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The Signaling Information from Stock Repurchases on Operating Performance

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ABSTRACT

Signaling theory is a heavily researched topic in the business field. This research uses the act of a stock repurchase and analyzes whether this provides a signal regarding the operating performance of the firm. Consistent with the market timing theory of stock repurchase, we find that companies experience better operating performance in the period with a repurchase. This effect is robust to multiple model specifications and estimation methods. The signaled effect of a stock repurchase is $109,601 on EBITDA for an average firm in our sample. Taken together, the results imply that stock repurchase can be used as a credible signal for firm performance. This result adds to the literature by identifying the commonly practiced activity of stock repurchase and demonstrating the significance of the information content in assessing firm performance.

Keywords: Stock Repurchase, Signaling Theory, Firm Performance

INTRODUCTION

There is extensive empirical evidence addressing the issue of stock repurchase theory from many different aspects of share buybacks (Abraham et al., 2018; Barillas & Shanken, 2018; Cox, 2018). The motives for share buybacks vary but include post-buyback operating performance, the signaling impact, liquidity, and capital structure adjustment (Bagwel, 1991). The rationale for a buyback might include takeover defense, the prevention of dilution of stock resulting from employee stock options, or perhaps an attempt to increase earnings per share to stockholders (Abraham et al., 2018; Bagwel, 1991; Bhattacharya & Jacobsen, 2016) Research also indicates that stock repurchases offer more flexibility for income distribution than dividends (Dittmar, 2000; Golbe & Nyman, 2013; Gupta, 2018; Ikenberry, Lakonishok, & Vermaelen, 2000; Levit, 2017; Shackleton et al. 2014).

Empirical research surrounding stock repurchases is conducted using various key performance measures relative to some benchmarks—for example, earnings per share, market-to-book ratio, the return of assets, and the return of equity (Ikenberry et al., 1995). There is limited empirical research done on the long-term effects on the operating income of the Fortune 1000 companies (Raghavan, 2004). The following sections present a review of prior literature, which includes information on the studies conducted on the share repurchase hypotheses and the impact of performance results according to various benchmarks.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Share repurchase hypotheses

Prior literature proposes several significant hypotheses to explain why leaders of a corporation would repurchase shares and the impact the repurchase has on the market (Bhattacharya, 2016). The impact includes dividend substitution, takeover deterrence, tax reform, finance, market timing, cash flow, post-buyback operating performance, and undervaluation or signaling, (Abraham et al., 2018; Bagwel, 1991; Bhattacharya & Jacobsen, 2016).

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A stock repurchase can help to bridge the gap between what a company's shares are currently selling for, and how much the business leaders, in theory, should be selling the stock for based on the intrinsic value of the firm. Managers who believe the company is undervalued may announce a repurchase to stimulate the market and raise the current selling price (Block, 2006; Bonaime, Hankins, & Bradford, 2016).

Miller and Modigliani (1961) developed the dividend substitution theory, which suggests that when capital markets are perfect and frictionless, dividends and share repurchases are perfect substitutes. Dividends are a payment made by a corporation to its shareholders, as a distribution of profits. Research has shown that U.S. industries decreased dividend payments from the 1970s through the late 1990s, and the fact that managers choose to substitute the distribution of cash through share repurchases instead of paying dividends is a decision based on their corporate strategy (Fama & French, 1993). Furthermore, firms that repurchase earn positive stock returns (Fama & French, 1993). On the other hand, dividend payments are commonly used to demonstrate to the investor that the company can make enough profit for distribution (Brav et al., 2005; Fama & French, 1993; Golden & Kohlbeck, 2017; Grullon & Michaely, 2002; Jagannathan et al., 2000).

Brav et al.'s (2005) study suggested that management can use the flexibility of the repurchasing policy, rather than paying dividends, to time the market. Firms may complete a repurchase when the stock value is low. On the other hand, the firm may choose not to repurchase when there are good projects available in which to invest cash. However, research by Bonaimé, Hankins, and Jordan (2016) showed that management is rarely able to time the fluctuations in the market and make repurchases when the stock price is low. Thus, they showed that the flexibility of repurchases does not add value for long-term shareholders (Bonaimé et al., 2016). The veracity of companies preferring stock dividends over stock repurchase varies over the years, according to the tax advantages (Grullon & Michaely, 2002). The reactions were not only because of the firm characteristics but also because of investors' preferences and firms' strategies related to the timing and flexibility of the payout policy. However, evidence shows that the implementation of tax reforms affected those buybacks, but in a smaller and less persistent manner, proving to be very cyclical (Jagannathan et al., 2000; Vianna, 2017).

The takeover deterrence theory refers to the strategic move of a firm to repurchase its treasury stock to prevent a hostile takeover (Bhattacharya & Jacobsen, 2016). The deterrence is twofold. The firm uses assets to repurchase the stock, thus reducing liquid assets and making the ownership less attractive to prospective companies. Jensen (1986) argues that repurchase acts as a takeover deterrent by distributing funds that otherwise would be used less efficiently. Second, if an outside firm purchases 51% of the company, they have a controlling interest. The potential acquirer pays to attain control by altering the distribution of shareholder reservation values. The crucial insight is that repurchase eliminates shareholders with the lowest reservation values. The acquirer is then left facing those with relatively higher valuations. The repurchase may, therefore, make a subsequent takeover less profitable (Bagwell, 1991; Bagwell & Shoven, 1989; Karpoff, Schonlau, & Wehrly, 2017). A hostile takeover of a company that has a majority shareholder is less likely unless the shareholder decides to sell. Otherwise, the company does not need to implement anti-takeover measures. Thus, even though takeover defenses are important for outside investors in very diverse firms, they are unimportant in closely held companies, unless the shareholders decide to sell stock (Debchuk & Hamdani, 2009). The holding of large stakes becomes the commonest takeover defense (Debchuk & Hamdani, 2009).

The market timing or window-of-opportunities hypothesis is the theory of how companies decide between debt and equity financing (Baker & Wurgler, 2002; Stein, 1996). The theory states that companies look for the least expensive way to raise capital. The primary focus of this theory is the market's valuation of the company and the management's view of the firm's intrinsic value. Market timing theory suggests that managers can increase current shareholders' wealth by timing the issue of securities. Accordingly, firms are likely to issue equity when the stock prices are overvalued and repurchase equity when the market undervalues stock prices. Baker and Wurgler (2002) research suggested that it was

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difficult to explain the choice of financing within the traditional window-of-opportunities hypothesis. The authors' study showed that capital structure evolves as the cumulative outcome of past attempts to time the equity market. When the firm share has a high market value relative to their book and previous market value, they can choose to issue equity. The firm will lower the costs of capital and benefit current shareholders, even at the expense of new shareholders. In addition, the research showed when the shares are undervalued, the firm may repurchase them when both debt and equity markets are favorable (Baker & Wurgler, 2004).

