CAPE & Excess CAPE Yield
as Tools to Compare Financial Markets

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Index

CAPE and ECY of some international stock markets

	CAPE	CAPE (average last 25 years)	Expected real annual yield (1/CAPE)	Historical real annual yield (1979-2024)	Excess CAPE Yield	Excess CAPE Yield (average last 25 years)
France	21,9	20,6	4,6%	7,1%	4,0%	4,6%
Germany	17,0	19,9	5,9%	6,5%	5,9%	4,7%
Italy	17,0	18,2	5,9%	5,7%	5,4%	6,4%
Spain	17,1	16,7	5,9%	7,4%	5,5%	6,5%
United Kingdom	13,8	15,6	7,2%	5,0%	5,8%	5,8%
Switzerland	22,8	23,1	4,4%	7,3%	4,5%	3,8%
USA	38,3	27,4	2,6%	8,5%	1,2%	2,8%
Japan	21,6	22,2	4,6%	4,8%	4,5%	4,4%
China	12,8	18,3	7,8%	7,6%	7,6%	5,0%

This table is designed to guide investors in making strategic asset allocation decisions.

The goal of this presentation is to explain CAPE, ECY and other concepts behind the construction of this table.

The Price/Earnings ratio (P/E) is one of the most widely used indicators for valuing stocks and equity market indexes.

It is a straightforward metric that estimates how many years it would take for an investment to be repaid through earnings.

However, it also provides insights into expected returns.

The P/E ratio can be calculated for an individual stock by dividing its current price by its earnings per share (EPS). For a stock index, it is obtained by summing the market capitalizations of its constituent companies in the numerator and their total earnings in the denominator.

Example 1

The P/E ratio of company A, whose capital is divided into 10,000,000 shares quoting 10 euros each and whose total profit amounts to 5,000,000 euros, can be calculated as follows:

$$EPS = \frac{5{,}000{,}000}{10{,}000{,}000} = 0.5$$

$$\frac{P}{E} = \frac{10}{0.5} = 20$$

Example 2

Given an index composed of the following securities:

Stock A
Capitalization: 10,000,000
Profit: 1,000,000

Stock B
Capitalization: 30,000,000
Profit: 4,000,000

Stock C
Capitalization: 20,000,000
Profit: 1,000,000

The P/E ratio can be computed as follows:

$$\frac{P}{E} = \frac{10{,}000{,}000 + 30{,}000{,}000 + 20{,}000{,}000}{1{,}000{,}000 + 4{,}000{,}000 + 1{,}000{,}000} = 10$$

It follows that, in the case of an index, the procedure is reversed compared to what applies to a single stock:

- first, the P/E ratio is calculated as described in Example 2;
- then, the EPS can be derived.

Thus, once the P/E ratio is determined, the EPS of an index can be calculated as follows:

$$EPS = \frac{P}{\frac{P}{E}}$$

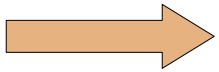
So, if we assume that the index in our example is trading at 1,000, its EPS can be calculated as follows:

$$EPS = \frac{P}{\frac{P}{E}} = \frac{1{,}000}{10} = 100$$

Through the Dividend Discount Model (DDM) it is possible to obtain an interesting interpretation of the P/E ratio.

Based on the DDM, in fact, the fundamental value of a share is equal to the sum of its infinite future dividends (D), discounted by the **required rate of return** (R):

(1) $$P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+R)^t}$$ assuming dividends grow at a constant annual rate (g), the formula becomes:



(2) $$P_0 = \frac{D_1}{R - g}$$

The (2) allows, given the current dividend, the dividend growth rate and the return required by the equity investment, to calculate the fundamental value of the share at time T_0.

Deriving the inverse formula, we obtain the relationship that links the return - **now to be understood as the expected return rather than the required return** - to the price, **which should now be interpreted as the market price rather than the fundamental value**.

(3) $$R = \frac{D_1}{P_0} + g$$

DIVIDEND YIELD **CAPITAL GAIN**

The (3) appears very "reasonable" in defining the expected annual return from an equity investment in the long term: this is equal to the current dividend yield plus the capital gain (the growth rate g of the dividends coincides with the expected appreciation of the share, provided that the dividend yield remains constant).

By introducing the payout (π), i.e. the fraction of profit (E) destined to dividend, (3) can be rewritten as follows:

$$(4) \quad R = \frac{\pi E_0}{P_0} + g$$

Assuming π constant, the growth rate g of dividends will therefore also be the growth rate of earnings. If the profits reinvested at the end of the year, equal to (1-π) E, provide an additional profit equal to R · E (1 - π) in the following year, we can express the growth rate g as follows:

$$(5) \quad g = \frac{R \cdot E\,(1-\pi)}{E} = R(1 - \pi)$$

Substituting (5) into (4) we arrive at:

$$(6) \quad R = \frac{E_0}{P_0}$$

Therefore, under the assumptions indicated, the inverse of the P/E ratio, called the Earnings Yield (EY), constitutes an estimate of the expected annual return from the share investment.

Equation (6) attributes a certain theoretical foundation to the stock valuation model known as the FED Model; this model, in fact, defines the attractiveness of the equity investments by comparing their expected return, approximated by the EY of a stock index, to the expected return of the bond market, represented by the yield to maturity of a ten-year government bond (TBY).

The condition of market equilibrium, according to the FED Model, is the following:

$$(7) \quad \mathbf{EY = TBY}$$

There are two very simple implications in relation to the stock and bond market:

- **EY > TBY suggests a greater attractiveness of the stock market**
- **TBY > EY suggests a greater attractiveness of the bond market**

A first critical issue of the Fed model arises from the fact that, by comparing the expected return of the stock market to that of a risk free Treasury bond, it overlooks the risk premium investors require to invest in equities.

But the main limitation of this approach lies in the different impact that inflation has on the variables used to estimate future returns in the two markets.

It is assumed that, over a given time interval, market expectations for inflation increase.

How will TBY and EY react to these changing conditions?

For TBY, the answer is straightforward: it will rise due to higher inflation, as investors will demand a higher nominal return on bond investments to hedge against increasing inflation.

The Fed Model states that, in order to maintain the pre-existing relationship between TBY and EY, ceteris paribus, EY must also increase.

