Universal Basic Buybacks

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Share repurchases (buybacks) have been a recent source of controversy due to misperceptions of their economic effects on firms and shareholders. Commentators in the financial press, financial institutions, and even politicians have misunderstood the effects of share repurchases on share prices and/or shareholder enrichment. I demonstrate the economic effects of share repurchase using financial statement analysis and a residual income valuation (RIM) approach. Consistent with decades of prior finance and accounting research, the results demonstrate that share repurchases do not contribute incremental value to shareholders. Share repurchases do not increase price per share. However, share repurchase do reduce market value, increase financial leverage and certain profitability metrics, and increase the equity cost of capital.

Keywords: share repurchases, corporate payouts, financial statement analysis, valuation, residual income model

INTRODUCTION

A popular misconception of share repurchases is that these transactions increase the price per share of the repurchasing firm. As demonstrated in this paper, when a firm repurchases its own shares, its market value declines and price per share does not change. It is important to understand that these two effects result from only the share repurchase transaction itself and not the increase in leverage that results or any investor interpretations of positive or negative signals they may derive from the firm's decision to repurchase shares.

To put repurchases in perspective, S&P Global recently announced that companies forming the S&P 500 index bought back $210.8 billion in the third quarter of 2022, with the top 20 companies accounting for 49.0 percent of the total. Including dividends, total capital returned to shareholders for the 12 months ended September 2022 was $1.534 trillion, another record. Given the significant dollar values of repurchases, it may have come as no surprise that proposals to tax these transactions quickly became law requiring a one percent excise tax on share repurchases. Some proponents of the tax argue for this measure as a way to "curb" share repurchases they see as enriching "CEOs" instead of investing in their own firms. (Brown, 2021; Faler, 2021) Contrary to these misguided proposals, returning surplus capital to shareholders so it can be redeployed to more attractive investment opportunities historically has been considered good corporate governance.

Misunderstanding the economics and mechanics of share repurchases can lead to many bad policy proposals designed to "curb" share repurchases and their related undesirable outcomes such as malinvestment. The following excerpts from the Wall Street Journal and Investopedia articles demonstrate this point.

> "Some on Wall Street have worried that buybacks and dividends redirect corporate spending away from capital expenditures or research and development, boosting stock prices in the short run at the expense of long-term growth that could return even more to shareholders." (Singh, 2021)

> "Some economists and investors argue that using excess cash to buy up their stock in the open market is the opposite of what companies should be doing, which is reinvesting to facilitate growth (as well as job creation and capacity)." (Wohlner, 2021)

> "Corporate executives 'too often use [buybacks] to enrich themselves rather than investing in workers and growing their businesses,' the White House said in a summary of the tax [on share repurchases]." (Faler, 2021)

These comments are generally consistent with two frequent but incorrect arguments typically portraying share repurchases as negative: 1) repurchases divert investment that should occur within the repurchasing firm; and 2) repurchases increase share prices of the repurchasing firm. The first argument implies that internal investment of surplus capital is somehow preferred to external investment using capital returned to shareholders. Besides violating well-accepted theories of asymmetric information, this view is consistent with a misunderstanding of basic economic principles: accept positive net present value (NPV) projects and select the project with the highest NPV when faced with multiple positive NPV projects. (Ross, et.al., 2022; Brealey, et.al., 2020; CFI Institute, 2023) Assuming company managers likely have better information than outside investors regarding investment opportunities within their firms, it seems reasonable to conclude that share repurchases signal surplus capital would be better invested outside the repurchasing firm. At least two interpretations, which are not necessarily mutually exclusive, of share repurchases are possible: 1) the firm is generating a lot of surplus capital that will continue to provide additional funds to investors for outside investment opportunities; and/or 2) the firm's future growth prospects may not be good since it is not pursuing ever increasing internal investment opportunities. Disentangling these two effects may be difficult empirically. From this simple thought experiment, it is not clear why one would conclude that potentially poor investments are preferred to returning capital to shareholders, who can redeploy capital to superior investment opportunities. This is a particularly troubling situation when policy makers in the White House appear to suffer from this same flawed logic while having so much influence on the U.S. economy through proposed tax policies.

The focus of this paper is establishing the theoretical underpinning and accounting mechanics to expose the flawed second argument that repurchases increase share prices. The following excerpts demonstrate this point and argue that investors are fooled by higher earnings per share (EPS) resulting from share repurchases and that this EPS-effect results in higher share prices.