The cash-flow hypothesis suggests that managers with free cash flow will invest it in negative net present value (NPV) projects rather than pay it out to shareholders. Jensen defines free cash flow as cash flow left after the firm has invested in all available positive NPV projects (Jensen, 1986). The free cash flow or overinvestment hypothesis points out that, when a firm accumulates free cash flow, it can either increase its cash dividends, repurchase some of its stock, or overinvest. Jensen argued that firms with substantial free cash flow tend to take on projects with a negative net present value or overinvest. A firm with free cash flow that increases the cash dividends it pays expects its value to increase because fewer negative net present value projects are now taken (Jensen, 1986, 1989; Gunthorpe, 1993; Yongqiang & Peng, 2016).

Operating performance theory studies by Dittmar and Field (2015), Ikenberry et al. (1995, 2000), and Peyer and Vermaelen (2009) seem to show that buyback is associated with an increase in stock price when the buyback occurs, but also with positive long-term excess returns. The positive changes in shareholder value may be an anomaly. However, with the exponential growth of stock repurchases over the last decade, studies have examined the effects of changes in the operating income the year following the repurchases of stock (Manconi et al. 2018).

Prior research has chosen to focus on company valuation using several abnormal performance measures, including cumulative abnormal return (CAR) (Ikenberry et al., 1995, 2000), earnings per share (Almeida, Vyacheslav, & Kronlu, 2013), stock prices, earnings before income and taxes (Brockman & Russell, 2014), return on equity, return on assets, real growth of earnings (defined as the year-over-year change in real net income divided by beginning-of-year equity capital), market size, and book-to-market ratio (Raghavan, 2004). The positive long-term returns following share buyback announcements can be explained by several factors proposed by Peyer, and Vermaelen (2009) and Ikenberry et al. (1995, 1996, 2000). There is limited research on accounting-based performance measures. Bartov (1991) and Lie (2005) found that operating performance improves following buyback announcements. Lie (2005) measures operating performance as operating income scaled by the average of cash-adjusted assets. The average cash adjusted assets are the value of the assets, less cash, and short-term investments, at the beginning and end of the fiscal quarter (Lie, 2005). Dann, Masulis, and Mayers, (1991); Hertzel and Jain, (1991); Lie and McConnell, (1998) studies found that stock repurchases have documented evidence that earnings improve around the announcements, especially during the announcement year (Lie, 2005).

Signaling theory is important in how a stock repurchase is interpreted by investors (Vermaelen, 1981). The signaling hypotheses are based on the premise that management has good insider information, which is not known by the market, of an expected increase in cash flows. The increased cash flow will be used to repurchase stock. The announcement is the signal to shareholders that management has positive information about the company and feels the stock is undervalued; this is generally received as good news by the market (Abraham et al., 2018; Comment & Jarrell, 1991; Dann, 1981; Ikenberry et al., 1995; Manconi et al. 2018; Vermaelen, 1981). Research shows that in an asymmetric information setting, undervalued firms can credibly and completely separate themselves from overvalued firms using stock repurchases (Constantinides and Grundy, 1989; Ofer and Thakor, 1987; Vermaelen, 1981). Block's (2006) research shows that the signal to the market is even stronger when the company is willing to pay a premium for the stock over the current market price. For example, Anheuser Bush, Citigroup, and Columbia/HCA announced repurchase programs of $3 billion during the market downturn of the early 2000s. The companies then saw double-digit value increases (Block,

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2006). Additional research has shown that firms that are the most undervalued must simply announce the repurchase; they do not have to fulfill the repurchase commitment (Bhattacharya & Jacobsen, 2016). The signaling hypothesis is controversial, as the firm's managers have no legal obligation to repurchase the announced target stock. However, firms that report a slight undervaluation of the stock price must follow through with the repurchase, and not just announce to achieve the desired price correction (Bhattacharya & Jacobsen, 2016). Historically, managers have not been required to report the actual repurchase results to investors. In response to concerns about potential managerial opportunism, the Securities and Exchange Commission (SEC) issued a new repurchase disclosure requirement in December 2003. Under the new rule, the SEC began requiring firms to disclose the number of shares purchased each month, the average price per share, and the maximum number or approximate dollar value of shares that may yet be purchased under the program (Liu & Chen, 2015). Empirical research by Dittmar and Field (2015), Ikenberry et al. (1995), and Peyer and Vermaelen (2009) determined buybacks are detrimental to long-term shareholder value; however, these findings differ from the literature on U.S. buybacks completed by Ikenberry et al. (2000). For example, U.S. data shows that buybacks are associated not only with a stock price increase at the time of the buyback authorization but also with positive long-term excess returns (Ikenberry et al., 2000).

Given the results from signaling theory and market-timing theory, there is reason to believe that repurchases have a value-added signal regarding the performance of the firm. Managers are insiders that have insider information regarding the firm and can act on this information. They can use their private, inside information to determine the optimal timing for a repurchase. One of the optimal times for a repurchase would be when a manager knows that firm performance will be high. Before the market becomes aware of the performance, managers have an opportunity to repurchase shares at a discount. Thus, the repurchase can serve as a signal that the firm will have higher performance in the period of the repurchase. This leads to two hypotheses.

H1: Firms involved in a stock buyback in the previous year will experience higher relative earnings in the future compared to firms when compared to firms who did not buy back stock while controlling for the size, market to book ratio, shares outstanding, long-term debt, buy and hold, and the dividends.

H2: Firms involved in a stock buyback in the previous year will experience better operational efficiency relative to earnings in the future compared to firms who did not buy back stock while controlling for the size, market to book ratio, shares outstanding, long-term debt, buy and hold, and the dividends.

Studies by Gentry & Shen (2010) have shown that market performance and accounting profitability are positively correlated across industries. Research by Richard et al. 2009 showed that firm performance is a multidimensional construct. This multidimensional construct consists of different aspects, such as operational effectiveness, organizational survival, and corporate reputation (Richard et at., 2009). The financial component of firm performance is one of the most extensively studied areas (Barney, 2002; Venkatraman and Ramanujam, 1986). In this study, our focus is on the impact of stock repurchases on firm performance. These hypotheses are testable using standard models and financial data. The next section will describe and test these hypotheses empirically.