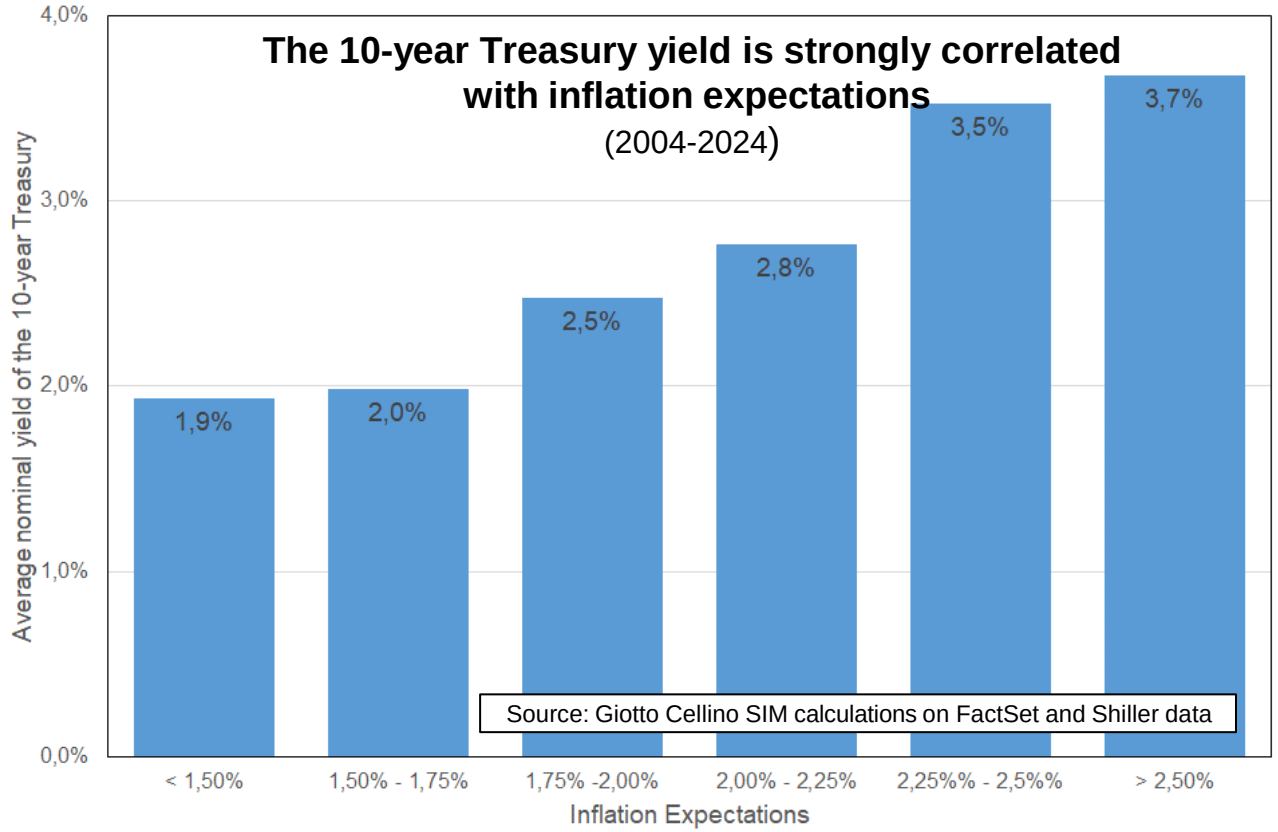
To understand why EY may not align with the predictions of the Fed Model in response to rising inflation expectations, let us return to formulation (4) of the expected return on equity investments.

$$R = \frac{\pi E_0}{P} + g$$

The demand for a higher yield resulting from increased inflation expectations could be largely satisfied by a growth of g. In fact, when inflation expectations change, earnings growth expectations also change: **higher inflation inflates expected profits**.

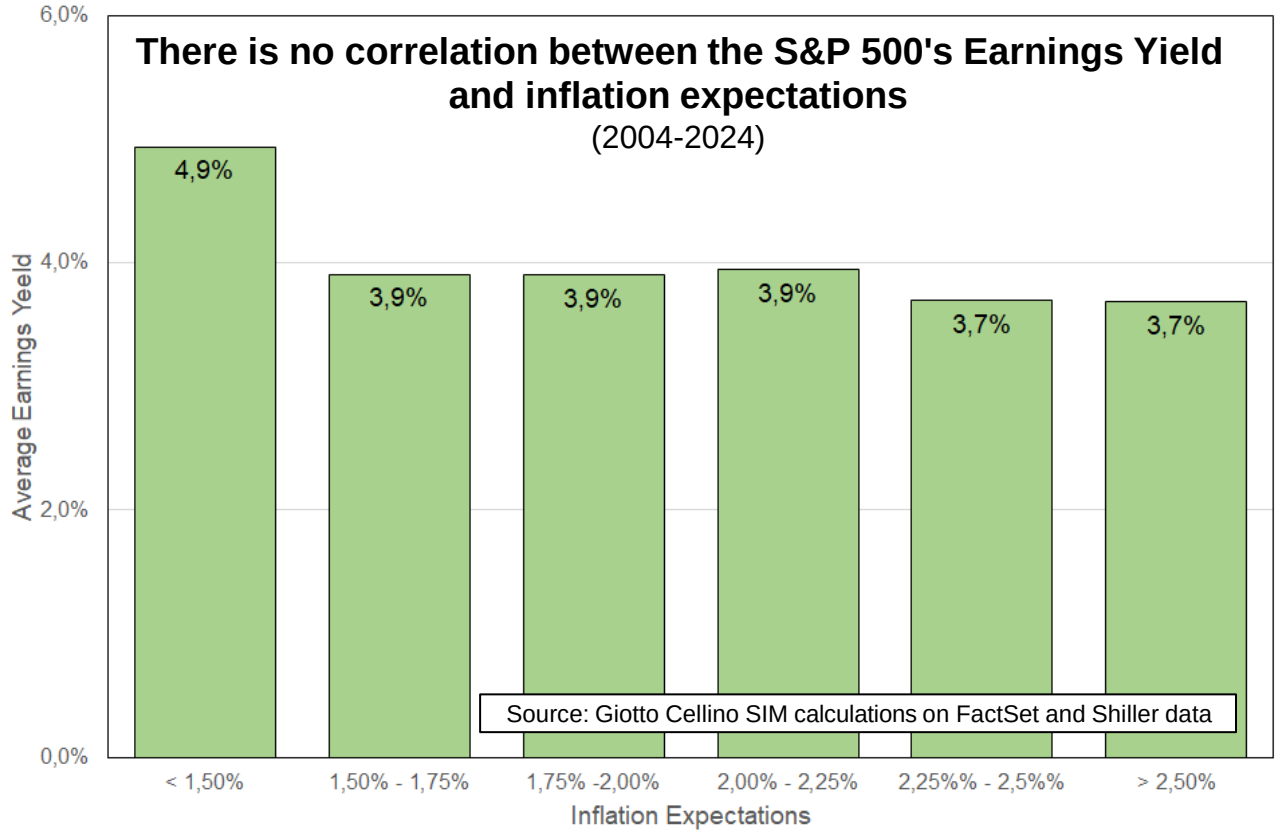
With the opposite reasoning, it can be stated that, in the face of lower inflation expectations, the reduction of TBY may not correspond to a reduction of EY.

Since EY is not sensitive to inflation, it is a real quantity, and it is therefore incorrect to compare it with a nominal one.



The chart refers to the U.S. market over the past 20 years, during which long-term inflation expectations, recorded monthly, were grouped into categories. The histograms display the average yield of the 10-year Treasury observed for each inflation expectation category.

As shown, the yield on the U.S. 10-year Treasury, being a nominal variable, is positively correlated with inflation expectations.



In this chart, using the same classification of U.S. inflation expectations as in the previous one, the histograms display the average Earnings Yield of the S&P 500 index observed for each inflation expectation category.

As shown, there is no correlation between the S&P 500's Earnings Yield and inflation expectations, supporting the hypothesis that it is a real variable.

Analysts generally calculate two types of multiples:

Forward P/E: when the denominator is the expected earnings for the next 12 months

Trailing P/E: when the denominator is the earnings in the last 12 months

The main limitation of both - Trailing P/E and Forward P/E - is that they rely on a single year earnings, making them highly sensitive to business cycle fluctuations.

