RELATIONSHIP BETWEEN PRICE AND EARNINGS THROUGH DIVIDEND YIELD AND REQUIRED YIELD ABOVE THE EXPECTED INFLATION

Prof dr Seadin Xhaferi
SUT Faculty of Economics
Tetovë, Macedonia

Prof dr Astrit Mehmeti
DeVry University
Chicago, USA

Mr.sci. Fekri Iseni
College Pjetër Budi
Prishtinë, Kosovo

SUMMARY
The ratio of prices and wages is the most popular and most widely used evaluation model to assess the relative value of capital assets in the financial markets. Empirically, the long-term statistics shows that required return on the capital markets has a regular pattern. Thus, investors first require a return above the stable inflation rate, and then the dividend yield and capital growth because of an increase in earnings that have impact on price under the assumption that the P / E ratio is stable.

Keywords: expected inflation, stable inflation, dividend yield, growth earnings

1. INTRODUCTION

With the data provided from a detailed empirical analysis of very long historical series of developed equity markets it is possible to determine the average required rate of return on the equity market niche. For the purposes of this paper, and available statistics, we analyzed the United States securities market and yields of the S&P 500 companies. Key variable that can be isolated in monitoring required rate of return in the stock market is *inflation*, i.e. requires anticipation which can be quantified with the adaptable anticipations model – anticipated inflation. The statistical data for the S&P 500 show that investors seek long-term returns which can be quantified as current dividend plus anticipated increase of revenues and attained rate of inflation over the stable inflation rate during which stable inflation is determined through surveys. With a fixed dividend and inflation expectations, it is possible to derive an approximation of the true rate of inflation because of prior relationship between the market price and profits, in addition to expected inflation rate and the dividend yield also acquires the unanticipated rate of inflation growth. The paper addresses the model of price and earnings ratio for the observed market index through actual returns from dividends, plus increased revenues and realized inflation over the sustainable inflation rate which shows the high importance of average indicators of price and earnings, based on historical data, which can be used in forecasting expected future geometric rate of inflation over a period of seven years.

2. PROFITS IN THE LONG RUN DEPICTED BY EXPONENTIAL FUNCTION

The ratio between price and income is the most popular indicator of equity market capitalization. Price survey in the number of annual profit after tax, depreciation and amortization relative to historical averages can be used in a comparative assessment of its level at the time of investment decision. Monitoring price and income for the stock market, as measured by the index of the selected market, becomes thus an essential tool in assessing the expected return related to long-term investment decisions. An expensive market i.e. overvalued market characterized by price

and earnings ratio higher than the long-term average, has an implicit return lower than the historical average and analogously – while an undervalued market is characterized by price / earnings ratios lower than the long-term average and implicit yields are higher than the long-term average [5]. But the stock market may impose long-term overvaluation or undervaluation, so a rational investment decision requires a long-term horizon. This forecast model is based on the assessment made as essential analytical tool in investment decision-making based on a series of statistically significant historical data.

Due to a short period of operation of the equity market in the Republic of Macedonia, we have handled the model of management and expected market values in the case of the U.S. stock market described by the S&P 500 index and the announced profits of companies that are part of it. In order to reduce the short-term effects of announced profits from companies that are part of the index over the relationship between price and earnings at the time of observation, the ratio of observed and index values, and the simple average of observed period earnings [9]. Thus, to some extent, cancelling the cyclical effects of short-period economic activities, where may come to exaggeration or non-attainment of announced profits as a result of the current economic environment.

On an average seven-year period, are included periods of fast and negative economic activity, as measured by GDP growth, respectively decline, and therefore such price / earnings ratio provides a clear image of the relative market price at the observed time. For purpose of model development and testing, data were obtained for the period since 1900 until 2012. The monthly data are for 112 years in the period analyzed, while the date is presented in the form of fractions. Monthly data are obtained by interpolation between the two quarters of the financial statements and for the initial period, the monthly data are published the previous year or interim financial statements. From the expressed series of data by putting the ratio between the index value at the end of the month and the average of the seven-year profits obtained a price value and profit for the period observed. Described series of the announced results by the exponential function has a high significance:

