The US Stock Market against the Background of the "Price-to-Sales" and the "Enterprise Value-to-Sales" Ratios

Dimiter Nenkov *

Introduction

Market ratios, also called ratios of market performance, are one important group out of the several groups of ratios for financial analysis of public companies[1]. The feature which distinguishes this group of ratios is that the numerator of each of them is the market price per share (P_0), or, alternatively the enterprise value of the company (EV). This is why they are called market ratios. This specific feature of market ratios provides the opportunity to use them in *several aspects*:

- for the analysis of the performance of companies, whose shares are publicly traded;
- for the analysis of the market as a whole and of different sectors, including for comparing among different markets and sectors;
- in the relative valuation of other companies, which is also popular as multiples valuation, etc.

Another specific feature of market ratios makes them especially useful in the above three aspects. This is the fact that they are a kind of "standardized prices" of stocks, which make different companies, sectors and markets comparable with each other.[2]

According to A. Damodaran, there are a few reasons for the popularity of relative valuation methods: that they are quick, easy to implement, easy to explain, they normally yield results, which are close to current market prices. The truth, however, is that the above advantages also contain the prerequisites for the disadvantages of relative valuation methods. Quite often, applying relative valuation, analysts and appraisers arrive at totally wrong price, because of ignoring key variables. The stocks are normally overpriced when the market overprices the comparable companies and vice versa. The lack of transparency with regard to key variables makes relative valuation very sensitive to manipulation.[3]

These are a part of the reasons why relative valuation methods are very convenient and very much wanted during bull markets. In such conditions most stock market players, such as investment bankers, consultants, and others, are interested in valuation results, which are close to market prices, thus justifying the respective transactions. Commissions are earned only if deals are finalized. Given the expectations for continuously rising stock prices, most players seem satisfied with such results (until the moment when the bubble bursts out). This copes perfectly with multiples valuation, which yield overpriced stocks in the conditions of an overpriced market. The relatively neutral DCF valuation models are often neglected in such situations. In this way the stock bubble is kind of "legalized" in the eyes of the public.[4] In this connection some valuation experts say that the most important question when reviewing a valuation is not which methods are used, but who paid for the valuation.[5]

Many analysts contend that the multiples valuation methods are easy to implement, but according to Koller, Goedhart and Wessels, in reality it is just the opposite.[6] A well elaborated multiples analysis requires a lot of the same efforts and adjustments as with the traditional DCF analysis. The disadvantages of the market ratios, which were discussed in terms of relative valuation,

* Dimiter Nenkov Nenkov,
Associate Professor, Dr.,
Department of Finance,
University of National and World Economy, Sofia

[1] Brigham, Eugene F., Louis Gapenski – "Financial Management – Theory and Practice", The Dryden Press, 1994

[2] Damodaran, A. – "Investment Valuation – Tools and Techniques for Determining the Value of Any Asset", John Wiley & Sons, New York, 2002, p. 453

[3] Damodaran, A. – "Investment Valuation – Tools and Techniques for Determining the Value of Any Asset", John Wiley & Sons, New York, 2002, p. 454

[4] Ненков, Д. – "Финансовият мениджмънт и уроците от финансовата криза", доклад, Международна научна конференция "Световната финансова криза и поуките за финансовия сектор на България", Равда, 24-26 септември 2010 г., стр. 19-26

[5] Damodaran, A. – „September 12 to October 16 – Five Weeks from Hell and the Lessons We Have Learned", http://pages.stern.nyu.edu/~adamodar/

[6] Koller, T., Goedhart, M., Wessels, D. – "Valuation – Measuring and Managing the Value of Companies", (McKinsey & Company), published by John Weley & Sons, New York, 2015, p. 371

need to be accounted for when used in the other two directions as well – for company analysis and for the analysis of the sectors and of the stock market as a whole.

"Price-to-Sales" (P/S) and "Enterprise Value-to-Sales" (EV/S) Ratios

James O'Shaughnessy qualifies the ***price-to-sales (P/S) ratio*** as the best of all market ratios.[7] Ken Fisher calls it "almost perfect measure of popularity".[8] The P/S is a measure of the value of company's equity, relative to its sales. As there are many investors who like high P/S ratios, there are also investors, who buy at low P/S ratios, since they believe they have a bargain.

The price-earnings (P/E) and the price-to-book (P/BV) ratios continue to be very popular as they used to be in the past, but during the latest two or three decades the analysts extended the circle of ratios used, including the P/S ratios. It is very attractive to investors and analysts for several reasons: *In the first place*, while P/E ratios are often negative, the P/S ratio is available even for the worst-performing companies, as well as for the start-up companies. There is virtually no bias of average P/S, resulting from the exclusion of loss making companies. *In the second place*, P/S is quite independent of the alternative accounting practices, unlike P/E and P/BV.[10] *In the third place*, P/S ratios are normally more sustainable in time than P/Es.[11] The latter are very volatile because of the effects of the operating and financial leverage, and the resulting serious volatility of earnings per share by year.[12]

The main disadvantage of the P/S and EV/S ratios is that they may lead to determining high value of a company with growing revenues, even if this company works at loss. In order to have high intrinsic value, the company should generate high profits and cash flows. In this connection, it is extremely important to ensure that the comparable companies have similar profitability ratios and cash flows with the valued company.

The P/S is the ratio between the market price per share and the sales per share:

$$\frac{P}{S} = \frac{Price\ per\ share}{Sales\ per\ share}$$

Alternatively, the P/S can also be presented as the ratio between market value of equity (market capitalization) and sales:

$$\frac{P}{S} = \frac{Market\ value\ of\ equity\ (market\ capitalization)}{Sales}$$

Another drawback of the P/S is that it is incorrectly defined – there is no compliance between numerator and denominator. The denominator is an enterprise indicator, which depends only on company's operations and is not influenced by financial leverage. The numerator is an equity indicator, which is a function of both of operations and capital structure. This way, when comparing companies with different capital structure, the P/S can lead to the wrong conclusions.