Specifically, during a periods of strong economic expansion, when earnings are high, the multiple will appear artificially low. Conversely, during economic downturns, when earnings are weak, the multiple will seem excessively high.

To address this issue, economist Robert Shiller proposed an alternative approach to calculating the price to earnings ratio, replacing the 12 months earnings measure in the denominator with the average earnings over the past ten years.

Given the extended time horizon and the need for comparability in terms of purchasing power, earnings must be adjusted for inflation. This adjustment provides a measure that captures both periods of strong growth and downturns, smoothing out extreme values and offering a more normalized perspective.

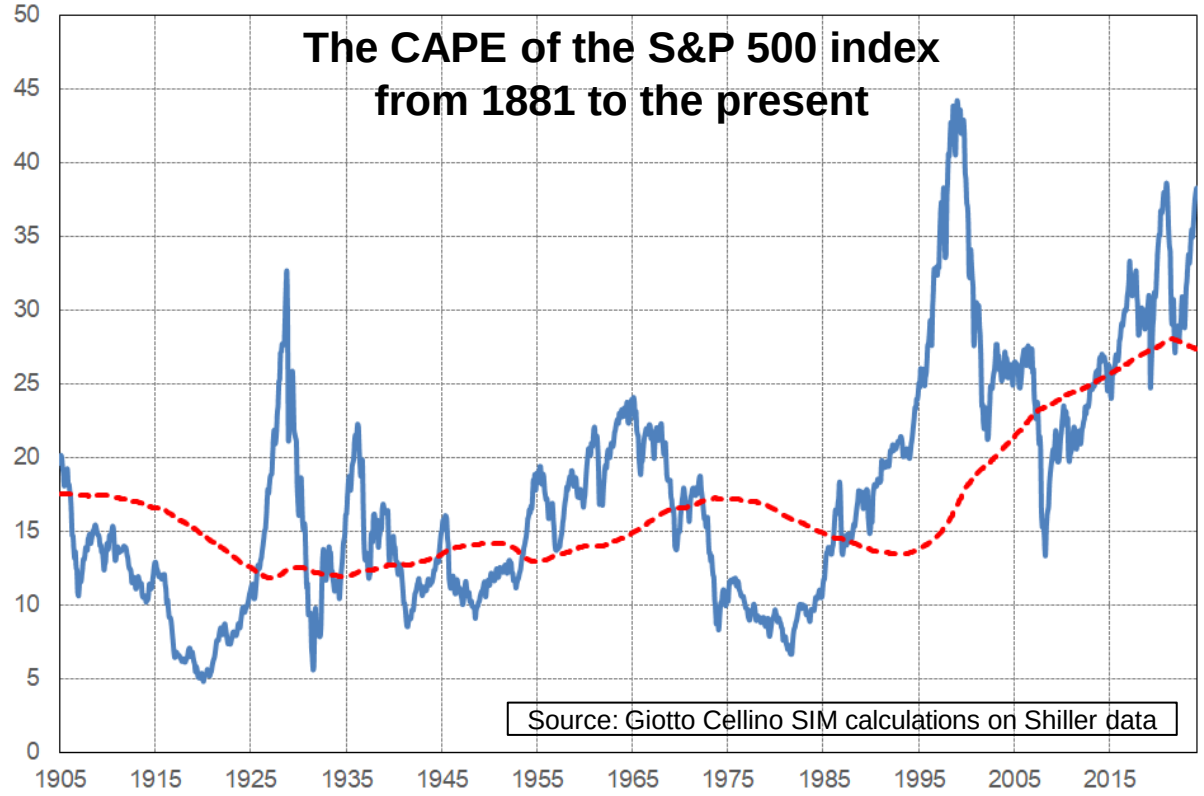
For this reason, Shiller's P/E ratio is known as the **Cyclically Adjusted Price Earnings (CAPE)**.

Assuming that:

E1, E2, ... E10 reperesnt the profits of the last 10 years. expressed in today's euro,

The CAPE calculation is as follows:

$$CAPE = \frac{\text{Current price}}{\frac{\sum_{t=1}^{10} E_t}{10}}$$

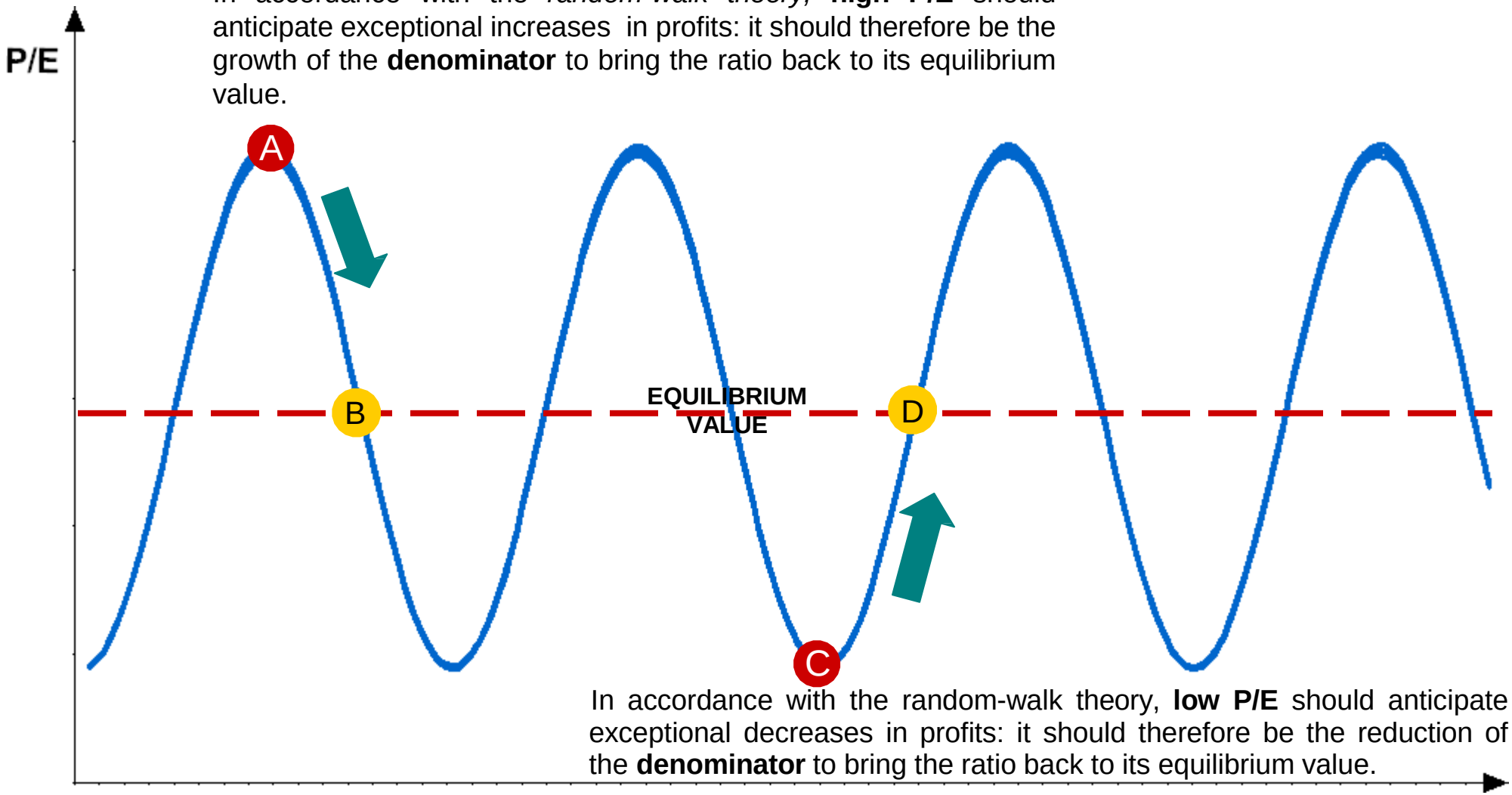


Thanks to an extraordinary research effort, Shiller reconstructed the historical series of the CAPE for the S&P 500 index dating back to 1881 and observed that this indicator tends to fluctuate around an equilibrium level.