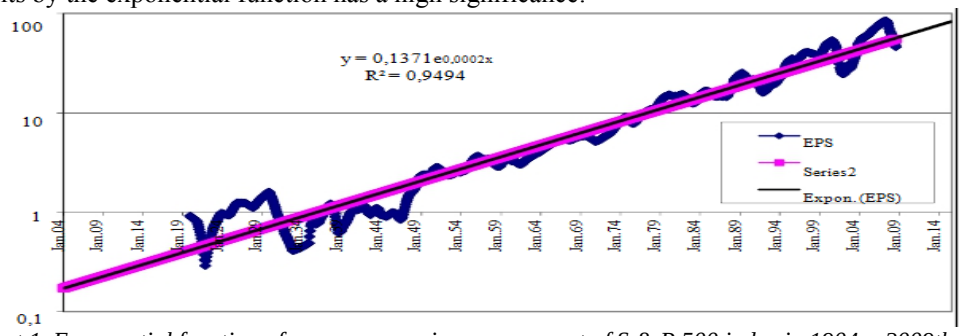

Chart 1. Exponential function of company earnings component of S & P 500 index in 1904. - 2009th, projections to 2014

Source:http://www.econ.yale.edu/~shiller/data.htm

As can be seen from the chart, the revenue function of the data series is displayed as the ratio between the index value at the end of the month and the average of the seven-year income; provide value price ratio and earnings for the period observed. Series depicted by the exponential function for the announced income is highly significant: As can be seen from the chart, the revenue function $\exp_{EPS} = 0{,}1371e^{0{,}0002x}$ where R^2 is a function with high percentage 94.94%, and has high importance because about 95% of the results provided can be explained on the basis of the given function.

3. THE THEORETICAL MODEL OF THE AVERAGE PRICE EARNINGS RATIO ON THE INFLATION FUNCTION WITH STABLE INFLATION, DIVIDEND RETURNS AND INCREASED FREE CASH FLOW

The Gordon model of the present value of the expected dividend price of equity securities can be described as current value of dividends:

$$P_0 = \frac{D_0(1+g)}{k_g - g} = \frac{D_1}{k_g - g},\ P_t = \frac{D_0(1+g)^{t+1}}{k_g - g}$$

where: P – price
D – dividends
k_g – the cost of equity
g – infinite growth rate,

During which the assessment is reduced to the evaluation of expected dividends for the following year; the growth rate of dividends from the historical average, based on historical data on the rate of payment of dividends and profit retention rate; and the estimated required return, i.e. discount rate. If Gordon model fits well to determine the price of equity, as sum of the present value of future cash flows, follows the function [1]:

$$P = \frac{FCF*(1+g)}{k_g - g},$$

where: P - price
FCF - Free Cash Flow
k_g - cost of equity
g - long-term free cash flow growth rate

This function can be further developed by looking at earnings in year t+1 as a result of earnings year t_0 and the growth rate of total free cash flow, which refers to a portion of the cash flows that are not paid, i.e. profits, by introducing a retained value c:

$$P = \frac{E*(1+g)}{k_g - g} + c, \qquad \frac{P}{E*(1+g)} = \frac{1}{k_g - g} + c,$$

where: p – price
E – income for the period t_0
c – the retained value is derived from the difference between free cash flow and earnings
hp – required return
g – long-term profit growth rate

So it remains variable c to be defined. It's proven that its size does not significantly affect the model. Even with its complete exclusion from the model, the relationship between modelled price and income describes with a high significance the flow of average P/E ratio. In the modelled P/E ratio, is applied the variable c defined as inverse monthly rate of revenue growth [8]. Therefore, from the given ratio, turns out that the so-called advanced P/E ratio, actually the ratio between price and profit, taking into account the estimated future income for 12 months are equal to the inverse deduction of required rate of return increase and the growth rate of the retained factor c.