> "The theory behind share buybacks is that they reduce the number of shares available in the market and—all things being equal—increase EPS on the remaining shares, benefiting shareholders. … A stock buyback thus enables a company to increase this metric without actually increasing its earnings or doing anything to support the idea that it is becoming financially stronger. … The impact on earnings per share can give an artificial lift to the stock and mask financial problems that would be revealed by a closer look at the company's ratios. …" (Wohlner, 2021)

> "It's a fair critique of corporate earnings to say that earnings "growth" in 2019 is a bit deceptive as the value is being financially engineered by corporate finance departments, not organic, core-business growth," wrote Tom Essaye, president of the Sevens Report, in a Wednesday note to clients. "Companies aren't making any more money than in 2018—they just have a smaller share count to spread the money over, so EPS are rising." (Matthews, 2019)

These arguments are flawed on many levels. First, the comments acknowledge that earnings (i.e., the dollar amount of net income) do not change from repurchases. Second, it is implied that investors would naively rely on EPS rather than perform more comprehensive analysis when evaluating an investment opportunity. Finally, the commentators miss the fact that shareholders remaining after repurchases hold a larger share of a smaller company, all else equal. It is difficult to credibly argue that investors are so unsophisticated and that an efficient market would result in the types of share pricing distortions implied by the above comments. To MarketWatch's credit, they understand that share repurchases cause EPS to grow faster than earnings and seem to imply that repurchases do not affect shareholder value. MarketWatch is silent on whether they feel investors are fooled by this effect.

A clear example of how market observers misunderstand the share price effects of repurchases can be seen in the following commentary and table produced by the Motley Fool.

> "Managers who are compensated via stock options rather than company stock don't receive dividends, but they can benefit from a buyback that pushes up the near-term or long-term stock price. … In the near term, the stock price may rise because shareholders know that a buyback will immediately boost earnings per share." (Motley Fool Staff, 2017)

McDonald's FY 2013 Metric	With Buyback	Without Buyback*
Earnings per share	$5.55	$5.45
Book value per share	$16.17	$17.65

DATA SOURCE: STANDARD AND POOR'S CAPITAL IQ * APPROXIMATE BASED ON AUTHOR'S ESTIMATES

Despite the claim, the included table is meant to be an example of how share repurchases can increase share price due to the higher EPS. Closer inspection of the author's own example shows the main component of valuation, book value per share, declines much more than the increase in the EPS resulting in a *lower* value per share overall. This is the case even when discounting the incremental $0.10 per share of EPS in perpetuity by any reasonable discount rate and/or growth rate. There are an endless supply of articles just like the ones presented here that make the same misguided arguments supported by flawed or at least incomplete logic. Some articles refer to the market demand supply dynamics as a rationalization for how repurchases increase price per share while others point to potential positive signaling effects investors assimilate into higher share prices. Examining the underlying valuation calculations and accounting mechanics in the remainder of the paper will help clear up the current misperceptions found in the financial media.

BACKGROUND ON REPURCHASE MECHANICS

To properly analyze the effects of repurchase transactions, it is first necessary to establish a framework traditionally used for security valuation. Once a model is in place, it can be reformulated to identify inputs affected by repurchase transactions so their resulting valuation effects can be observed. In the analysis that follows, results are developed through derivation of a residual income valuation model (RIM) and through the application of the model with numerical examples. This study contributes to the capital markets literature by presenting a structured approach to analyzing the effects of share repurchases on security prices. Using well-established economic concepts and accounting frameworks, the analysis highlights the non-value-added nature of share repurchases to provide a basis for evaluating the contrary claims prevailing in the financial media.

The rest of this section describes the theoretical underpinnings of the RIM applied to the financial statement reformulation found in (Nissim, et.al., 2001). The first order of business is to present the basic valuation model and reformulate the required inputs so the effects of share repurchases can be examined. The RIM is based on the dividend discount model (DDM) but rather than forecasting dividends as required by the DDM, the RIM forecasts inputs based on accrual accounting financial statements. (Ohlson, 1995;

Feltham, et.al., 1995) The RIM is particularly useful as an analytical tool for identifying share repurchase effects on security prices due to the financial statement effects of the transaction, however this feature in no way diminishes the value or importance of dividend-based or cash flow-based valuation models. In fact, (Penman, 1997) establishes that all three forms of valuation models will generate the same valuation under internally consistent conditions.

The RIM can value any asset, but the focus here is on a firm's equity. The model states the value of common equity at date 0 as:

$$V_0^E = BV_0 + \sum_{t=1}^{T} \frac{E_t(RI_t)}{(1+r)^t} + \frac{\frac{E_t(RI_{T+1})}{(r-g)}}{(1+r)^T} \quad (1)$$

where, V_0^E is the value of the equity security at time 0; BV_0 is the book value of equity at time 0; RI_t is the residual income in period t [defined as net income, NI, minus a charge on beginning book value of equity, BV, or $RI_t = NI_t - (r \times BV_{t-1})$]; RI_{T+1} is the residual income in period T+1 beyond the forecast period, r is the investor's required rate of return; g is the expected growth rate in residual income at time T; and E(.) refers to expected values of residual income. Determining the cost of capital is not addressed here but can be found extensively discussed in the finance literature. The version of the RIM presented in equation (1) forecasts residual income based on net income, which does not distinguish between operating and financing activities.

A finite-horizon model is presented here in equation (1) because application of an infinite-period model is impractical. Residual income is forecast for a finite number of years and a "terminal value", represented by the far-right term in equation (1) captures all future periods beyond the individual period forecasts. This version of the model forecasts perpetual growth in expected residual earnings after period T. Other versions of these models can alter this assumption by replacing this term with 0, representing a steady state of zero residual income, or replacing the denominator of the term with (1+r), representing a constant steady state of positive residual income with no growth. Selecting the most appropriate terminal value assumption will depend on the analyst's expectation for the firm's future performance relative to its cost of capital. Forecasting a future growth rate is particularly important given the sensitivity of the terminal value to this input.