In order to overcome this drawback of P/S, an alternative sales-based market ratio is recommended – the ***enterprise value-to sales ratio (EV/S)***. It is the ratio between enterprise value and sales:

$$EV/S = \frac{Enterprice\ value}{Sales}$$

According to Aswath Damodaran (Damodaran, A. 2002), the enterprise value (EV) is equal to:[13]

EV = Market value of equity + Market value of debt - Cash

This should correspond to the market value of the operating assets of the company. By definition, it does not include financial and other non-operating assets. The above formula reflects the earlier definition provided by Damodaran.[14] In more recent

[7] O'Shaughnessy, J. P. – "What Works on Wall Street", McGraw-Hill, 2005, p. 127
[8] Same source
[9] Same source
[10] Damodaran, A. – "Investment Valuation – Tools and Techniques for Determining the Value of Any Asset", John Wiley & Sons, New York, 2002, p. 543
[11] Reed, J.P. – "Five Fisher Super Stocks", March 2011, https://www.forbes.com/sites/investor/2011/03/07/five-fisher-super-stocks/#33070f3752fb (Accessed 1 Aug, 2017)
[12] Molodovsky, Nickolas – "A Theory of Price-Earnings Ratios", Financial Analysts Journal, January/February 1995 (Reprinted from "The Analyst Journal", November 1953), p. 33
[13] Damodaran, A. – "Investment Valuation – Tools and Techniques for Determining the Value of Any Asset", John Wiley & Sons, New York, 2002, p. 544
[14] Same source

publications[15] the same author gives a little bit different definition, as follows:

EV = Market value of equity + Book value of debt - Cash

This second definition should be accepted as more sustained. The main argument for this is that when calculating equity market value, it is normal to deduct the book value of debt from enterprise value. This is the amount due to creditors. For example, when the company has high default risk, the market value of bonds goes down significantly below their face value. If we deduct this low market value of debt, we arrive at equity value, which is overpriced. The market value of debt is connected with bond holders and potential buyers of debt on the secondary bond markets. This is the value at which bondholders could sell their bonds. But the principle due by a company to its bondholders should equal their book value, regardless of the current market value of bonds. Finally, it makes sense to use book value of debt in the formula for EV.

Another important issue related to the above definition of EV concerns the scope of "cash". In our view this should not be limited to cash in banks, but should also include investments in different *financial and other non-operating assets*. The EV, defined in this way, is indeed the equivalent of the operating value of the company.

The interpretation of EV is not unanimous by different authors. Koller, Goedhart and Wessels[16] have a little bit different understanding about *enterprise value*. They define it in an alternative way, as the function of certain positions in the asset side of the balance sheet, as follows:

Operating value (value of operations)
+ Value of financial assets
+ Value of non consolidated interest in other companies
+ Excess cash
= Enterprise value (EV)

Obviously, these authors have in mind the *value of the company as a whole*, including both *operating and non operating assets*. For this value Damodaran uses the term ***Firm Value***.[17]

[15] http://pages.stern.nyu.edu/~adamodar/
[16] Koller, T., Goedhart, M., Wessels, D. – "Valuation – Measuring and Managing the Value of Companies", (McKinsey & Company), published by John Weley & Sons, New York, 2015, p. 107
[17] http://pages.stern.nyu.edu/~adamodar/

Identifying EV with operating value is more justified in terms of ensuring comparability between the numerator and denominator of the EV/S. The sales (S) in the denominator are the function predominantly of the operating assets of the company. They do not include revenue from financial and other non operating assets. In this connection, it is sustained that the numerator is equal to the value of operating assets only, which corresponds to the definition of enterprise value, given by A. Damodaran. Further in this study we stick to this interpretation of enterprise value (EV).

P/S and EV/S Ratios on the US Capital Market

Table 1 contains summarized data about the P/S and EV/S ratios of companies on the US capital market for the period 2007-2016. This period covers the last year before the crisis - 2007, the years of the financial crisis, and the post-crisis years. The average P/S is 1.46, and the average EV/S is 1.96. In 2008 both ratios go down significantly – almost by half. During the following years the ratios start growing again, reaching higher than the pre-crisis levels at the end of the period, respectively of 1.81 for the P/S and EV/S of 2.89. The net margin also goes down at the beginning of the crisis – from 4.58% to 3.08%, after which it goes up to 8.32% in 2011. Its average value for the period is 6.02%. The average operating margin is 12.52%, about 2 percentage points below the pre-crisis level. 7

Table 1: P/S and EV/S ratios for the US market for the period 2010 – 2016

Year	Number of Companies	P/S	Net Margin	EV/S	Operating Margin
2007	7364	1.79	4.58%	2.11	14.25%
2008	6870	0.94	3.44%	1.28	14.61%
2009	7036	1.12	3.08%	1.53	11.89%
2010	5928	1.51	4.47%	1.88	14.84%
2011	5891	1.28	8.32%	1.67	12.62%
2012	6177	1.29	7.84%	1.64	12.43%
2013	5748	1.56	7.98%	1.37	n.a.
2014	7887	1.65	7.84%	2.60	11.15%
2015	7480	1.62	6.40%	2.65	10.62%
2016	7330	1.81	6.22%	2.89	10.28%
Average	**6771**	**1.46**	**6.02%**	**1.96**	**12.52%**

Source: http://pages.stern.nyu.edu/~adamodar/ (Value Line, Bloomberg и Capital IQ)

Table 2 shows the values of P/S for the S&P 500 index at the end of each year during the period 31 Dec, 2000 - 28 July, 2017. The average P/S of 1.52 is almost the same as the average for the broad sample of 6771 companies in the USA, shown in *Table 1*. Here again, the P/S ratio goes down below 1 only at the end of 2008, and goes significantly above the average in 2016 and 2017.