METHODOLOGY

Sample

In this study, we use data from COMPUSTAT's Fortune 1000 companies for the 10 years from 2008 to 2017. The Fortune 1000 is a common dataset to use for financial studies and allows our results to be comparable to other financial studies. Variables collected are EBITDA, ROA, PURZISE, SIZE, MB, LTD, SHAREOUT BHR, and DIV. We selected all nonmissing data available from this dataset. Our final sample has 7,756 nonmissing firm-year observations.

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Model

In this study, our focus is on the impact of stock repurchases on firm performance. For this study, earnings before interest, tax, depreciation and amortization (EBITDA), and return on assets (ROA_100) are used as a proxy for firms' financial performance. Managers often use EBITDA when planning for both the short-term and long-term company goals. EBITDA is also often used to evaluate the impact of strategic decisions. Despite the frequent use of EBITDA, various authors have highlighted some disadvantages associated with it (Muhammad, 2013). Jensen's (1986) study found that many analysts use EBITDA as an approximation of cash flows, and some even call it free cash flow. Free cash flow is defined as the cash flow over and above that required to fund all projects that have positive net present values when discounted at the relevant cost of capital. Jensen also found that many financial analysts regard operating cash flow as a better gauge of corporate financial performance than net income since it is less subject to distortion from differing accounting practices (Jensen,1986). Free Cash Flows (FCF) are discretionary cash flows available to all investors after the company has made all necessary expenditures. Investors are interested in FCF because a company with no expected future Free Cash Flows is likely to have very little or no value beyond a liquidation value" (Chemical Week, May 8, 1991, p. 28). "A growing number of portfolio managers and analysts insist that cash flows are a more meaningful measure of a company's value than reported earnings" (Dechow, 1994; Institutional Investor, August 1988, p. 55). A change in shareholder value is one of the foundations of financial and economic measures used to determine the value of firms. These changes in value have been measured in part by the change in share prices and operating performance of the firms (Raghavan, 2004). We take the natural logarithm of the value for EBITDA before analysis. ROA_100 is the value for ROA multiplied by 100 to convert to basis points. All variable definitions are available in Appendix I.

Two variables are used to capture the repurchase activity of the firm. *Purchase size* (PURSIZE) is the dollar value of the number of treasury shares repurchased by a firm and is reported in the millions by Compustat (Standard & Poor Compustat, 2000). Treasury stock is the cost of stock repurchased from shareholders by the corporation. If these shares are not retired stock, their repurchase cost is reported on the balance sheet as a negative offset to book equity. The shares may be resold in the future, and this is one example of earnings management theory (Ball et al. 2017).

REPURCHASE is a dichotomous variable, equal to one if the firm repurchased stock in the previous year and zero if it did not repurchase stock in the previous year. REPURCHASE is the variable of interest that will be tested in the regression model to determine if it is a significant predictor of earnings after controlling for the variables listed below. The prediction is the decision to repurchase will positively impact operating performance.

Control Variables

The study uses control variables based on previous research. *Size* (SIZE) is a measure of total assets and is Compustat's item representing current assets *plus* net property, plant, and equipment *plus* other noncurrent assets (including intangible assets, deferred items and investments, and advances (Standard & Poor Compustat, 2000). The natural logarithm of size is used in regression analysis. *Market-to-book ratio* (MB) is the ratio of the market capitalization (market value) of the firm divided by the accounting net book value of the firm. *Long Term Debt* (LTD) is any amount of outstanding debt a company holds that has a maturity of 12 months or longer. The variable LTD is calculated by dividing a company's total liabilities by its shareholder equity and is used to calculate the company's financial leverage.

Buy and Hold Returns (BHR) is the total return over five years for the firm. Compustat defines BHR as the total returns that are annualized rates of return. The BHR adjusts the beginning and ending stock prices by the total return factor for the corresponding months to account for reinvested dividends.

Dividends are the dividends paid to owners for the year in millions. They are included because, when a firm repurchases stock, the dividends paid in future periods could be decreased in total dollars. Thus, the firm can even

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increase the per-share dividend while still decreasing the total cash expenditure for dividends by repurchasing shares. Thus, dividends and stock repurchase activity are related. Research by Bliss, Cheng, & Denis (2015) showed that stock repurchases represent a more flexible form of a payout from the corporation to the shareholders. *Shares Outstanding* (SHAREOUT) are included as a control variable because they may also affect managerial decision-making related to repurchasing. The anti-takeover element of the repurchase decision is influenced by the shares outstanding, so it is controlled for in the analysis. The natural logarithm of the value for SHAREOUT is taken before analysis.

This yields four formulations for the empirical model:

Model 1:

$$EBITDA = \beta_o + \beta_1 * PURSIZE + \beta_2 * SIZE + \beta_3 * MB + \beta_4 * LTD + \beta_5 * SHAREOUT + \beta_6 * BHR + \beta_7 * DIV + \varepsilon.$$

Model 2:

$$EBITDA = \beta_o + \beta_1 * REPURCHASE + \beta_2 * SIZE + \beta_3 * MB + \beta_4 * LTD + \beta_5 * SHAREOUT + \beta_6 * BHR + \beta_7 * DIV + \varepsilon.$$

Model 3:

$$ROA\_100 = \beta_o + \beta_1 * PURSIZE + \beta_2 * SIZE + \beta_3 * MB + \beta_4 * LTD + \beta_5 * SHAREOUT + \beta_6 * BHR + \beta_7 * DIV + \varepsilon.$$

Model 4:

$$ROA\_100 = \beta_o + \beta_1 * REPURCHASE + \beta_2 * SIZE + \beta_3 * MB + \beta_4 * LTD + \beta_5 * SHAREOUT + \beta_6 * BHR + \beta_7 * DIV + \varepsilon.$$

Although the subject of the signal of repurchasing has been examined empirically, we add to the literature by examining whether the repurchase signals improved operating performance rather than stock market performance. By making this central to our research, we rigorously test whether the effect on operating performance is due to the repurchase or due to other variables.

Some previous studies use matched firms to create their samples. These matches firms can be based on combinations of Book to Market Ratio, Market Value, Firm Size, Firm Performance, and Industry membership (See Gong et al. 2008, Medury et al 1992, McNally 1999, Murali and Stephens 2003, Lie 2005). Although matching is a common control mechanism in this literature, its main drawback is that it is not feasible to match firms on multiple characteristics. Rather than rely on matching, we estimate the effect of repurchases while explicitly controlling for these other variables in our regressions.

Summary Statistics

All financial data to be used in this study are retrieved from the Compustat database. We select this dataset as it allows for comparable results to similar studies. For the periods January 2008 to December 2017, we have 958 firms with non-missing data from the Fortune 1000 listing. Of these, 126 firms did not have any reported repurchases; the remainder had at least one repurchase during the sample period. Table 2 presents the Pearson and Spearman correlations of all variables used in our regression models. Pearson correlations appear below the diagonal, and Spearman correlations appear above the diagonal.

