market capitalization of each reference period. Results from the study showed that market capitalization declined for the stock buyback portfolio relative to all other stocks.

METHODS

Data

Quarterly data with regard to money, in millions, spent on buybacks by companies listed on the Dow Jones Industrial Average were obtained, for the years 2008 to 2020, from YCharts. Also, data on stock price, earnings per share, and dividend payout over the same quarters for the same companies were obtained utilizing the Wharton Research Data Services (WRDS).

Time series analysis

In this study, we use the transfer function approach in time series to relate a stationary input time series (buyback as the independent variables) to a stationary output time series (stock price, earnings per share, or dividend payout as the dependent variable). In general, the model relating a stationary output series y_t to a stationary input series x_i is expressed as

$$y_t = v(B)\, x_t + \eta(t), \quad (1)$$

where $\eta(t)$, is the residual and

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

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

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

B is the backshift operator,

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

$$\eta(t) = y_t - v(B)\, x_t \quad (2)$$

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

For this analysis, the independent variable (Buyback) and the dependent variables (stock price, earnings per share, and dividend payout) were 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 final model was checked for adequacy in representing the data by examining the auto-correlations of residuals and the cross-correlations of residuals with buybacks. An adequate model will indicate no significant auto-correlations or cross-correlations. This was the case for all the models presented in Tables 1-3, pointing to the fact that the models were all adequate and correct.

RESULTS AND DISCUSSION

Table 1 presents the model from Equation (1) for each of the firms with price as the dependent variable and buyback as the independent variable. For model representation, the model for 3M can be expressed as

$$\text{Price}(t) - \text{Price}(t\text{-}1) = 0.729 - 0.00769\,(\text{Buybacks}(t) - \text{Buybacks}(t\text{-}1)) + e(t) / (1\text{-}0.463B) \quad (3)$$

Where e(t) represents the independent random errors at time t.

It is seen from the sign of the 0.00769 coefficient that the relationship between the change in Buyback and the price change is negative, but not significant at the 5% level. However, it is significant at the 10% level (p = .10). The negative relationship is not according to expectation, and it indicates that buyback has no positive effect on increasing stock price. Price can be said to be dependent on the investor and is influenced by both external market factors and internal firm financial factors.

If one examines the p values for the coefficients of the independent variable (Buyback), one sees that there were eight firms showing significant relationships at the 5% level between buybacks and stock price. Of these eight, five were positive according to expectation and three negative. On the other hand, 6 were significant at the 10% level, one was positive and 5 negative. These results show little evidence for a positive relationship between stock price and buybacks over the years.

Table 2 gives the time series model for earnings as the dependent variable and Buyback as the independent variable. Considering the coefficient of the independent variable and its p value for each firm, it is seen that only two firms had a significant (at the 5% level) positive relationship between buyback and earnings per share. Three firms showed a negative significant relationship. These results do not support a relationship between buybacks and earnings per share.

Results in Table 3 give the time series model for each firm that relates the independent variable (Buyback) to the dependent variable (Dividend). From the p values for each coefficient of the independent variable, it is seen that there were six firms where the relationship between buybacks and dividends was positive and significant at the 5% level and two where the relationship was negative. In addition, there were three firms showing a positive significant (at the 10% level) relationship between buybacks and dividends.

It is clear that results from the time series analysis do not support the hypotheses that buybacks have a significant relationship with stock price, dividends paid, or earnings per share. The argument for buybacks is that they have a positive effect on returns and earnings per share Also, buybacks are used as a substitute for dividends, in which case one would expect a negative relationship between buybacks and dividends paid. Clearly there is no support for these arguments, at least in the long term. Only five firms showed a positive significant relationship at the 5% level between buybacks and stock price. Two firms showed a significant relationship at the 5% level between buybacks and earnings per share and two firms where the relationship between buybacks and dividends was negative and significant at the 5% level.

The literature reports short-term effects of buybacks. To our knowledge, the present study using state-of-the-art time series analysis is the first long-term study examining the relationship of share buybacks with stock price, earnings per share, and dividend payment on a company basis. The lack of evidence for a long-term effect of buybacks, indicates that a firm's performance in the long run depends on its financial strength and on market factors and not on share repurchase. Buybacks are not known to contribute to a company gaining a stronger financial position.

