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# Relative Valuation and Stock-Market Bubbles

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## Summary

The subject of this study is the use of relative valuation methods for estimating the value of companies and for analysis of the stock market as a whole. The study uses the findings of earlier studies of the author in the subject area. It can be viewed as a kind of extension and update of these previous studies in certain aspects, which is extended to include the post-crisis period. The focus is put on the specific features of the price-earnings and the price-to-book ratios, including on certain weaknesses, related to using these market ratios for explaining the levels of major stock-price indexes. A review is made of the dynamics of some major stock indexes before and after the global financial crisis, as well as of the corresponding price-earnings and price-to-book ratios on the US capital market. The same is done for the Bulgarian capital market. Fundamental price-earnings and price-to-book value ratios are estimated and compared with the respective real market ratios of both the US and Bulgarian stock indexes. The results of the study show that during the period prior to the financial crisis, the average levels of the actual ratios on both capital markets were much higher than the levels, suggested by fundamentals. During the early years of the post-crisis period this changed significantly and the market ratios became quite close to fundamental ratios. However, the PE and PBV ratios of the last couple of years have again exceeded their historical average levels, as well as the levels of the corresponding fundamental ratios.


**Key words:** company valuation, relative valuation, stock-market bubbles, PE, PBV, fundamentals

**JEL classification:**

## 1. Introduction

One reason for the huge collapse of stock indexes during the global financial crisis were price bubbles of stocks and respectively the unreasonably high levels of stock indexes before the crisis. There were different factors that facilitated the formation of significant bubbles on the equity capital markets worldwide. One of them was the extensive use of relative valuation methods (or multiples valuation). These methods are very popular among market players for several reasons. According to Aswath Damodaran, *in the first place*, the relative valuation approach looks much shorter, since all it needs is one multiple and one comparable company. *In the second place*, relative valuation is simpler and easier to explain than the discounted cash flow models. *In the third place*, price estimates based on multiples are much closer to current market prices than are the ones based on discounted cash flows (Damodaran, 2002).

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The above advantages, however, also contain the prerequisites for the disadvantages of the same methods: *in the first place,* the resulting price estimates can also be very far from reality, because of the ignoring of key variables such as risk or earnings potential; *in the second place*, a company is most likely to be overpriced when the market as a whole is overpriced; *in the third place*, the lack of transparency makes these methods easy to manipulate, given that each valuation is accompanied by a certain level of prejudice or partiality. In practice, an analyst can come up with whatever estimation about the value of any stock (Damodaran, 2002).

Relative valuation methods are especially attractive during bull markets, because they are useful in justifying bubble prices. Under such conditions, they normally overprice stocks, which satisfies the taste of the majority of market players. It turns out that in the conditions of rising markets' relative valuation becomes attractive mainly for its disadvantages rather than its advantages. Discounted cash flow methods are much more independent on market distortions, including price bubbles. And this is actually one reason why these methods are often avoided, or used as models of minor importance.

## 2. Dynamics of Stock Indexes in the USA and in Bulgaria before and after the Financial Crisis

It took less than 5 years following the 2008 crash for the main indexes of the US stock market to recover and break the record high levels of October 2007. The DJIA surpassed the pre-crisis peak of 14,093.08 points of 8 October 2007 on 4 March 2013, when it closed at 14,127.82. A similar movement was demonstrated by the S&P 500, which closed at 1,563.77 on 26 March 2013, thus exceeding the pre-crisis record level of 1,561.80. (Nenkov, 2014)

This trend has continued since then, though with some volatility. On 7 October 2016, the S&P index 500 closed at 2,153.74 (*See Table 1*). This is by **37.90**% higher than the top level of October 2007. The DJIA closed on 7 October 2016 at 18,240.49, which is by **29.43**% higher than the pre-crisis top level of 14,093.94.

The situation is quite similar with the FTSE and with the German DAX, and not sufficiently different from the Eurstoxx 100.

*Dynamics of the Bulgarian SOFIX before and after the crisis*

The situation regarding the recovery of the indexes on the Bulgarian Stock Exchange

*Table 1. Some Key Values of DJIA and S&P500 during the Period 2007-2016*

| Index | Date | Peak Value Before the Crisis | Bottom Value | Value as of 7 October, 2016 |
|---|---|---|---|---|
| **DJIA** | 8.10.2007<br>2.03.2009<br>7.10.2016 | 14 093.08 | 6 626.94 | 18 240.49 |
| **% peak value** | | **100.00%** | **47.02%** | **129.43%** |
| **Difference (%)** | | | **-52.98%** | **+29.43%** |
| | | | | |
| **S&P 500** | 8.10.2007<br>2.03.2009<br>7.10.2016 | 1 561.80 | 683.38 | 2 153.74 |
| **% peak value** | | **100.00%** | **43.76%** | **137.90%** |
| **Difference (%)** | | | **-56.24%** | **+37.90%** |

*Source:* http://finance.yahoo.com/q?s=%5EDJI *(7 Oct, 2016)*
http://finance.yahoo.com/echarts?s=%5Egspc+interactive *(7 Oct, 2016)*