Table 2: P/S of the S&P 500 index for the period 2000-2017

End of Year	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*
P/S	**1.77**	**1.56**	**1.30**	**1.56**	**1.54**	**1.43**	**1.49**
End of Year	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*
P/S	**1.43**	**0.87**	**1.23**	**1.31**	**1.19**	**1.31**	**1.66**
End of Year	*2014*	*2015*	*2016*	***July 2017***			
P/S	**1.77**	**1.81**	**1.95**	**2.11**			
Arithmetic average	**1.52**						
Median	**1.52**						

Source: http://www.multpl.com/s-p-500-price-to-book/table/by-year (Accessed 30 July, 2017)

It is logical to ask the question what is the purpose of the above review of the P/S and EV/S ratios. This is done with a reason. An important prerequisite for the correct use of market ratios is to find out which values are low or high, and which are normal for the market. The analysts should know the typical levels of market ratios on different stock markets both at present and from historical perspective. This requires that analysts are familiar to what extent the average values themselves might be distorted by individual *extremely high or low ratios* of certain companies in the samples.[18] This can cause significant distortion of the average, when the samples contains a small number of companies, as is the case with the Bulgarian capital market, for example. There are too many such cases in reality.[19]

It is also curious to ask why *net margin* and *operating margin* are included as important data in the table. Both indicators measure the profitability of sales. The *net margin* is the so called ***companion variable*** for the P/S ratio, which pretty much explains the changes in its values.[20] Respectively, the *operating margin* is the ***companion variable*** for the EV/S ratio has the most serious impact on its values. This will be explained further in the course of the study.

Fundamental Model of the P/S Ratio

The correct use of the P/S ratio goes through serious analysis of the average ratios from a sample, before they are applied as multiples for valuation or as indicators for assessment of the performance of companies, sectors and markets. This analysis includes, among other things, comparing current average P/S of a sample with the average P/S in other sectors or markets for the same period, as well as comparing them with historic average P/S. Another perspective of the analysis of the actual market ratios, including P/S, is the comparison with their corresponding ***fundamental ratios***, which are derived directly from *fundamentals*. While ***actual*** *market ratios* indicate the price at which a company's ***stocks are traded***, ***fundamental*** *ratios* indicate the price at which a company's ***stocks should be traded***. Unfortunately, this perspective of the analysis is preformed quite rarely in reality, which is a serious prerequisite for the distortion of many valuations and analyses.

Only after the above aspects of the analysis we could know whether the respective market ratios of the comparable companies (peer companies), or of any sample, are normal, representative, and have economic sense, in order to be used in a specific valuation or analysis.

In order to find out which variables drive the fundamental P/S, we have to get familiar with its theoretical or fundamental model. It is derived as follows:

$$P_0 = \frac{DIV_1}{r-g} = \frac{EPS_1 \times (1-b)}{r-g} = \frac{EPS_0 \times (1-b) \times (1+g)}{r-g} \quad (1)$$

Where:

P_0 = current price per share of stock,

DIV_1 = expected dividend per share for next year (year 1),

EPS_1 = expected earnings per share for next year (year 1),

EPS_0 = earnings per share for the current year,

b = foreseen plowback ratio,

$(1-b)$ = foreseen payout ratio,

r = cost of equity,

g = expected growth rate of dividends per share.

The net margin is equal to the net profit divided by sales (NI/Sales). It can also be presented as the ratio of earnings per share to sales per share (EPS/Sales per share). This makes possible to express EPS as a function of the net margin and sales per share, as follows:

$$EPS_0 = Net\ margin \times S_0$$

Where:

S_0 = current sales per share

Given the above, equation (1) becomes:[21]

$$P_0 = \frac{S_0 \times Net\ margin \times (1-b) \times (1+g)}{r-g} \quad (2)$$

[18] Stickney, Clyde P. – "Financial Reporting and Statement Analysis", The Dryden Press, 1996, p. 614

[19] Nenkov, D., Bathala, C. – "Price-Earnings Ratios on the Bulgarian Capital Market: An Analytical Approach to Comparing Actual Vs. Fundamental P/E Ratios", in "Globalization: Opportunities & Challenges", Wisdom Publications, Delhi, 2008, p. 351

[20] Damodaran, A. – "Investment Valuation – Tools and Techniques for Determining the Value of Any Asset", John Wiley & Sons, New York, 2002, p. 462

[21] Damodaran, A. – "Investment Valuation – Tools and Techniques for Determining the Value of Any Asset", John Wiley & Sons, New York, 2012, p. 546

Dividing both sides by the sales per share (S_0) we come at the fundamental model of the P/S – equation (3):

$$\frac{P}{S} = \frac{Net\ margin \times (1-b) \times (1+g)}{r-g} \quad (3)$$

As seen from the equation, the price-to-sales ratio is a function of:

- the net margin,
- the plowback ratio (or alternatively the payout ratio),
- the cost of equity, and
- the growth rate of EPS - g.

If we express the plowback ratio b as a function of the return on equity (ROE) and the expected growth rate (g), the model becomes as follows – equation (4):

$$\frac{P}{S} = \frac{\text{Net margin} \times (1 - g/ROE) \times (1+g)}{r-g} \quad (4)$$

One of the advantages of this variant of the model is that it can be used to determine the P/S of non public (closed) companies, which do not pay dividends. It also becomes clear from the model that the price-to-sales ratio of a company with a very low or zero growth rate is actually determined by the differential between net margin and cost of capital. If the net margin is higher than the cost of equity, the price per share should be higher than the sales per share. And vice versa, if the net margin is lower than the cost of equity, the price per share should be lower than the sales per share.

