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THE S&P 500 CURRENT RECORD-HIGH LEVELS AGAINST FUNDAMENTAL PE AND PBV RATIOS[2]

The subject of this research is the performance of the S&P 500 index during the last decade, including in the context of the 2020 Covid pandemic. The main issue of interest is whether the index price levels are supported by fundamentals, or there is a bubble on the US stock market. The study is based on the use of the price-earnings ratios (PE) and price-to-book ratios (PBV) of the index during this period. The 2020 PE and PBV of the index are compared with historical market PE and PBV ratios. Another aspect of the analysis also involves fundamental PE and PBV ratios of the S&P 500 index, which are derived from the fundamentals, determining the value of stocks in the index. The results of the analysis do not confirm the validity of the high current PE and PBV ratios and do not justify the high stock price levels of the S&P 500 during most of 2020.
Keywords: stock markets; PE and PBV ratios; fundamentals; stock market bubble
JEL: G11; G12; G15

1. Introduction

One of the main questions that has constantly excited analysts, investors, investment bankers and everyone else interested in the capital markets at each stage of their development, is whether price levels of traded securities are justified or not. This issue is even more acute in times of uncertainty, turmoil and crisis, such as the current one, due to the COVID-19 pandemic.

For most of the last decade, stock markets in general, and the US market in particular, have set new and new price records. Thus, in the period after the global financial crisis, this used to give rise to another discussion about whether the US market is again in the situation of another bubble. The prevailing opinion is that the big collapse of the stock markets during the global financial crisis of 2007-2009 was due to the previously formed price bubbles. Proponents of this understanding are generally more likely to see another bubble in the US market, and not only in it, for most of the post-crisis period. However, according to other analysts, before the global financial crisis, there was no price bubble, and the collapse in stock prices only reflected the deterioration of the fundamental indicators of companies and

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the economy as a whole. According to this second group of market participants and observers, the levels of stock-market indices in the post-crisis years and at the present stage are fully justified and supported by the significantly increased earnings potential of companies. Among these analysts, there are those who have predicted and continue to predict serious potential for further growth in stock prices, above previous record levels.

The probable movements in the stock market in the short run remain outside the present study. In this regard, temporary, short-term factors and influences on market movements remain in the background. The focus is entirely on the sustainable, medium-term and long-term values of the important variables that should determine stock prices in the long run.

2. General Approach of the Analysis of Stock-Market Price Levels

As typical indicators for the existence of a price bubble on the stock market Henry Blodget points out (Blodget, 2011):

1. Excessive stock prices compared to fundamentals;
2. Everyone participates in the market and everything rises;
3. Skeptics have been alarmed about the presence of a bubble for years;
4. People say en masse that "This time is different";
5. There is a huge leverage in the system.

According to Blodgett, a significant factor for the long duration of sectoral or general market bubbles are the huge waves of capital that flood the market along the lines of the "Three I":

- Innovators
- Imitators, and
- Idiots (virtually everyone else).

Innovators are the first to identify high-potential stocks and make big profits. Imitators simply copy them and also achieve relatively high profitability. "Idiots" step in at the end when the potential for additional returns is virtually exhausted. As a result, prices continue to rise and there is a widespread fraudulent feeling that this will be a long-term trend.

At the present stage, however, people are not en masse with such an attitude - they are more likely divided. There are those who expect the market to continue to rise steadily, others claim that most of the shares have unreasonably high prices.

Regarding indicators 2, 3 and 4, a lot could be discussed, as there are signs and arguments for their manifestation. Definitely, the markets have been growing rapidly in the last 7-8 years and set record after record. During all this time, there have been numerous warnings about the presence of a bubble, including from well-known experts with a high reputation. The arguments for the "new economy" and the "new factors" for future growth, familiar from previous bubbles, have been heard again. Nevertheless, these three indicators have not

manifested themselves so strongly, as compared to the technology bubble from the late 1990s.

This is not the case with the fifth indicator for a market bubble mentioned above – ***the huge leverage in the system***. The problem is not really new and the danger in this aspect remains rather real, given the zero (or close to zero) interest rates for more than a decade, the ongoing government "incentives", the huge government deficit not only of the United States, but also too high levels of consumer and government debt in the world as a whole. There is unprecedented printing of money by leading central banks, and so-called "quantitative easing", intensified sharply in order to overcome the economic difficulties caused by the Covid-19 pandemic. In other words, the "records" in this aspect seem to be much more impressive than the above-mentioned stock market price records. All this inflates stock prices. It is in this regard that back in 2013, Aswath Damodaran said that it is very possible that the market is in the centre of a bubble, caused by the Federal Reserve Bank, which traditionally never ends well (Damodaran, 2013). For this reason, Damodaran makes the following statement: "The market is dancing to the music of the Fed. The question is not whether the music will stop, but when?" (Damodaran, 2013).

According to Ray Dalio of Bridgewater Associates, founder of the world's largest hedge fund, "Today the economy and markets are run by central banks in coordination with central governments. As a result, "capital markets are not free markets that allocate resources in the traditional way" (Infostock, 2020).

According to Nobel laureate Robert Shiller, the global financial crisis of 2007-2009 once again reminded of the need for a qualitative analysis of stocks and their price levels, both for the individual investor and for the better functioning of markets as a whole (Shiller, 2012; 2015). The same is especially true in the context of the current crisis in the markets, caused by the Covid pandemic.

