Macro-Adjusted P/E : How to Measure the Amplitude of Exuberance

by Q-Hedge Technologies *

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Abstract

The beauty of the *Macro-Adjusted P/E* is to resuscitate the old Benjamin Graham's Price / Earnings (P/E) level. According to him, the price of an equity should not exceed 16 times its earnings. However, this level define the lower limit for expensive equities in an economy which is neutral. Indeed, according to central banks, there is an interest rate curve that is neutral to the economy. *Macro-Adjusted P/E* allows investors to isolate the exuberance factor in equity prices by neutralizing the disturbing effects of macro economical factors. Indeed, P/E left alone is missing to price in the opportunity cost of other securities like bonds. In order to illustrate, the more bonds are yielding the less equities are attractive and the more they are relatively "expensive". Last but not least, P/E does not take into account Gross Domestic Product (GDP) growth. However, when growth is high, it is easier for a company to increase its Earning Per Share (EPS) over the years. As a consequence, for a same multiple, the higher the economic growth, the less "expensive" are equities.

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1   Introduction

When trying to appraise the exuberance of market valuation, Price-earnings ratio (P/E) is one of the reference points in use amongst investors despite major identified flaws. P/E expresses the price of a stock in terms of Earning Per Share (EPS). However P/E does not take into account the other major financial quantities. As an example, it is easier for a company to generate earnings when the economy is strong. Hence, an equity could be valued as 'cheap' in case of a 5% GDP growth rate and very expensive with a rate of 0%. Therefore, one should include the Gross Domestic Product (GDP) growth rate when valuing a company. Nevertheless nothing has been made available to evaluate in a consistent quantitative way the 'cheapness' of equities embracing all the major global macro quantities. Those quantities are thought to be CDS index levels, GDP growth rate, interest rates and EPS. Therefore we propose to adjust the P/E according to global macro economical data.

2   *Macro-Adjusted P/E*

To address those flaws, we suggest a new multiple called *Macro-Adjusted P/E* to better account for global macro market conditions. To be more useful than P/E, this multiple should vary according to the following well accepted considerations :

- Credit Markets (CDS index levels) provide with one of the best information regarding likeliness of corporate bankruptcy. Besides, when bankruptcies are less likely, investors are carrying less risk. Therefore, for a same market valuation, equities are more 'expensive' when CDS index levels are high.

- GDP growth rate explains most of companies earnings' growth. Therefore, for a same market valuation, equities are more 'expensive' when GDP growth rate is low.

- Interest rates curve represents the relative value one investor could obtain from risk-free assets. Therefore, for a same market valuation, equities are more 'expensive' when interest rates are high.

- EPS levels are the main indicators of the 'cheapness' of an equity. Therefore, for a same market valuation, equities are more 'expensive' when EPS are low.

We would expect m, the *Macro-Adjusted P/E*, to act as :

$$m \sim P/E + f(macroeconomics)$$

MQ P/E is defined like the following :

P: S&P500® index level

E: S&P500® Earnings Per Share

P/E: S&P500® Price Earnings Ratio (P/EPS)

n: Number of years in the future

DF_i is the discount factor with r_t being the instantaneous forward risk free interest rate. $DF_i^* = e^{-\int_0^i r_s^* ds}$ is the Risky Discount Factor. The Risky Discount Factor is calculated with r_s^*, built from a yield curve including credit risk derived from Markit® CDX® NA IG (on the run series). [1]

g_i: instantaneous forward GDP growth rate for the i-th year. And G_i, the annualized GDP growth rate between now and the i-th years.

with ξ, the instantaneous forward Exuberance factor and with m the *Macro-Adjusted P/E*.