The ratio between price and seven-year average earnings of the index constituent companies can be seen through the relationship between price and profit [7]. The ratio of current price to the announced earnings in the last four quarters may be expressed through the ratio of the current prices and profits. By modelling the movement of price and profit we conclude like in the following function with significant correlation, but with a delay of three years that describes the average ratio between price and profits:

$$f(cpi, dy, g, n) = \frac{\left|\sum_{i=1}^{n} cpi_i\right| + \sum_{i=1}^{n} dy_i + \sum_{i=1}^{n} g_i}{n} - 1{,}5\%,$$

where: f – inverse model P/E

n – a period of 84 months - seven years

cpi – the annual rate of inflation, observed at monthly intervals

dy – dividend yield annually, monitored monthly intervals

g – the monthly rate of earnings growth

The logic behind this function is as follows, equity market, namely the average P/E ratio moves inversely to price stability, and shows the characteristics of the function Y [11]. So, as far away the level of inflation is from stable prices, the average P/E ratio is lower, respectively, the closer the level of inflation is to the stable level, the average P/E ratio is higher. While the function is so simply set, it mainly includes non-scientific trends and is shown in insufficient detail in periods of fluctuations of other variables such as dividend yields and average rate of income growth. In a further development of the function, the problem of determining the required yield or discount rate in the definition of this term can be used statistics of return on the equity market [8]. Namely the long-term statistics seem that investors first seek a return above the rate of inflation and then the dividend yield and increase productivity of equity caused by increased revenue that affect the price, provided that the P/E ratio is stable[2]. For example, the S&P 500 in the last 100 years has actually increased above the inflation rate increase, to steady growth rate in earnings.

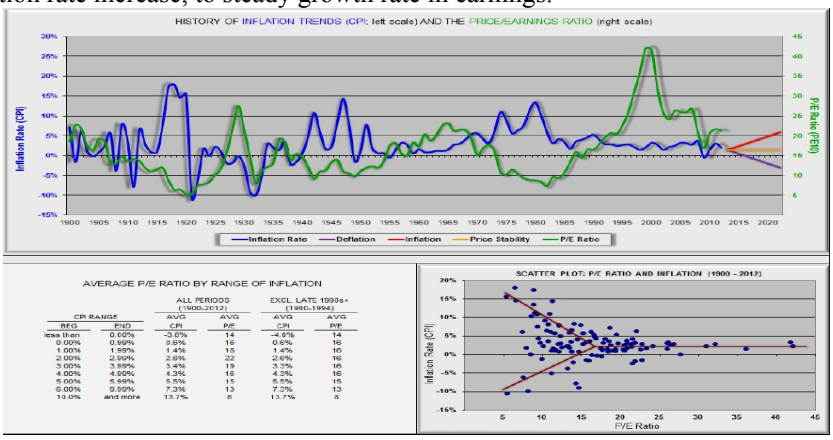

Chart 2. Relationship of inflation&price/earnings ratios (1900-2012)

Source: Crestmont Research (www.CrestmontResearch.com, 05.04.2013)

If we consider that in the observed period investors have also gained dividend yield, this can be acquired through the following function of required return:

$$ks = |CPI| - 1{,}5\% + dy + g,$$

where: k_s – required yield

CPI – Annual inflation rate

dy – the dividend yield

g – the growth rate of income

The nominal market index return increased for the return of corresponding dividend yield of higher inflation to 1.5% increased for the revenue and dividend growth, compared to a long-term growth of required return over 1.5% inflation [6].

Observing extremely long-term modelled price / earnings ratios and average price / earnings ratio; is clear that the average ratio of price and earnings is rarely kept in a balanced state in relation to price and earnings model. In contrast, the average ratio of income and price usually hovers around the modelled price and earnings ratio, during which, after attaining equilibrium in an average ratio usually ends up in changes or displacements as a regular occurrence or a modelled ratio of average price and income. It is important to note that significant deviations

occur in the absence of monetary policy, until the end of the great depression of 1942, namely the introduction of modern monetary policy of the central bank, thus management of the monetary supply. Since then, the price ratio and the market return get its distinctiveness conditional cyclical deviation from the targeted inflation.
Comparing P/E ratio extracted from the model and the average P/E ratio shows that the movement of the two sets of variables occurs in a very long time with an extremely high correlation:

$$\rho_{\frac{P}{E}\bmod el,\ \rho_{\frac{P}{E}average}} = \frac{\operatorname{cov}(\frac{P}{E}\bmod el, \frac{P}{E}average)}{\rho_{\frac{P}{E}\bmod el,\ \rho_{\frac{P}{E}average}}} = 0{,}9656\ ,$$

In fact that the ratio of parameters P/E i.e. modelled market P/E ratio is "insatiable", because the regression function isolates the changes effects in prices and wages in the market index [3].