In the present study, the focus is on *the first indicator* – what stock prices look like in relation to *fundamentals*. The main consideration is that the proposed study is mainly in the context of fundamental analysis. In other words, the logic that follows is that the source of the value of companies, and hence of shares, is the expected future income that they can bring to their owners (Nenkov, 2005). Thus, in the end, the value of the company is a function of:

- *the earnings potential (cash flow potential),*
- *the expected growth of earnings (cash flows),*
- *the level of risk.*

An appropriate way to analyze the market as a whole is to use market ratios such as the price-earnings (PE), price-to-book value (PBV) and others. It is natural to ask the question "Why exactly market ratios, given that we are talking about research in the context of fundamental analysis?". Fundamental analysis is logically related mainly to the models of discounted future cash flows – they are designed to determine the fundamental value of stocks. The use of relative valuation methods based on these same market ratios has traditionally been considered as an alternative to DCF models, i.e. an alternative to fundamental analysis. According to Damodaran, they are used to determine primarily the market price, not intrinsic

(fundamental) value. Thus, comparative evaluation methods seem far from fundamental analysis. This division is directly related to the question raised by Prof. Damodaran: "Are we pricing or valuing?" (What are we looking for – price or actual value?) (Damodaran, 2012). According to him, DCF models (fundamental analysis) are aimed at determining intrinsic value, and relative (market ratio) methods are aimed at determining the market price (Damodaran, 2012).

Damodaran's views on relative valuation methods are far from unfounded. Comparative valuation methods are particularly desirable for use in long-term bullish markets, where optimism has gripped almost all market participants, prices are inflated and continue to rise. In such conditions, the reason for the preferences for comparative methods are not only their advantages, but also their disadvantages. These methods are particularly convenient for "justifying" apparently inflated stock market prices during upside markets (Nenkov, 2017).

In reality, however, there are also other views on this issue. To the extent that market ratios have become (standardized) forms of stock prices, they should also be a function of the ***three fundamental variables*** discussed above: *the earnings potential, the expected earnings growth and the level of risk*. This is natural and logical, as long as any prudent investors, regardless of their preferences for one or another valuation approach, are guided primarily by their ideas and expectations about these three variables – sometimes explicitly (in DCF models), sometimes implicitly (in relative valuation, while using market ratios).

For example, Burton Malkiel clearly links fundamental stock valuation analysis to the use of the PE market ratio. When explaining the techniques of fundamental analysis, he does so in the context of the interpretation and application of the PE ratio. According to Malkiel, "The fundamentalist uses four basic determinants to help estimate the proper value for any stock". They are as follows (Malikel, 2015):

- Determinant 1: The expected growth rate;
- Determinant 2: The expected dividend payout;
- Determinant 3: The degree of risk;
- Determinant 4: The level of market interest rates.

In fact, Malkiel refers to the same fundamental factors (variables) that determine the value of shares and which have been commented above. At the equity level, suitable indicators of the three fundamentals are respectively (Nenkov, Bathala, 2008):

- ROE – synthesized expression of the earnings potential (per 100 units of equity invested);
- g – expected growth rate of EPS (net earnings per share);
- R_E – cost of equity (expressing the degree of risk of the respective stock).

In this case, Malkiel's four determinants are another combination of the above *three indicators (variables) of fundamentals*, that determine the value of a stock. *Determinant 2* – the expected dividend, concerns the potential of the share to generate income for its owners, but in absolute terms. More generally, it can be represented by the dividend payout ratio (1-b), which in turn should be equal to: (1-*b* = *(*1-*g/ROE* = *(*1-*g/(EPS/Equity*)). In other words,

the dividend (*determinant 2*) is a function of the stock's earnings potential (ROE) and the projected growth rate (g). *Determinant 1* – the expected growth rate (g), is the indicator of the second fundamental variable. *Determinants 3 and 4* in combination are an expression of the cost of equity – risk-free interest rate, plus a risk premium for the respective stock. In other words, *determinants 3 and 4* together are an expression of the indicator of the third fundamental – risk.

It is no coincidence that the price-earnings ratio (PE) is the oldest market ratio used to analyze stocks and make investor decisions. In other words, from the group of market ratios, it is the one with the "longest experience". This is quite logical. The main reason for its great popularity among the investor community is that it shows one of the most direct relationships of interest to investors – the relationship between the price they pay per share of stock and the income that this share brings. This is actually the relationship between price and the first of the three fundamental variables - *the earnings potential*. Apparently for this reason, James O'Shaughnessy says that "The PE ratio per share is the most widely used measure of how cheap or how expensive a stock is compared to other stocks. Many investors tend to pay above the average price based on current profits because they believe that the company can achieve high growth once it has high PE. Thus, most people equate high PE stocks with so-called *growth investing* (O'Shaughnessy, 2005).

At the same time, investors who buy shares of low PEs think they are making a very profitable deal. They usually believe that when PE is high, buyers have unrealistic expectations about the growth of earnings per share. As a result, the prices of these shares are inflated. Conversely, proponents of this position believe that stocks with low PE ratios are unreasonably undervalued and when profits recover, their prices will also go up. This group of investors is known as *value investors*. Accordingly, this method of stock selection is known as *value investing* (O'Shaughnessy, 2005).

The situation is similar to the price-to-book value ratio (PBV). There is a direct logical connection between PE and PBV. Clyde Stickney decomposes the actual PBV ratio and presents it as the product between PE and ROE (Stickney, 1996), i.e.:

$$PBV = PE \times ROE \quad (1)$$

The reason for deriving this dependence is seen by presenting the PBV as a function of what it is equal to:

$$PBV = \frac{P}{BV} = \frac{P}{EPS} \times \frac{EPS}{BV} = PE \times ROE \quad (2)$$

In other words, the PBV ratio also represents a direct relationship between the price per share and the fundamental variable *earnings potential* – in absolute terms (EPS) and in relative terms (relative to equity – ROE).

Market ratios, also called market performance indicators or market multipliers, are one of several important sets of ratios for financial analysis of public companies (Brigham, Gapenski, 1994; Hristozov, 2020). What sets them apart as a group, is that in the numerator of each of them is the market price per share (P_0) or, alternatively, the enterprise value (EV) of the company. This specificity of the market ratios allows for their use in several different directions:

- In the analysis of the financial performance of the respective companies, whose stocks are traded on the capital market;
- In the analysis of the stock market as a whole, of different sectors, including for comparison between markets and sectors;
- In relative valuation methods, for valuing other companies (multiples approach or peer companies approach).