*Table 2. Some Key Values of the Bulgarian SOFIX during the Period 2007-May 2016*

| Index | Date | Peak Value Before the Crisis | Bottom Value | Value as of 7 October, 2016 |
|---|---|---|---|---|
| SOFIX | 15.10.2007<br>24.02.2009<br>7.10.2016 | 1 952.40 | 259.95 | 507.51 |
| % peak value | | 100.00% | 13.31% | 25.99% |
| Difference (%) | | | -86.69% | -74.01% |

*Source:* http://www.infostock.bg/infostock/control/trading/index/quotes/SOFIX *(7 Oct, 2016)*

can be defined as very pessimistic. Three key values of the Bulgarian stock index SOFIX are shown in *Table 2*, similar to the ones, commented above about the US indexes. The three values are respectively: the peak value of SOFIX from before the financial crisis of 1,952.40 on 15 October 2007, the bottom value after the crisis of 259.95 points on 24 February 2009, and its current value of 507.51 as of 7 October, 2016.

It is evident that, unlike the US and European indexes, the SOFIX reached only 25.99% of the pre-crisis peak value. It does not even come close to potential recovery of the pre-crisis top level of 1,952.40. On one hand, this fact just exposes the large scale of the price bubble on the Bulgarian stock market before the crisis. On the other, this is evidence to the lack of interest among investor community in Bulgarian public companies during the post-crisis period. This is particularly true about international investors that this country's economy is desperately in need of. One reason for this lack of interest is that the majority of Bulgarian companies, listed on the Bulgarian Stock Exchange (BSE), failed to create economic value added for their shareholders during this period.

## 3. Reasonability of Stock Indexes against the Background of Price-Earnings and Price-to-Book Ratios

Another advantage of relative valuation methods, in addition to the ones laid down in the introduction, is that they provide the opportunity to value not only a separate company but also the market as a whole. This is not quite applicable to DCF models. The opportunity to analyze the overall market and compare different sectors or companies is provided by the specific market ratios. Each of the market ratios, including the *price-earnings (PE)* and the *price-to-book (PBV)* ratios, is actually a kind of a standardized price of the respective stock. These standardized prices are comparable among different companies, which is not possible for their absolute stock prices.

The reasonability of stock-market indexes can be analyzed using the market ratios, such as the PE, PBV, among other indicators. One way is by comparing some market ratios of the leading indexes for each year with their historical average values. This is the main task of this section. What is more, the actual PE, PBV, or other ratios should be analyzed against fundamentals. This will be accomplished in one of the next sections.

According to Reilly and Brown, the PE and the PBV ratios are among the most widely used ones for the relative valuation of private (non-public) companies (Reilly, Brown, 2003). They vary across companies, sectors and markets. Their levels were high before the financial crisis and went significantly down after that. According to some earlier studies (Nenkov, 2010), the arithmetic average PE derived from a global

database for 156 sectors stood at 32,76 in 2004, and only 18,03 at the end of 2008. The case is the same with the PBV ratio. The PBV arithmetic average for the major markets in 2004 was quite impressive - 2,88 for the USA, 4,23 for Europe (Western Europe), 3,41 for Japan, and 3,37 for the emerging markets. The numbers were similar or even higher, during the following years - 2005, 2006 and 2007. The arithmetic average values at the end of 2008 more than halved for some of the aforementioned markets – 1,89 for the USA, 1,27 for Europe, 1,09 for Japan, and 1,57 for the emerging markets. The highest decrease was for Europe – by 70%, followed by Japan – 68%. The drop was not as significant in the USA – 34%, while on the emerging markets it was 53% (Nenkov, 2010).

*Table 3* presents the S&P 500 PE ratios from the beginning of this century until now. There are two groups of PEs, calculated in two different ways. The first group comprises **trailing PEs**, representing the ratio between the current market price per share, and the earnings per share (EPS) for the last four quarters. The second group encompasses the **PE 10** or **Shiller PE** ratios. They are called so after their author's name – the Nobel Prize winner for economics for 2013 Robert Shiller. They are calculated as ratios between the current price per share and the averaged earnings per share for the preceding 10 years. For the purpose of this calculation the EPS for each of the preceding years is adjusted for inflation, using the consumer price index (CPI). These ratios are calculated as of 1 January each year. They are not influenced by the annual volatility of net profits and the dynamics of their values is predominantly determined by the movements of the stock index.