The fundamental P/S ratio of a company with temporarily high growth can be derived from the two-stage dividend discount model. Under this model future dividends are grouped in two sub-periods: high growth period and stable (sustainable) growth period. One way to present the two-stage dividend discount model is as follows:[22]

$$P_0 = \frac{EPS_0 \times (1-b_1) \times (1+g_1) \times \left[1 - \frac{(1+g_1)^n}{(1+r_1)^n}\right]}{r_1 - g_1} +$$

$$+ \frac{EPS_0 \times (1-b_2) \times (1+g_1)^n \times (1+g_2)}{(r_2-g_2) \times (1+r_1)^n} \quad (1)$$

[22] Same source

Where:

P_0 = price per share of stock,

EPS_0 = net income (profit) per share for current year,

$(1-b_1)$ = payout dividend during high-growth period,

$(1-b_2)$ = payout dividend during stable-growth period,

g_1 = expected growth rate of EPS during high-growth period,

g_2 = expected growth rate of EPS during stable-growth period,

r_1 = cost of capital during high-growth period,

r_2 = cost of capital during stable-growth period,

n = number of years of high-growth period.

The first collectible at the right side of the equation is the present value of a growing perpetuity, in which the annual cash flows are the dividends for the respective years of the high-growth period. The second collectible presents the present value of the future price P_n, which is the equivalent of the future dividends during the stable-growth period.

The EPS_0 can be expressed as the function of *sales per share* (S_0) and *net margin*, after which both sides of the equation are divided by the sales per share, as a result of which we arrive at the two-stage fundamental model of P/S:

$$\frac{P}{S} = \frac{\text{Net margin} \times (1-b_1) \times (1+g_1) \times \left[1 - \frac{(1+g_1)^n}{(1+r_1)^n}\right]}{r_1 - g_1} +$$

$$+ \frac{\text{Net margin} \times (1-b_2) \times (1+g_1)^n \times (1+g_2)}{(r_2-g_2) \times (1+r_1)^n} \quad (2)$$

Fundamental Model of the EV/S Ratio

Taking into account that the numerator of the EV/S is the operating value of the company, the *DCF enterprise valuation model* is the most appropriate for deriving the fundamental model of this ratio. If the case is about a mature company, with assumed stable growth rate until infinity, its enterprise value can be determined as follows:

$$EV = \frac{NOPLAT_1 \times (1-b)}{WACC - g} =$$

$$= \frac{NOPLAT_0 \times (1+g) \times (1-b)}{WACC - g} \quad (1)$$

Where:
NOPLAT = net operating profit after tax,
b = retention (reinvestment) ratio,
WACC = weighted average cost of capital,
g = expected growth rate of NOPLAT.

Dividing both sides by the sales from current year (S_0), we arrive at:

$$\frac{EV_0}{S_0} = \frac{NOPLAT_0/S_0 \times (1+g) \times (1-b)}{WACC - g} \quad (2)$$

The net operating margin is equal to the ratio between net operating profit after tax (NOPLAT) and sales ($NOPLAT_0/S_0$). After substituting, the above equation transforms into the one-stage fundamental model of EV/S:

$$\frac{EV}{S} = \frac{\text{Net operating margin} \times (1+g) \times (1-b)}{WACC - g} \quad (3)$$

In this case the net operating margin is calculated as the ratio of current NOPLAT to current sales. From equation (3) we see that the enterprise value-to-sales ratio is a growing function of the *net operating margin* and the *growth rate* ***(g)*** and a decreasing function of the reinvestment rate ***(b)*** and the weighted average cost of capital ***(WACC)***. After expressing the reinvestment rate ***(b)*** as a function of the return on invested capital ***(ROIC)*** and the growth rate ***(g)***, the fundamental model acquires the following shape:

$$\frac{EV}{S} = \frac{\text{Net operating margin} \times (1+g) \times (1-g/ROIC)}{WACC - g} \quad (4)$$

It becomes clear from the model that for a company with a growth rate close to or equal to zero, the EV/S should be determined by the differential between net operating margin and WACC. The model also shows that for a given level of the growth rate ***(g)***, the higher the ROIC, the higher is the EV/S.

The two-stage fundamental model of EV/S can be derived from the two-stage DCF enterprise valuation model, where the future is divided into two sub-periods - an explicit forecast period and after it. From the DCF model we know that, other things being equal, the free cash flow to investors (FCFI) for each year is equal to that part of NOPLAT, which is not retained and reinvested, and can be expressed as follows:

$$FCFI = NOPLAT \times (1-b)$$

If we assume that there is one and the same growth rate for the years of the explicit growth period - g_1, and another constant growth rate after the explicit forecast period - g_2, then the model can be presented in the following way:

$$EV = \frac{NOPLAT_0 \times (1-b_1) \times (1+g_1) \times \left[1 - \frac{(1+g_1)^n}{(1+WACC_1)^n}\right]}{WACC_1 - g_1} + \frac{NOPLAT_0 \times (1-b_2) \times (1+g_1)^n \times (1+g_2)}{(WACC_2 - g_2) \times (1+WACC_1)^n} \quad (1)$$

Where:
$NOPLAT_0$ = net operating profit for current year,
b_1 = reinvestment rate for NOPLAT during the explicit forecast period,
b_2 = reinvestment rate for NOPLAT after the explicit forecast period,
g_1 = expected growth rate of NOPLAT during the explicit forecast period,
g_2 = expected growth rate of NOPLAT after the explicit forecast period,
$WACC_1$ = weighted average cost of capital during the explicit forecast period,
$WACC_2$ = weighted average cost of capital after the explicit forecast period,
n = number of years of the explicit forecast period.