The RIM has a long history and has become widely accepted in the academic literature. See (Preinreich, 1938), (Edwards, et.al., 1961), (Kay, 1976), and (Ohlson, 1995) as examples. The model has contributed to valuation research and financial statement analysis in (Brief, et.al., 1992), (Frankel, et.al., 1998), (Lee, et.al., 1999), (Penman, et.al., 1998), (Francis, et.al., 2000), and (Abarbanell, et.al., 2000). As proof of its technological contributions, the model has become widely adopted in financial analysis texts and practical equity research. See (Penman, 2013) and the CFA Institute's 2022 Level II RIM Module on equity investments as examples. A simple Google search will produce results too numerous to count, including textbooks, practitioner and academic articles, website content, videos, and many other references to the model. (Huong, 2011; Cheng, 2015; Ashton, et.al., 2015; Liu, 2021)

For the RIM to be most useful in examining the effects of share repurchases, it helps to reformulate the financial statement inputs needed to properly focus the analysis. Following the analysis in (Nissim, et.al., 2001), the financial statement reformulation here separates operating and financing items to highlight relevant features of share repurchases that properly categorize these transactions as financing related. Operating activities are those involved in producing goods and services for customers, while financing activities raise and dispose of capital needed for and generated by operating activities. (Nissim, et.al., 2001) provides an excellent description of the detailed financial statement categories and coverage of the financial statement reformulation.

Starting with the basic accounting equation, Assets = Liabilities + Equity, the reformulation below provides a refined set of inputs for the analysis of share repurchases using the RIM.

$$A = L + E \quad (2)$$

$$E = A - L \quad (3)$$

$$E = (FA + OA) - (FL + OL) \quad (4)$$

$$E = (FA - FL) + (OA - OL) \quad (5)$$

$$E = (OA - OL) + (FA - FL) \quad (6)$$

$$E = NOA + NFO; (NFO < 0 \text{ when Debt} > \text{Cash}) \quad (7)$$

where, FA are financial assets such as cash & equivalents and marketable securities; FL are financial liabilities such as debt; OA are operating assets representing all assets not included in FA; and OL are operating liabilities representing all liabilities not included FL. NOA and NFO are net operating assets and net operating liabilities, respectively. Equation (7) presents the operating and financial equivalents to book value of equity representing net assets.

The reformulation above is based on the Modigliani and Miller concept that operating activities generate value while financing activities are zero net-present-value activities, net of tax effects. In addition, this formulation has the benefit of separating financial assets and liabilities reported close to market value on the balance sheet. Therefore, only the operating activities require analysis.

Applying the reformulated financial statements to the residual income model allows for a more parsimonious analysis. Just as residual earnings can be calculated for common equity (net assets), it can be calculated for any component of net assets. For purposes of this analysis, it is assumed that there are no clean surplus violations (i.e., no items affect the value of equity that by-pass the income statement). In other words, there are no items causing differences between Net Income and Comprehensive Income. Relaxing this assumption will not affect the analysis if Net Income is replaced by Comprehensive Income. See (Feltham, et.al., 1995). For the operating and financing components identified in equation (7) above,

$$(ReOI)_t = OI_t - (r_\omega - 1)\, NOA_{t-1}; \text{ and} \quad (8)$$

$$(ReNFE)_t = NFE_t - (r_D - 1)\, NFO_{t-1} \quad (9)$$

where, $(ReOI)_t$ is residual operating income; OI_t is after-tax operating income at time t; r_ω is the required return for the operations ("ω" represents the weighted-average cost of capital); $(ReNFE)_t$ is residual net financial expense; NFE_t is net financial expense at time t; and r_D the required return on the net financial obligations (the cost of capital for debt). For any asset or obligation measured at market value, equation (9), forecasted residual income must equal zero (i.e., forecasted to earn its cost of capital). If NFO is measured on the balance sheet at market value such that $NFO = VNFO_0$, then the present value of forecasted $ReNFE_t$ equals zero. The notation in the equations below is simplified by using the $\sum$ symbol to represent the respective summation terms of the present value calculations. The full mathematical expressions can be found in the Appendix.

Applying the reformulated financial statements to the RIM results in the following parsimonious version of the model.

$$V(E) = V(NOA) - V(NFO) \text{ where,} \quad (10)$$

$$V(NOA) = NOA + \sum ReOI; \text{ and} \quad (11)$$

$$V(NFO) = NFO + \sum ReNFE; \text{ thus} \quad (12)$$

$$V(E) = NOA - NFO + \sum ReOI - \sum ReNFE; \text{ becomes} \quad (13)$$

$$V(E) = NOA - NFO + \sum ReOI - 0 \text{ ; and finally} \quad (14)$$

$$V(E) = E + \sum ReOI \quad (15)$$

The valuation effect of any specific type of transaction, operating or financing, can be analyzed using the framework above by first determining which category of input is affected by the transaction, then quantifying the input's effect on V(E). For example, dividends are financing transactions because cash is returned to shareholders through a dividend payment while share repurchases are similar financing transactions with one critical difference: the number of shares outstanding declines when cash is returned to shareholders in exchange for their shares. Applying these type of financing transactions to the RIM confirms that share repurchases are zero NPV projects that reduce market value. The numerical examples in the following section reinforce this result by showing that the accounting mechanics for share repurchases and valuation effects of repurchase transactions using the RIM reduce the book value of equity and valuation of common equity by the dollar amount of share repurchases while leaving the per share price of shares unchanged.