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Table 1: Summary Statistics

Variable	Minimum	Maximum	Mean	Std Dev
EBITDA	-2.44185	11.78006	6.42333	1.52739
ROA_100	-1540.6	100.11	13.06192	1.52673
SIZE	-0.1485	15.02314	8.58153	1.6765
MB	-2319.337	15144.189	7.69716	184.96719
LTD	-77658.7	5099341	393.91421	38346.42
BHR	-87.136	428.163	11.42996	19.89725
LN_SHARESOUT	-6.90776	9.29303	4.96335	1.55637
DIV	-34928.16	130785.91	43.62323	1152.8566
PURSIZE	0	772.174	3.30303	14.8807
REPURCHASE	0	1	0.71	0.448

Table 1 presents summary statistics for our final dataset. The observation unit is the years 2008 to 2017.

Table 2: Correlation Matrix

		1	2	3	4	5	6	7	8	9	10
1	EBITDA		.054**	.383**	.198**	0.017	.319**	.743**	.905**	.154**	.184**
2	ROA_100	.059**		.195**	.142**	.271**	.063**	.050**	-.275**	.576**	-.223**
3	PURSIZE	.285**	.036**		.796**	.132**	.112**	.364**	.281**	.176**	-.032**
4	REPURCHASE	.195**	.127**	.142**		.119**	.098**	.167**	.141**	.128**	-.029*
5	BHR	-0.003	.127**	-0.001	.110**		.052**	-.045**	-.084**	.476**	-.026**
6	DIV	0.000	-0.004	0.006	-0.008	-0.002		.212**	.281**	.154**	.150**
7	LN_SHARESOUT	.640**	.057**	.315**	.165**	-.046**	-0.002		.696**	.151**	.032**
8	SIZE	.900**	-.075**	.245**	.142**	-.097**	0.009	.591**		-.060**	.254**
9	MB	.039**	-0.001	-0.003	-0.007	.027*	0.001	.024*	.032**		0.196
10	LTD	0.005	-0.001	-0.003	-0.011	-0.001	0.000	0.008	0.004	-0.006	

Table 2 presents the Pearson and Spearman correlations of all variables used in our regression models. Pearson correlations appear below the diagonal, and Spearman correlations appear above the diagonal. Correlations coefficients are significant at least at the 0.05 level denoted * and 0.01 level denoted **. All variables are defined in Appendix A.

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Table 3: Stock Repurchases by Year

Year	Number of Stock Repurchases
2008	391
2009	360
2010	450
2011	522
2012	524
2013	541
2014	605
2015	608
2016	549
2017	493

Table 2 shows the count of repurchases made by each year in our final sample.

The study presents Pearson and Spearman correlations for all variables included in our regression models in Table 2. The correlations between PURSIZE, REPURCHASE to EBITDA, and ROA_100 are positive and statistically significant. The correlation analysis provides preliminary support that firms with stock repurchases show better operating performance in the following year.

In the first model, EBITDA is the dependent variable. The model uses PURSIZE as the variable of interest that is tested in the regression model to determine that it is a significant predictor of earnings after controlling for the variables listed below. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV.

The second model is using EBITDA as the dependent variable. The model uses REPURCHASE as the variable of interest that was tested in the regression model to determine that it is a significant predictor of earnings after controlling for the variables listed below. The difference between model 1 and model 2 is that the variable PURSIZE is replaced by REPURCHASE, which is a dichotomous variable, using a 1 if the firm repurchased stock in the previous year and a 0 if it did not repurchase stock in the previous year. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV.
The third model uses ROA_100 as the dependent variable. The model uses PURSIZE as the variable of interest that was tested to determine whether it is a significant predictor of earnings after controlling for the variables listed below. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The fourth and final model uses ROA_100 as the dependent variable. The model uses REPURCHASE as the variable of interest that is tested in the regression model to determine that it is a significant predictor of earnings after controlling for the variables. This model changed the variable PURSIZE to REPURCHASE. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV.

The first model is as follows:

$$\mathbf{EBITDA = \beta_o + \beta_1 * PURSIZE + \beta_2 * SIZE + \beta_3 * MB + \beta_4 * LTD + \beta_5 * SHAREOUT + \beta_6 * BHR + \beta_7 * DIV + \varepsilon.}$$

The statistical measure of the linear relationship or correlation, between a dependent variable and the independent variables is adjusted R-squared. The adjusted R-squared is a statistical measure of how close the data are to the fitted

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regression line, and it is the percentage of the response variable variation that is explained by a linear model. In our first model, the adjusted R-squared is .846, which means that 84.6% of the variable variation is represented by the independent variables. Model 1 shown in Table 4, column 4, shows a large F-stat of 4523.53, and a P value of .000 shows a statically significant relationship between the model as a whole and the dependent variable EBITDA.

Table 4, column 4 shows the first model using the variable of interest PURSIZE and the dependent variable EBITDA. The model shows a statically significant relationship (T-stat = 3.015, P-value < 0.003) between the variable of interest, PURSIZE, and the dependent variable EBITDA. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant. This model, found in Table 4 and column 4, provides a hypothesis test for H1.
The second model is as follows:

Table 4: Regressions on Stock Repurchase EBITDA

Variable	1		2		3		4		5	
Intercept	-0.372		6.478	***	6.478	***	-0.151	***	-0.209	***
	0.043		*0.030*		0.031		*0.045*		*0.044*	
PURSIZE			0.026	***			0.001	***		
			0.001				0.000			
REPURCHASE					0.600	***			0.104	***
					0.036				0.016	
CONTROLS:										
SIZE	0.590	***					0.552	***	0.550	***
	0.007						*0.007*		*0.007*	
MB	0.000						0.000	**	0.000	***
	0.000						*0.000*		*0.000*	
LTD	0.000						0.000		0.000	
	0.000						*0.000*		*0.000*	
BHR	0.008	***					0.008	****	0.008	***
	0.001						*0.000*		*0.000*	
DIV	0.000	***					0.000	***	0.000	
	0.000						*0.000*		*0.000*	
LN_SHARESOUT	0.353	***					0.380	***	0.381	***
	0.008						0.009		0.009	
Adjusted RSQ	0.833		0.085		0.012		0.846		0.847	
F-Stat	5693.70		642.07		84.26		4523.53		4554.29	
N	6,827		6,866		6,920		5,769		5,769	

Table 4 contains the regression output for operating performance to stock repurchase. Column 1 reports coefficients and standard errors for only the control variables, columns 2 and 3 report coefficients and standard errors for only the variables of interest, and columns 4 and 5 report coefficients and standard errors for the variables of interest and the control variables. Standard errors are reported below coefficient estimates. Significance is denoted with * as significant at 10%, ** as significant at 5%, and * as significant at 1%.**

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EBITDA= βo + β1*REPURCHASE + β2*SIZE + β3*MB + β4*LTD + β5*SHAREOUT + β6*BHR+ β7*DIV+ε.