The first collectible at the right side of the equation is the sum of the present values of annual free cash flows to the firm (FCFI) during the explicit forecast period. The second collectible is the present value of the continuing or terminal value (CV, TV). CV is the equivalent of future FCFI after the end of the explicit forecast period.

After expressing $NOPLAT_0$ as a function of *sales and the net operating margin* and dividing both sides of the equation by (S_0), we arrive at the two-stage fundamental model of the EV/S:

$$\frac{EV}{S} = \frac{\text{Net operating margin} \times (1-b_1) \times (1+g_1) \times \left[1 - \frac{(1+g_1)^n}{(1+WACC_1)^n}\right]}{WACC_1 - g_1} + \frac{\text{Net operating margin} \times (1-b_2) \times (1+g_1)^n \times (1+g_2)}{(WACC_2 - g_2) \times (1+WACC_1)^n} \quad (2)$$

The sales-based market ratios, even though a function of several variables, are mostly influenced by the profit margins – the net margin for P/S and the net operating margin for EV/S. Different sectors and

businesses have different profit margins, which suggests different P/S and EV/S for these businesses. Companies in businesses with high margin should have high sales-based ratios and vice versa. A low profit margin directly leads to lower P/S and EV/S, but it has also indirect effect in the same direction, because it reduces the growth rate ***(g)***.

However, this does not necessarily mean that all companies with low net margin or net operating margin would be with poor financial results and not creating value. Many companies rely on high turnover, which very often is at the expense of low operating margin. They bet on being the leaders in the market by volume of sales. Others bet on high margin, trying to be the price leaders. Not always the latter are better off than the first. This depends on the effect which the selected strategy has over the value creation process. Value creation itself depends on the spread between the return on invested capital (ROIC) and the cost of capital (WACC), at the enterprise level, and respectively on the spread between the return on equity (ROE) and the cost of equity (r), at the equity level. This is the moment to note that each of the two sales-based market ratios is influenced also by another variable, which does not show up in the above fundamental models of P/S and EV/S. In this connection it is useful to express ROIC and ROE in the following way:

$$ROIC = \frac{NOPLAT}{Invested\ Capital} = \frac{NOPLAT}{Sales} \times \frac{Sales}{Invested\ Capital} =$$

$$= Net\ Operating\ Margin \times Capital\ Turnover$$

$$ROE = \frac{NI}{Equity} = \frac{NI}{Sales} \times \frac{Sales}{Equity} =$$

$$= Net\ Margin \times Equity\ Turnover$$

The two equations indicate that the variable in question at the enterprise level is ***capital turnover*** ratio and at the equity level it is ***equity turnover*** ratio. Normally businesses with low margin have higher turnover of both invested capital and equity. This compensates the low profit margin, leading to ROIC and ROE which are high enough. This explains how companies with low profit margins can also create economic value added.

The fact that the net margin is the leading (companion) variable, which has significant impact on the values of the P/S ratio is confirmed by different studies. For example, one very simplified regression of P/S against net margin for companies in sector "production of machines and equipment" on the Bulgarian Stock Exchange in 2006 establishes strong positive correlation and a relatively high determination ratio (R^2) of 0.68. The same strong positive correlation is established between EV/S and the operating margin, with coefficient of determination (R^2) of 0.78[23]. In other words, in this case both margins explain the changes in the two market ratios to a very high extent.

Damodaran makes annual regressions for each of the main market ratios against a group of independent variables. They also confirm the high weight of the profit margins in explaining the changes of P/S and EV/S.[24]

Fundamental P/S and EV/S for the US Capital Market for 2017

Fundamental P/S ratio for the US stock market

For the calculation of the average fundamental P/S for the US stock market we can use average values of the key variables which determine it. We can start with the one-stage model, as a more simple one. Besides the average *net margin* for the USA of 6.02% for the period 2007-2016 (*Table 1*), some other input variables for the USA are also needed, such as: *cost of equity (r), return on equity (ROE) and retention rate (b)*. The last two variables are necessary for determining forecasted growth rate (*g*).

It turns out that the selection of the appropriate values for each of the above variables itself is a challenge. This refers most of all to the cost of equity, since there is no consensus about its true value. There are quite a few different methods for determining it. For example, when calculating cost of equity as the sum of risk free rate and risk premium, it can be calculated at least in three variants: *historic arithmetic average, historic geometric average, and implied (current) cost of equity*. According to data in the website of A. Damodaran, these values in the middle of 2017 for the US market are as follows:[25]

[23] Nenkov. D. – "Opredelyane na stoynostta na kompaniite", Sofia, 2015, p. 286

[24] Source: http://pages.stern.nyu.edu/~adamodar/

[25] Source: http://pages.stern.nyu.edu/~adamodar/ (Value Line, Bloomberg и Capital IQ) [Accessed 14 April, 2017]

- historic arithmetic average (r)= 11.42%,
- historic geometric average (r)= 9.53%,
- current (implied) (r)= 8.59%.

The cost of equity is not the subject of discussion in this study. In this case we select as the most representative the historic geometric average cost of equity *(r)* for the USA of 9.53%. It is also close to the average among the above three variants of the cost of equity.