In the theory of *Present Value*, all prices are a sum of discounted cash flows. The cash flows always come from company earnings, in other words from EPS. Year after year, EPS are accruing at a rate which is usually define as the multiple. Here we state that this rate is composed of both the broad GDP growth rate, g_i, and the exuberance factor : ξ. Therefore, we can state that the price is define as :

$$P = E \sum_{t=1}^{n} e^{\int_0^t (g_s - r_s + \xi) ds}$$

Hence, we deduce a new formulation of the P/E that matches our quantities :

$$P/E = \sum_{t=1}^{n} e^{\int_0^t (g_s - r_s + \xi) ds}$$

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[1]There is no need to extract the default probability, P^{def} from CDS levels and to define the Discount Factors by :

$$DF_t^* = (1 - R)DF_t(1 - P^{def}(\tau > t)) + DF_T P^{def}(\tau > t)$$

with λ, the default intensity, and :

$$P^{def}(\tau > t) = e^{-\lambda t}$$

To avoid the hassle of determining R (the recovery rate), it is preferable to bump the yield curve by the credit spread level as it maintains the sense of variation.

One shall approximate as the following :

$$P/E = \sum_{i=1}^{n} \left[1 + i(G_i + \xi)\right] DF_i^*$$

hence :

$$\xi = \frac{P/E - \sum_{i=1}^{n}(1 + iG_i)DF_i^*}{\sum_{i=1}^{n} iDF_i^*}$$

ξ is the multiple in excess of the GDP growth rates and discounted according to the current interest rates yield curve and incorporating a credit risk premia. hence, we can finally calculate the *Macro-Adjusted P/E* as the capitalization of the exuberance factor.

$$m = \sum_{i=1}^{n} \left[1 + i\xi\right]$$

3   *Macro-Adjusted P/E* historical values

Macro-Adjusted P/E evolved according to the following graph :
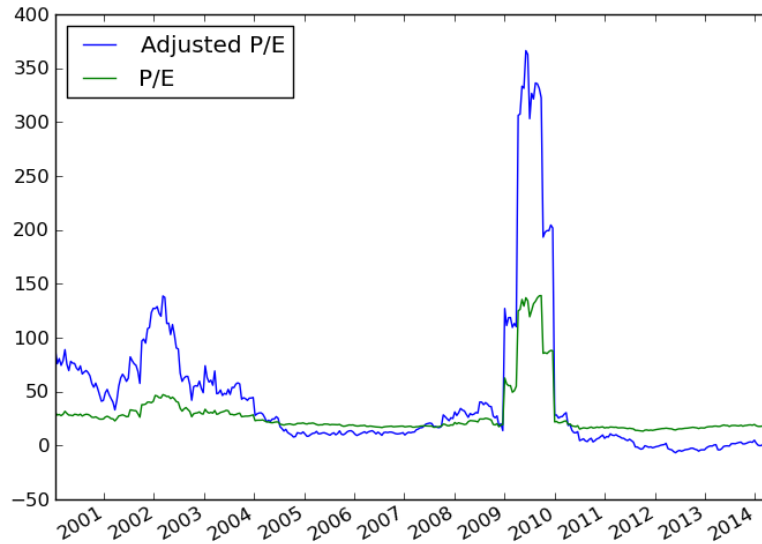

As we might have expected, *Macro-Adjusted P/E* exploded during the sub

primes crisis (2008-2009) due to the massive fall in EPS. Here is the TTM (Trailing Twelve Months) EPS as provided by S&P. The sharp fall at the beginning of 2009 is mostly explained by the negative EPS in the 4th quarter of 2008 due to the AIG and Citi loss and the recession (negative growth rates). We can see that EPS is also very high compared to pre-subprime crisis levels. To have a better look at it, here is the same graph without the 2009 explosion.
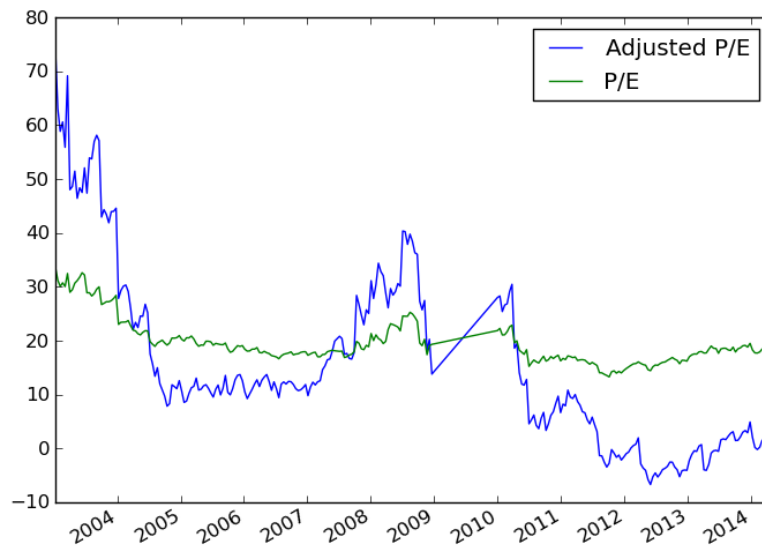