In the second model, the variable of interest is REPURCHASE. REPURCHASE is a dichotomous variable, using a 1 if the firm repurchased stock in the previous year and a 0 if it did not repurchase stock in the previous year. The estimation including the REPURCHASE variable shows an R-squared at 84.7%. The model shows a large F-stat of 4554 and a P value of 0.000, showing a statically significant relationship between the model as a whole and the dependent variable EBITDA.

Table 4, column 5 shows the second model using the variable of interest REPURCHASE and the dependent variable EBITDA. The model shows a statically significant relationship (T-stat = 6.5, P-value < 0.017) between the variable of interest, REPURCHASE, and the dependent variable EBITDA. This model is found in Table 4 and column 5 and provides a hypothesis test for H2.

Table 4 shows that PURSIZE and REPURCHASE, the variables of interest were statistically significant. The control variables SIZE, BHR, DIV, and SHAREOUT were all statistically significant at 1%, and MB was statistically significant at 5%. LTD was not statistically significant. The results show a strong correlation between stock repurchase and operating performance.

The third model is as follows:

ROA_100 = βo + βo + β1*PURSIZE + β2*SIZE + β3*MB + β4*LTD + β5*SHAREOUT + β6*BHR+ β7*DIV+ε.

In Table 5, column 4 the third model has an adjusted R-squared of 84.6%. The model shows a large F-stat of 381.537 and a P value of 0.000, indicating a statically significant relationship between the model as a whole and the dependent variable ROA_100. The model shows a statically significant relationship (T-stat = 2.828, P-value < 0.005) between the variable of interest, PURCHASE, and the dependent variable ROA_100. This model is found in Table 5 and column 4 and provides a hypothesis test for H1.

The fourth model is as follows:

ROA_100 = βo + βo + β1*REPURCHASE + β2*SIZE + β3*MB + β4*LTD + β5*SHAREOUT + β6*BHR+ β7*DIV+ε.

The fourth model has an adjusted R-squared of 31.4%. The model shows a large F-stat of 401.058, and a P value of .000 shows a statically significant relationship between the model as a whole and the dependent variable ROA_100.

Table 5, column 5 shows model 4 using the variable of interest REPURCHASE and the dependent variable return on assets (ROA_100). The model shows a statically significant relationship (T-stat = 10.161, P-value < 0.002) between the variable of interest, REPURCHASE, and the dependent variable ROA_100. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant. Model 4 provides a test for H2.

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Table 5: Regressions on Stock Repurchase- ROA_100

Variable	1		2		3		4		5	
Intercept	0.281	***	13.297	***	11.629	***	30.380	***	29.465	***
	0.005		*0.103*		*0.187*		*0.576*		*0.565*	
PURSIZE			0.020	***			0.017	***		***
			0.007				*0.006*			
REPURCHASE					2.427	***			2.075	***
					0.221				0.204	
CONTROLS:										
SIZE	-0.038	***					-4.304	***	-4.342	***
	0.010						*0.094*		*0.093*	
MB	0.000						0.001		0.001	
	0.000						*0.001*		*0.001*	
LTD	0.000						0.000		0.000	
	0.000						*0.000*		*0.000*	
BHR	0.001	***					0.124	***	0.118	***
	0.000						*0.005*		*0.005*	
DIV	0.000	***					0.000		0.000	
	0.000						*0.000*		*0.000*	
LN_SHARESOUT	0.037	***					4.008	***	3.987	***
	0.001						0.115		0.112	
Adjusted RSQ	0.2670		0.0010		0.0160		0.303		0.314	
F-Stat	443.77		9.29		120.03		381.537		401.058	
N	7,296		7,333		7,333		6,126		6,126	

Table 5 contains the regression output for operating performance to stock repurchase. Column 1 reports coefficients and standard errors for only the control variables, columns 2 and 3 report coefficients and standard errors for only the variables of interest, and columns 4 and 5 report coefficients and standard errors for the variables of interest and the control variables. Standard errors are reported below coefficient estimates. Significance is denoted with * as significant at 10%, ** as significant at 5%, and * as significant at 1%.**

Results from Tables 3 and 4 show the effect is robust; the positive effect stays significant across the model specifications.

Additional Analysis:

Tables 6 and 7 contain the regressions on operating performance to stock repurchase using 8 different model specifications for each dependent variable for a total of 16 regressions. In Table 6, the dependent variable is ROA_100, and in Table 7, the dependent variable is EBITDA. In Tables 6 and 7, regressions 1 and 2 use the random-effects framework. Regressions 3 and 4 use the time fixed-effects framework. Regressions 5 and 6 use the industry fixed effects framework calculated by the SIC 1-digit industry designation codes. Regressions 7 and 8 use a time and firm fixed effects framework.

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Table 6: Regressions on Stock Repurchase Fixed Effects ROA_100

Variable	1		2		3		4		5		6		7		8	
REPURCHASE	1.574	***			1.402	***			1.555	***			0.114	***		
	0.161				*0.162*				*0.164*				*0.012*			
PURSIZE			0.013	***			0.011	***			0.012	***			0.012	***
			0.004				*0.004*				*0.004*				*0.004*	
Control:																
SIZE	-3.369	***	-3.289	***	-3.556	***	-3.539	***	-3.000	***	-2.917	***	0.763	***	-2.596	***
	0.150		*0.151*		*0.169*		*0.170*		*0.162*		*0.163*		*0.014*		*0.198*	
MB	-0.0012		-0.002		-0.002		-0.002		-0.002		-0.002		0.000		-0.003	*
	0.001		*0.001*		*0.001*		*0.004*		*0.002*		*0.002*		*0.000*		*0.002*	
LTD	0.000	**	0.000		0.000		0.000		0.000		0.000		0.000	***	0.000	
	0.000		*0.000*		*0.000*		*0.000*		*0.000*		*0.000*		*0.000*		*0.000*	
BHR	0.084	***	0.088	***	0.091	***	0.094	***	0.083	***	0.087	***	0.006	***	0.081	***
	0.004		*0.004*		*0.004*		*0.004*		*0.004*		*0.004*		*0.000*		*0.004*	
DIV	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	
	0.000		*0.000*		*0.000*		*0.000*		*0.000*		*0.000*		*0.000*		*0.000*	
LN_SHARESOUT	3.012	***	2.990	***	3.198	***	3.227	***	2.855	***	2.833	***	0.022		1.637	***
	0.205		*0.208*		*0.217*		*0.220*		*0.209*		*0.212*		*0.034*		*0.462*	
Year Effects	No		No		Yes		Yes		No		No		Yes		Yes	
Industry Effects	No		No		No		No		Yes		Yes		No		No	
Firm Effects	No		No		No		No		No		No		Yes		Yes	
Adjusted RSQ	0.945		0.829		0.111		0.103		.0957		0.846		0.945		.823	
F-Stat	966		860		1,097		1,011		1,063		958		966		861	
N	6,126		6,126		6,126		6,126		5,945		5,945		6,126		6,126	

