A Profitability-Valuation Framework Based on a Firm's Cash-Flows

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Abstract

The traditional Profitability-Valuation framework is based on the Residual Income Model which is in fact a derivation of the Dividend Discount Model. Drawbacks of the dividend or earnings approach to valuation are well known, and practitioners in the equity investment community tend to prefer cash-flow based valuation metrics. We show that it is perfectly feasable to build a Profitability-Valuation framework based on a firm's cash-flows.

1 Introduction

In a prior working paper, Pierre and al. have shown how to build a stock selection framework based on the profitability of a firm and its stock price valuation. This Profitability-Valuation framework is derived from the Residual Income Model (hereafter *RIM*) which is in fact a derivation of the Dividend Discount Model (hereafter *DDM*). In this context, Pierre and al. show that profitability is necessarely measured using Return On Equity (hereafter *ROE*) while the valuation metric is necessarely the Price To Book (hereafter *PB*). As such, screening for stocks using ROE and PB consists in buying stocks that appear cheap from a dividend perspective or, more generally from an earnings perspective. Dividends can, indeed, be replaced by earnings as long as the clean surplus accounting rule that underpins the RIM is observed.

Drawbacks of the dividend or earnings approach to valuation are well known. For example, earnings are a pure accounting measure that can be manipulated because it incorporates non-cash items of the income statement. Another drawback often mentioned by practitioners is that profitability measures based on earnings depend on a firm's gearing, defined as the amount of debt relative to equity. A company can have an attractive *ROE* despite having an unattractive Return on Invested Capital (hereafter *ROIC*). More importantly, a company using financial leverage to enhance its *ROE* actually makes it more volatile often at the expense of its financial strength (measured by the health of the balance sheet). For these reasons, practitioners in the equity investment community tend to prefer cash-flow based valuation metrics.

The purpose of this working paper is to show that it is perfectly feasable to adapt the Profitatbiliy-Valuation framework so as to hinge it on a firm's cash-flows instead of earnings. Using cash-flows has several advantages: first of all, it allows us to avoid the debt caveat. Secondly, by using cash-flows when valuing a firm, practitioners adopt a more entrepreneurial attitude towards stock valuation; typically, a private equity firm or any type of firm that wishes to value a potential target will do so by discounting cash-flows instead of earnings or dividends.

The paper is organised as follow. First section recapitulates theoretical and empirical findings in Pierre and al. regarding the link between *DDM*, *RIM*, *PB-ROE*, and how to combine financial screens and fundamental analysis when using the Profitablity-Valuation framework. In the second section, we show how to adapt this approach to cash-flow based valuations measures; links between Profitablity-Valuation screens, fundamental analysis and Discounted Cash-Flow models (hereafter *DCF*) are also explicitly described. In this section we also show how a cash-flow based Profitablity-Valuation framework is in fact identical to the Economic Value Added (hereafter *EVA*) which is also known as Residual Cash-Flow and thus comparable to Residual Income.

2 *DDM*, *RIM* and the *PB-ROE* approach

2.1 Valuing assets

We start off firslty by reminding the general model for valuing assets. A well know accounting identity expresses the relation between the value of an asset, the income stream it generates and to which the holder of the asset is entitled (C_1,C_2, . . . C_n) and an endogeneous return R

$$V_t = \sum_{i=1}^{K} \frac{C_{t+i}}{(1+R)^i} + \frac{V_{t+K}}{(1+R)^K} \tag{1}$$

In other words, R is what you earn if you pay V_0, receive C_1,C_2, . . . C_K and sell the asset at V_{t+K}. The value of the asset when you sell it is the terminal value of the asset. This basic principle is at the root of many equity valuation models; the *DDM* is the exact translation of this accounting principle where dividends are the revenues a shareholder is entitled to.

2.2 The *DDM*

Applying equation (1) to equities leads to

$$P_t = \sum_{i=1}^{K} \frac{D_{t+i}}{(1+R)^i} + \frac{P_{t+K}}{(1+R)^K} \tag{2}$$

where P_t is the stocks price at t, D_{t+i} the future dividend at $t+i$, R the discount rate and P_{t+K} the terminal value. Again, R is necessarely the average total return of the shareholder over one period if he pays P_t, receive D_{t+1},D_{t+2}, . . . D_{t+K} and sells the stock at P_{t+K}. It is worth mentioning that the dividends are always reinvested and that the total shareholder return is going to be $(1+R)^K - 1$ over K periods.