The situation is not very different with selecting the proper return of equity (ROE). The issue is about what is the ROE, which is the most representative to be used as the basis for forecasting future ROE – whether this should be the current ROE from the most recent year or the average for the latest several years. Each option provides values, that in most cases are quite different from each other. These differences have serious impact on the estimated fundamental P/S ratios. The current ROE for 2016 is 10.24% (without financial companies), while the average ROE for the period 2008-2016 is 12.10%.[26] What is more, usually data in different databases are different, which additionally makes it difficult to decide on which specific value to choose for the respective input variable. In this case we use the average ROE for the period (2008-2016) of 12.10%. We also use the average plowback (retention) ratio for 2016 for companies in the USA ***b*** = 0.3351 (without financial companies).[27]

Finally, the input variables for applying the one-stage model are:

Net margin = 6.02%
Plowback (retention) ratio ***b*** = 0.3351
Cost of equity ***r*** (RRR_E) = 9.53%
Growth rate ***g*** = 4.05% ($ROE \times b = 12.10\% \times 0.3351 = 4.05\%$)

Table 3 shows the calculated by the model average fundamental P/S ratio. It is equal to **0.76** and is almost half the actual arithmetic average P/S for the US market of 1.46, as shown in *Table 1*. The low value of the fundamental (theoretical) P/S should be explained with the relatively low net margin of 6.02%. Given the much lower fundamental P/S, a conclusion can be made that the level of the actual average P/S is not justified.

Table 3: Average fundamental P/S for the US market for 2017 (one-stage model)

Pace of change of net margin (in %):						*10%*					
Pace of change of "r" (in %):						*10%*					
Values of *"r"*	Values of **Net Margin**										
	3.0%	3.6%	4.2%	4.8%	5.4%	6.0%	6.6%	7.2%	7.8%	8.4%	9.0%
	P/S	*P/S*	*P/S*	*P/S*	*P/S*	*P/S*	*P/S*	*P/S*	*P/S*	*P/S*	*P/S*
4.8%	2.93	3.52	4.10	4.69	5.28	5.86	6.45	7.04	7.62	8.21	8.80
5.7%	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.26	3.51	3.76
6.7%	0.80	0.96	1.11	1.27	1.43	1.59	1.75	1.91	2.07	2.23	2.39
7.6%	0.58	0.70	0.82	0.93	1.05	1.17	1.28	1.40	1.52	1.63	1.75
8.6%	0.46	0.55	0.64	0.74	0.83	0.92	1.01	1.11	1.20	1.29	1.38
9.5%	0.38	0.46	0.53	0.61	0.68	0.76	0.84	0.91	0.99	1.06	1.14
10.5%	0.32	0.39	0.45	0.52	0.58	0.65	0.71	0.78	0.84	0.91	0.97
11.4%	0.28	0.34	0.39	0.45	0.51	0.56	0.62	0.68	0.73	0.79	0.85
12.4%	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75
13.3%	0.22	0.27	0.31	0.36	0.40	0.45	0.49	0.54	0.58	0.63	0.67
14.3%	0.20	0.24	0.28	0.33	0.37	0.41	0.45	0.49	0.53	0.57	0.61

Source: Calculations of the author

[26] Same source
[27] Same source

The values in the table also illustrate the high sensitivity of the fundamental P/S to the combination between ***net margin*** and ***r***. They vary within broad range from 0.20 at the bottom left corner of the table to 8.80 at the upper right corner of the table (under a combination of 4.8% cost of equity and a net margin of 9.0%). This is mainly due to the application of the one-stage model. The extreme values received under this model usually do not have economic sense and should not be taken seriously.

The one-stage models for determining the fundamental ratios reproduce the drawbacks of the capitalization models, from which they were derived, such as the Gordon dividend model and its analogues. Because of this, one-stage models easily yield illogical and misleading results for the fundamental ratios. This is why, it is recommended in most cases to apply the two-stage fundamental models.

From the models above it became clear that the two-stage model divides the future into two sub-periods: high growth period and stable growth period. More conservative values for the growth rate g_2 should normally be used for the stable growth period. The retention ratio b_2 should be with some moderate value, such as 0.50. Other things being equal, the average ROE in the long run would most likely be equal to the average cost of equity ***r***. This is why, in this case we assume that ROE during the stable growth period will be equal to the cost of capital of 9.53%.

Because of the lack of another available benchmark for the average net margin for USA in the long run, we use the same average net margin of 6.02% for the period 2007-2016 (from *Table 1*). We simply assume that it is quite representative and will remain the same during the stable growth period.

Thus, the input variables for the two-stage model are as follows:

Net margin for the first sub-period (first 5 years) = 6.02%

Retention ratio for the first sub-period b_1 = 0.3351

Cost of equity for the first sub-period r_1 = 9.53%

Growth rate for the first sub-period g_1 = 4.05%

($ROE \times b = 12.10\% \times 0.3351 = 4.05\%$)

Continuance of the first sub-period *n* = 5 years

Net margin for the stable growth period = 6.02% (remains the same)

Retention ratio during the stable growth period $b_2 = 0.5$

Cost of equity during the stable growth period r_2 = 9.53%

Growth rate during the stable growth period g_2 = 4.77%

($ROE \times b = 9.53\% \times 0.5 = 4.77\%$)

The specifics in this case is that it is not correct to talk about a high growth period at the beginning. The input assumptions and variables are such, that forecasted growth rate during the first sub-period is actually somewhat lower than growth rate during the stable growth period.