REPURCHASE ACCOUNTING AND VALUATION

In this section, share repurchases are analyzed by examining their effects on a stylized balance sheet and income statement. The analysis highlights the nature of repurchases as financing transactions and shows how these transactions reduce the book value of equity, a major component of equity value in the RIM valuation framework. At the same time, the analysis demonstrates why price per share remains unchanged by share repurchases, a result which appears to be counterintuitive to some observers in the financial media. A "Calculations" column is included to make the analysis easier to follow.

Table 1 below shows how cash, a financial asset, declines by $180 when used to repurchase the company's shares. There is an equivalent $180 decline in equity equal to the total cost of the shares repurchased, $18 per share x 10 shares repurchased. The decline in equity can affect different equity accounts depending on the selected accounting treatment: the cost method where treasury stock is reported as a negative amount of equity or the retirement method where common stock, additional paid-in-capital, and potentially retained earnings are reduced. The reduction in equity represented on the balance sheet is especially important here because it represents a significant component of equity value in the RIM. Moving to the income statement panel on Table 1, notice that the share repurchase reduces the shares outstanding by 10. The number of shares repurchased is calculated as the dollar amount of cash used for the repurchase ($180) divided by the price per share at the time of the purchases ($18).

There are a few highlights worth noting. First, sales and net income are unaffected by the share repurchases making it clear that repurchases do not affect the operations of the firm. Second, market value declines in direct proportion to the $180 of share repurchases. Recall from the previous section, and confirmed in this analysis, that share repurchases are financing transactions reported at market value. Thus, any reduction in financial assets due to repurchases should have an equivalent reduction in market value of equity, which is demonstrated here. Third, earnings per share (EPS) increases because net income is unaffected while shares outstanding decline. In this example, a 10 percent reduction in shares outstanding increases EPS by 11.1%. This "growth" in EPS should not be mistaken as growth in net income and equity and contributes no incremental value to shareholders. Finally, and perhaps the most misunderstood result, price per share does not change from the share repurchase. This result is confirmed by dividing the market value of equity by the outstanding shares before and after the share repurchases: before the repurchase, $1,800 market value divided by 100 shares outstanding equals $18.00 per share, and after the repurchase, $1,620 market value divided by 90 shares outstanding equals $18.00 per share.

Given the results in the panel above, it is understandable why some investors and/or market observers may misunderstand the effects of share repurchases on share prices. Focusing on EPS and EPS growth without fully understanding their composition can give the impression of significant value creation when there is none. Misapplying these metrics to a valuation model can in turn lead to an incorrect assessment of

price per share. In context of this analysis, "incorrect" simply means different that would otherwise be absent the share repurchases and is not meant to suggest a lack of market efficiency.

TABLE 1
SHARE REPURCHASE EFFECTS ON FINANCIAL STATEMENT ITEMS AND SELECTED ANALYTIC METRICS

Balance Sheet Items	**Before Repurchases**	**Repurchases**	**After Repurchases**	**Percent Change**	**Calculations**
Financial Assets	$200.00	($180.00)	$20.00	**-90.0%**	**[a]**
Operating Assets	$1,000.00		$1,000.00		**[b]**
Total Assets	$1,200.00		$1,020.00	**-15.0%**	**[c] = [a] + [b]**
Financial Liabilities	$250.00		$250.00		**[d]**
Operating Liabilities	$50.00		$50.00		**[e]**
Total Liabilities	$300.00		$300.00		**[f] = [d] + [e]**
Shareholders Equity	$900.00	($180.00)	$720.00	**-20.0%**	**[g]**
Liabilities and Shareholders Equity	$1,200.00	**[1*]**	$1,020.00	**-15.0%**	**[h] = [f] + [g]**
Income Statement Items					
Sales	$1,000.00		$1,000.00		**[i]**
Net Income	$150.00		$150.00		**[j]**
EPS	$1.50		$1.67	**11.1%**	**[k] = [j]/[l]**
Shares Outstanding	100.00	(10.00)	90.00	**-10.0%**	**[l]**
Market Value	$1,800.00	($180.00)	$1,620.00	**-10.0%**	**[m] = [g]*[P/B=2.0]**
		[m*] = [m] - [1*]			
Price per Share	**$18.00**		**$18.00**	**0.0%**	**[n] = [m]/[l]**

As a continuation of the above analysis, Table 2 below shows the effects of share repurchases on selected analytic metrics typically used for valuation. The calculations column is continued here with references to the above panels as needed. An important insight from the analysis is the increase in leverage that results from share repurchases. Assets and equity decline while liabilities remain constant. This results in significant increases in both leverage metrics, debt-to-equity and NFO-to-equity. Ultimately, increased leverage will increase the equity cost of capital as demonstrated in the residual income valuation analysis shown in Figure 6 below. Price-to-book (P/B) *increases* from 2.0 to 2.3 because the $180 of share repurchases decrease market value ($1,800 to $1,620) and book value of equity ($900 to $720) by the same amount. The $180 reduction has a larger effect on the relatively smaller book value so the ratio increases.