*Table 3. PE Ratios of the Index S&P500 for the period 2001-2016*

| *Beginning of Year* | *7 October, 2016* | | *2016* | *2015* | *2014* | *2013* |
|---|---|---|---|---|---|---|
| **Trailing PE** | **24.92** | | **22.18** | **20.02** | **18.15** | **17.03** |
| **Shiller PE** | **26.72** | | **24.21** | **26.49** | **24.86** | **21.90** |
| *Beginning of Year* | *2012* | *2011* | *2010* | *2009* | *2008* | *2007* |
| **Trailing PE** | **14.87** | **16.30** | **20.70** | **70.91** | **21.46** | **17.36** |
| **Shiller PE** | **21.21** | **22.98** | **20.53** | **15.17** | **24.02** | **27.20** |
| *Beginning of Year* | *2006* | *2005* | *2004* | *2003* | *2002* | *2001* |
| **Trailing PE** | **18.07** | **19.99** | **22.73** | **31.43** | **46.17** | **27.55** |
| **Shiller PE** | **26.46** | **26.58** | **27.65** | **22.89** | **30.28** | **36.98** |

*Source:* http://www.multpl.com/s-p-500-price-to-earnings/table/by-year *(7 Oct, 2016)*

The average S&P 500 PE ratios for a period of 140 years – from January 1871 to October 2016 - are presented in *Table 4* below. For the Shiller PE the period starts ten years later, because of the specific nature of calculating this ratio. The current values as of October 7 are also included in order to be compared with the average PEs, as well as their percentage difference with the mean.

The data in the table illustrates that the Shiller PE have varied within a rather broad range, with a minimum value of 4.78 - in December 1920, and a maximum of 44.19 – in December 1999, at the height of the internet bubble. The magnitude of volatility

*Table 4. Average PE Ratios of the Index S&P500 for the period 1871-2016*

| Indicator | Shiller PE | Trailing PE |
|---|---|---|
| Mean | 16.70 | 15.62 |
| Median | 16.05 | 14.64 |
| Minimum | 4.78 (December 1920) | 5.31 (December 1917) |
| Maximum | 44.19 (December 1999) | 123.73 (May 2009) |
| PE as of 7 October, 2016 | 26.72 | 24.92 |
| Difference from Mean | +60.00% | +59.54% |

*Source:* http://www.multpl.com/s-p-500-price-to-earnings/table/by-year *(7 Oct, 2016)*

of the trailing PE was even higher, reaching 123.73 in May 2009. This was not due to high stock prices, because the market was close to the bottom at that time. The reason was the extremely low profits during this period of the financial crisis. Another fact worth noting is that the average S&P 500 Shiller PE does not differ much from average S&P 500 trailing PE during the period 1881-2016. The mean of the Shiller PE is 16.70, while the mean for the trailing PE is 15.62. The medians are respectively 16.05 and 14.64.

The current levels of PE ratios (as of 7 October, 2016) are much higher than their historic average. The Shiller PE is by **60.00**% higher than its mean and the trailing PE is by **59.54**% higher than its mean. As long as the historical average of the market ratios derived for a very long period is considered to be the norm, it follows that the current higher S&P 500 PEs are probably an indicator of unreasonably high stock prices and index.

*Table 5* shows the year-end values of the *price-to-book value (PBV)* ratio of the S&P 500 for the period 1999-2016. The data in the table indicate that there is actually no year-end value of less than 2.00 throughout this period. If we examine the PBV by quarters, we will see that there were only four quarters during this period that ended with PBV of slightly below 2.00, the minimum being 1.78 on 30 March 2009. The year-end values ranged between 2.00 at the end of 2008, at the beginning of the financial crisis, and 5.05 at the end of 1999, during the internet bubble. The mean is 2.75 and the median is 2.73. The current value of 2.86, as of 7 October 2016 looks quite normal, given of historical average as represented by the

*Table 5. PBV Ratios of the Index S&P500 for the period 1999-2016*

| *End of Year* | *7 October 2016* | *2015* | *2014* | *2013* | *2012* | *2011* |
|---|---|---|---|---|---|---|
| **PBV** | **2.86** | **2.76** | **2.83** | **2.58** | **2.14** | **2.05** |
| *End of Year* | *2010* | *2009* | *2008* | *2007* | *2006* | *2005* |
| **PBV** | **2.17** | **2.17** | **2.00** | **2.77** | **2.81** | **2.76** |
| *End of Year* | *2004* | *2003* | *2002* | *2001* | *2000* | *1999* |
| **PBV** | **2.92** | **3.03** | **2.73** | **2.39** | **4.05** | **5.05** |
| | | | | | | |
| ***Mean*** | **2.75** | | ***Minimum*** | **1.78** | ***March 2009*** | |
| ***Medan*** | **2.73** | | ***Maximum*** | **5.06** | ***March 2000*** | |

*Source:* http://www.multpl.com/s-p-500-price-to-book/table/by-year *(7 Oct, 2016)*

mean and the median. This implies that the current PBV is not high as compared with its historic average. However, we should also bear in mind that the period covered by the data in *Table 5* is relatively short and not quite representative. What is more, more than half of this period covers the years prior to the financial crisis, characterized by bubble stock prices. Besides that, it is logical to ask the question "what is the source of this significant surplus value which makes the market value of stock to be nearly 3 times its book value?"

The proponents of the high prices on the stock market during the post-crisis period bring forward as their main argument the record high profits per share and the big cash flows to shareholders. These include Jim O'Neill, guru of Goldman Sachs Asset Management (O'Neill, 2013) and Tom Lee from JP Morgan (Lee, 2013). Other specialists also affirm that stock prices are adequate, given that corporate profits reach very high levels far before stock prices (The Bondag Blog, 2013).