An important advantage of market ratios is that they provide comparability for the needs of comparative analysis, both between different companies, sectors and markets, and in a dynamic aspect – between different historical periods. This is due to the fact that market ratios are a kind of "standardized" share prices, or prices on a common basis (Damodaran, 2012). According to Burton Malkiel, market multipliers (such as the price-earnings ratio (PE)) provide a good yardstick for comparing different stocks that have different prices and different earnings per share in absolute terms (Malkiel, 2015).

One of the problems with market ratios research is that relatively little is written about it. According to Emanuel Bagna and Enrico Ramusino, "market multipliers are used more than they are studied. Stock analysts, investment bankers and other practitioners make extensive use of market multipliers to determine the value of companies. However, the literature on multipliers is not as rich as the widespread use of these assessment tools in practice suggests." (Bagna, Ramusino, 2017). The current price-earnings (PE) and price-to-book (PBV) ratios will be used in this specific market price analysis. With the help of these ratios, the current levels of the stock market indices can be analyzed as follows:

- By reviewing the dynamics of the actual PE and PBV ratios in historical terms, and comparing them to the current PE и PBV levels;
- By determining fundamental PE and PBV ratios and comparing them to the current actual PE and PBV ratios.

In the first case, the current price levels against the average historical values are tested. In the second case, the current price levels against what the fundamental variables dictate are tested, insofar as the fundamental ratios are entirely their function. In this regard, it is useful to know that *the actual market ratios show at what price the **stocks are traded**, and the fundamental ratios show at what price the **stocks should be traded***.

Both proposed aspects of the analysis seem extremely simple and clear and create an expectation for easy and definite conclusions. However, their application is actually quite demanding in itself and usually raises more new questions than originally asked. Almost always (in fact, always) additional analysis of each of the input variables is required, as a result of which many different assumptions and variants are invariably reached. This usually blurs and calls into question the conclusions as to whether the market is overvalued, undervalued or adequately valued. However, despite these conventions, the analysis in the above two aspects usually leads to a much better and more informed view of where the market should be at this stage.

3. Historical Levels of PE and PBV Ratios and Comparison with Their Current 2020 Levels

The appropriate stock index for the purpose of this analysis is the S&P 500. The reasons for choosing this particular index are as follows:

- The US market was the one that recorded the most remarkable price records throughout the post-crisis period. In this sense, it is the most interesting to analyze in terms of the question *"Is there (or has there been so far) a stock market bubble?";*
- S&P 500 is one of the most widely monitored indices in the world. It is a very broad index, including 500 large public companies in the US, traded on US stock exchanges, and according to many experts, is the most representative of the US stock market as a whole. It is considered that its structure by sectors and industries replicates the structure of the US economy as a whole;[3]
- The S&P 500 is also highly representative of the global stock market, as it represents over 30% of the market capitalization of all public companies in the world. The total market capitalization of the S&P 500 as of June 30, 2020, amounts to about 27 trillion US dollars, which is about 80% of the total market capitalization in the United States.[4]

As of March 13, 2020, the breakdown of the S&P 500 by sector is as follows:[5]

- Information Technology: 24.4%
- Health Care: 14%
- Financials: 12.2%
- Communication Services: 10.7%
- Consumer Discretionary: 9.9%
- Industrials: 8.9%
- Consumer Staples: 7.2%
- Energy: 3.6%
- Utilities: 3.5%
- Real Estate: 3.1%
- Materials: 2.5%

Table 1 shows the average values of the PE ratios of the S&P 500 index for a period of almost 150 years – from January 1871 to August 21, 2020, for trailing PE, and from January 1881

[3] Data source: https://www.thebalance.com/what-is-the-sandp-500-3305888.
[4] Data source: https://www.google.com/search?q=s%26p+500&rlz=1C1GCEU_enBG895BG 895&oq=S%26&aqs=chrome.1.69i57j0l5j46j0.3051j0j8&sourceid=chrome&ie=UTF-8; Data source: https://www.thebalance.com/what-is-the-sandp-500-3305888.
[5] Data source: https://www.thebalance.com/what-is-the-sandp-500-3305888.

to August 21, 2020, for Shiller PE. The latter are Cyclically Adjusted PE, known by the abbreviation CAPE. Also included for comparison are the current values as of August 21, 2020, and their percentage difference from the arithmetic mean.

Table 1

Average PE Ratios of the S&P500 for the Period 1871-2020

Indicator	Shiller PE (CAPE)	Trailing PE
Mean	16.73	15.81
Median	15.79	14.83
Minimum	4.78 (December 1920)	5.31 (December 1917)
Maximum	44.19 (December 1999)	123.73 (May 2009)
PE Ratios as of August 21, 2020	**31.26**	**29.20**
Difference from the mean (%)	**+86.85**	**+84.69**

Source: http://www.multpl.com/s-p-500-price-to-earnings/table/by-year (21.08.2020).

It can be seen that Shiller PE varied in a fairly wide range, with a minimum value of 4.78 in December 1920 and a maximum value of 44.19 in December 1999, in the midst of the Internet bubble. The fluctuations of the trailing PE are even bigger, reaching 123.73 as of May 1, 2009. This is not due to high stock prices, as at that time they were almost at the bottom. The reason is too low profits in the midst of the crisis. Table 1 also shows that the average values of the Shiller PE ratios of the S&P 500 index for the period 1881-2020 differ very little from the trailing PE ratios. The arithmetic mean for the former is 16.73, and for the latter – 15.81. The medians are 15.79 and 14.83, respectively.