TABLE 1. TIME SERIES MODELS RELATING STOCK BUYBACK TO STOCK PRICE FOR DIFFERENT COMPANIES LISTED ON THE DOW JONES INDUSTRIAL AVERAGE

Company name	Dependent Variable- Price	Mean	Independent Variable- Buyback	Model for residuals $\eta(t)$
3M	D-Price (t)	0.729	-0.0077 D-Buy(t) (p = 0.10)	$\eta(t) = e(t)/(1-.463B)$
AMEX	D-Price(t)	0.529	0.529 Buy(t-6) (p =.194)	$\eta(t) = e(t)$
Apple	D-Price(t)	102.920	0.0805Buy(t-5) (p = 0.401)	$\eta(t) = e(t)$
Caterpillar	D-Price(t)	3.979	-0.00657 Buy(t) (p = 0.068)	$\eta(t) = e(t)$
Cisco	D-Price(t)	-0.206	0.0004692 Buy(t) (p = 0.043)	$\eta(t) = e(t)/(1+0.325B)$
Coca Cola	D-Price(t)	5.403	-0.00917 Buy(t-7) (p = 0.0001)	$\eta(t) = e(t)$
Disney	D-Price(t)	6.788	-0.00394 Buy(t) (p = 0.0045)	$\eta(t) = e(t)$
Exxon	D-Price(t)	0.088	0.00218 D-Buy(t) (p = 0.053)	$\eta(t) = e(t)/(1+0.336B)$
Goldman Sachs	D-Price(t)	-19.232	0.00803 Buy(t-1) + 0.00704 Buy(t-2) (p = 0.0239, .045)	$\eta(t) = e(t)$

Home Depot	D-Price(t)	1.061	0.00251 Buy(t) (p = 0.054)	$\eta(t) = e(t)/(1+0.408B^4)$
IBM	D-Price(t)	-1.352	0.000946 Buy(t) (p = 0.415)	$\eta(t) = e(t)/(1+0.315B)$
Intel	D-Price(t)	0.28927	0.000342 Buy(t) (p = 0.355)	$\eta(t) = e(t)$
Chase	D-Price(t)	3.379	-0.000288 Buy(t-7) (p = 0.1032)	$\eta(t) = e(t)$
Johnson & Johnson	D-Price(t)	1.523	0.000232 Buy(t) (p = 0.757)	$\eta(t) = e(t)/(1+0.604B^4)$
McDonald	D-Price(t)	4.752	-0.00170 Buy(t) (p = 0.376)	$\eta(t) = e(t)$
Merck	D-Price(t)	0.493	0.000633 Buy(t-1) (p = 0.195)	$\eta(t) = e(t)$
Microsoft	D-Price(t)	5.911	-0.000704 Buy(t) (p = 0.089)	$\eta(t) = e(t)/(1-.906B)$
Nike	Price(t)	83.973	-0.0129Buy(t) (p = 0.0797)	$\eta(t) = e(t)/(1-0.777B)$
Chevron	D-Price(t)	0.703	0.00376 D-Buy(t) (p = 0.3300)	$\eta(t) = e(t)$
Traveler	D-Price(t)	-0.0145	0.00317 Buy(t) (p = 0.195)	$\eta(t) = e(t)/(1+0.248B)$
Pfizer	D-Price(t)	0.101	0.000177 Buy(t) (p = 0.2790)	$\eta(t) = e(t)/(1+0.304B)$
Proctor & Gamble	D-Price(t)	-1.565	0.00178 Buy(t) (p = 0.0693)	$\eta(t) = e(t)$
Unitedhealth	D-Price(t)	-1.286	0.0145 Buy(t-7) (p = 0.0126)	$\eta(t) = e(t)$
Visa	D-Price(t)	4.336	-0.00126 Buy(t) (p = 0.589)	$\eta(t) = e(t)$

Walgreen	D-Price(t)	1.689	(-0.00304 Buy(t-2) / (1 - 0.368B(1) + 0.993 B(2)) (p = 0.0023, 0.0001, 0.0001)	$\eta(t) = e(t)$
Walmart	D-Price(t)	-0.972	0.00137 Buy(t) (p = 0.126)	$\eta(t) = e(t)$

D-Refers to first difference and buy refers to buyback

TABLE 2. TIME SERIES MODELS RELATING STOCK BUYBACK TO EARNINGS PER SHARE FOR DIFFERENT COMPANIES LISTED ON THE DOW JONES INDUSTRIAL AVERAGE