The high earnings per share is indeed an important argument in favor of the high index levels. However, it can hardly support the high current S&P 500 PE ratios, which are by 60% higher than their historical average. It should be just the opposite, considering the counter movement principle, explained by Nicholas Molodovski (Molodovski, 1953). This principle renders misleading any judgments about stock prices' reasonability only by using current PE ratios unless a more careful analysis is made. According to Frank Block, "Molodovsky's counter movement principle (rule) was a major breakthrough which provided analysts with their first clear insight into the behavior of price-earnings ratios" (Block, 1995). Estimated future earnings (or ***"basic earning power"***) are essentially an average. They contain within themselves high earnings as well as low. Therefore, when current earnings rise above the estimated basic earning power, they should be capitalized by the application of a lower multiplier (a lower PE); when they fall below such estimate, the multiplier should be higher than if it were used for capitalizing earning power itself. (Molodovsky, 1953)

Based on the counter movement rule, the record high earnings of US companies in the post-crisis years are the prerequisite for lower PE levels of companies during this period. The greater the upward deviation of current earnings from the representative earning power, the lower price-earnings will have to plunge in order to discount the rise of current earnings above earning power. This could be eventually accepted as e serious indicator that current S&P 500 PE ratios, which are by 60% higher than their historic average, should be lower, and that they are not supported by the intrinsic value of the companies in the index. However, the final conclusion should depend on the fact whether the current record high earnings are only temporary phenomenon or else, they expose the new, higher earning power of companies.

## 4. PE and PBV ratios on the Bulgarian capital market during the period 2003-2009

The high growth of stock prices on the Bulgarian Stock Exchange, Sofia (BSE) started in 2002 and continued until October 2007. The annual average growth rate of the main index SOFIX for the period 2003-2009 was 44%. It was specifically high in 2006 – 51%, and the first ten months of 2007 – 59%. This way SOFIX almost hit the 2000 level – it reached 1952,4 on 15 October 2007. After that the index started a continuous downward trend, with a few short interruptions, until it hit the bottom of 259,95 on 24 February 2009 (Nenkov, 2009). As shown in *Table 2*, this is equivalent to 87% loss of market capitalization, as compared with the top levels in 2007.

The situation was similar with the broader index BG-40. Its highest value was 619.99 on 8 October 2007, while on 23 February 2009 the stock exchange closed at only 84.3, lower than the starting level of this index of 100. This is equivalent to a decrease of 86%, compared to its record high level (Nenkov, 2009).

This growth of the indexes on the Bulgarian Stock Exchange during that period was accompanied by the growth of the PE and PBV ratios of the most actively traded public companies. *Table 6* shows the SOFIX PE year-end ratios for the period 2005-2009. The arithmetic average was 18.60 in 2005, 16.77 in 2006, and reached 31.77 in 2007. At the onset of the financial crisis it plunged to 7.61 at the end of 2008, and further down to only 5.64 at the end of the first quarter of 2009.

The PBV ratios demonstrate a similar trend for the same period, as can be seen from Table 7. The arithmetic average starts at level of 1.36 at the end of 2005, 2.72 in 2006, goes up to 4.36 times book value towards the end of 2007, plummeting to only 0.64 at the end of the first quarter of 2009. Thus the PBV ratio went back to the levels, typical of the years 2002 and 2003.

During the top-levels period - October 2007, the average (weighted) PE of SOFIX reached 31.98 and the average (arithmetic) PE of BG-40 reached its record high of 185.43 times earnings. As of 18 September, 2008, immediately after the start of the crash of international capital markets, the ratios acquired more logical values of 12.83 for SOFIX, and 19.38 for BG-40.[1] The PBV

*Table 6. Average PE ratios of SOFIX for the period 2005-2009**

| | PE – SOFIX | | | | |
|---|---|---|---|---|---|
| Indicator | 2005 | 2006 | 2007 | 2008 | 2009 Q1 |
| Arithmetic average | 18.60 | 16.77 | 31.33 | 7.61 | 5.64 |
| Median | 6.77 | 17.83 | 27.11 | 5.80 | 4.98 |
| Weighted average | 8.33 | 19.61 | 24.92 | 5.63 | 4.36 |
| Standard deviation | 39.99 | 11.53 | 15.03 | 6.55 | 2.90 |
| Minimum | 0.21 | 0.57 | 1.64 | 1.23 | 1.92 |
| Maximum | 144.26 | 44.03 | 55.71 | 26.37 | 11.97 |

**Source: Financial Supervision Commission:* http://www.fsc.bg
*Bulgarian Stock Exchange, Sofia:* http://www.bse-sofia.bg