The Gordon Growth Model is a simple version of the DDM where it is assumed that dividends will grow at a constant rate, duration of equity is infinite so that terminal value is negligeable:

$$P_t = \sum_{i=1}^{\infty} \frac{D_{t+i}}{(1+R)^i} \approx \frac{D_{t+1}}{R-g} \tag{3}$$

where g is the expected constant dividend growth rate to perpetuity.If we isolate future returns R, we get:

$$R = \frac{D_{t+1}}{P_t} + g \tag{4}$$

This equation highlights the fact that future returns are driven by the current valuation and future growth.

Although the *DDM* is theoretically correct, it carries some well known caveats. One in particular is its expression of equity valuation purely from a dividend distribution standpoint. Value creation is not apparent in this formula. By injecting the book value of equity in the DDM one can explain how dividends are generated through time and why investment and economic returns are at the basis of dividend growth and value creation. The Residual Income Model (RIM hereafter) makes this possible.

2.3 Linking the *RIM* with the *DDM*

The *RIM* developed by Ohlson and Felthman (1995) assumes an accounting identity, the clean surplus rule , which states that the change in book value is equal to the difference between earnings and dividends $B_t - B_{t-1} = E_t - D_t$. Earnings that are not distributed to investors are reinvested in the company. It then appears obvious that if a company's economic profitability is better than what shareholders expect, the company has an incentive to reinvest profits in order to generate even bigger future earnings and dividends. Residual income, or abnormal earnings, is constructed as the difference between accounting earnings and the previous-period book value mutliplied by the cost of equity (i.e. the cost of equity being what investors expect as future returns) $A_t = E_t - RB_{t-1}$. Using these accounting identities allows us to rewrite dividends as $D_t = B_{t-1}(1+R) - B_t + A_t$. Replacing D_t with this new expression into the *DDM* formula (2) and operating some simplifications leads to the following *RIM* equation :

$$P_t = B_t + \sum_{i=1}^{K} \frac{A_{t+i}}{(1+R)^i} - \frac{B_{t+K}}{(1+R)^K} + \frac{P_{t+K}}{(1+R)^K} \tag{5}$$

where P_t is the stocks price at t, B_t is the book value at t, A_{t+i} the future abnormal earnings in $t+i$, R the discount rate, P_{t+K} and B_{t+K} the market value and book value of equity in $t+K$ respectively. It is now obvious that a market value of equity superior to its book value necessarely implies that the company generates abnormal earnings i.e. that its*ROE* is above the shareholder expected return (Cost Of Equity). Abnormal earnings are the ability of the company to generate more earnings than what investors are asking for. Under General Equilibrium Theory assumptions, abnormal earnings do not last indefinitely and tend to fade away. If we assume that at a period sufficiently far out in the future $t+k$, abnormal earnings have been arbitraged away and disappear, then market value of equity must equal the book value and the formula (3) becomes

$$P_t = B_t + \sum_{i=1}^{K} \frac{A_{t+i}}{(1+R)^i} \tag{6}$$

Using similar mathematical simplification tools than the ones used in the Gordon Growth Model, we can simplify Eq. 5 :

$$P_t = B_t + \frac{1}{(1+R-\omega)} A_{t+1} \tag{7}$$

Or,

$$P_t = B_t + \frac{1}{(1+R-\omega)} (E_{t+1} - RB_t) \tag{8}$$

Dividing the value by the current book value leads to the following relation between price to book and return on equity :

$$\frac{P_t}{B_t} = 1 + \frac{1}{(1+R-\omega)} (ROE_{t+1} - R) \tag{9}$$

This formula highlights some important facts. First the higher the *ROE*, the higher the *PB*, everything else being equal; valuation can increase without destroying shareholder returns as long as the *ROE* also increases. Moreover given two companies with the same *ROE* but different *PB*s, the higher *PB* will either have a lower discount rate R and/or have a higher persistence rate ω (ability to generate more abnormal earnings). There is a clear similarity between the *PB-ROE* model and the Gordon Growth Model (*GGM*) (Equ. 3). Recall that the *GGM* is :

$$P_t = \frac{D_{t+1}}{R-g} \tag{10}$$

Or,

$$P_t = \frac{\rho E_{t+1}}{R-g} \tag{11}$$

By dividing both terms of the equation by the book value B_t we get :