Against the background of these historical averages, the current levels of market PE ratios (as of August 21, 2020) of **31.26** (for CAPE) and **29.20** (for trailing PE) seem to be very high. Shiller PE ratio is by **86.85%** higher than the arithmetic mean. The trailing PE ratio is respectively by **84.69%** higher than the arithmetic mean. Since the historical average values of the ratios for a long period of time are considered normal, it is logical to conclude that the current higher PEs are most likely an indicator of unreasonably high stock prices.

Table 2

Price-Earnings Ratios (Trailing PE) of the S&P 500 for the period 1999-2020

End of Year	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
PE	29.04	27.55	46.17	31.43	22.73	19.99
End of Year	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
PE	18.07	17.36	21.46	70.91	20.70	16.30
End of Year	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*
PE	14.87	17.03	18.15	20.02	22.18	23.59
End of Year	*2017*	*2018*	*2019*	April 1, *2020*	August 21, *2020*	
PE	24.97	19.60	24.88	24.97	29.20	
Mean	25.61		Minimum	13.50	*Sep 2011*	
Median	22.18		Maximum	123.73	*May 2009*	
Difference: current-mean (%)	+14.02					

Source: https://www.multpl.com/s-p-500-pe-ratio/table/by-year, (21.08.2020).

One of the arguments in favour of the validity of the current high PE ratios is that the lower average historical values are mainly due to periods quite distant in the past, which are not representative of the conditions of the 21st century. With regard to this, Table 2 presents the current PE ratios only for the last 22 years, from 1999 to August 2020. The aim is to see how they have moved over the last two decades and what the averages are, based on this period alone. This period is supposed to be much more representative of current and future market developments, according to opponents of the use of long historical periods as a base. The arithmetic mean value of PE for this period is 25.61, and the current PE as of August 21, 2020, is 29.20, exceeding this average by 14.02%. On this higher basis, the S&P 500 index in August 2020 again seems overvalued, but with very little. The question remains whether there are enough arguments to accept the significantly higher average of the last two decades of 25.61 as normal.

Table 3

Price-to-Book Ratios (PBV) of the S&P 500 for the Period 1999-2020

End of Year	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
PBV	5.05	4.05	3.39	2.73	3.03	2.92
End of Year	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
PBV	2.76	2.81	2.77	2.00	2.17	2.17
End of Year	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*
PBV	2.05	2.14	2.58	2.83	2.76	2.91
End of Year	*2017*	*2018*	*2019*	March 31, *2020*	August 21, *2020*	
PBV	3.23	2.94	3.53	2.92	3.84	
Mean	2.83		Minimum	1.78	*March 2009*	
Median	2.77		Maximum	5.06	*March 2000*	
Difference: current-mean (%)	+35.69					

Source: http://www.multpl.com/s-p-500-price-to-book/table/by-year (8.07.2020).

Table 3 shows the values of the price-to-book (PBV) ratios of the S&P 500 for the period 1999-2020. It is noteworthy that there is no year that ends with a PBV ratio lower than 2.00. For different years (as of December 31), it varied between 2 at the end of 2008, at the height of the financial crisis, and 5.06 at the end of 1999, during the internet bubble. By quarters the lowest value is from the end of March 2009 – 1.78, and the maximum is from the end of March 2000 – 5.06. The arithmetic mean and median are 2.83 and 2.77, respectively. Logically, the question arises as to what is the source of value-added, which makes it possible for the market price to be almost three times higher than the book value. And the current value as of August 21, 2020, of 3.84 is as much as 35.69% higher than the average for the period. Interestingly, as of March 31, 2020, at the height of the market crash caused by the Covid pandemic, the PBV ratio dropped to 2.92, i.e. still higher than the average value for the entire 20-year period.

It is indisputable that in both studied ratios, the current values are significantly higher than the historical averages. This is especially evident with the PE, if the whole historical period since 1871 is used. Assuming that historical averages are an indicator of the normal level of PE and PBV, this should mean that current stock prices in the S&P 500 are seriously overvalued.

The only counter-argument remains the possibility to assume that the average historical values of the two market ratios are not representative for the current stage. In other words, this would mean agreeing that there is now a "new normality" in this respect, for example, in the context of another "new era" in business. This is an important aspect of further analysis in the current research.

4. Fundamental PE and PBV Ratios of the S&P 500 at This Stage

The fundamental PE and PBV ratios are entirely a function of the already discussed three fundamental variables: earnings potential, earnings growth rate and risk. As it has become clear, the appropriate indicators for these three fundamental variables at the level of equity are:

- Return on equity – ***ROE***;
- Expected EPS growth – $\boldsymbol{g}$;
- Cost of equity – $\boldsymbol{R_E}$.

Fundamental ratios for the S&P 500 index are calculated below, based on the characteristic values of the fundamental variables at this stage. Current fundamental PE is used, which should ensure comparability with current and trailing actual PEs. The specific one-step model used is as follows:

$$PE = \frac{(1+g)\times(1-b)}{R_E-g} = \frac{(1+g)\times(1-g/ROE)}{R_E-g} \quad (3)$$

Where:

PE – fundamental price-earnings ratio,

ROE – return on equity,

g – expected growth rate of earnings per share (EPS growth),

b – plowback (retention) rate,

R_E – cost of equity.

Respectively, the model for determining the fundamental PBV ratio is as follow:

$$PBV = \frac{ROE\times(1+g)\times(1-b)}{R_E-g} = \frac{(ROE-g)\times(1+g)}{R_E-g} \quad (4)$$

Where:

PBV – fundamental price-to-book value ratio

The input variables are the same as in the model for determining the fundamental PE: ROE, g, b, R_E.

Each of the two fundamental ratios is then calculated on the basis of two-step models, the results of which are much more reliable. In order to correctly determine the fundamental PE

and PBV, the appropriate input variables must be derived, that are sufficiently representative of what will happen in the future (Hristozov, 2020). This in itself is more difficult, given the many options and sources for deriving these input variables – ROE, g, b and R_E.