*Table 7. Average PBV ratios of SOFIX for the period 2005-2009**

| | PBV – SOFIX | | | | |
|---|---|---|---|---|---|
| **Indicator** | 2005 | 2006 | 2007 | 2008 | 2009 Q1 |
| Arithmetic average | 1.36 | 2.72 | 4.36 | 0.91 | 0.64 |
| Median | 1.16 | 3.13 | 3.92 | 0.75 | 0.45 |
| Weighted average | 1.19 | 2.78 | 3.78 | 0.74 | 0.57 |
| Standard deviation | 1.39 | 1.72 | 2.71 | 0.65 | 0.49 |
| Minimum | 0.02 | 0.16 | 0.48 | 0.26 | 0.17 |
| Maximum | 5.08 | 5.65 | 11.16 | 2.47 | 1.7 |

**Source: Financial Supervision Commission:* http://www.fsc.bg
*Bulgarian Stock Exchange, Sofia:* http://www.bse-sofia.bg

[1] Source: Bulgarian Stock Exchange, Sofia: http://www.bse-sofia.bg

ratios looked quite the same. In October 2007, the PBV reached the impressive level of 6.36 times book value for SOFIX, and 5.25 times book value for BG-40.[2]

One of the Bulgarian analysts' arguments in support of such growth was that, at the beginning of the period covered in the above two tables, the market ratios of Bulgarian companies were much lower than the ratios on the international capital markets. In this respect the stocks of Bulgarian companies were seen as undervalued, and with high growth potential. As a result of the general optimism on the BSE, the PE and PBV ratios of most listed companies actually reached the levels of the ratios on the international capital markets. During the top period of the bull market the PE and PBV ratios on the BSE became even higher than the ratios on the international capital markets.

## 5. Current PE and PBV ratios of the Bulgarian SOFIX – October 2016

The data in *Table 8* contains the key ratios of the 15 companies included in the SOFIX as of 10 October 2016. The arithmetic average PE is 30.02 and the median PE is 19.00. The range of individual values varies significantly, with a minimum of 5.74 and a maximum of 113.96. The average is obviously tilted upwards, because of two or three high PE ratios in the sample. In such cases the median is the more appropriate measure, since it is much more independent on the influence of extreme individual ratios.

*Table 8. PE,* **PBV** *and Other Ratios of SOFIX Companies as of 10 October, 2016**

| Company | PE | PBV | ROE | ROA | ROCE | Payout Ratio | Plowback Ratio |
|---|---|---|---|---|---|---|---|
| Sopharma AD-Sofia | 22.33 | 0.97 | 7.53% | 5.72% | 6.42% | 0.51 | 0.49 |
| Chimimport AD-Sofia | 5.74 | 0.27 | 2.78% | 2.05% | 2.73% | 0.26 | 0.74 |
| Monbat AD-Sofia | 14.50 | 1.67 | 12.60% | 8.99% | 10.36% | 0.56 | 0.44 |
| CB First Investment Bank AD-Sofia | 8.67 | 0.36 | | | | | |
| Albena AD-Albena | 113.96 | 0.60 | 4.44% | 3.51% | 4.31% | 0.19 | 0.71 |
| M+S Hydraulic AD-Kazanlak | 20.95 | 3.40 | 16.29% | 13.53% | 17.84% | 0.84 | 0.16 |
| Advance Terrafund REIT-Sofia | 21.17 | 0.77 | | | | | |
| Holding Varna AD-Varna | | 1.05 | 2.76% | 1.99% | 2.00% | | |
| Neochim AD-Dimitrovgrad | 13.92 | 1.95 | 22.87% | 15.05% | 19.06% | 0.34 | 0.66 |
| Trace Group Hold AD-Sofia | 82.60 | 1.22 | 9.98% | 4.68% | 8.20% | 0.18 | 0.82 |
| CB Central Cooperative Bank AD-Sofia | 17.05 | 0.34 | | | | | |
| Stara Planina Hold AD-Sofia | 16.57 | 1.28 | 13.34% | 12.46% | 12.72% | 0.87 | 0.13 |
| Industrial Holding Bulgaria PLC-Sofia | | 0.24 | 1.67% | 0.80% | 1.35% | | |
| Industrial Capital Holding AD-Sofia | 22.72 | 1.49 | 6.53% | 6.48% | 6.33% | | |
| Bulgarian Real Estate Fund REIT-Sofia | | 0.59 | | | | | |
| **Average** | **30.02** | **1.08** | **9.16%** | **6.84%** | **8.30%** | **0.47** | **0.53** |
| **Median** | **19.00** | **0.97** | **7.53%** | **5.72%** | **6.42%** | **0.43** | **0.58** |
| **Minimum** | **5.74** | **0.24** | **1.67%** | **0.80%** | **1.35%** | **0.18** | **0.13** |
| **Maximum** | **113.96** | **3.4** | **22.87%** | **15.05%** | **19.06%** | **0.87** | **0.82** |

**Source:* http://www.infostock.bg/infostock/control/trading/index/quotes/SOFIX *(10 Oct, 2016)*

[2] Source: Bulgarian Stock Exchange, Sofia: http://www.bse-sofia.bg

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The average PBV ratio of the SOFIX companies is respectively 1.08 and the median is 0.97. The minimum is 0.24 and the maximum is 3.4.