We can see that the *Macro-Adjusted P/E* signals to enter the equity market only when the economy has entered a period of recovery. We notice it both after the internet crisis in 2004 and after the sub primes crisis in 2010. Furthermore, *Macro-Adjusted P/E* warns as soon as mid-2007 that the equity market is too expensive by a clear signal. During the period 1999-2014, *Macro-Adjusted P/E*'s Market-timing is good both to enter the market and to leave it.

From 2010, the relative levels between GDP expected growth and the interest rates curve have been very positive to the economy. During this period, the P/E is totally explained by the GDP growth. Equities have been "cheap" as never before. The exuberance factor even became negative in 2010, announcing the strong rally. An explanation can be found looking at the direct consequences of the QE on the different risk premia. As an example, let's have a look at the history of Investment Grade Index CDS levels.
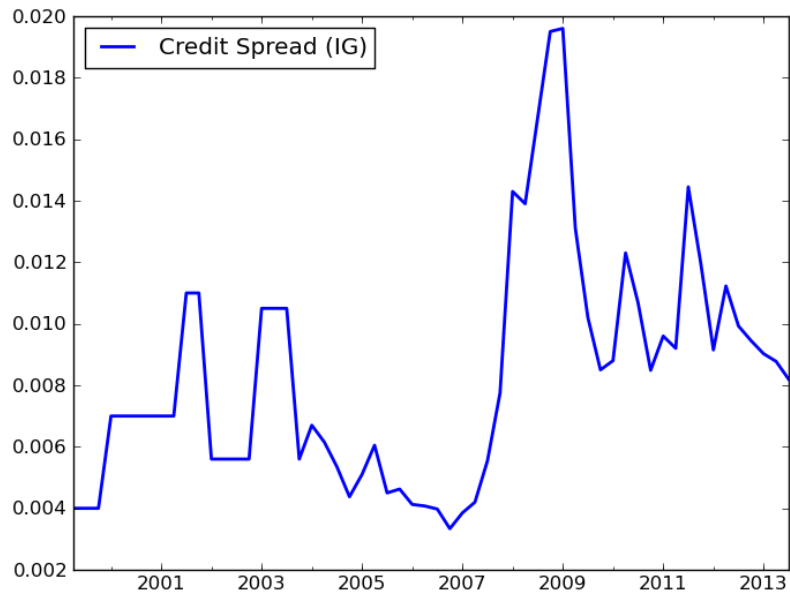
which had the following impact on the sum of the Discount Factors extracted from the yield curve incorporating the credit spread. We can perfectly see how QE has progressively eliminated all kind of risk premia as the risky discount factor tends towards its limit value: 1. At 1 precisely, it would mean there is no risk at all.
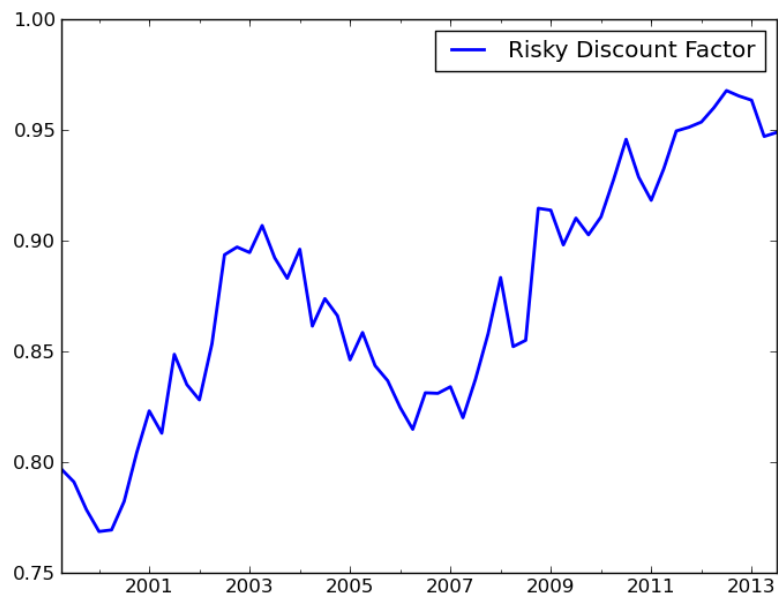