$$\frac{P_t}{B_t} = \frac{\rho ROE_{t+1}}{R-g} \tag{12}$$

Where ρ is the payout ratio. We can use the clean surplus accounting rule and replace ρROE_{t+1} by $ROE_{t+1} - g$ where g is the perpetual growth rate in dividends. We therefore have another version of the GGM based on the price-to-book :

$$\frac{P_t}{B_t} = \frac{ROE_{t+1} - g}{R-g} \tag{13}$$

The GGM shows that the $PB - ROE$ relationship reflects a trade-off between the discount rate and future growth while the RIM shows that the $PB - ROE$ relationship is a trade-off between the discount rate and the persistence rate. There is, thus, a close relationship between growth and persistence of abnormal earnings. This is very intuitive since future abnormal earnings drive investment which in turn drives growth in dividends.Finally, the term $(ROE_{t+1} - R)$ reflects the ability for the firm to create value. If a firm is able to create value, its PB will be above 1.

As a conclusion to this section, hereafter are the important ideas we wish to highlight before moving on to the cash-flow approach :

- The *RIM* is a derivation of the the *DDM* using clean surplus accounting and introducing the abnormal earnings concept
- The *RIM* helps us better understand the notion of value creation and the relationship between value creation and valuation
- *PB-ROE* is a simplified version of the *RIM* the same way the *GGM* is a simplified version of the *DDM*.
- Valuation multiples are simple versions of multi-period discounting models and as such are very helpful as a starting point for stock selection (through screening for example).
- As a consequence, it is advised to build more sophisticated valuation models after the initial screen.

3 Building a Profitability-Valuation framework mounted on a Discounted Cash-Flow model

3.1 Identifying the main components of the model

We will be using the Discounted Free Cash-Flow to Firm model (*FCFF* hereafter). As its name suggests, this model effectively discounts all the cash-flows that are/can be distributed to the shareholders and debt holders of the firm. Applying (1) to the firm, we get :

$$EV_t = \sum_{i=1}^{K} \frac{FCFF_{t+i}}{(1+R)^i} + \frac{EV_{t+K}}{(1+R)^K} \tag{14}$$

where EV_t is the enterprise value of the firm generating the free cash-flows ($FCFF$). R is the discount rate, or the return required by shareholders and debt holders. R is effectively the cost of capital for the firm and is equivalent to the concept of $WACC$ used by the financial analyst community.

Secondly, we need to define the different components of the model. We follow Damodaran and use his definitions. We are quite aware that there exists numerous definitions for each of the following concepts but Damodaran's definitions can serve as a starting point, where other definitions are refined versions of these basics definitions. Specifically, Damodaran posts articles on his blog (*http://pages.stern.nyu.edu/ adamodar/*)

that summarize the courses he teaches at the Stern School of Business at New York University. In an article posted in 2013 entitled "A tangled web of values: Enterprise value, Firm Value and Market Cap" Damodaran gives a very clear definition of the accounting concepts we will be using. As a starting point, the balance sheet allows us to write the following accounting identity :

$$CashOtherNon - OperatingAssets + OperatingAssets = Debt + Equity + ShortTermLiabilities \quad (15)$$

Operating Assets are comprise of Fixed Assets, Intangible Assets and Working Capital, so that we have :

$$CashOtherNon - OperatingAssets + FixedAssets + IntangibleAssets + WorkingCapital = Debt + Equity \quad (16)$$

3.2 The Cash-Flow based valuation model

If we define Enterprise Value as the market value of Debt and Equity minus the cash (and other non-operating assets) a firm holds, it appears clear from these accounting identities that Enterprise Value is the market value of the operating assets. We define Invested Capital as the book value of the operating assets, also equal to the book value of Debt and Equity. Following the Profitablity-Valuation framework based on earnings and equity, the challenge is to link the *FCFF* model defined in (9) to a Profitablity-Valuation relationship where valuation is a ratio that relates the market value of operating assets EV_t to the book value of the operating assets IC_t.

Thirdly, we need to identify a certain number of accounting identities similar to the ones we used for the *RIM* in order to link cash-flow generation, the balance sheet and the market value of the balance sheet.