At the same time the average SOFIX PE as of 10 October 2016, published on the website of the Bulgarian Stock Exchange, was only 9.91. This is much lower than both the arithmetic average and the median calculated in Table 8. One possible reason for this is that SOFIX average market ratios are calculated as a weighted average. The PBV on the website is 1.04. The two ratios of the broader Bulgarian index BGBX40 on the same date (10 Oct, 2016) are respectively: PE=10.81 and PBV=1.20.

There is no much sense of calculating historical average ratios to compare current market ratios with, because of the short history of the Bulgarian Stock Exchange-Sofia.

## 6. Fundamental PE and PBV Ratios for the US Market in 2016

According to Henry Blodget, one of the five important indicators for a bubble on the stock market are stock prices that are too high relative to fundamentals (Blodget, H., 2011). With regard to this the most appropriate basis for comparison, when analyzing the actual market ratios, are their corresponding fundamental (theoretical) ratios.

The fundamental ratios are the function of the **three fundamental variables**, which determine the value of companies: ***the earning power, the expected growth in earnings, and the level of risk***. The indicators for each of these three variables at the equity level are respectively: *return on equity (ROE)*, *expected growth of earnings per share (g)* and the *cost of equity* (– $r_E$ ($RRR_E$) (Nenkov, D., Bathala, C., 2008). For the purpose of this analysis, the fundamental PE and PBV ratios for the S&P500 and SOFIX are estimated as the function of the above three indicators. Both one-stage and two-stage fundamental models are used. The first is derived from the constant-growth dividend model and the second is derived from two-stage dividend model.

The average ROE of US companies, which is used for the models of fundamental ratios in this case, is for the latest year with such data in the website of A. Damodaran - 2015. It is **10.77**% and is calculated as the average ROE for all sectors in the economy. The average payout ratio is 52.18%, which corresponds to a plowback ratio of **47.82**%. These numbers are used in the model for deriving the expected growth rate of EPS – ***g*** (g=b×ROE=0.4782×10.77%=5.15%).

With regard to the third fundamental variable – the cost of equity, or the required rate of return from equity capital ($RRR_E$), things are usually more complicated, since this is always subject to discussion. The cost of equity in this case is derived, applying the logic of the Capital Asset Pricing Model (CAPM). This is shown in *Table 9*. Three different possible costs of equity are calculated – historic arithmetic average, historic geometric average, and implied (current). The first two are based on the longest historic period 1928-2015. The implied cost of equity is as of 1 October 2016.

*Table 9. Risk-Free Rate, Market Risk Premium, and Cost of Equity ($RRR_E$) in the USA for 2016**

| Indicator | Risk-Free Rate | Beta | Market Risk Premium (ERP) | Cost of Equity ($RRR_E$) |
|---|---|---|---|---|
| Historic – Arithmetic Average | 5.23% | 1 | 6.18% | 11.41% |
| Historic – Geometric Average | 4.96% | 1 | 4.54% | 9.50% |
| Current (Implied), as of Oct 1, 2016 | 1.60% | 1 | 6.16% | 7.76% |

** Source:* http://pages.stern.nyu.edu/~adamodar/ (10 Oct, 2016)

As seen in *Table 9* the highest cost of equity is the historic average of 11.41%, followed by the historical geometric average of 9.50%. The lowest cost of equity is the implied cost of equity – 7.76%. It represents the current expectations (opinion) of investors. This low implied cost of equity is one of the reasons for the high prices on the stock market.

The fundamental PE and PBV ratios are calculated using the *one-stage models* and the *two-stage models* for theoretical PE and PBV ratios. Each of the models calculates 3 variants of fundamental ratios, corresponding to the three possible cost of equity. The input variables and results under the one-stage model are demonstrated in *Table 10*.

*Table 10. Fundamental PE and PBV Ratios for the USA for 2016 – One-stage Model*

| Variant | $RRR_E$ | (1-b) | ROE | g | PE | PBV |
|---|---|---|---|---|---|---|
| Variant 1 | **11.41%** | 0.5218 | 10.77% | 5.15% | **8.77** | **0.94** |
| Variant 2 | **9.50%** | 0.5218 | 10.77% | 5.15% | **12.61** | **1.36** |
| Variant 3 | **7.76%** | 0.5218 | 10.77% | 5.15% | **21.02** | **2.26** |

At the historical arithmetic average cost of equity of 11.41%, the fundamental PE is 8.77, at the geometric average of 9.50% it is 12.61, and at the implied cost of equity of 7.76% it is 21.02. The fundamental PBVs are respectively – 0.94, 1.36 and 2.26. The results show that the fundamental ratios are very sensitive to the changes in the cost of equity. This is mainly due to some shortcomings of the one-stage model of fundamental ratios. Quite often the fundamental ratios, calculated through the one-stage model are abnormally high or negative, and have no economic sense. This is why they could be very misleading sometimes.