In this graph we use a 25-year moving average as a proxy for the equilibrium level. This approach captures long-term structural changes without being influenced by short-term distortions. Therefore, while it is possible to state that the CAPE is above or below its equilibrium level, it will also be possible to deduce in which direction the indicator will move to return to equilibrium.

What determines the CAPE fluctuation around its equilibrium level?

In accordance with the *random-walk theory,* **high P/E** should anticipate exceptional increases in profits: it should therefore be the growth of the **denominator** to bring the ratio back to its equilibrium value.

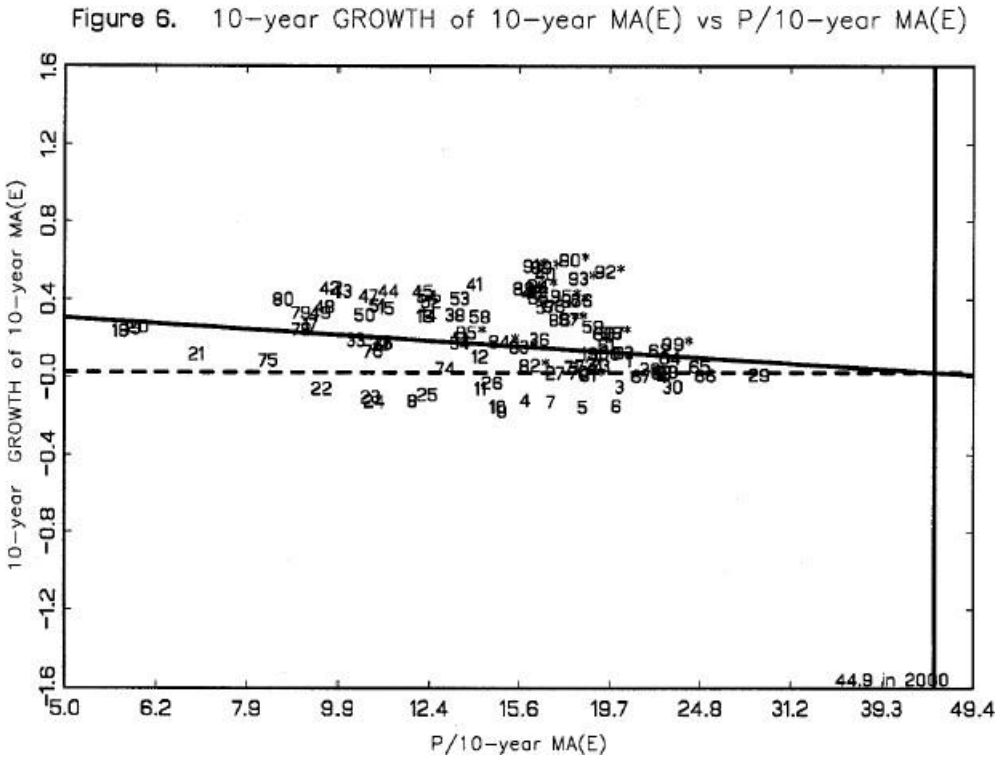


In accordance with the random-walk theory, **low P/E** should anticipate exceptional decreases in profits: it should therefore be the reduction of the **denominator** to bring the ratio back to its equilibrium value.

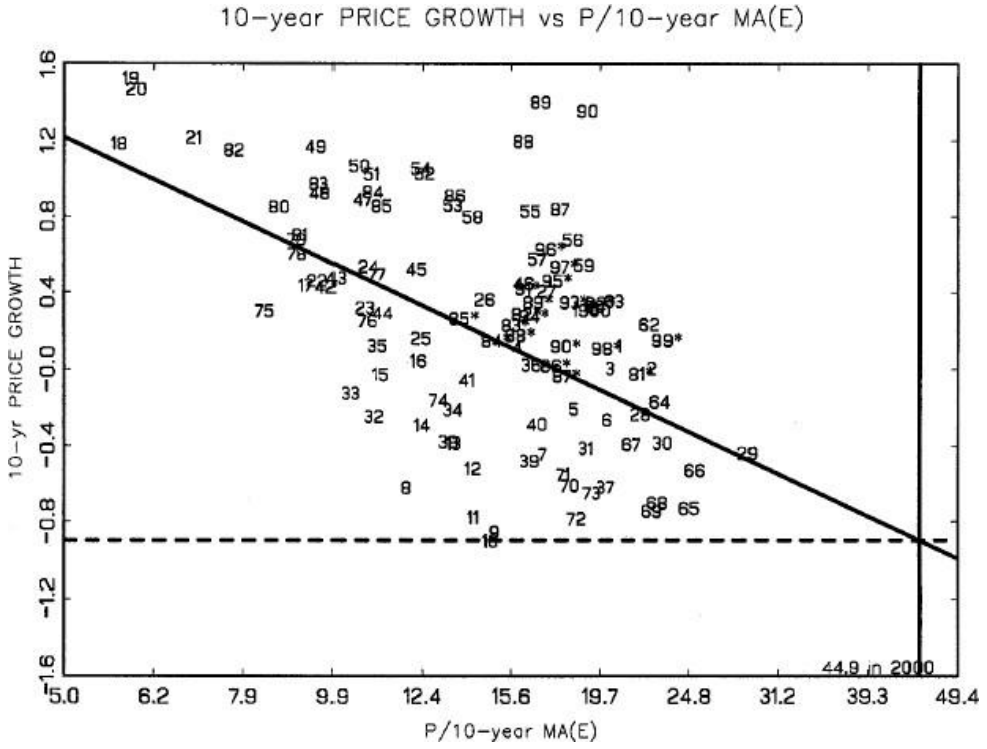
What determines the CAPE fluctuation around its equilibrium level?

However, the historical analysis conducted by Shiller has shown CAPE is a good predictor of price movements and not profits, thus denying the *random walk theory* and, ultimately, the hypothesis of efficient markets.

This is one of the most important results of behavioral finance allowing Shiller to achieve the Nobel Prize in Economics in 2013.