Table 6 contains the regressions on operating performance to stock repurchase using the different model specifications. All 8 specifications use the dependent variable ROA_100 1) Model 1 and 2 use the random-effects model. 2) Models 3 and 4 use the time fixed-effects model. 3) Models 5 and 6 use the industry fixed effects model calculated by the SIC 1-digit industry designation codes. 4) Models 7 and 8 use the time and firm fixed-effects model. Standard Errors are reported below coefficient estimates. Significance is denoted by * as significant at 10%, ** as significant at 5%, and * as significant at 1%.**

In Table 6, regression 1 shows the fourth model using the variable of interest REPURCHASE and the dependent variable ROA_100. Table 6, regression 1 uses a random-effects regression that has an F-stat of 966, showing a statically significant relationship between the model as a whole and the dependent variable ROA_100. The model shows a statically significant relationship (T-stat = 9.75, P-value < 0.001) between the variable of interest, REPURCHASE, and the dependent variable ROA_100. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant. This model is found in Table 6 and column 1, which provides a hypothesis test for H2.

In Table 6, regression 2 shows the third model using the variable of interest PURSIZE and the dependent variable ROA_100. This regression uses a random-effects framework that has an F-stat of 860, showing a statically significant

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relationship between the model as a whole and the dependent variable ROA_100. The regression shows a statically significant relationship (T-stat = 2.98, P-value < 0.003) between the variable of interest, PURSIZE, and the dependent variable ROA_100. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant. This regression is found in Table 6 and column 2, which provides a hypothesis test for H1.

In Table 6, regression 3 shows the fourth model using the variable of interest REPURCHASE and the dependent variable ROA_100. Regression 3 uses a time value fixed effects regression that shows an F-stat of 1,097 and shows a statically significant relationship between the model as a whole and the dependent variable ROA_100. The regression shows a statically significant relationship (T-stat = 8.63, P-value < 0.001) between the variable of interest, REPURCHASE, and the dependent variable ROA_100. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant. This regression is found in Table 6 and column 3, which provides a hypothesis test for H2.

In Table 6, regression 4 shows the third model using the variable of interest PURSIZE and the dependent variable ROA_100. Regression 4 uses a time value fixed effects regression that shows an F-stat of 1,011, showing a statically significant relationship between the model as a whole and the dependent variable ROA_100. The regression shows a statically significant relationship (T-stat = 2.67, P-value < 0.008) between the variable of interest, PURSIZE, and the dependent variable, ROA_100. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant. This regression is found in Table 6 and column 4, which provides a hypothesis test for H1.

In Table 6, regression 5 shows the fourth model using the variable of interest REPURCHASE anthe d dependent variable ROA_100. Regression 5 uses an industry fixed effects regression that shows an F-stat of 1,063, showing a statically significant relationship between the model as a whole and the dependent variable ROA_100. The regression shows a statically significant relationship (T-stat = 9.45, P-value < 0.006) between the variable of interest, REPURCHASE, and the dependent variable, ROA_100. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. REPURCHASE is statistically significant at 1%. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant. This regression, found in Table 6 and column 5, provides a hypothesis test for H2.

In Table 6, regression 6 shows the third model using the variable of interest PURSIZE and the dependent variable, ROA_100. Regression 6 uses an industry fixed effects regression that shows an F-stat of 958, showing a statically significant relationship between the model as a whole and the dependent variable, ROA_100. The regression shows a statically significant relationship (T-stat = 2.73, P-value < 0.001) between the variable of interest, PURSIZE, and the dependent variable, ROA_100. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant. This regression, found in Table 6 and column 6, provides a hypothesis test for H1.

Table 6, regression 7 shows the fourth model using the variable of interest REPURCHASE and the dependent variable, ROA_100. Regression 7 uses both time and firm fixed effects regression that shows an F-stat of 966, showing a statically significant relationship between the model as a whole and the dependent variable ROA_100. The regression shows a statically significant relationship (T-stat = 9.75, P-value < 0.001) between the variable of interest, REPURCHASE, and the dependent variable, ROA_100. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant. This regression, found in Table 6 and column 7, provides a hypothesis test for H2.

Table 6, regression 8 shows the third model using the variable of interest, PURSIZE, and the dependent variable, ROA_100. Regression 8 uses a time and firm fixed effects regression that shows an F-stat of 861, showing a statically

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significant relationship between the model as a whole and the dependent variable ROA_100. The regression shows a statically significant relationship (T-stat = 2.98, P-value < 0.003) between the variable of interest, PURSIZE, and the dependent variable, ROA_100. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant. This regression is found in Table 6 and column 8, which provides a hypothesis test for H1.

Table 7: Regressions on Stock Repurchase Fixed Effects EBITDA

Variable	1		2		3		4		5		6		7		8	
REPURCHASE	0.121	***			0.100	***			0.122	***			0.114	***		
	0.012				0.012				0.012				0.012			
PURSIZE			0.001	***			0.001	*			0.001	***			0.001	***
			0.000				0.000				0.000				0.000	
Control:																
SIZE	0.682	***	0.687	***	0.637	***	0.636	***	0.726	***	0.732	***	0.756	***	0.763	***
	0.011		0.011		0.013		0.013		0.012		0.012		0.014		0.014	
MB	0.0000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	
	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	
LTD	0.000		0.000		0.000		0.000	*	0.000	**	0.000	***	0.000	**	0.000	***
	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	
BHR	0.006	***	0.006	***	0.006	***	0.006	***	0.006	***	0.006	***	0.006	***	0.006	***
	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	
DIV	0.000		0.000		0.000		0.000	**	0.000		0.000		0.000		0.000	
	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	
LN_SHARESOUT	0.226	***	0.226	**	0.272	***	0.276	***	0.214	***	0.213	***	0.026		0.022	
	0.016		0.016		0.017		0.017		0.015		0.016		0.034		0.034	
Year Effects	No		No		Yes		Yes		No		No		Yes		Yes	
Industry Effects	No		No		No		No		Yes		Yes		No		No	
Firm Effects	No		No		No		No		No		No		Yes		Yes	
Adjusted RSQ	0.427		0.418		0.442		0.436		0.420		0.411		0.427		0.418	
F-Stat	9,062		8,841		9,450		9,292		10,297		9,971		9,062		8,841	
N	6,263		6,263		6,263		6,263		6,076		6,076		6,263		6,263	