The input variables and results under the two-stage model are demonstrated in *Table 11*. The calculated ratios are again under three variants, depending on the cost of equity. The following additional forecast input variables are used with regard to the second stage of the model – the stable growth period:

- Continuity of the high growth period (n) = 5 years;
- Return on equity during stable growth period ($ROE_2$) = 9.50%;
- Payout ratio during stable growth period $(1\text{-}b)_2$ = 0.50;
- Growth rate during stable growth period $(g_2) = ROE_2 \times b_2 = 9.50\% \times 0.50 = 4.75\%$;
- Cost of equity during stable growth period ($RRR_{E\,2}$) = 9.50%.

At the historic arithmetic average cost of equity of 11.41% the fundamental PE is 10.46, at the geometric average of 9.50% it is 11.31, and at the implied cost of equity of 7.76% it is 12.18. The fundamental PBVs are respectively – 1.02, 1.10 and 1.19.

The results indicate that the fundamental PE and PBV under the two-stage model are not sensitive to the changes in the cost of

*Table 11. Fundamental PE and PBV Ratios for the USA for 2016 – Two-stage Model*

| Variants | $RRR_{E1}$ | $(1\text{-}b)_1$ | $ROE_1$ | $g_1$ | PE | PBV |
|---|---|---|---|---|---|---|
| Variant 1 | **11.41%** | 0.5218 | 10.77% | 5.15% | **10.46** | **1.02** |
| Variant 2 | **9.50%** | 0.5218 | 10.77% | 5.15% | **11.32** | **1.10** |
| Variant 3 | **7.76%** | 0.5218 | 10.77% | 5.15% | **12.18** | **1.19** |
| | $RRR_{E2}$ | $(1\text{-}b)_2$ | $ROE_2$ | $g_2$ | | |
| | **9.50%** | 0.50 | 9.50% | 4.75% | | |

equity. This is mainly due to the fact that the differential between ROE and $RRR_E$ is valid only for the first five years. After this first stage we assume 1/ a moderate level of the cost of equity of 9.50% and 2/ that in the long run average ROE will equal average cost of equity ($RRR_E$). The PE and PBV under the two-stage model are much more reliable.

With regard to the question about the correct cost of equity, the opinions are as many as the number of analysts. However, recently the historical geometric average of 9.50% seems to be the most adequate one, being somewhere in the middle among the three different cost of equity. If we decide to use the average among the three cost of equity, we would come up with about the same number.

Given the above, the most reasonable values of the two fundamental ratios should be the ones of *Variant 2* of *Table 11*, respectively **PE = 11.32** and **PBV = 1.10**. These ratios are less than half of the actual 2016 PE and PBV of the S&P500, which are respectively trailing PE = 24.92, Shiller PE = 26.72, and PBV 2.86.

## 7. Fundamental PE and PBV Ratios for the Bulgarian Market in 2016

The exercise from the previous section is repeated here, but for the Bulgarian emerging capital market. The ROE for Bulgarian companies, which is used for the models of fundamental ratios in this case, is the average ROE of the SOFIX companies of **9.16%**, which is shown in Table 8. The average payout ratio of **47%**, and the plowback ratio of **53%** are also taken from there. The expected growth rate of EPS – ***g***, under these conditions is respectively **4.85%** (g=b×ROE=0.53×9.16%=4.85%).

The already used required rate of return from equity capital ($RRR_E$) in the USA, as a mature capital market, is used as the basis for deriving the cost of equity for Bulgarian companies. In this case the geometric historic average of **9.50%** is used, since it has a moderate value and is considered to be closer to the truth. After that we adjust this basic cost of equity of the mature market by adding country risk premium for Bulgaria to account for the extra risk of the Bulgarian emerging market. This is the approach applied by Damodaran for emerging markets (Damodaran, 2002). The country risk premium for Bulgaria for 2016, arrived at on the basis of the spread of Bulgarian government bonds, stands at **2.94%**. An additional risk premium of **4.00%** for specific risk can also be added to reflect the smaller average size of Bulgarian companies.

The fundamental ratios are calculated **in three variants**. *In the first variant* we use the most conservative approach with the two additional risk premiums, which we also think is the most correct approach. The cost of equity under this variant is:

$$RRR_{E\,BG} = RRR_{E\,US} + \text{Country Risk Premium}_{BG} + \text{Specific Premium}_{BG}$$
$$= 9.50\% + 2.94\% + 4.00\% = \mathbf{16.44\%}$$

Under the *second variant* only country risk premium is added: Respectively, the cost of equity is:

$$RRR_{E\,BG} = RRR_{E\,US} + \text{Country Risk Premium}_{BG}$$
$$= 9.50\% + 2.94\% = \mathbf{12.44\%}$$

Under the *third variant,* an attempt has been made to take on the view of the opponents of the additional risk premiums for the Bulgarian capital market. What they do is simply applying the same cost of equity as the one on the developed capital markets. The cost of equity in such case would be:

$$RRR_{E\,BG} = RRR_{E\,US} = \mathbf{9.50\%}$$

The fundamental PE and PBV ratios on Bulgarian market are also calculated using the *one-stage models* and the *two-stage models* as in the above section. The input

variables and results under the one-stage model are demonstrated in *Table 12*. At cost of equity of 16.44% the fundamental PE is 4.25, at cost of equity of 12.44% it is 6.50, and at cost of equity of 9.50% it is 10.61. (In case that we decide to use current (implied) US cost of equity of 7.76% under Variant 3, then the PE goes up to 16.96.) The fundamental PBVs are respectively – 0.39, 0.60 and 0.97. The results indicate again that the fundamental ratios are very sensitive to the changes in the cost of equity.