4.1. Selecting the appropriate input variables for the model

Return on equity (ROE)

The return on equity (ROE) is a key variable for the fundamental ratios PE and PBV, not only because of its direct participation in the model. ROE is also often used in forecasting another key variable – EPS growth rate (g).

ROE can be taken from different sources and on different bases, incl. current value, average for the last 5 years, average for the last 10 years, etc. The aim is to choose the ROE that we believe is most representative of the future. The ROE ratio of the S&P 500 for the last full year – 2019, is 15.92%. The average for the last 5 years is 14.61%, for the last 10 years it is 15.35%, since the beginning of this century it is 15.37% (Aleksandrova, 2012). In its models for determining the current market risk premium (ERP), incl. as of September 1, 2020, and to determine the value of the S&P 500 index, Damodaran used a trailing ROE of the index for the last four quarters of 16.29% (Damodaran, 2020). The good thing, in this case, is that ROE does not vary significantly in different sources and for different sub-periods within the current century. For example, if we choose the current one as more representative, we will bet an ROE of about 16%. If we choose a more representative average for the last few years (5, 10, 20), we will focus on a coefficient of about 15%, or the difference is insignificant. For the needs of this model, for the fundamental PE and PBV an **ROE** of **15.50%** will be used.

Expected growth rate (g)

The expected EPS growth rate (g) can be determined in several ways (Nenkov, 2015):

- as historic growth rate;
- as internal (fundamental) growth rate;
- by using the forecasts of security market analysts;
- by using the sector average or the market average growth rate (when a forecast about (g) for a specific stock has to be made).

The specific way in each case depends on the available data, as well as on whether a *temporary growth rate* (for the next few years) or the so-called *stable growth rate* is being forecasted for an indefinitely long period in the future.

The growth rate of earnings per share (EPS) of the S&P 500 varies significantly across periods, unlike ROE, as discussed above. Combined with the fact that there are a number of ways to determine (g), it makes it difficult to decide which is the most representative growth

rate. For example, the historical growth rate of earnings per share of the index, calculated as a geometric mean, from point to point, is as follows: [6]

Period	**S&P 500 EPS Growth**
1871-2019	1.94%
1979-2019	2.61%
1989-2019	3.72%
1999-2019	3.25%
2006-2019	2.30%
2010-2019	4.90%
2015-2019	10.36%

It can be seen that the historical growth rate of EPS of the S&P 500 index seems quite uneven and very dependent on the specific selected period. One important reason, in this case, is the way of calculating the average – it is a *geometric average*, from point to point. In principle, it is an adequate measure of actual growth for a given period, but it is very sensitive to the indicators for the first and last year. If the first year of the selected period has an atypically low EPS, then the average will be skewed upwards. This is the case with the period 2015-2019. If the last year has an atypically low EPS, the average will be skewed downwards. One way is to use some smoothing, by calculating the geometric mean, but "from average to average". And an even better option is to use least squares regression - the average thus obtained should generally be the most representative of the actual historical growth rate. In addition to these weaknesses, the historical growth rate has another – it is that the historical growth rate is often not indicative of what the future rate will be.

This is one of the main reasons for using quite intensively the so-called *internal growth rate*, in which (g) is defined as a function of the current earnings potential of the company and the plowback (retention) ratio of profit:

$$g = ROE \times b \tag{5}$$

Where:

g – the forecasted EPS growth rate,

ROE – return on equity,

b – plowback (retention) ratio.

The main advantage of the internal growth rate is that it takes into account the actual potential of the company to generate a specific growth rate at this stage. This means that the following are taken into account: the rate of return on invested equity and the company's policy for reinvestment of profits, in the pursuit of EPS growth. In this sense, this way of predicting (g)

[6] Data source: https://www.multpl.com/s-p-500-earnings.

can be considered firmly grounded. This approach is particularly suitable for forecasting growth for the next few years, or the so-called *temporary growth rate*.

It is very clear from the model that this way of predicting growth rate (g) is very sensitive to the correct selection of ROE and retention ratio (b). For the present analysis, it can definitely be said that there is no serious case with ROE – we have already decided that it is correct to use ROE = 15.5%.

The plowback ratio (b), is a direct function of the payout ratio, which is (1-b). Regarding the historical payout ratio of the S&P 500, the data show that in the past it was much higher, but decreased in the last one or two decades. For the whole period 1871-2019, the average payout ratio is 61%. From 1871 to 1960, it was 68.86%, and from 1961 to 2019, it dropped to 49.02%. From 2010 to 2019, it was 39.47%, and from 2015 to 2019, it was 45.07%.[7]

Does this mean that there is a steady downward trend in the payout to shareholders by the 500 companies in the index? On dividends – yes, but on cash flows to shareholders - no. It is very important to take into account the widespread share repurchase (or stock buybacks) policy since the 1990s. These could be considered as a kind of "hidden dividends", "extraordinary dividends", "special dividends", paid to shareholders in addition to regular, traditional dividends. For this reason, the classic payout ratio is, in many cases, quite misleading. This is exactly the situation with the S&P 500, because the policy of repurchase of shares has been intensively applied by the companies in the index for the last 2-3 decades. In this regard, in his models A. Damodaran deals with an extended payout ratio, which is determined by adding to the dividend the cash flow from share repurchases and the amount divided by the net profit, or:

$$Payout\ (1-b)_{modified} = \frac{Dividends+Buybacks}{Earnings} \quad (6)$$

This could be called a *modified payout ratio*. This seriously changes the picture in terms of the actual part of the profit that has been directed to the shareholders during this period. It turns out that the share of profits paid out during this period is much higher than the traditional payout ratio shows. Respectively, the share of the profit that remains for reinvestment during this period is much smaller. Thus, this modified payout ratio, according to the data used by Damodaran, for 2019 is as much as 93.08%. For the last 10 years it is 87.96%, and for the last 5 years – 97.85%.[8] These high values of almost 100% should not be a surprise, given that since the beginning of this century, cash flows to shareholders through share repurchases in most years have exceeded cash flows in the form of dividends. Thus, the average annual dividend yield for shareholders in the companies of the S&P 500 for the period 2001-2019 is 1.94%, and their average annual yield from stock buybacks is 2.77%.[9]