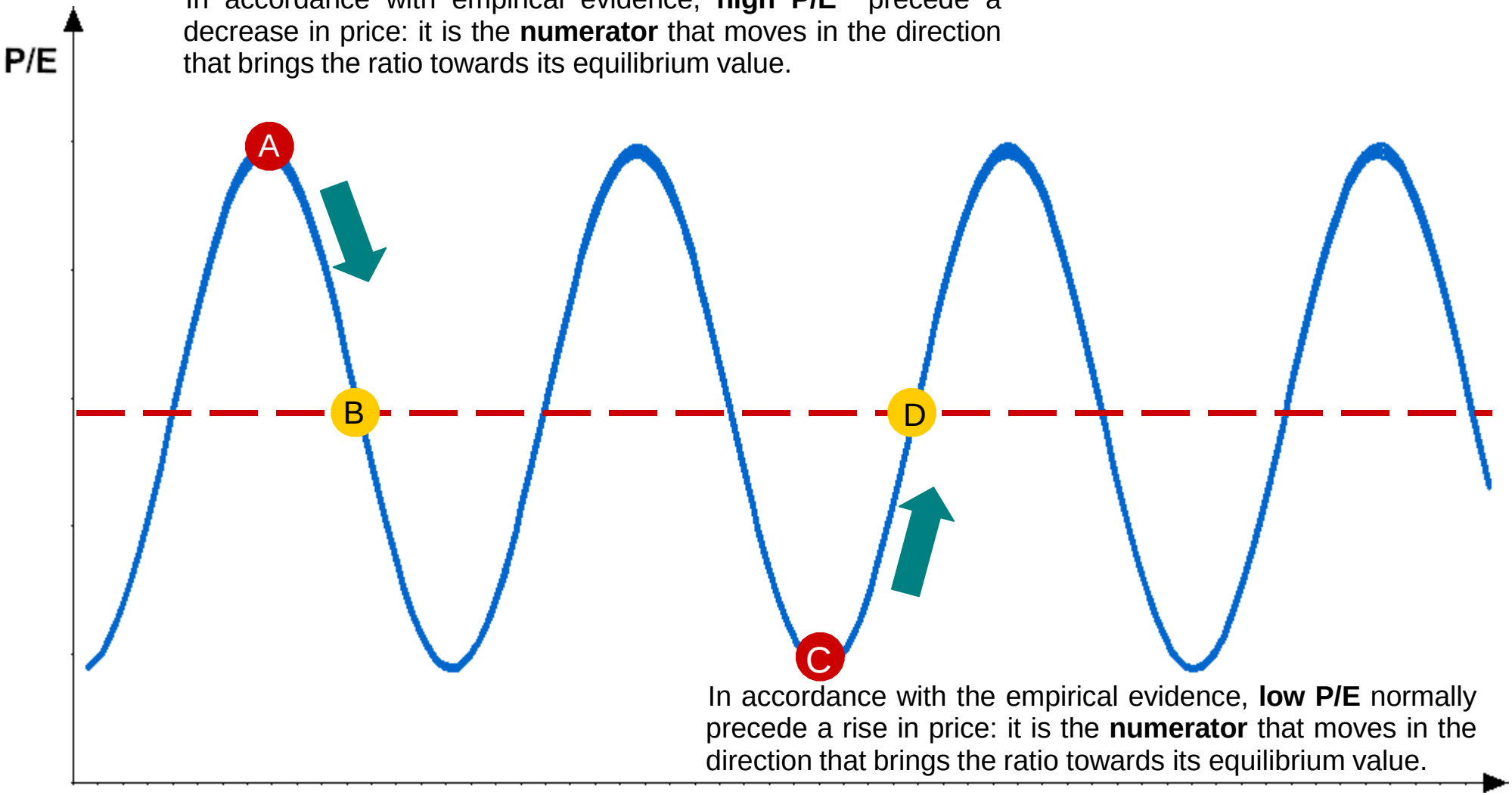
Source: J.Y. Campbell and R.J. Shiller



Source: J.Y. Campbell and R.J. Shiller

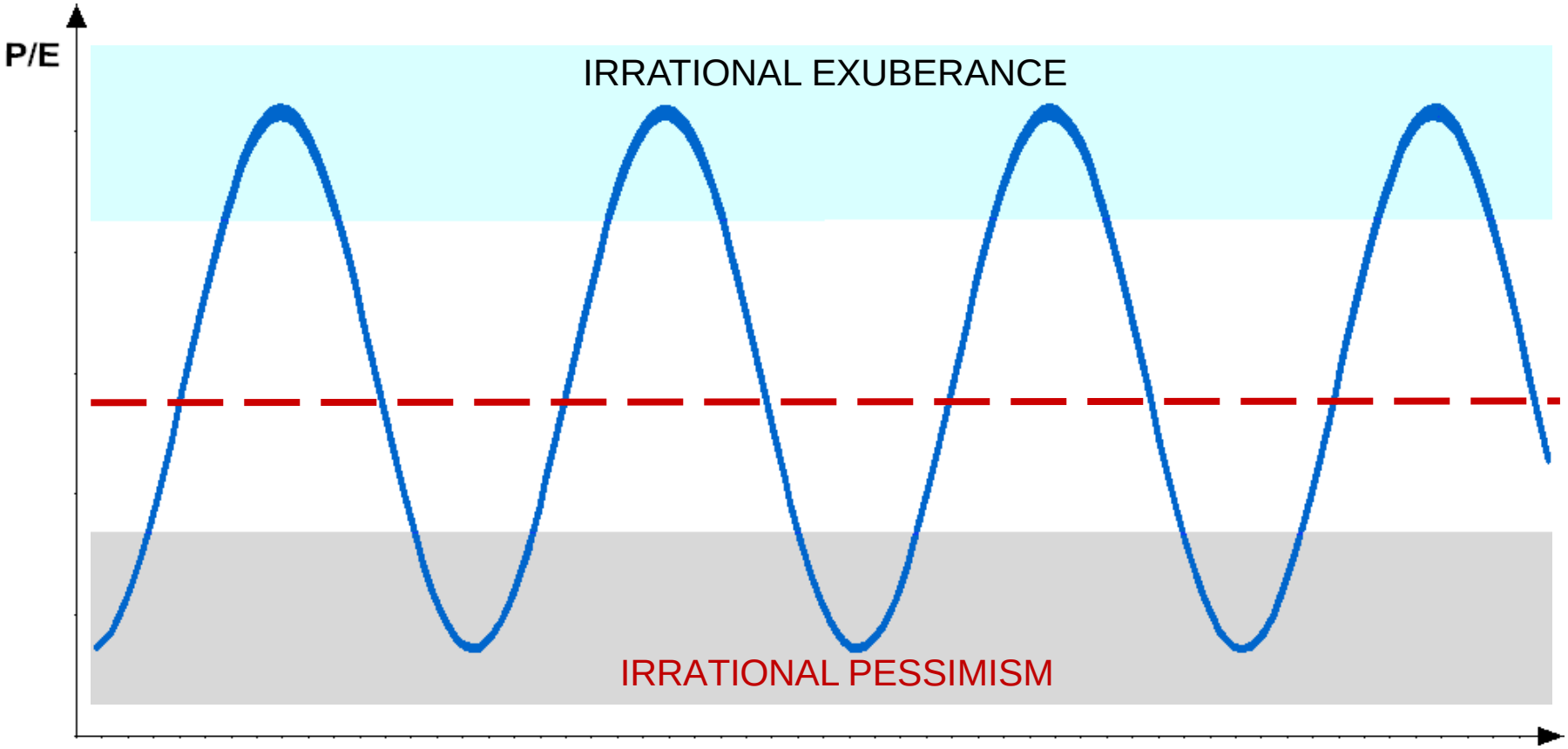
What determines the CAPE fluctuation around its equilibrium level?