Table 7 contains the regressions on operating performance to stock repurchase using the different model specifications. All 8 specifications use the dependent variable EBITDA 1) Model 1 and 2 use the random-effects model. 2) Models 3 and 4 use the time fixed-effects model. 3) Models 5 and 6 use the industry fixed effects model calculated by the SIC 1-digit industry designation codes. 4) Models 7 and 8 use the time and firm fixed effects model. Standard Errors are reported below coefficient estimates. Significance is denoted by * as significant at 10%, ** as significant at 5%, and * as significant at 1%.**

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In Table 7, regression 1 shows the second model using the variable of interest REPURCHASE and the dependent variable EBITDA. Regression 1uses a random-effects regression that has an F-stat of 9,062, showing a statically significant relationship between the model as a whole and the dependent variable, EBITDA. The regression shows a statically significant relationship (T-stat = 10.31, P-value < 0.001) between the variable of interest, REPURCHASE, and the dependent variable, EBITDA. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant. This regression is found in Table 7 and column 1, which provides a hypothesis test for H1.

Table 7, regression 2 shows the first model using the variable of interest PURSIZE and the dependent variable EBITDA. Regression 2 uses a random-effects regression that has an F-stat of 8,841, showing a statically significant relationship between the model as a whole and the dependent variable, ROA_100. The regression shows a statically significant relationship (T-stat = 2.34, P-value < 0.019) between the variable of interest, PURSIZE, and the dependent variable EBITDA. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant. This regression is found in Table 7 and column 2, which provides a hypothesis test for H1.

Table 7, regression 3 shows the second model using the variable of interest, REPURCHASE, and the dependent variable, EBITDA. Regression 3 uses a time-fixed effects regression that shows an F-stat of 9,450, providing evidence of a statically significant relationship between the model as a whole and the dependent variable, EBITDA. The regression shows a statically significant relationship (T-stat = 10.29, P-value < 0.001) between the variable of interest, REPURCHASE, and the dependent variable EBITDA. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant. This regression is found in Table 7 and column 3, which provides a hypothesis test for H2.

Table 7, regression 4 shows the first model using the variable of interest, PURSIZE, and the dependent variable, EBITDA. Regression 4 uses a time values fixed effects regression that shows an F-stat of 9,292, showing a statically significant relationship between the model as a whole and the dependent variable, EBITDA. The regression shows a statically significant relationship (T-stat = 1.84, P-value = 0.066) between the variable of interest, PURSIZE, and the dependent variable, EBITDA. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant. This regression is found in Table 7 and column 4, which provides a hypothesis test for H1.

Table 7, regression 5 shows the second model using the variable of interest REPURCHASE and the dependent variable EBITDA. Regression 5 uses an industry fixed effects regression that shows an F-stat of 10,297, showing a statically significant relationship between the model as a whole and the dependent variable, ROA_100. The regression shows a statically significant relationship (T-stat = 10.29, P-value < 0.001) between the variable of interest, REPURCHASE, and the dependent variable, EBITDA. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant. This regression is found in Table 7 and column 5, which provides a hypothesis test for H2.

Table 7, regression 6 shows the first model using the variable of interest, PURSIZE, and the dependent variable, EBITDA. Regression 6 uses an industry fixed effects regression that shows an F-stat of 9,971, demonstrating a statically significant relationship between the model as a whole and the dependent variable, EBITDA. The regression shows a statically significant relationship (T-stat = 10.29, P-value < 0.001) between the variable of interest, PURSIZE, and the dependent variable, EBITDA. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant. This regression is found in Table 7 and column 6, which provides a hypothesis test for H1.

Table 7, regression 7 shows the second model using the variable of interest, REPURCHASE, and the dependent

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variable, EBITDA. Regression 7 uses both time and firm fixed effects regression that shows an F-stat of 8,841, showing a statically significant relationship between the model as a whole and the dependent variable, EBITDA. The regression shows a statically significant relationship (T-stat = 10.31, P-value < 0.001) between the variable of interest, REPURCHASE, and the dependent variable, EBITDA. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant. This regression, found in Table 7 and column 7, provides a hypothesis test for H2.

Table 7, regression 8 shows the first model using the variable of interest, PURSIZE, and the dependent variable, EBITDA. Regression 8 uses a time and firm fixed effects regression that shows an F-stat of 9,062, showing a statically significant relationship between the model as a whole and the dependent variable, EBITDA. The regression shows a statically significant relationship (T-stat = 2.34, P-value = 0.019) between the variable of interest, PURSIZE, and the dependent variable, EBITDA. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant. This regression is found in Table 7 and column 8, which provides a hypothesis test for H1. Results from tables 5 and 6 show the effect is robust; the positive effect stays significant across the model specifications.

Table 8 shows the regression of operating performance to stock repurchases using different specifications on the dependent variables EBITDA and ROA_100. Column 1 uses EBITDA and column 2 uses ROA_100. The specifications use REPURCHASE not lagged and then lagged yearly, up to the 5-year mark. This is an explicit test regarding the duration of the effect of the repurchase signal. To the extent that we find significance in the additional lags of the repurchase variables, we will have evidence of the persistence of this effect.

Column 1 uses EBITDA as the dependent variable. Column 1 reports an F-stat of 116.00, showing a statically significant relationship between the dependent variable, EBITDA, and the model as a whole. The regression shows a statically significant relationship (T-stat = 5.570, P-value <0.001) between the variable of interest, REPURCHASE, and the dependent variable, EBITDA.

In Column 1 the regression uses REP_2, the variable of interest lagged 1 year and shows a statically significant relationship (T-stat = 1.980, P-value = 0.048) between the variable of interest, REP_2, and the dependent variable EBITDA. After REP_2, the second year, there does not seem to be a statistically significant relationship for time periods 3, 4, and 5. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant.

Column 2 uses the dependent variable ROA_100 and shows an F-stat of 32.00. This regression shows a statically significant relationship between the dependent variable ROA_100 and the model as a whole. The regression shows a statically significant relationship (T-stat = 5.130, P-value = <0.001) between the variable of interest, REPURCHASE, and the dependent variable, ROA_100.