Price-to-earnings (P/E) *declines* from 12.0 to 10.8 due to share repurchases. When calculating using total dollar amounts, the ratio declines because market value decreases by the dollar amount of repurchases ($1,800 to $1,620), while net income is unchanged ($150). On a per share basis, price per share is unchanged ($18) while EPS increases ($1.50 to $1.67). In both cases, the ratio decreases.

Share repurchases affect some profitability metrics but not others as can be seen in Table 2. Profit margin is unaffected because repurchases do not affect sales or net income. Return on net operating assets (RNOA) is also unaffected by repurchases because this profitability measure is based on only the operations of the firm and ignores the financing activities. Operating income, operating assets, and operating liabilities are unchanged by repurchases. Return on total assets (ROA) and return on common equity (ROCE) increase as a result from share repurchases due to the respective reduction in total assets (cash in this case) and equity while net income is unchanged. Increases in these two profitability metrics due to repurchases can be yet another source of misunderstanding for investors and market observers. Increasing profitability by itself suggests value creation and would naturally lead to higher equity values. However, in the case of repurchases, profitability measures can be mechanically increased with no incremental value creation. One

must be careful to identify the sources of profitability changes and any related inputs to ensure they originate from value-added activities and not from transactions such as repurchases that add no incremental value.

TABLE 2
SHARE REPURCHASE EFFECTS ON FINANCIAL STATEMENT ITEMS AND SELECTED ANALYTIC METRICS (CONTINUED)

Leverage Metrics	Before Repurchases	Repurchases	After Repurchases	Percent Change	Calculations
Debt/Equity	0.33	0.08	0.42	**25.0%**	**[o] = [f]/[g]**
NFO/Equity	0.06	0.26	0.32	**475.0%**	**[p] = {[d]-[a]}/[g]**
Market Multiples					
P/B	2.0	0.3	2.3	**12.5%**	**[q] = [m]/[g]**
P/E	12.0	(1.2)	10.8	**-10.0%**	**[r] = [m]/[j]**
P/E (Per Share Calculation)	12.0	(1.2)	10.8	**-10.0%**	**[s] = [n]/[k]**
Profitability Metrics					
Profit Margin	15.0%	0.0%	15.0%	**0.0%**	**[t] = [j]/[i]**
ROA	12.5%	2.2%	14.7%	**17.6%**	**[u] = [j]/[c]**
RNOA	15.8%	0.0%	15.8%	**0.0%**	**[v] = [j]/{[b]-[e]}**
ROCE	16.7%	4.2%	20.8%	**25.0%**	**[w] = [j]/[g]**

The chart in Figure 1 below for Apple Inc. provides an example of how share repurchases can have a dramatic effect on the P/B ratio. Apple began returning capital to shareholders through dividends and share repurchases in 2012. The blue line calculates the P/B ratio for Apple using its market value and reported book value of equity. The red line adjusts the book value of equity by adding back the cumulative amount of share repurchases to-date in each respective year. The divergence between the two lines demonstrates the dramatic effect share repurchases can have on key valuation metrics.