In accordance with empirical evidence, **high P/E** precede a decrease in price: it is the **numerator** that moves in the direction that brings the ratio towards its equilibrium value.



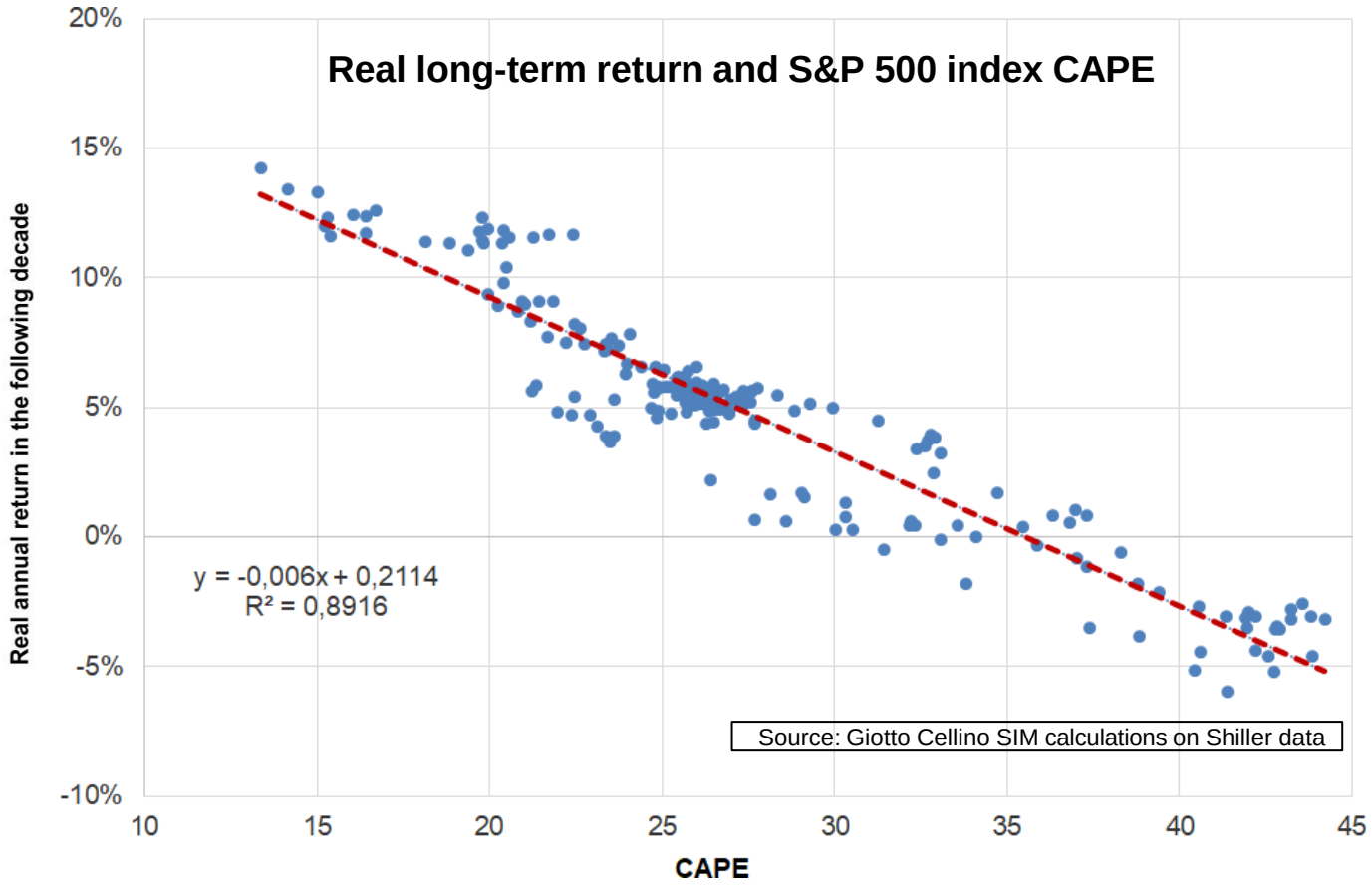
In accordance with the empirical evidence, **low P/E** normally precede a rise in price: it is the **numerator** that moves in the direction that brings the ratio towards its equilibrium value.

What determines the CAPE fluctuation around its equilibrium level?



Therefore, stock markets fluctuate alternating moments of "irrational exuberance" with others of "irrational pessimism" and only briefly passing through "correct" valuation levels.
When the P/E is relatively low, prices are bound to rise, while when the multiple is relatively high, prices are likely to decline. T**herefore, it is price movements, not those of earnings, that drive P/E ratio's oscillations around its equilibrium level.**

The predictive power of CAPE



The scatterplot replicates an analysis conducted by Michael Finke, published in July 2020, in which he confirmed the CAPE's remarkable ability to predict S&P 500 index returns for the decades starting between 1995 and 2010, thereby validating Shiller's hypothesis.

The conclusion was rather discouraging: based on CAPE level observed in July 2020, Finke's regression model suggested that the U.S. stock market should expect a decade of very modest returns.

Robert Shiller, in an article published in November 2020, partially contradicted the pessimistic conclusions that Finke, and with him many other analysts, draw from reading the CAPE.

In fact, Shiller said that, despite the high level achieved by the CAPE, equity investment continued to be attractive. In support of his thesis he introduced a new indicator called Excess CAPE Yield (ECY).