Company name	Dependent variable	Mean	Independent variable	Model for residuals $\eta(t)$
3M	D-Earning (t)	0.125	0.0000608 D-Buy(t) (p = 0.980)	$\eta(t) = e(t)/(1-0.379B + 0.424B^3)$
AMEX	Earning(t)	14.161	0.000336 Buy(t) (p = 0.934)	$\eta(t) = e(t)/(1 -1.404B +0.692B^2)$
Apple	D-Earning(t)	-1.299	0.000228 Buy(t) (p = 0.746)	$\eta(t) = e(t)/(1 + 0.299B)$
Cisco	D-Earning(t)	-0.375	0.000378 Buy(t) (p = 0.342)	$\eta(t) = e(t)/(1-0.186B +1.053B^4 +0.677B^8)$
Coca Cola	Earning(t)	9.377	0.00586 Buy(t) (p = 0.272)	$\eta(t) = e(t)/(1 - 0.778 B) (1 + 0.578 B^4)$
Disney	D-Earning(t)	2.037	-0.00133 Buy(t) (p = 0.115)	$\eta(t) = e(t)/(1+0.852B^4 + 0.357B^8)$
Exxon	D-Earning(t)	-0.384	0.00393 D-Buy(t) (p = 0.245)	$\eta(t) = e(t)/(1-0.428B)$
Goldman Sachs	Earning(t)	165.356	0.00976 Buy(t) (p = 0.502)	$\eta(t) = e(t)/(1-0.986B)$
Home Depot	D-Earning(t)	3.246	-0.00189 Buy(t) (p = 0.0008)	$\eta(t) = e(t)/(1+0.893B^4 +0.678B^8)$

Intel	Earning(t)	27.696	-0.00138 Buy(t) (p = 0.780)	$\eta(t) = e(t)/(1-1.135B+0.509B^2)$
Chase	Earning(t)	-85.652	{0.0142/(1-0.570B)} x Buy(t-2) (p = 0.0001, 0.0001)	$\eta(t) = e(t)$
Johnson &Johnson	D-Earning(1)	3.213	-0.00267Buy(t-1) (p = 0.0509)	$\eta(t) = e(t)/(1+0.594B^4)$
McDonald	Earning(t)	22.468	-0.00516 Buy(t) (p = 0.538)	$\eta(t) = e(t)/(1-0.614B)$
Merck	Earning(t)	48.665	-0.00830 Buy(t) (p = 0.524)	$\eta(t) = e(t)/1-0.412B)$
Microsoft	D-Earning(t)	0.178	0.000145 Buy(t) (p = 0.8570)	$\eta(t) = e(t)/(1+0.84B^4 +0.735B^8)$
Nike	D-Earning(t)	-0.254	0.00265 D-Buy(t) (p = 0.2765)	$\eta(t) = e(t)/ (1 - 0.386 B) (1 + 0.669B^4)$
Traveler	D-Earning(t)	6.55309	-0.00948 Buy(t-4) (p = 0.1685)	$\eta(t) = e(t)/ (1 - 0.298 B) (1 + 0.540B^4)$
Pfizer	Earning(t)	10.563	0.00215 Buy(t-1) (p = 0.266)	$\eta(t) = e(t)/(1-0.797B + 0.274B^3)$
Proctor & Gamble	Earning(t)	1.396	-0.00118 Buy(t) (p = 0.660)	$\eta(t) = e(t)/(1-0.755B)$
Unitedhealth	D-Earning(t)	1.761	-0.00222 Buy(t-4) (p = 0.0498)	$\eta(t) = e(t)/(1 - 0.557 B)(1 + 0.898 B^4)$
Visa	Earning(t)	41.902	0.00504 Buy(t) (p = 0.664)	$\eta(t) = e(t)/ (1 - 0.818B) (1 + 0.655 B^4)$

Walgreen	Earning(t)	8.805	0.00170 Buy(t) (p = 0.248)	$\eta(t) = (e(t) - 0.912\ e(t-1))/(1+0.603B^4)$
Walmart	Earning(t)	-8.649	0.0134 Buy(t-2) (p = 0.0271)	$\eta(t) = e(t)/(1-0.8B)$

D-refers to first difference and buy refers to buyback

TABLE 3. TIME SERIES MODELS RELATING STOCK BUYBACK TO DIVIDEND FOR DIFFERENT COMPANIES LISTED ON THE DOW JONES INDUSTRIAL AVERAGE

Company name	Dependent variable	Mean	Independent variable	Model for residuals $\eta(t)$
3M	D-Dividend(t)	0.094	0.000525 D-Buy(t) (p = 0.407)	$\eta(t) = e(t)/(1-0.681B + 0.292B^4)$
AMEX	D-Dividend(t)	-0.319	0.000575 Buy(t) (p = 0.393)	$\eta(t) = e(t)/(1-0.433B)$
Apple	D-Dividend(t)	-69.355	-0.00256 Buy(t) (p = 0.0228)	$\eta(t) = e(t)/(1-0.99B)$
Caterpillar	D-Dividend(t)	0.072	0.0000543 Buy(t) (p = 0.827)	$\eta(t) = e(t)/(1-824B)$
Coca Cola	D-Dividend(t)	-0.538	{0.000271 /(1-0.606B)} Buy(t-2) (p = 0.022, 0.0044)	$\eta(t) = e(t)/(1-0.472B)$
Exxon	D-Dividend(t)	-0.0328	0.000219 D-Buy(t) (p = 0.104)	$\eta(t) = e(t)/ (1 - 0.774\ B)x (1 + 0.619B^4)$
Goldman Sachs	D-Dividend(t)	0.516	0.000191 Buy(t) (p = 0.871)	$\eta(t) = e(t)/(1-0.693B+0.333B^3)$
Home Depot	D-Dividend(t)	1.355	-0.000666 Buy(t-4) (p = 0.0261)	$\eta(t) = e(t)/(1- 0.348B) (1+ 830B4)$
IBM	D-Dividend(t)	-1.113	0.000203 Buy(t-2) (p = 0.0518)	$\eta(t) = e(t)/(1-0.854\ B)(1 + 0.624\ B^4)$