FIGURE 1
PRICE-TO-BOOK VALUE OF EQUITY FOR APPLE, INC. 2007-2022

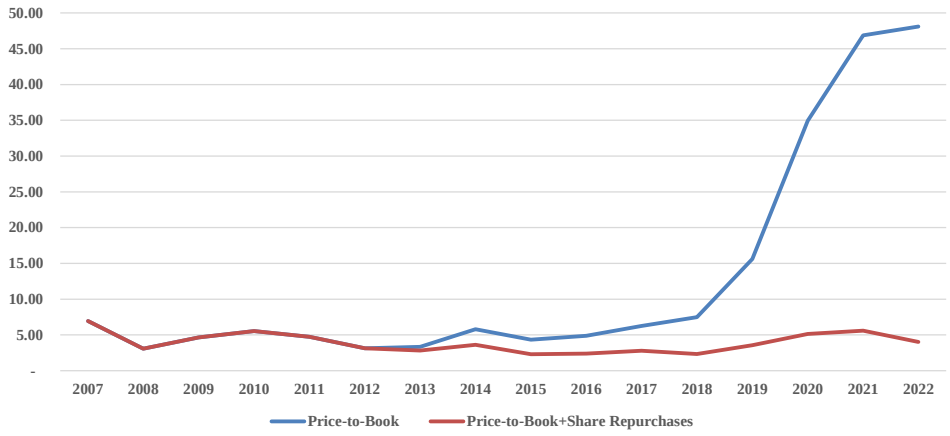
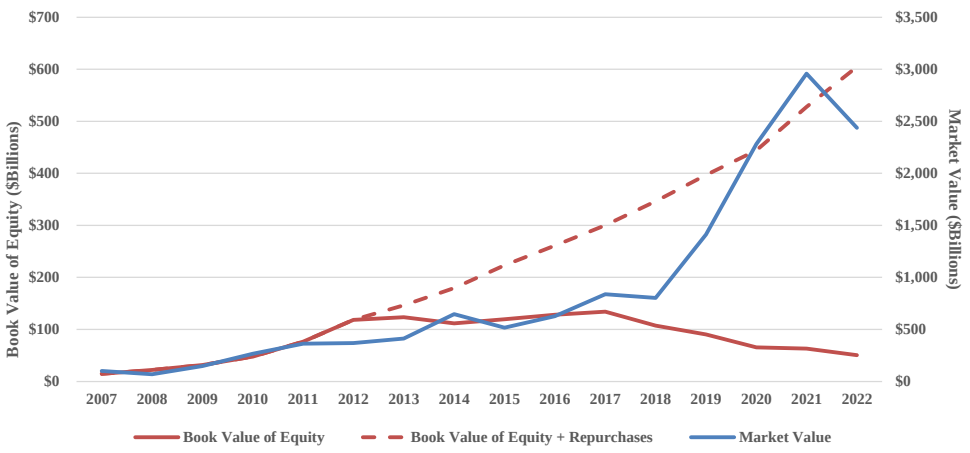


Figure 2 below presents the inputs to the two versions of the P/B ratio for Apple in Figure 1 above. Examining the individual inputs reveals the sizable impact of Apple's share repurchases on its reported book value of equity.

FIGURE 2
COMPONENTS OF PRICE-TO-BOOK RATIO FOR APPLE, INC. 2007-2022



The large increase in Apple's market value (right scale) since 2018 has certainly contributed to its higher P/B ratio. However, less obvious is the additional contribution from a declining book value of equity (left scale) over the same period. This is shown by the solid red line. This decline in book value of equity is also occurring at a time when Apple is generating significant net income that is increasing equity through retained earnings. The denominator effect on the P/B ratio is exacerbated by the significant amount of capital returned to shareholders through repurchases that would otherwise have increased the reported book value of equity.

Results observed from the accounting example can be confirmed through an alternative analysis of share repurchases using the RIM. The analysis begins with the presentation of a standard forecasted balance sheet before and after share repurchase transactions. This sample balance sheet is shown below in Table 3 with the effects of the share repurchases highlighted in yellow. Period 0 reflects the valuation date and periods 1-4 reflect the forecasted periods. The balance sheet amounts are purposefully simplified to focus attention on the valuation of the share repurchase transactions. Performing the analysis on financial statements where assets, liabilities, and equity are changing over time from non-share repurchase activity slightly complicates the analysis but does not change the results.

TABLE 3
RESIDUAL INCOME VALUATION EXAMPLE

Balance Sheet	**Before Share Repurchases**					**After Share Repurchases**				
Assets	**0**	**1**	**2**	**3**	**4**	**0**	**1**	**2**	**3**	**4**
Financial Assets	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Operating Assets	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
Total Assets	$2,100	$2,100	$2,100	$2,100	$2,100	$2,100	$2,100	$2,100	$2,100	$2,100
Liabilities										
Financial Liabilities	$400	$400	$400	$400	$400	$800	$800	$800	$800	$800
Operating Liabilities	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700
Total Liabilities	$1,100	$1,100	$1,100	$1,100	$1,100	$1,500	$1,500	$1,500	$1,500	$1,500
Equity	$1,000	$1,000	$1,000	$1,000	$1,000	$600	$600	$600	$600	$600
Total Liabilties & Equity	$2,100	$2,100	$2,100	$2,100	$2,100	$2,100	$2,100	$2,100	$2,100	$2,100

These financial statements are reformulated by grouping the operating assets and liabilities as well as the financing assets and liabilities so both operating and financing activities can be independently valued using the RIM. The reformulated balance sheet and a similarly formatted income statement are presented in Table 4 below along with the valuation calculations for each activity. As is shown just below the cost of capital assumptions, the present value of operating activities equals $200 independent of the share repurchase transactions. This result makes sense because share repurchases are not part of the firm's business operations, i.e., do not affect any operating assets or liabilities, so any forecasts of future residual operating income are also unaffected by share repurchases.