Table 4: Average fundamental P/S for the US market for 2017 (two-stage model)

	Pace of change of net margin (in %):					*10%*					
	Pace of change of "r" (in %):					*10%*					
Values of *"r"*	Values of **Net Margin**										
	3.0%	3.6%	4.2%	4.8%	5.4%	6.0%	6.6%	7.2%	7.8%	8.4%	9.0%
	P/S	***P/S***	***P/S***	***P/S***	***P/S***	***P/S***	***P/S***	***P/S***	***P/S***	***P/S***	***P/S***
4.8%	0.74	0.76	0.78	0.80	0.82	0.84	0.86	0.88	0.90	0.92	0.94
5.7%	0.71	0.73	0.75	0.77	0.78	0.80	0.82	0.84	0.86	0.88	0.90
6.7%	0.68	0.70	0.72	0.73	0.75	0.77	0.79	0.81	0.83	0.85	0.87
7.6%	0.65	0.67	0.69	0.71	0.72	0.74	0.76	0.78	0.80	0.81	0.83
8.6%	0.62	0.64	0.66	0.68	0.70	0.71	0.73	0.75	0.77	0.78	0.80
9.5%	0.60	0.62	0.63	0.65	0.67	0.69	0.70	0.72	0.74	0.75	0.77
10.5%	0.58	0.59	0.61	0.63	0.64	0.66	0.68	0.69	0.71	0.73	0.74
11.4%	0.55	0.57	0.59	0.60	0.62	0.63	0.65	0.67	0.68	0.70	0.72
12.4%	0.53	0.55	0.56	0.58	0.60	0.61	0.63	0.64	0.66	0.68	0.69
13.3%	0.51	0.53	0.54	0.56	0.57	0.59	0.60	0.62	0.64	0.65	0.67
14.3%	0.49	0.51	0.52	0.54	0.55	0.57	0.58	0.60	0.61	0.63	0.64

Source: Calculations of the author

The calculated average P/S ratios is only **0.69** (*Table 4*) and is not sufficiently different from the fundamental P/S calculated through the one-stage model. As a rule, the results received under the two-stage model are much more precise. For most businesses it is normal to forecast return on equity (ROE) for the stable growth period, which is oriented around the level of the cost of equity. This is the most likely scenario in the long run. This combination suggests moderate levels of the fundamental P/S. Under the two-stage model, given a duration of the first period of 5 years, the weight of the cash flows from the stable growth period (the so called "continuing value") is decisive for the present value of stocks. In the applied here two-stage model the net margin and the cost of equity (***r***) change only during the first sub-period, and remain constant during the stable growth period. This is why the values in *Table 4* are not very sensitive to the different combinations between net margin and cost of equity. They vary within a narrow range between 0.49 and 0.94.

This fundamental average P/S of 0.69 is even lower than the one calculated under the one-stage model (0.76). It is about two times lower than the average actual P/S of the US market of 1.46. If we assume that this actual average P/S is representative, as well as if the input variables for the calculation of the fundamental P/S are representative, we can make the conclusion that stock prices on the US capital market are almost twice overpriced.

Fundamental EV/S ratio for the US stock market

The input variables for the fundamental EV/S are indicators at the enterprise level (or invested capital level), including: *net operating margin, weighted average cost of capital (WACC), return on invested capital (ROIC), growth rate of net operating profit (g)*. We use WACC for the period 2008-2016 of 6.95%. In order to determine the expected growth rate we use the average value of return on capital (ROC) for the same period 10.17%, and the average reinvestment (retention) rate of operating profit *(b)* for the same period of 0.7057.

Thus, the input variables for the one-stage model for calculating the fundamental EV/S are as follows:

Net operating margin = 12.52%
Reinvestment rate ***b*** = 0.7057
Weighted average cost of capital ***WACC*** = 6.92%
Growth rate ***g*** = 7.18% (*ROC* × *b* = 10.17% × 0.7057 = 7.18%)

Table 5: Average fundamental EV/S for the US market for 2017 (one-stage model)

	Pace of change of net operating margin (in %):										
	Pace of change of "WACC" (in %):								*10%*	*10%*	
Values Of *WACC*	Values of **Net Operating Margin**										
	6.3%	7.5%	8.8%	10.0%	11.3%	12.5%	13.8%	15.0%	16.3%	17.5%	18.8%
	EV/S	***EV/S***	***EV/S***	***EV/S***	***EV/S***	***EV/S***	***EV/S***	***EV/S***	***EV/S***	***EV/S***	***EV/S***
3.5%	-0.53	-0.64	-0.74	-0.85	-0.96	-1.06	-1.17	-1.27	-1.38	-1.49	-1.59
4.2%	-0.65	-0.78	-0.91	-1.04	-1.17	-1.31	-1.44	-1.57	-1.70	-1.83	-1.96
4.8%	-0.85	-1.02	-1.18	-1.35	-1.52	-1.69	-1.86	-2.03	-2.20	-2.37	-2.54
5.5%	-1.20	-1.44	-1.68	-1.93	-2.17	-2.41	-2.65	-2.89	-3.13	-3.37	-3.61
6.2%	-2.08	-2.50	-2.91	-3.33	-3.75	-4.16	-4.58	-4.99	-5.41	-5.83	-6.24
6.9%	-7.68	-9.22	-10.76	-12.29	-13.83	-15.37	-16.90	-18.44	-19.98	-21.52	-23.05
7.6%	4.54	5.45	6.35	7.26	8.17	9.08	9.99	10.89	11.80	12.71	13.62
8.3%	1.75	2.10	2.45	2.80	3.15	3.50	3.85	4.20	4.56	4.91	5.26
9.0%	1.09	1.30	1.52	1.74	1.95	2.17	2.39	2.61	2.82	3.04	3.26
9.7%	0.79	0.94	1.10	1.26	1.42	1.57	1.73	1.89	2.04	2.20	2.36
10.4%	0.62	0.74	0.86	0.99	1.11	1.23	1.36	1.48	1.60	1.73	1.85

Source: Calculations of the author

The results of the application of the one-stage model are in *Table 5*. The calculated EV/S of **-15.37** has no economic sense and cannot be used. This is due to the main disadvantage of the one-stage model – the extreme sensitivity of results towards the combination between ***WACC*** and ***g***. In this specific case the reason for the negative calculated ratio is the combination of a relatively low cost of capital (WACC) on one hand, and a relatively high return on capital (ROC), accompanied by a high retention rate on the other hand. This leads to negative difference in the denominator of the model, because of the growth rate $g = 7.18\%$, which is higher than the cost of capital $WACC = 6.92\%$. In such cases the model cannot be used.