As its name suggests, the *RIM* hinges on the clean surplus accounting identity, where profits that are not distributed to shareholders are reinvested in the firm thus changing the value of the equity. Similarly, the cash generated by the firm that is not distributed to equity holders and debt holders is reinvested in the firm in net capital expenditures and non-cash working capital :

$$FCFF_t = NOPAT_t - (NetCapex_t + \triangle WC_t) \quad (17)$$

Where $NOPAT_t$ is the Net Operating Profit After Tax at time t and $NetCapex_t$ are the Capital Expenditures Net of Depreciation and $\triangle WC_t$ the change in non-cash Working Capital also at time t. Over one period, the change in Invested Capital IC is equal to :

$$IC_t - IC_{t-1} = NetCapex_t + \triangle WC_t \quad (18)$$

or

$$IC_t = IC_{t-1} + NetCapex_t + \triangle WC_t \quad (19)$$

Just as in the *RIM* approach, we introduce the notion of abnormal operating earnings :

$$A_t = NOPAT_t - WACC \times IC_{t-1} \quad (20)$$

where A_t are the abnormal operating earnings and $WACC$ the Weighted Average Cost of Capital. We define abnormal operating earnings as earnings that are not discounted by shareholders and debt holders ($WACC \times IC_{t-1}$).

By combining Eq. 15 and Eq. 17, we get :

$$IC_t = IC_{t-1} + NOPAT_t - FCFF_t \quad (21)$$

And by replacing $NOPAT$ by its equivalent in Eq.13 we get :

$$IC_t = IC_{t-1} + A_t + WACC \times IC_{t-1} - FCFF_t \tag{22}$$

Which gives :

$$IC_t = IC_{t-1}(1 + WACC) + A_t - FCFF_t \tag{23}$$

And $FCFF$ is thus equal to :

$$FCFF_t = IC_{t-1}(1 + WACC) + A_t - IC_t \tag{24}$$

We can now transform Eq. 9 by replacing the $FCFF$ with its equivalent identified in Eq. 17.

$$EV_t = \sum_{i=1}^{K} \frac{FCFF_{t+i}}{(1+R)^i} + \frac{EV_{t+K}}{(1+R)^K} \tag{25}$$

becomes

$$EV_t = \sum_{i=1}^{K} \frac{IC_{t+i-1}(1 + WACC) + A_{t+i} - ICt + i}{(1 + WACC)^i} + \frac{EV_{t+K}}{(1 + WACC)^K} \tag{26}$$

This can be simplified (with alot of terms cancelling out) so that finally we get :

$$EV_t = IC_t + \sum_{i=1}^{K} \frac{A_{t+i}}{(1 + WACC)^i} - \frac{IC_{t+K}}{(1 + WACC)^K} + \frac{EV_{t+K}}{(1 + WACC)^K} \tag{27}$$

If we assume that at a period sufficiently far out in the future $t+k$, abnormal earnings have been arbitraged away and disappear, then market value of invested capital (EV) must equal book value (IC) then the formula becomes :

$$EV_t = IC_t + \sum_{i=1}^{K} \frac{A_{t+i}}{(1 + WACC)^i} \tag{28}$$

Using the notion of persistence rate allows us to simplify even more the valuation equation. The persistence rate ω is defined such that $A_{t+1} = \omega^i A_t$. ω is necessarely less than one so that abnormal earnings fade away at speed ω.

Finally, Eq. becomes :

$$EV_t = IC_t + (\frac{1}{1 + WACC - \omega})(NOPAT_{t+1} - WACC \times IC_t) \tag{29}$$

By dividing left and right term by IC_t we have :

$$\frac{EV_t}{IC_t} = (\frac{1}{1 + WACC - \omega})(ROIC_{t+1} - WACC) \tag{30}$$

3.3 Some remarks on the Cash-Flow based valuation model

Our equation linking $\frac{EV}{IC}$ with the $ROIC$ and the $WACC$ is completely in line with valuation models and concepts such as EVA. The idea is the same : value is created when a business is able to earn more than its cost of capital ($ROIC > WACC$); in this situation, the market value of a business warrants a premium relative to its book value ($\frac{EV}{IC}$ ¿1).
Just as we did for the DDM, the DCF can be transformed and simplified in order to take into account

growth dynamics in a very simplified manner. For example, a DCF version of the Gordon Growth Model (GMM) would look like :

$$EV_t = \frac{FCF_{t+1}}{WACC - g} \tag{31}$$

Using the clean surplus accounting rule and replacing $\rho ROIC_{t+1}$ (where ρ is the proportion of NOPAT converted into Free Cash Flows) by $ROIC_{t+1} - g$ where g is the perpetual growth rate in Free Cash Flows, we get :

$$\frac{EV_t}{IC_t} = \frac{ROIC_{t+1} - g}{WACC - g} \tag{32}$$