TABLE 4
RESIDUAL INCOME VALUATION EXAMPLE (CONTINUED)

Reformulated Balance Sheet	**Before Share Repurchases**						**After Share Repurchases**					
	0	**1**	**2**	**3**	**4**		**0**	**1**	**2**	**3**	**4**	
Net Operating Assets	$1,300	$1,300	$1,300	$1,300	$1,300		$1,300	$1,300	$1,300	$1,300	$1,300	
Net Financial Assets	($300)	($300)	($300)	($300)	($300)		($700)	($700)	($700)	($700)	($700)	
Equity	$1,000	$1,000	$1,000	$1,000	$1,000		$600	$600	$600	$600	$600	
Income Statement												
Revenue	$400	$400	$400	$400	$400		$400	$400	$400	$400	$400	
Operating Expenses	$265	$265	$265	$265	$265		$265	$265	$265	$265	$265	
Operating Income	$135	$135	$135	$135	$135		$135	$135	$135	$135	$135	
Net Financial Expense	($15)	($15)	($15)	($15)	($15)		($35)	($35)	($35)	($35)	($35)	
Net Income	$120	$120	$120	$120	$120		$100	$100	$100	$100	$100	
Assumptions												
Cost of capital for Operations	**9.0%**						**9.0%**					
After-tax cost of Debt	**5.0%**						**5.0%**					
Long-term growth in Residual Operating Income	**0.0%**						**0.0%**					
Valuation Calculations						**TV**						**TV**
Residual Operating Income (ReOI)		$18.0	$18.0	$18.0	$18.0	$200.0		$18.0	$18.0	$18.0	$18.0	$200.0
Discount Factor		1.090	1.188	1.295	1.412	1.412		1.090	1.188	1.295	1.412	1.412
PV of ReOI		$16.51	$15.15	$13.90	$12.75	$141.69		$16.51	$15.15	$13.90	$12.75	$141.69
Sum of PV of ReOI	**$200.00**						**$200.00**					
						TV						**TV**
Residual Financial Expense (ReFE)		$0.0	$0.0	$0.0	$0.0	$0.0		$0.0	$0.0	$0.0	$0.0	$0.0
Discount Factor		1.050	1.103	1.158	1.216	1.216		1.050	1.103	1.158	1.216	1.216
PV of ReFE		$0.00	$0.00	$0.00	$0.00	$0.00		$0.00	$0.00	$0.00	$0.00	$0.00
Sum of PV of ReFE	**$0.00**						**$0.00**					
+ Equity	**$1,000**						**$600**					
Value of Equity	**$1,200.00**	**P/B**	=	**1.20**			**$800.00**	**P/B**	=	**1.33**		
Shares Outstanding	600						400	Repurchased 200 shares for $2 per share for $400 total.				
Price Per Share	**$2.00**						**$2.00**					

Cost of Equity Calculations

		RNOA		**Weighting**				**RNOA**		**Weighting**			
Operating Income / Net Operating Assets	Net Operating Assets / Value of Equity	$135 / $1,300	x	$1,300 / $1,200	=	11.3%		$135 / $1,300	x	$1,300 / $800	=	16.9%	
							10.0%						**12.5%**
		Cost of NFE		**Weighting**				**Cost of NFE**		**Weighting**			
Net Financial Expense / Net Financial Assets	Net Financial Assets / Value of Equity	($15) / ($300)	x	($300) / $1,200	=	-1.3%		($35) / ($700)	x	($700) / $800	=	-4.4%	

By performing the valuation on operating and financing activities separately, it is easier to observe that share repurchases are financing activities. As the post-repurchase balance sheet shows, debt increases and equity declines by the same amount, which effectively changes the capital structure of the firm without affecting the operating assets or liabilities. Equity declines because cash, a financial asset measured at market value, is used to repurchase shares at their market price. The post-repurchase balance sheet shows this as a $400 decrease in net financial assets (increase in debt) and a commensurate $400 reduction in equity. Mechanically, debt is issued to raise the cash, which is then used to repurchase shares at the market value. If internal cash is used for the repurchase, as opposed to raising cash through a debt issuance, the

results would not change because net financial assets would still decline by $400. Notice the valuation of net financial expense, just beneath the residual operating income forecasts, produces zero residual financial expense in each forecasted period and zero present value overall. This result obtains because financial assets and liabilities are reported at close to market value on the balance sheet thus, earn or cost exactly their expected rate of return or cost of capital. Hence, there can be no residual net financial expense associated with these assets or liabilities and forecasts of residual net financial expense can contribute no incremental value to the firm. Changes in net financial obligations/expenses due to share repurchases produce the same result, zero residual net financial expenses and no contribution to a firm's value.

Share repurchases do *decrease* equity value, however the reduction in equity value results from the amount of the share repurchase in the period of the repurchase. In the above example, the book value of equity decreases from $1000 to $600 in the equity value calculation (just above the blue highlighted box in the table above). The $400 reduction represents the repurchase of 200 shares at $2 per share. The market value of equity declines by the same $400 ($1200 - $800) because the present value of forecasted residual operating income does not change from the share repurchases and forecasted residual net financial expenses is always zero.

A less intuitive result of share repurchases to many market observers is that price per share does not decline despite the reduction in market value. The calculations for the green highlighted share prices in Table 4 above show that the lower market value divided by a lower number of outstanding shares after the repurchases result in precisely the same price per share. Although the repurchase transaction does not affect price per share directly, it does increase the risk of the shares through the higher cost of equity capital shown by last analysis in Table 4 above. Share repurchases increase the financial leverage of the firm so the residual interest equity holders will require a higher rate of return for owning shares when there are relatively more obligations that reduce their claim on assets. The return on net operating assets and net financial obligations do not change, only their respective weightings in the capital structure change.