In Column 2, we do not obtain a statistically significant relationship for time periods 2, 3, 4, and 5. Only the variable REPURCHASE is statistically significant. For instance, REP_2 and shows a less statically significant relationship (T-stat = 1.170, P-value = 0.205) between the variable of interest, REP_2, and the dependent variable ROA_100. The control variables are SIZE, MB, LTD, SHAREOUT, and DIV. The control variables SIZE, BHR, and SHAREOUT were all statistically significant. LTD, DIV, and MB are not statistically significant.

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Table 8: Regressions on Stock Repurchase fixed effects on EBITDA and ROA_100

Variable	1		2	
REPURCHASE	0.090	***	1.120	***
	0.016		*0.219*	
REP_2	0.032	***	0.274	
	0.016		0.216	
REP_3	0.005		0.080	
	0.015		*0.204*	
REP_4	0.006		0.110	
	0.014		0.192	
REP_5	0.007		0.135	
	0.014		*0.186*	
Control:				
SIZE	0.661	***	-4.566	***
	0.023		*0.318*	
MB	0.0000		0.006	
	0.000		*0.003*	
LTD	0.000	***	0.000	***
	0.000		*0.000*	
BHR	0.004	***	0.063	***
	0.000		*0.006*	
DIV	0.000		0.000	
	0.000		*0.000*	
LN_SHARESOUT	0.064		1.067	
	0.057		*0.794*	
Adjusted RSQ	0.310		0.115	
F-Stat	116		32	
N	3,506		3,401	

Table 8 contains the regressions on operating performance to stock repurchase using the different model specifications. Column 1 uses the dependent variable EBITDA, and column 2 uses the dependent variable ROA_100. Standard Errors are reported below coefficient estimates. Significance is denoted by * as significant at 10%, ** as significant at 5%, and * as significant at 1%.**

CONCLUSION

This study examines the impact of stock repurchases on the operating performance of the Fortune 1000 companies. The period of the research covers the 10 years between 2007 to 2017. From the multivariate analyses, we find strong evidence supporting our assertion that a stock repurchase increases the firm's EBITDA and ROA. Similarly, results also provide evidence that the increase only affected the year of and the year immediately following the repurchase.

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As shown above, the empirical results show a positive, significant relationship between repurchase activity and operating performance across all specifications and metrics. Both the level of repurchase and the act of repurchasing are correlated with higher operating performance. These results are interpreted as evidence of the signaling effect. The signaling hypotheses are based on the premise that management has good insider information, which is not known by the market, of an expected increase in cash flows (Jensen, 1986). Our evidence shows that the evidence being sent by the signaling effect is that operating income will increase with a company repurchases stock.

Model 1 as estimated from Table 4, column 4 shows the mean of $3.303 million of stock repurchase. For a million-dollar repurchase of stock, the company is expected to see an increase in operating income of $1,003.00. Model 2 as estimated from Table 4, column 5 shows, that if there is a repurchase, net income is expected to be $109,601 higher. Model 3 as estimated from Table 5, column 4 shows, that for every one million dollars repurchased we get 1.7% of a basis point increase in ROA. Model 4 as estimated from Table 5, column 5 shows, that if there is a repurchase of stock, we get a 2.075 basis point increase in ROA. Given the marginal effect, the evidence shows that the act of the repurchase is more important than the amount of the repurchase. The signal sent by engaging in the repurchase is more substantial a signal than the amount repurchased.

Given the results from signaling theory and market-timing theory, there is reason to believe that repurchases have a value-added signal regarding the performance of the firm. Managers are insiders that have insider information regarding the firm and can act on this information. They can use their private, inside information to determine the optimal timing for a repurchase. One of the optimal times for a repurchase would be when a manager knows that firm performance will be high. Before the market becomes aware of the performance, managers have an opportunity to repurchase shares at a discount. Thus, the repurchase can serve as a signal that the firm will have higher performance in the period of the repurchase.

Standard limitations of empirical research apply to this work. This study is limited to the size of observed firms and reliance on data collection solely from the Compustat database. Although Compustat contains substantive data on Fortune 1000 firm value and other related variables of interest in the North American region, other resources such as Bloomberg and STR (Smith Travel Research) can be used to enlarge the sample size and enhance the generalizability of our findings.

Future research may extend our analyses by including more firms or different reporting groups (e.g., Dow Jones) and comparing the valuation effect of stock repurchases on firm operating performance. Moreover, instead of using the North American data source alone, the future study may extend the testing sample into a global source to add an international perspective to the research. One more country (e.g., China) with distinctive macroeconomic features can be included to conduct a comparative analysis by adopting our testing models on the operating performance effect. One more possibility for future study may be to extend our analyses by including an event study several years after The Tax Cuts and Jobs Act (TCJA) of 2017. The mass influx of stock repurchases during 2018 and 2019 offers a unique perspective on the effects of stock repurchases on operating performance.

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Appendix I: Variable Names

BHR	Buy-and-hold return (BHR) is the annualized return over the preceding five years for the firm. The BHR adjusts the beginning and ending stock prices by the total return factor for the corresponding months to account for reinvested dividends.
DIV	Dividends (DIV) are the cash payment of dividends for the year in millions of US Dollars
EBITDA	EBITDA is Earnings before interest, tax, depreciation, and amortization in millions of US Dollars. The natural logarithm of this number is taken before analysis.
LTD	LTD is calculated as the long-term debt-to-equity ratio, calculated by dividing a company's total liabilities by its shareholder equity, and is used to calculate the company's financial leverage.
MB	Market-to-book ratio (MB) is the ratio of the market capitalization (market value) of the firm divided by the accounting net book value of the firm.
PURSIZE	Purchase size (PURSIZE) is the dollar value of the number of treasury shares repurchased by a firm and is reported in millions of US Dollars
REPURCHASE	REPURCHASE is a dichotomous variable, using a 1 if the firm repurchased stock and a 0 if it did not repurchase stock.
ROA_100	Return on Assets (ROA_100) is an indicator of how profitable a company is relative to its total assets. ROA_100 is the ROA times 100 to convert to basis points.
SHAREOUT	Shares outstanding (SHAREOUT) refers to the natural logarithm of the number of a company's stock currently held by all its shareholders. The shareholders include shares held by institutional investors and restricted shares owned by the company's officers and insiders.
SIZE	Size is the total book value of assets for the company in millions of US Dollars. Compustat's item represents current assets plus net property, plant, and equipment plus other noncurrent assets (including intangible assets, deferred items and investments, and advances)