Based on the above data, a high payout ratio to the shareholders of the S&P 500 companies of the order of 90% is not far from reality. This would mean a profit retention ratio (b) of

[7] Data source: https://www.multpl.com/s-p-500-earnings.
[8] Data source: http://pages.stern.nyu.edu/~adamodar/, 6.09.2020.
[9] Data source: http://pages.stern.nyu.edu/~adamodar/, 6.09.2020.

about 10%. Thus, with an expected ROE of 15.5% and a retention rate (b) of 10%, the expected internal (fundamental) growth rate for the next 4-5 years should be:

$$g = ROE \times b = 0.155 \times 0.1 = 0.0155 = 1.55\%$$

A very modest and conservative growth rate is obtained, which is due to the extremely low projected profit retention ratio. This could be adjusted in view of the current situation, which requires additional investment by companies to restructure and adapt to the new conditions. Thus, repurchases are likely to shrink sharply, and dividends will be negatively affected for many companies. On the other hand, it should not be forgotten that one major reason for buybacks by companies is the lack of good opportunities for new successful investments in the real economy. In this respect, the economic environment is unlikely to improve in the next few years. Things are not limited to the desire and intentions to invest in real assets, but also to the availability of favourable opportunities for this.

When forecasting the growth rate of EPS during the period of the so-called stable (sustainable) growth, a recommended and reliable way is by forecasting the nominal growth of the economy as a whole in the long run. In this approach, the future growth rate (in the more distant future), for a long period of time (ideally – until infinity), is determined by adding the projected inflation rate and the projected growth (real growth) of gross domestic product (GDP).

In the longer term. Forecasts for this approach should, as a rule, be more conservative, given the long (unlimited) period in the future. One commonly used benchmark for long-term growth is the *current yield* of long-term treasury bonds (Damodaran, 2020). This same indicator is often used as a risk-free rate for the needs of CAPM (capital asset pricing model) and will be commented on later in the analysis (*This is the approach used for the purposes of this analysis.*)

Short, medium and long-term forecasts of specialized investment and consulting firms can also be used. It is useful to check these forecasts to what extent they are supported by the growth rates that are projected through the alternative ways presented above to determine the growth of EPS. Commonly used forecasts are those of Thomson Reuters, Factsheet, Yardeni, S&P Capital IQ and others. The latest forecasts for the growth rate of EPS of the S&P 500 index since July 2020 take into account the effects of the current Covid 19 pandemic. Various sources predict between 20% and 26% decline for 2021 and subsequent recovery within 2021 and 2022. The average cumulative growth rate (geometric average) by the end of 2024 varies from 3.28% at Yardeni (Top-Down Estimates), 4.7% for Thomson Reuters (Bottom-Up Estimates), 4.7% for Analyst Consensus (Bottom-Up Estimates), to 4.89% for S&P Capital IQ (Bottom Up Estimates).[10] The average value of the four forecasts is 4.39%.

In this analysis, we use the average annual growth rate of EPS in three variants, corresponding to the three variants of the cost of equity. These three options are based on the yield of risk-free long-term securities – long-term US Treasury bonds, as follows:

[10] Data source: http://pages.stern.nyu.edu/~adamodar/, 6.09.2020.

- growth rate (g) based on the ***historic yield*** of 10-year US treasury bonds, calculated as **arithmetic average**;
- growth rate (g) based on the ***historic yield*** of 10-year US treasury bonds, calculated as **geometric average**;
- growth rate (g) based on the ***current yield*** of 10-year US treasury bonds.

At the time of the study, the current yield of 10-year US treasury bonds is at a record low level – only 0.72%, mainly as a result of the Federal Reserve's policy of close to zero interest rates. The geometric mean for the longest period (1928-2019) is 4.88%, and the arithmetic mean is 5.15%, respectively. Reasons to use exactly these rates, equal to the corresponding risk-free rate, become clear in the context of the logic of determining the price of equity.

Cost of equity (R_E)

Usually, the most complicated is the case with the third fundamental variable – the risk expressed in this case by *the cost of equity*, i.e. *the required rate of return on common stocks* (R_E). This is probably the most controversial input parameter for the model for calculating the fundamental ratios. Table 4 shows the determination of the cost of equity on the market portfolio of common stocks in the United States by 2020. The capital assets pricing model (CAPM) is used. The beta coefficient is equal to 1, because the object of analysis is the market portfolio as a whole. The risk-free rate is represented by the yield on 10-year US treasury bonds, and the market risk premium is the difference between the yield on the market portfolio of ordinary shares and the yield on 10-year treasury bonds. In this case, the problem stems from the existence of various possible options for determining the risk-free rate of return and market risk premium (Aleksandrova, 2012). The first choice is between the *historical average* and the *current (implied)* value of each. There are pros and cons to using either. If a historical average is chosen, another subsequent choice is required – between *arithmetic average* and *geometric average*. And here are the pros and cons of each.

Thus, in the end, the CAPM model leads to different costs of capital at the same time. The question is which is the most correct, the most appropriate to be used (Hristozov, 2020). It is not the task of the present study to go into the depth of this discussion. We will simply use three different variants of these input variables in the application of the model and then calculate three different fundamental PE and PBV, corresponding to the different variants.

The historical averages for the risk-free rate and the risk premium are based on the longest available period: from 1928 to the end of 2019. The current risk-free rate and the current risk premium are as of September 1, 2020. Academic researchers usually favour historical averages, and managers and analysts in practice almost necessarily adhere to current values. The latter guarantee results closer to the prevailing market view.