FINAL THOUGHTS

The analysis in this paper attempts to clear up some misconceptions of share repurchases. Contrary to claims that share repurchases increase price per share, the analysis demonstrates how share repurchases reduce market value while leaving price per share unchanged. When a company repurchases its own shares, assets, equity, and the number of outstanding shares decline so the investors are left owning a smaller company with fewer outstanding shares. In an efficient market, the repurchasing company's market value declines by exactly the dollar amount of stock repurchased. This direct reduction in market value results because cash, used for the stock buyback, is reported at market value and contributes no premium above the book value of equity. Dividing the lower market value by the reduced outstanding shares results in precisely the same price per share as before the share repurchase.

In follow-on research, I will explore several aspects of share repurchases in more detail. Future research will focus on testing the results confirmed by the analytics established in this paper. Some specific areas of exploration will include examining the relationships between share repurchases and stock prices/returns, investment activity, subsequent growth in operating activity, financial leverage, and valuation metrics. Given the significant increase in share repurchase activity recently, this stream of research should be useful for practitioners, academics, and policy makers so they can better understand the nature of repurchases and their economic effects.

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APPENDIX

The Residual Income Model (RIM) as presented in equation (A1) states the value of common equity at date 0 as:

$$V_0^E = BV_0 + \sum_{t=1}^{\infty} \frac{E_t(RI_t)}{(1+r)^t} \quad \text{(A1)}$$

where, V_0^E is the value of the equity security at time 0; BV_0 is the book value of equity at time 0; RI_t is the residual income in period t [defined as net income, NI, minus a charge on beginning book value, BV, or $RI_t = NI_t - (r \times BV_{t-1})$]; r is the investor's required rate of return; and E(.) refers to expected values of future residual income.

Equation (A2) below presents a finite-horizon version of the RIM model as a practical alternative to estimating an infinite-period model. Residual income is forecast for a finite number of years and a "terminal value", represented by the far-right term in equation (A2), captures all future periods beyond the individual period forecasts. This version of the model forecasts perpetual growth, g, in expected residual earnings after period T.

$$V_0^E = BV_0 + \sum_{t=1}^{T} \frac{E_t(RI_t)}{(1+r)^t} + \frac{\frac{E_t(RI_{T+1})}{(r-g)}}{(1+r)^T} \quad \text{(A2)}$$

To simplify the derivation on the reformulated financial statement inputs, the unrestricted equation (i.e., infinite forecast version) is extended to the operating and financing activities separately and the respective results are combined into a single value. Focusing on this version of the model simplifies the analysis by ignoring the terminal value calculation in truncated versions of the model, although results are the same regardless of the model selected.

For the operating and financing components comprising equity, the RIM can be separated into the two following models:

$$V_0^{NOA} = NOA_0 + \sum_{t=1}^{\infty} \frac{E_t(ReOI_t)}{(1+r_\omega)^t} \quad \text{(A3)}$$

$$V_0^{NFO} = NFO_0 + \sum_{t=1}^{\infty} \frac{E_t(ReNFE_t)}{(1+r_\delta)^t} \quad \text{(A4)}$$

where, V_0^{NOA} represents the value of the net operating assets at time 0 and V_0^{NFO} represents the value of the net financial obligations at time 0. The discount rate terms in each model represent the required rate of return on NOA and NFO, respectively. Combining the two models results in the original value of equity, V_0^E, the starting point of the derivation. See equations (A5) and (A6) below for the deconstructed model.

$$V_0^E = V_0^{NOA} - V_0^{NFO} \quad \text{(A5)}$$

$$V_0^E = NOA_0 - NFO_0 + \sum_{t=1}^{\infty} \frac{E_t(ReOI_t)}{(1+r_\omega)^t} - \sum_{t=1}^{\infty} \frac{E_t(ReNFE_t)}{(1+r_\delta)^t} \quad \text{(A6)}$$

Because financial assets and liabilities are reported at close to market value, they earn or cost their respective cost of capital producing zero forecasted residual net financial income or expense. Thus, the equity value reduces to the following parsimonious model.

$$V_0^E = NOA_0 - NFO_0 + \sum_{t=1}^{\infty} \frac{E_t(ReOI_t)}{(1+r_\omega)^t} - 0 \quad \text{(A7)}$$

$$V_0^E = BV_0 + \sum_{t=1}^{\infty} \frac{E_t(ReOI_t)}{(1+r_\omega)^t} \quad \text{(A8)}$$

Notice that the term forecasting net financial expense in equations (A6) and (A7) equals zero and can be ignored. The form of the more parsimonious model with a truncated forecast period and terminal value is represented in equation (A9) by:

$$V_0^E = BV_0 + \sum_{t=1}^{T} \frac{E_t(ReOI_t)}{(1+r_\omega)^t} + \frac{\frac{E_t(ReOI_{T+1})}{(r_\omega - g)}}{(1+r_\omega)^T} \quad \text{(A9)}$$

As the final version of the model demonstrates, the value of equity is based on the current book value of equity and forecasted residual *operating* income. Net financial obligations only affect equity value in as far as they reduce the current book value of equity but contribute nothing additional to equity value through the forecast of residual financial expenses (or financial income).