Intel	D-Dividend(t)	-0.567	0.000257 Buy(t-2) (p = 0.0712)	η(t) = (e(t) + e(t-4))/(1-0.703B)
Chase	D-Dividend(t)	-18.998	0.00569 Buy(t-8) (p = 0.0001)	η(t) = e(t)/(1-0.358B)
McDonald	Dividend(t)	25.246	0.00172 Buy(t) (p = 0.2043)	η(t) = e(t)/(1-0.744B – $0.256B^4$)
Merck	Dividend(t)	0.220	0.0000442 Buy(t) (p = 0.494)	η(t) = e(t)/ (1 - 0.775 B) (1 + $0.751B^4$)
Nike	D-Dividend(t)	-0.406	0.000453 Buy(t-1) (p = 0.382)	η(t) = e(t)/(1-0.698B)
Chevron	D-Dividend(t)	0.0359	{0.00152/(1-.685B)} x D-Buy(t-1) (p = 0.0001, 0.0001)	η(t) = e(t)/(1-0.366B)
Traveler	D-Dividend(t)	-1.299	0.000602 Buy(t) + 0.00127 Buy(t-1) (p = 0.1412, 0.0029)	η(t) = e(t)/(1-0.709B + $0.341B^2$)
Pfizer	D-Dividend(t)	-0.157	-0.0000287 Buy(t) (p = 0.882)	η(t) = e(t)/(1-0.531B + $0.529B^3$)
Proctor and Gamble	D-Dividend(t)	-0.574	0.000109 Buy(t-3) + 0.000148 Buy(t-4) (p = 0.0219, 0.0219)	η(t) = e(t)/(1-0.703B)
Unitedhealth	Dividend(t)	97.409	-0.000995 Buy(t) (p = 0.965)	η(t) = e(t)/(1-0.344B + $0.644B^2$)
Visa	Dividend(t)	131.798	0.00386 Vuy(t) (p = 0.6385)	η(t) = e(t)/1-0.996B)

Walgreen	D-Dividend(t)	-0.565	0.000244 Buy(t-1) + 0.000212 Buy(t-2) (p = 0.067, 0.109)	$\eta(t) = e(t)/(1-0.99B)$
Walmart	D-Dividend(t)	-0.858	0.000261 Buy(t) (p = 0.198)	$\eta(t) = e(t)/ (1 - 0.706 B) (1 + 0.998B^4)$

D-refers to first difference and buy refers to buyback

CONCLUSION

Share buybacks are often used by companies to boost their stock price and earnings per share and as a substitute for dividend payout. Studies in the field have shown that share buybacks tend to increase share price in the short-term after the buyback announcement. Of importance is to determine if buybacks are related to stock price, earnings per share, and dividend payout of a company over the long-term in years. In this study, we investigate this relationship using time series analysis on quarterly data from 2008 to 2020 for individual firms listed on the Dow Jones Industrial Average. The analysis corrected for non-stationarity and auto-correlation arising in time series data. Results of the analysis showed little evidence of a relationship between buybacks and share price, earnings per share, and dividend payout. Of eight firms which showed a significant relationship at the 5% level between buybacks and stock price, five were positive relationships, as expected, and three were negative. Two firms showed a significant positive relationship between buybacks and earnings per share and in three firms the relationship was negative, contrary to expectation.

Furthermore, six firms showed a significant positive relationship between buybacks and dividend payout, which is contrary to expectation, and only two firms showed a negative relationship according to expectation. Results showing no evidence for long-term effects of buybacks is in agreement with results by Lai et. al. (2017), Bhargava (2013), and Keasler and Byerly (2015).

The fact that there is little evidence of a relationship between buybacks and a company's share price, earnings per share, or dividend payout supports the argument that buybacks do not contribute significantly to the financial strength of a company, which is the guiding factor in its performance.

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