It is useless to compare this fundamental EV/S of -15.37 with the actual EV/S. The rest of the values in *Table 5* show high sensitivity towards the combination between net operating margin and WACC. This is due to the one-stage model again.

The input variables for the two-stage model are determined, following the same logic as for the two-stage fundamental P/S model. We assume that the net operating margin during the stable growth period will remain the same as for the explicit forecast period. For determining the expected growth rate g_2 we assume that the return on capital (ROC) in the long term will be about the same as the weighted average cost of capital (WACC), and the reinvestment rate of the net operating profit (NOPLAT) is with a moderate value of 0.5.

Thus, the input variable for the model are as follows:

Net operating margin during the explicit forecast period = 12.52%

Retention (reinvestment) rate during the explicit forecast period $b_1 = 0.7057$

Weighted average cost of capital during the explicit forecast period $WACC_1 = 6.92\%$

Growth rate during the explicit forecast period $g_1 = 7.18\%$

($ROC \times b = 10.17\% \times 0.7057 = 7.18\%$)

Continuance of the explicit forecast period n = 5 years

Net operating margin after the explicit forecast period = 12.52% (remains the same)

Retention (reinvestment) rate after the explicit forecast period $b_2 = 0.5$

Weighted average cost of capital after the explicit forecast period $WACC_2 = 6.92\%$

Growth rate after the explicit forecast period $g_2 = 3.46\%$

($ROC \times b = 6.92\% \times 0.5 = 3.46\%$)

Table 6: Average fundamental EV/S for the US market for 2017 (two-stage model)

	Pace of change of net operating margin (in %):								*10%*		
	Pace of change of "WACC" (in %):								*10%*		
Values Of *WACC*	Values of **Net Operating Margin**										
	6.3%	7.5%	8.8%	10.0%	11.3%	12.5%	13.8%	15.0%	16.3%	17.5%	18.8%
	EV/S	*EV/S*	*EV/S*	*EV/S*	*EV/S*	*EV/S*	*EV/S*	*EV/S*	*EV/S*	*EV/S*	*EV/S*
3.5%	2.34	2.36	2.38	2.40	2.42	2.44	2.46	2.48	2.50	2.52	2.54
4.2%	2.26	2.28	2.30	2.32	2.34	2.36	2.38	2.40	2.42	2.44	2.46
4.8%	2.19	2.21	2.23	2.25	2.27	2.29	2.31	2.33	2.35	2.37	2.38
5.5%	2.12	2.14	2.16	2.18	2.20	2.21	2.23	2.25	2.27	2.29	2.31
6.2%	2.05	2.07	2.09	2.11	2.13	2.15	2.17	2.18	2.20	2.22	2.24
6.9%	1.99	2.01	2.02	2.04	2.06	2.08	2.10	2.12	2.14	2.15	2.17
7.6%	1.93	1.94	1.96	1.98	2.00	2.02	2.03	2.05	2.07	2.09	2.11
8.3%	1.87	1.88	1.90	1.92	1.94	1.96	1.97	1.99	2.01	2.03	2.04
9.0%	1.81	1.83	1.84	1.86	1.88	1.90	1.91	1.93	1.95	1.97	1.98
9.7%	1.75	1.77	1.79	1.80	1.82	1.84	1.86	1.87	1.89	1.91	1.93
10.4%	1.70	1.72	1.73	1.75	1.77	1.78	1.80	1.82	1.84	1.85	1.87

Source: Calculations of the author

Table 6 shows that the received average EV/S ratio under the two-stage model is **2.08**. This fundamental EV/S is a little bit higher than average actual EV/S for the US market of 1.96, which is an indicator that according to the results from two-stage model, the market as a whole seems fairly priced. Of course, we again make the provision that the above conclusion is valid only if we accept that the actual average EV/S for the US is representative, as well as if we accept that the input variables for the calculation of the fundamental EV/S are also representative enough for the US. The table shows also that as a result of the change of the net operating margin and the weighted average cost of capital during the explicit forecast period, the fundamental EV/S ratios vary within a narrow range – between 1.70 and 2.54. This is mainly due to the moderate average input variables after the end of the explicit forecast period (or during the stable growth period).

Conclusion

The P/S and EV/S ratios provide excellent opportunity for analysis of stock prices and indexes on the main international capital markets, including the US market. The stock indexes have been very dynamic during the post-crisis period, going down significantly in the first post-crisis years and gradually going up after that. In the latest few years they reached and, in some places, surpassed the pre-crisis levels of 2007. This raises the question whether the current high levels are justified.

Besides through the comparison among different markets, and with historic averages, actual P/S and EV/S can be even better analyzed by comparing with the respective fundamental P/S and EV/S for each capital market. The results for the US stock market are ambiguous. The calculated fundamental P/S for the US market is about twice lower than the actual P/S, both under the one-stage and the two-stage fundamental models. This means that the US stock market seems highly overpriced, judging from the P/S ratio. However, the results are different for the EV/S. Only the two-stage model yields results that make sense. The fundamental EV/S under this two-stage model is about the same, and even a little bit higher than the actual EV/S, which implies that the US stock market is fairly priced, judging from this market ratio. The above conclusions, of course, are valid only if the average actual P/S and EV/S are representative for the US market, and also if the input variables for calculating the fundamental P/S and EV/S for the US are representative.

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