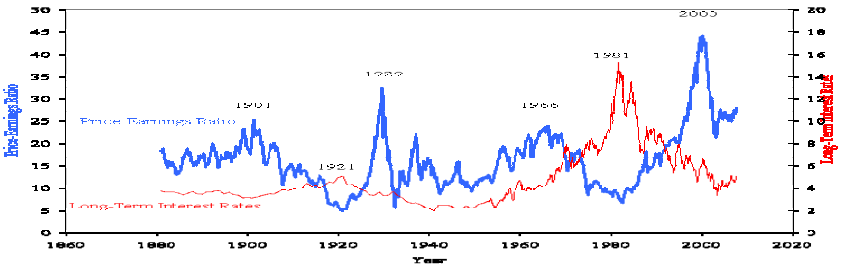

Chart 3. Average fluctuation of modeled P/E ratio model
Source: http://www.econ.yale.edu/~shiller/ie_data.htm; 10.04.2013

This empirically shows that the required return on equity in large measure is determined by the current inflation rate, namely, the trend of overall price level. Thus inflation becomes the core of cycle studying and functional modelling the expected trend of financial price movements, while the model shown by the correlation has great importance and gets empirical confirmation.

4. EXPECTED INFLATION AS A RESULT OF THE MODELED RATIOS BETWEEN PRICE AND PROFIT

This model can be used to perform the projection of financial markets and individual real economic variables expectations, such as inflation. Thus, from the previously showed formulas is extracted possible relation of advanced (forward) P/E ratio and inflation. This way is shown that the model in question is feasible to forecast inflation expectations derived from financial market[4]. The formula for modelling alleged P/E ratio is based on return and stable inflation rate.

Table 1: Target inflation gap of FED

FOMC Target	from	to
19.02.2009	1,70%	2,00%
27.02.2008	1,50%	2,00%
20.11.2007	1,50%	2,00%

Source: Fed minutes, www.federalreserve.org

In the long-term, stable rate of inflation is equal to the expected rate due to the fact that the central bank is trying to target long-term, to keep the public in a particular direction, according to a recent statement of Federal Reserve Chairman: Thus, in a short-term the formula stated earlier can be reformulated so that instead of a stable rate of inflation to be used average expected rate of inflation, according to adaptable and actual seven-year expectations.
The reformulated function follows equally movement of advanced price and earnings ratios (forward P/E ratio) and the modelled core price / earnings ratio. With a given certain dividend

yield and expected inflation, it is possible to derive an approximation of the actual inflation rate for the P/E ratio of the forward market; in addition to expected rate of inflation and the dividend yield rate there is the rate of potential "unexpected" growth of inflation [10]. Finally, based on model results that the actual forward P/E ratio for the U.S. equity market as measured by the S&P 500 index has a gap of 2.43% with an average dividend yield in seven years of 2.44%, the real geometric rate of expected inflation for the next seven-years will be 5.81%.

Table 2: Expected (geometric) rate of inflation extracted from the model

ExpCPI – adaptive exp					**Aprox**
CPI T-7Y AVG	*F PE SPX*	*Dy - ExpCPI + CPI*	*Dy + CPI*	*Dy*	*RealCPI*
2,47%	*17,29002*	5,78%	8,25%	2,44%	5,81%

5. CONCLUSION

By comparing the two series of prices and wages, modeled and the average relationship is noticeable significant correlation between the movement of the two series of variables the deviation from the aforementioned three, so one could think in a way that the current market prices, discounted three years expected the level of inflation, dividendnog yield and growth rate Earnings market indeks.The observed time the relationship between the average adjusted relations price earnings ratios on the market index and the modeled price earnings ratios can clearly indicate the expected dynamics and direction of the relations in the period follows, and so that:

- If the current price-earnings ratio is higher than the average of the price-earnings expected to fall current price earnings ratios, which can be achieved in two ways:
  1. To increase earnings market index over the level provided exponential function, whereby is expected to increase in market prices.
  2. To fall in price of the market index case published earnings are at last year's level or lower.
- If the current price-earnings ratio is lower than average of the price-earnings, is expected to increase current price earnings ratios, which is achieved in two ways:
  1. To earn company index constituents reject less income than they provided in exponential model,
  2. To increase the stock prices of companies constituents market index rates higher than they grew earnings, or if earnings are unchanged, the market prices are rising at a slower but positive rate.

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