Table 4

Risk-free rate, market risk premium and cost of equity (R_E) in the USA for 2020

Indicator	Risk-free rate (%)	Beta coefficient	Market risk premium (ERP) (%)	Cost of equity (%)
Historic – arithmetic average	5.15	1	6.43	11.57
Historic – geometric average	4.88	1	4.83	9.71
Current (implied) – 1 Sep, 2020	0.72	1	4.62	5.34

Source: http://pages.stern.nyu.edu/~adamodar/.

The highest value is for the cost of equity, calculated as historical arithmetic mean – 11.57%, and the lowest – 5.34%, is the cost of equity calculated on the basis of the current risk-free rate and current risk premium. In the middle is the cost of equity-based on historical geometric average – 9.71%. The current cost of equity of 5.34% is at its historic lowest values. The reason was already commented above – it is that "the market plays on the music of the Fed". This also shows the low actual expected and required rate of return by investors in common stock at the present stage and is definitely the decisive factor for the high levels of indices, and for the high levels of market ratios. The atypically low current cost of equity lies in the current risk-free rate of return of **0.72%** (almost zero), as compared to a historical arithmetic mean of 5.15% and a historical geometric mean of 4.88%.

A very important finding in this regard is made by Daniel White, Senior Research and Strategy Manager at Canada Life Investments in London. It is that for many investment professionals, there has never been a world in which interest rates have done anything but go down. He shares: "I started in 1994. Throughout my career, interest rates have been falling. It was a one-way trade to buy growth-oriented stocks" (Infostock, 2020).

The leading reason for this abnormally low risk-free rate of return is the artificially maintained by the Fed low, close to zero, interest rate. At this stage, this is dictated by the need to support an economy that has been hit hard by the Covid crisis. In reality, however, the artificial maintenance of unnaturally low-interest rates and so-called quantitative easing by central banks has been valid for the whole decade since the global financial crisis. It's just that this policy has been further strengthened in the current pandemic crisis. According to Michael Harnett, chief investment strategist at the Bank of America's research unit, "stock prices are rising not because of optimism about the economy, but in fact, because the future looks relatively bleak." (Sokolova, 2020). This leads to the biggest paradox in the current stock market. It turns out that the worse the economy, the better for stock market growth.

On top of that, apart from the very low risk-free rate, the current market risk premium at the moment of 4.62%, is also slightly lower than both historical averages, despite the difficult situation for the economy. In such periods of low-interest rates, as well as in periods of higher uncertainty, the current risk premium rises well above average, as it did at the start of the Covid 19 pandemic. However, with the current stock market frenzy, it has fallen again from 6.02% (or 5.76% excluding the effects of the pandemic) as of April 1, 2020, to just 4.62% (as of September 1 2020).[11]

[11] Data source: http://pages.stern.nyu.edu/~adamodar/ (1.09.2020).

5. Fundamental PE и PBV Ratios for the S&P 500

The input variables for applying the one-stage models of fundamental PE and PBV have been selected in the previous section, and are as follows:

- Return on equity (**ROE**) – **15.50%**;
- EPS growth rate **(g) – three variants: 5.15%, 4.88%** and **0.72%**, corresponding to the three variants of the cost of equity;
- Cost of equity **(R_E) – three variants**:
  - Historic arithmetic average – **11.57%**;
  - Historic geometric average – **9.71%**;
  - Current (implied) – **5.34%**.

The fundamental PE and PBV, calculated on the basis of the one-stage model, are not precise enough. This model reproduces the shortcomings and limitations of the Gordon dividend model from which it is derived. However, the fundamental PE and PBVs thus obtained give some initial idea of what the correct average values of the actual PE and PBV should be. On the other hand, these shortcomings of the one-stage model can also be useful, while illustrating some of the typical gaps that are made in the valuation of stocks and thus provoke analysts to look for ways to avoid them.

In this case, the PE and PBV ratios are calculated in three variants corresponding to the three variants of cost of equity and are presented in Table 5. The growth rates in each of the three variants correspond to the three different risk-free rates, used to determine the cost of equity. At a cost of equity of 11.57%, the fundamental PE is 10.94. At a cost of equity of 9.71% it is 14.88 and at a cost of equity of 5.34% it is 20.79. The values for the fundamental PBV are respectively: 1.70 at a cost of equity of 11.57%, 2.31 at a cost of equity of 9.71%, and 3.22 at a cost of equity of 5.34%. In general, the one-step model is characterized by the strong sensitivity of the calculated fundamental ratios to the different combinations of input variables. This is best seen at combinations of low cost of equity with more optimistic growth rate forecasts, leading to abnormally high or negative ratios. However, in this particular analysis, the sensitivity of the model is not so impressive due to the logically selected growth rates, corresponding to the cost of equity forecasts. Thus, in this case we do not come to negative values in the denominator of the model, and hence to the calculation of negative ratios that have no economic meaning.

Table 5

Fundamental PE and PBV ratios for the USA for 2020 (one-stage model)

Indicator	R_E (RRR_E)	(1-b)	ROE	g	PE	PBV
Variant 1	**11.57%**		15.50%	5.15%	**10.94**	**1.70**
Variant 2	**9.71%**		15.50%	4.88%	**14.88**	**2.31**
Variant 3	**5.34%**		15.50%	0.72%	**20.79**	**3.22**

Source: Calculations of the author.

The calculated fundamental ratios based on the two-stage model are also in three variants, corresponding to the three variants of cost of equity. They are presented in Table 6. In this model, the future is divided into two sub-periods – temporary growth period and stable growth period. For the period of stable growth, which is more distant in the future, it is recommended to use more conservative input variables, closer to the average values. This applies to each of the three input variables.