Last but not least, interest rates are a weight on the economy. We can see that there are two regimes. The first one presents negative discounted growth rates and the second, positive on the economy. Therefore we can see here that the increase in american equities since 2009 have been mainly driven by

this positive excess rates. The prices are mainly representing the EPS growth explained by macroeconomic factors, the economic recovery, extremely low interest rates and price of the credit risk.

4 How will the market react after the end of tapering

To get a better understanding of what could be the market reaction, we shall stress *Macro-Adjusted P/E* with those different scenarii, and all the other quantities remaining identical:

- In case of credit risk returning to 2005 levels, equities would even be 'cheaper', as the credit spread was lower.

- In case of GDP growth rate forecasts returning to 2005 levels, equities would even be 'cheaper', as the GDP growth forecasts were higher at that time.

- In case of EPS returning to 2005 levels, meaning decreasing from above USD 100 to USD 71.70 (inflation-adjusted), the *Macro-Adjusted P/E* would literally explode. As a consequence, equities would be 'expensive'. As expected, earnings are one of the key drivers.

- In case of mid-term interest rates increase to 2007 levels, we would be near the level of 16. As a consequence, equities would be about to be 'expensive'.
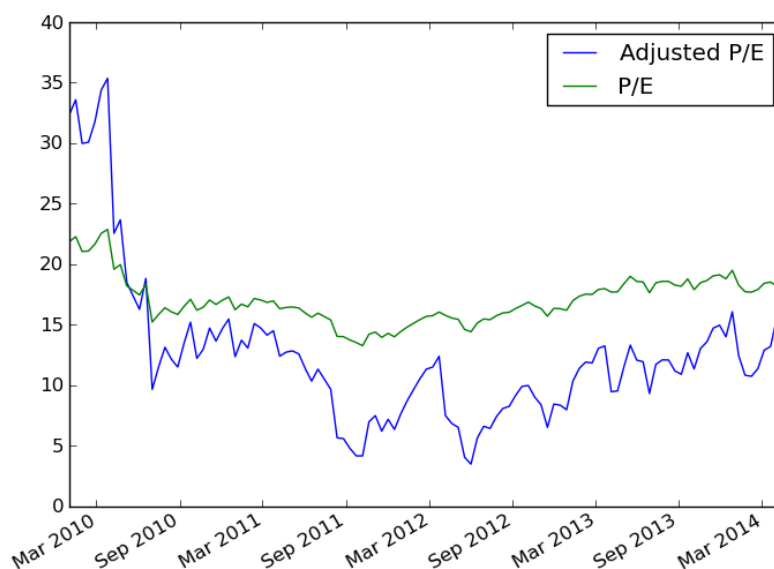
As a conclusion, when the monetary policy was more neutral to the economy, the traditional P/E was sufficient to gauge the expensiveness of the equity market and, as Benjamin Graham stated, a price of 16 times the earnings was the upper bound to buy it. Nevertheless, for more than 30 years, central banks have played a role, each year, more intrusive into the market mechanisms. As a consequence, traditional P/E's market timing has become inaccurate. Instead we suggest to use *Macro-Adjusted P/E*. It neutralizes the macroeconomic effects and exclusively analyse the exuberance of market valuation. *Macro-Adjusted P/E* is better to the traditional P/E as it clearly states when equity market is "cheap" and when it is "expensive" taking into account both the strength of the economy and the level of interest rates.