*Table 12. Fundamental PE and PBV Ratios for Bulgarian Market for 2016 – One-stage Model*

| Variant | $RRR_E$ | (1-*b*) | *ROE* | *g* | *PE* | *PBV* |
|---|---|---|---|---|---|---|
| Variant 1 | **16.44%** | 0.47 | 9.16% | 4.85% | **4.25** | **0.39** |
| Variant 2 | **12.44%** | 0.47 | 9.16% | 4.85% | **6.50** | **0.60** |
| Variant 3 | **9.50%** | 0.47 | 9.16% | 4.85% | **10.61** | **0.97** |

The input variables and results under the two-stage model are displayed in *Table 13*. The calculated ratios are again under three variants, depending on the cost of equity. The following additional forecast input variables are used with regard to the second stage of the model – the stable growth period:

- Continuity of the high growth period (n) = 5 years;
- Return on equity during stable growth period ($ROE_2$) = 12.44%;
- Payout ratio during stable growth period $(1\text{-}b)_2$ = 0.50;
- Growth rate during stable growth period ($g_2$) = $ROE_2 \times b_2$ = 12.44% × 0.50 = 6.22%;
- Cost of equity during stable growth period ($RRR_{E\,2}$) = 12.44%.

Under the first variant, at initial cost of equity of 16.44%, the fundamental PE is 6.79, under second variant 7.94 and under the third variant it is 8.94. In case that the current (implied) cost of equity of US market of 7.76 is used, the PE would go up to 9.61. The fundamental PBVs are respectively 0.79, 0.92 and 1.04.

The results indicate that the fundamental PE and PBV under the two-stage model are not sensitive to the changes in the cost of equity. This is mainly due to the fact that the differential between ROE and $RRR_E$ applies only to the first five years. The assumption again is that in the long run ROE and cost of equity overlap (are equal on average), as a result of free flow of capital and the resulting average return on capital. In this case we assume that in the long run ROE goes up to 12.44% and the cost is also 12.44%.

Given the above, the most reasonable values of the two fundamental ratios should be the ones of *Variant 1* of *Table 11*, respectively **PE = 6.79** and **PBV = 0.79**. As becomes evident, these values are considerably lower than the corresponding current actual PE and PBV of the SOFIX, which were discussed above: average PE = 30.02, median PE = 19.00, average PBV = 1.08 and median PBV = 0.97. The difference is specifically large for the PE ratio.

*Table 13. Fundamental PE and PBV Ratios for Bulgarian Market for 2016 – Two-stage Model*

| Variants | $RRR_{E1}$ | $(1\text{-}b)_1$ | $ROE_1$ | $g_1$ | *PE* | *PBV* |
|---|---|---|---|---|---|---|
| Variant 1 | **16.44%** | 0.47 | 9.16% | 4.85% | **6.79** | **0.79** |
| Variant 2 | **12.44%** | 0.47 | 9.16% | 4.85% | **7.94** | **0.92** |
| Variant 3 | **9.50%** | 0.47 | 9.16% | 4.85% | **8.94** | **1.04** |
| | $RRR_{E2}$ | $(1\text{-}b)_2$ | $ROE_2$ | $g_2$ | | |
| | **12.44%** | 0.50 | 12.44% | 6.22% | | |

## 8. Conclusions

The relative valuation methods are often used to "justify" high stock prices. This usually happens during bull equity markets. For developing markets this is usually done through mechanically "implanting" the inflated actual ratios from international mature markets, without the needed adjustment. The results of this study and earlier studies indicate that the high actual PE and PBV ratios for the period preceding the financial crisis were not supported by fundamental ratios. This was true for both US developed market and Bulgarian emerging market. When the markets were at the bottom in the first quarter of 2009 actual PE and PBV ratios became almost in line with the calculated fundamental ratios of that time.

During the latest years of the post-crisis period (after the beginning of 2013) the index levels of the US stock-market broke the pre-crisis records and continued to pursue further higher levels. The current levels of PE ratios (as of October 2016) are much higher than their historic average – by about 60%. At the same time the fundamental ratios are more than twice lower than the actual 2016 PE and PBV of the S&P500. These are important indicators for unreasonably high stock prices and index levels.

The current situation seems quite different on the Bulgarian stock market, since the current SOFIX level (as of 7 Oct, 2016) corresponds to only 25.99% of its top level from before the crisis (in Oct 2007). Current PE and PBV are not analyzed against historic averages, because of the very short history of Bulgarian stock market. However, when compared with their corresponding fundamental ratios, the current actual market ratios seem to be quite higher. In other words, fundamentals on the Bulgarian capital market indicate for overpricing of the companies in the leading Bulgarian index. It is worth putting efforts in additional research of this matter.

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