For the application of the two-stage model, additional input parameters are used. The input variables are as follows:

- Duration of the initial period of temporary growth: n = 5 years;
- Return on equity during the initial period of temporary growth: ROE_1 = 15.50%;
- EPS growth rate during the initial period of temporary growth: (g_1) – in three variants: 5.15%, 4.88% and 0.72%;
- Cost of equity during the initial period of temporary growth: (R_{E1}) – in three variants: 11.57%, 9.71% и 5.34%;
- Return on equity during the period of stable growth: ROE_2 = 15.50%;
- EPS growth rate during the period of stable growth: (g_2) = 4.88%;
- Cost of equity during the period of stable growth: (R_{E2}) = 9.71%.

At a cost of equity for the first sub-period of 11.57%, the calculated fundamental PE amounts to 13.87, at a cost of equity of 9.71% it is 14.88, and at a cost of equity of 5.34% it is 17.20. The values for the fundamental PBV are respectively: 2.15 at a cost of equity of 11.57%, 2.31 at a cost of equity of 9.71%, and 2.67 at a cost of equity of 5.34%. Here the opposite of the one-stage model is observed in terms of sensitivity - the obtained ratios vary within a very small range and are always with values that make economic sense. This is due to the fact that for the period of stable growth (after the fifth year) the forecasted values for the cost of equity (R_E) and the return on equity (ROE) are closer to the average. Such forecasts are justified because, in the long run, the average cost of equity and the actual average return on equity (ROE) are expected to converge.

Table 6

Fundamental PE and PBV ratios for the USA for 2020 (two-stage model)

Indicator	RRR_{E1}	$(1\text{-}b)_1$	ROE_1	g_1	PE	PBV
Variant 1	**11.57%**		15.50%	5.15%	**13.87**	**2.15**
Variant 2	**9.71%**		15.50%	4.88%	**14.88**	**2.31**
Variant 3	**5.34%**		15.50%	0.72%	**17.20**	**2.67**
	***RRR*$_{E2}$**	**(1-*b*)$_2$**	***ROE*$_2$**	***g*$_2$**		
	9.71%		15.50%	4.88%		

Source: Calculations of the author.

What has been discussed above makes the question of the validity of the cost of equity that has been used particularly important. The current implied cost of equity of 5.34% can be considered unreasonably low, mainly due to the low current risk-free rate of 0.72%. The

historical geometric average of 9.71%, which is somewhere in the middle between the three calculated cost of equity, should be considered as the most justified. Hence the conclusion that the most reasonable are the fundamental ratios with average values, those of Variant 2 in the last table - respectively PE = **14.88** and PBV = **2.31**.

6. Actual PE and PBV of the S&P 500 at the Background of the Fundamental PE And PBV of the Index

The following Table 7 compares the obtained fundamental PE and PBV ratios with the actual average historical PE and PBV ratios of the S&P 500 for the period 1999-2020. Table 7 does not use the average fundamental ratios under Variant 2, which were outlined as the most logical and reasonable (according to the author's opinion). These are respectively PE of 14.88 and PBV of 2.31. Instead, a compromise is made and the highest fundamental ratios obtained are taken. They are the result of using the low current cost of equity and amount to: PE = 17.20 and PBV = 2.67. The idea is to take into account the prevailing now market view on the expected return on investments in common stock. The table shows that the actual PE and PBV of the S&P 500 for the period 1999-2020 are higher than the relatively optimistic fundamental PE of 17.20 and PBV of 2.67. The actual PE is by 32.84% higher than the fundamental PE and the actual PBV is by 5.65% higher than the fundamental PBV.

Table 7

Actual average Vs. fundamental PE and PBV for S&P 500 for the period 1999-2020

Market Ratio	Actual Average 1999-2020 Arithmetic mean	Fundamental Two-stage model	Difference (k.2-k.3)	Difference (%)
k.1	k.2	k.3	k.4	k.5
PE	25.61	17.20	8.41	32.84%
PBV	2.83	2.67	0.16	5.65%

Source: Calculations of the author.

Table 8 shows that the excess of the current actual PE and PBV ratios as of August 21, 2020 compared to the fundamental PE and PBV, as obtained under the two-stage model, is even greater. Thus, the actual current PE is as much as 41.1% higher than the optimistic fundamental PE, and the current PBV is as much as 30.47% higher than the optimistic fundamental PBV.

Table 8

Actual current Vs. fundamental PE and PBV for S&P 500 as of 21 Aug, 2020

Market Ratio	Current Actual – August 21, 2020	Fundamental Two-stage model	Difference (k.2-k.3)	Difference (%)
k.1	**k.2**	**k.3**	**k.4**	**k.5**
PE	29.20	17.20	12.00	**41.10%**
PBV	3.84	2.67	1.17	**30.47%**

Source: Calculations of the author.

7. Conclusion

In the present study, the current levels of the S&P 500 index have been analyzed using the market ratios PE and PBV. For this purpose, the current actual ratios were compared: 1/ with their average historical values and 2/ with the respective fundamental ratios PE and PBV. The latter have been calculated for this purpose, based on projected values for *ROE*, *g* and cost of equity (R_E).

Thus, in the end, the answer to the question *"Is there a new bubble in the US stock market?"*, is rather *"YES"*, given the tangible excess of current market ratios over their historical averages and even more – over fundamental ratios. Even if the higher average actual PE and PBV ratios of the last two decades and the more optimistic fundamental ratios (at a low current cost of equity) are taken, it still could be concluded that:

- There are strong arguments suggesting the presence of a bubble when comparing current PE and PBV with their long-term historical averages.
- Even more serious are the arguments for the existence of a bubble when comparing the current actual PE and PBV and the average actual PE and PBV from the beginning of this century until now, on the one hand, with the fundamental PE and PBV ratios, on the other hand.

The main factor for this situation is the unusually low cost of equity, mainly due to the Fed's policy of low-interest rates and quantitative easing, which has lasted for a decade, but has been exacerbated by the Covid crisis.

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