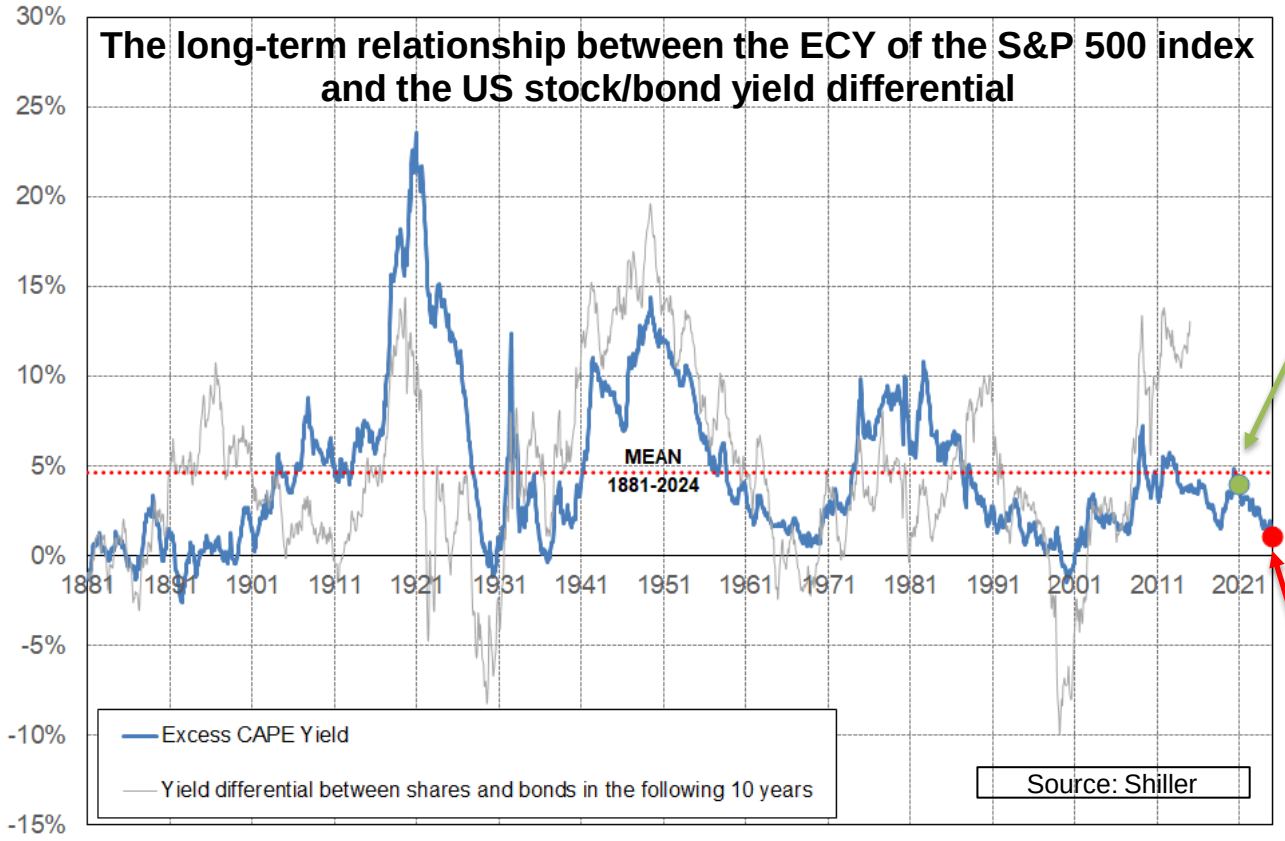
The ECY is nothing more than a measure of the prospective equity risk premium, obtained by subtracting the real yield of the ten-year government bonds from the expected real return on shares, that is the EY.

Called RTBY (Real Treasury Bond Yield) the real yield on 10-year government bonds, the ECY can be derived as follows:

$$ECY = EY - RTBY$$

Note that, like the Fed Model, ECY assumes the balance between the expected returns of the bond market and of the stock market, correcting however the two errors that we have identified:

- **the equilibrium is constructed on the basis of a yield differential between stocks and bonds (risk premium) that the Fed Model ignores;**
- **the EY is compared with the expected real yield of the bonds (RTBY) and not with the nominal one.**



As can be observed, at the time Shiller wrote his article, in November 2020, the level of the ECY (highlighted by the green dot) was very close to its long-term historical average.

In relative terms, therefore, the S&P 500 index was not overvalued at that time.

The current ECY value (highlighted by the red dot), as can be seen, is significantly lower than the historical average, calculated over the period 1881–2024.

It is one of the lowest levels ever recorded by this indicator.

Therefore, the S&P 500 is currently highly overvalued in relative terms.

As shown by the graph, the ECY proved to be a good predictor of the ten year over returns of stocks compared to bonds:

high levels of ECY generally anticipated high over-returns, on the contrary, low levels of ECY are followed by modest or negative over-returns.

Note that the ECY is not an alternative to the CAPE; in fact, the two indicators provide different and complementary information:

- **the CAPE allows to predict the absolute performance of the stock market;**
- **the ECY instead constitutes a proxy of its relative performance.**

Given the current level of both indicators, we can therefore conclude that over the next 10 years we should expect an extremely modest performance from the U.S. stock market, just slightly above the return offered by bond investments.

TRULY, NOT A PROMISING OUTLOOK!

CAPE and ECY of some international stock markets

(CAPE calculated on FactSet Market Indices, historical returns calculated on MSCI indices; for US CAPE and historical returns calculated for the S&P500 index)

	CAPE	CAPE (average last 25 years)	Expected real annual yield (1/CAPE)	Historical real annual yield (1979-2024)	Excess CAPE Yield	Excess CAPE Yield (average last 25 years)
France	21,9	20,6	4,6%	7,1%	4,0%	4,6%
Germany	17,0	19,9	5,9%	6,5%	5,9%	4,7%
Italy	17,0	18,2	5,9%	5,7%	5,4%	6,4%
Spain	17,1	16,7	5,9%	7,4%	5,5%	6,5%
United Kingdom	13,8	15,6	7,2%	5,0%	5,8%	5,8%
Switzerland	22,8	23,1	4,4%	7,3%	4,5%	3,8%
USA	38,3	27,4	2,6%	8,5%	1,2%	2,8%
Japan	21,6	22,2	4,6%	4,8%	4,5%	4,4%
China	12,8	18,3	7,8%	7,6%	7,6%	5,0%

Source: Giotto Cellino SIM calculations on FactSet, Shiller and Barclays data

The expected returns for most markets are, to varying degrees, lower than their historical average (comparison between the third and fourth columns). Exceptions include the Italian, British, and Chinese markets, where return expectations are relatively higher.

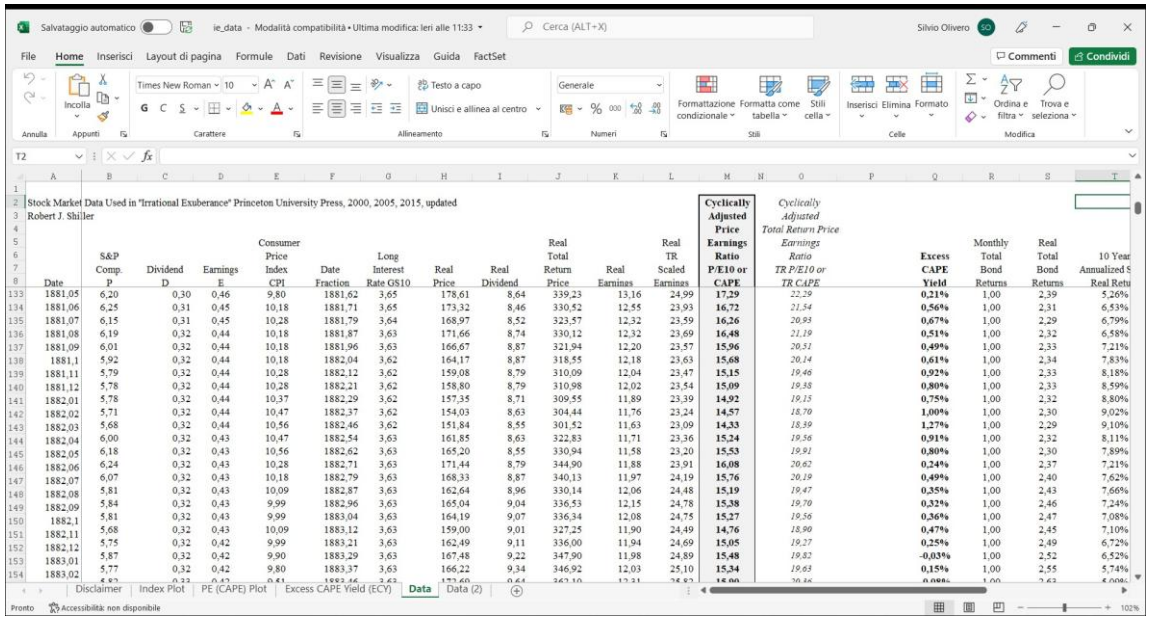
In Italy, Spain, and France, the ECY is below its historical level, while in Germany it is higher. Outside the Eurozone, the ECY exceeds the historical average in China, matches it in the United Kingdom and Japan, and falls below it in the United States (comparison between the fifth and sixth columns).

