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Abstract

Ratio analysis is generally presented as something that has to be calculated after completing other financial statements and is generally viewed, particularly by students, as busy-work with little value. This paper changes the context of ratio analysis in order to demonstrate how a focus on the information provided by ratios adds to the value of the firm. By dissecting the valuation of a publicly traded firm using a price to earnings ratio multiplier, value generating factors in the form of ratios, can be inferred for smaller non-publicly traded ventures.

I. Introduction

Ratio analysis is generally not one of the most popular topics covered inside and outside of the classroom. Many believe generating fractions after completing all of the financial statements is unnecessary work that provides redundant information in a less than obvious format. The criticism of ratio analysis in this fashion is somewhat overly harsh, but admittedly, textbook presentations and many of the lectures drawn from textbook presentations very easily lead to this mindset. In a college setting, an internship is relied upon to make ratio analysis important. Outside the college setting, the desire for a bank loan or other funding is the instrument for making ratios pertinent. Each of these settings may force the use of ratios, but still may not develop the true importance of ratios in evaluating the potential value of a firm. The goal of this paper is to provide a firm value context for ratio analysis that makes ratio analysis more accessible and more valuable to the user.

To accomplish this goal, a simple valuation metric is used based on a publicly traded firm's market capitalization (i.e. stock price × number of shares outstanding). By extracting ratios from an expansion of the firm's market capitalization, the ratios are now seen as part of the firm's value. Empirical research, such as, Ibarra and Manila (2009) use ratio analysis to determine a firm's financial standing. However, this presentation is more algebraic as ratios are extracted from a firm's market capitalization, but the idea is in the same "spirit" as the empirical work using ratio analysis.

For a privately held firm, the same inference of a ratio being a value-driver within a publicly traded firm often applies to the non-publicly traded firm as well. In a sense, by dissecting what creates value in a publicly traded firm, many of the value-drivers for a private firm also emerge.

II. Extracting ratios from a firm's market capitalization

As stated earlier, the market capitalization of a firm is the stock price multiplied by the number of shares outstanding. This metric is not the only way to measure a firm's value, but is an easy valuation to understand and even though it may not be a perfect measure, market capitalization is most likely highly correlated with better measures of firm value. By adjusting market capitalization (MCAP), the price-to-earnings ratio (P/E) emerges as a multiplier for earnings after taxes (EAT) to compute the market capitalization.

$$P/E = \text{stock price} \div \text{earnings per share} \quad (1)$$

$$\text{Earnings per share (EPS)} = EAT \div \text{number of shares} \quad (2)$$

$$EAT \times (P/E) = (EAT \times \text{stock price}) \div (EAT \div \text{number of shares})$$
$$= \text{stock price} \times \text{number of shares} = MCAP \quad (3)$$

The P/E emerges as the first ratio extracted from the market capitalization of the firm. Graham and Dodd (2009, revised sixth edition of the original 1934 text) used P/E as a means of firm analysis back in the 1930s. Current investment texts, such as, Bodie, Kane, and Marcus (2010), still view P/E as a valuable measure and a number of pedagogical articles in which firms are analyzed rely on the P/E ratio (Agrrawal, Borgman, Clark, and Strong (2010), Evans (2008), Hess (2006), and Mukherji (2003)).

Despite being a valuable measure, P/E is definitely only available for publicly traded firms and is of little use for private firms, however, there are more ratios imbedded in equation (3) that are more useful for analyzing a non-public firm.

Expand EAT in Equation (3) to make EBIT (earnings before interest and taxes) visible.

$$MCAP = EAT \times (P/E)$$

$$MCAP = (EBIT - Interest) \times (1 - Tax\ rate) \times (P/E)$$

$$MCAP = EBIT \times (1 - [Interest \div EBIT]) \times (1 - Tax\ rate) \times (P/E) \quad (4)$$

Notice, MCAP can be viewed as EBIT multiplied by a factor. This factor is called the EBIT Multiplier.

$$EBIT\ Multiplier = (1 - [Interest \div EBIT]) \times (1 - Tax\ rate) \times (P/E) \quad (5)$$

Within the EBIT Multiplier, the bracketed term [Interest ÷ EBIT] is the inverse of a very common debt coverage ratio named the Times Interest Earned ratio (TIE). TIE is used frequently by banks to assess loans with higher TIE viewed as being better. Notice, a higher TIE leads to a higher EBIT Multiple making a more valuable MCAP.

$$EBIT\ Multiplier = (1 - [1 \div TIE]) \times (1 - Tax\ rate) \times (P/E) \quad (6)$$

In a similar fashion, Equation (3) can have EAT expanded to make EBITDA (earnings before interest, taxes, and depreciation/amortization) visible.

$$MCAP = EAT \times (P/E)$$

$$MCAP = (EBITDA - Depreciation/Amortization - Interest) \times (1 - Tax\ rate) \times (P/E)$$

$$MCAP = EBITDA \times \{1 - [Depreciation/Amortization \div EBITDA] - [Interest \div EBITDA]\} \times (1 - Tax\ rate) \times (P/E) \quad (7)$$

Similar to the EBIT Multiplier, an EBITDA Multiplier emerges for the MCAP.

$$EBITDA\ Multiplier = \{1 - [Depreciation/Amortization \div EBITDA] - [Interest \div EBITDA]\} \times (1 - Tax\ rate) \times (P/E) \quad (8)$$

The bracketed term, [Interest ÷ EBITDA], is the inverse of another very common debt coverage ratio called the Cash Coverage ratio (CCR). Similar to TIE, the CCR is used often by banks to assess a loan offering with higher values of CCR preferred. Again, similar to TIE, a higher EBITDA Multiplier and MCAP are achieved with higher values for the CCR.

$$EBITDA\ Multiplier = \{1 - [Depreciation/Amortization \div EBITDA] - [1 \div CCR]\} \times (1 - Tax\ rate) \times (P/E) \quad (9)$$

Thus far, three ratios have emerged from the MCAP: P/E, TIE, and CCR. As mentioned previously, the TIE and CCR are frequently used ratios by banks in determining a firm's ability to repay a loan. In the MCAP context, these ratios are viewed as a means to increase the value of the firm and can also be considered value-drivers for private firms as well. The P/E is also important in the MCAP context, but the metric is not pertinent in the context of a non-publicly traded firm.

Before concluding this section, one should not overlook the value of tax treatment. Within the EBIT Multiplier and the EBITDA Multiplier, the ability to pay less tax by whatever means is reflected in the (1 – Tax rate) portion of the calculations with less tax creating more value.

III. Extracting "margins" from a firm's market capitalization

Profit margins or "margins" are definite value-drivers for any firm, private or public. These ratios are income statement based and are intuitively logical, but are generally not directly connected to value. By extracting a Sales Multiplier from Equation (3), the interplay between profit margin and MCAP becomes apparent. Net profit margin (NPM) is very easy to extract from MCAP, however, operational profit margins tend to be more informative: gross profit margin (GPM), EBITDA margin (EBITDAM) and EBIT margin (EBITM).

GPM = (Sales – Cost of goods sold) ÷ Sales (10)

EBITDAM = EBITDA ÷ Sales (11)

EBITM = EBIT ÷ Sales (12)

NPM = EAT ÷Sales (13)

First, Equation (3) has to have EAT expanded to make Sales visible.

MCAP = EAT × (P/E)

MCAP = (Sales – Cost of goods sold – Salary, General, Administrative Expenses – Depreciation/Amortization – Interest) × (1 – Tax rate) × (P/E)

MCAP = Sales × {1 – [Cost of goods sold ÷ Sales] – [Salary, General, Administrative Expenses ÷ Sales] – [Depreciation/Amortization ÷ Sales] – [Interest ÷ Sales]} × (1 – Tax rate) × (P/E) (14)

A Sales Multiplier can be defined and then reconfigured to illustrate where the three operating margins and net profit margin are located within the calculation.

Sales Multiplier = {1 – [Cost of goods sold ÷ Sales] – [Salary, General, Administrative Expenses ÷ Sales] – [Depreciation/Amortization ÷ Sales] – [Interest ÷ Sales]} × (1 – Tax rate) × (P/E) (15)

Sales Multiplier = {GPM – [Salary, General, Administrative Expenses ÷ Sales] – [Depreciation/Amortization ÷ Sales] – [Interest ÷ Sales]} × (1 – Tax rate) × (P/E) (16)

Sales Multiplier = {EBITDAM – [Depreciation/Amortization ÷ Sales] – [Interest ÷ Sales]} × (1 – Tax rate) × (P/E) (17)

Sales Multiplier = {EBITM – [Interest ÷ Sales]} × (1 – Tax rate) × (P/E) (18)

Sales Multiplier = NPM × (P/E) (19)

The benefit of being able to view profit margin within MCAP is not to determine how much profit margin is enough, but to understand how each portion of profit margin is important to the overall value of the firm. The importance of seeing profit margin within the context of firm value is that the metric ceases to be a 'stand-alone" calculation and appears to be a value-driver. Further, these margin calculations are not unique to publicly traded firms and are equally applicable to private firms.

IV. In the classroom

Students are expected to understand the basic structure of financial statements. Being able to make accounting entries is not necessary. The ratios used in this presentation are consistent with the text by Ross, Westerfield, and Jordan (2009) and are reasonably universal, but one should check against the given text being use in the classroom.

My approach is to define market capitalization and then as in Equation (3), demonstrate how P/E multiplied by EAT is equivalent to the market capitalization. If I intend to have a banker speak to the class at some point during the semester, I will perform the derivations with TIE and CCR from Section II followed by Section III. If I do not have a banker presenting to the class, I have on occasion, skipped Section II and concentrated on extracting all of the different profit margins from the Sales Multiplier in Section III.

Numerical examples are useful, but I have found that deriving the equations without numbers works better when followed by a homework assignment to get the students working with numbers. Otherwise, the students' tendency is to simply mimic my calculations which is fine for testing, but of no intuitive value.

Further, students will often ask how these derivations are applicable to a private firm. Certainly, P/E does not apply, but all the other ratios are applicable because if these ratios are value-drivers within a publicly traded firm, these ratios are also value-drivers within a private firm. Class presentations by private equity investors will help to demonstrate this to be true.

V. Conclusions

By deriving ratios from the market capitalization of the firm, the student or non-student can be made to see how certain ratios are value-drivers within the firm. Although the derivations demonstrate a particular mathematical relationship, the exact form of the relationship is not as important as being able to see that ratios do not "exist in a vacuum". The ultimate benefit of this presentation is the context it provides for understanding the information provided by a ratio and how the given ratio is part of the value of the firm.

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