Based on the table analysis, we can conclude that **the overvaluation of the U.S. market is significant**, both because the expected return is exceptionally low and because the risk premium appears inadequate. This is a concerning factor, only partially mitigated by the relative attractiveness of European, Japanese, and Chinese markets..

According to the model, over the next decade, the U.S. stock market is expected to deliver a modest returns to investors, lower than that of most other global equity markets.

The CAPE and ECY for the US refer to the S&P 500 index, for China to the MSCI China index, and for other countries to national indices compiled by FactSet. The historical real annual return for all markets is based on MSCI national total return indices in local currency. The real risk-free rate, used for ECY calculation, is obtained by subtracting each country's average inflation rate from the nominal yield of the respective 10-year risk-free bond (for Eurozone countries, the German Bund was selected).
The historical return of the UK market covers the period from 1988 to 2024, while that of the Chinese market spans from 2002 to 2024. The average ECY for the Japanese and Chinese markets is computed based on data from the last 19 and 20 years, respectively.

Shiller's database



Stock Market Data Used in "Irrational Exuberance" Princeton University Press, 2000, 2005, 2015, updated
Robert J. Shiller

Date	S&P Comp. P	Dividend D	Earnings E	Consumer Price Index CPI	Date Fraction	Long Interest Rate GS10	Real Price	Real Dividend	Real Total Return Price	Real Earnings	Real TR Scaled Earnings	Cyclically Adjusted Price Earnings Ratio P/E10 or CAPE	Cyclically Adjusted Total Return Price Earnings Ratio TR P/E10 or TR CAPE	Excess CAPE Yield	Monthly Total Bond Returns	Real Total Bond Returns	10 Year Annualized S Real Retu
1881,05	6,20	0,30	0,46	9,80	1881,62	3,65	178,61	8,64	339,23	13,16	24,99	17,29	22,29	0,21%	1,00	2,39	5,26%
1881,06	6,25	0,31	0,45	10,18	1881,71	3,65	173,32	8,46	330,52	12,55	23,93	16,72	21,54	0,56%	1,00	2,31	6,53%
1881,07	6,15	0,31	0,45	10,28	1881,79	3,64	168,97	8,52	323,57	12,32	23,59	16,26	20,93	0,67%	1,00	2,29	6,79%
1881,08	6,19	0,32	0,44	10,18	1881,87	3,63	171,66	8,74	330,12	12,32	23,69	16,48	21,19	0,51%	1,00	2,32	6,58%
1881,09	6,01	0,32	0,44	10,18	1881,96	3,63	166,67	8,87	321,94	12,20	23,57	15,96	20,51	0,49%	1,00	2,33	7,21%
1881,1	5,92	0,32	0,44	10,18	1882,04	3,62	164,17	8,87	318,55	12,18	23,63	15,68	20,14	0,61%	1,00	2,34	7,83%
1881,11	5,79	0,32	0,44	10,28	1882,12	3,62	159,08	8,79	310,09	12,04	23,47	15,15	19,46	0,92%	1,00	2,33	8,18%
1881,12	5,78	0,32	0,44	10,28	1882,21	3,62	158,80	8,79	310,98	12,02	23,54	15,09	19,38	0,80%	1,00	2,33	8,59%
1882,01	5,78	0,32	0,44	10,37	1882,29	3,62	157,35	8,71	309,55	11,89	23,39	14,92	19,15	0,75%	1,00	2,32	8,80%
1882,02	5,71	0,32	0,44	10,47	1882,37	3,62	154,03	8,63	304,44	11,76	23,24	14,57	18,70	1,00%	1,00	2,30	9,02%
1882,03	5,68	0,32	0,44	10,56	1882,46	3,62	151,84	8,55	301,52	11,63	23,09	14,33	18,39	1,27%	1,00	2,29	9,10%
1882,04	6,00	0,32	0,43	10,47	1882,54	3,63	161,85	8,63	322,83	11,71	23,36	15,24	19,56	0,91%	1,00	2,32	8,11%
1882,05	6,18	0,32	0,43	10,56	1882,62	3,63	165,20	8,55	330,94	11,58	23,20	15,53	19,91	0,80%	1,00	2,30	7,89%
1882,06	6,24	0,32	0,43	10,28	1882,71	3,63	171,44	8,79	344,90	11,88	23,91	16,08	20,62	0,24%	1,00	2,37	7,21%
1882,07	6,07	0,32	0,43	10,18	1882,79	3,63	168,33	8,87	340,13	11,97	24,19	15,76	20,19	0,49%	1,00	2,40	7,62%
1882,08	5,81	0,32	0,43	10,09	1882,87	3,63	162,64	8,96	330,14	12,06	24,48	15,19	19,47	0,35%	1,00	2,43	7,66%
1882,09	5,84	0,32	0,43	9,99	1882,96	3,63	165,04	9,04	336,53	12,15	24,78	15,38	19,70	0,32%	1,00	2,46	7,24%
1882,1	5,81	0,32	0,43	9,99	1883,04	3,63	164,19	9,07	336,34	12,08	24,75	15,27	19,56	0,36%	1,00	2,47	7,08%
1882,11	5,68	0,32	0,43	10,09	1883,12	3,63	159,00	9,01	327,25	11,90	24,49	14,76	18,90	0,47%	1,00	2,45	7,10%
1882,12	5,75	0,32	0,42	9,99	1883,21	3,63	162,49	9,11	336,00	11,94	24,69	15,05	19,27	0,25%	1,00	2,49	6,72%
1883,01	5,87	0,32	0,42	9,90	1883,29	3,63	167,48	9,22	347,90	11,98	24,89	15,48	19,82	-0,03%	1,00	2,52	6,52%
1883,02	5,77	0,32	0,42	9,80	1883,37	3,63	166,22	9,34	346,92	12,03	25,10	15,34	19,63	0,15%	1,00	2,55	5,74%

The dataset containing the historical series of U.S. stock market data compiled by Shiller is freely available for download (see next page). For each year since 1871, on a monthly basis, it provides:

- The value of the S&P 500 index (both nominal and real)
- The amount of dividends and earnings associated with the index (both nominal and real)
- The long-term interest rate on U.S. government bonds
- The values of the CAPE and ECY for the S&P 500 index

Additionally, the dataset includes a corrected version of CAPE, known as the Total Return CAPE (TRC). The TRC adjusts for biases introduced by recent changes in corporate payout policies. In the U.S., share repurchases have largely replaced dividends as the dominant method of cash distribution to shareholders. This shift may impact the growth rate of real earnings and, consequently, the average real earnings per share used in the CAPE ratio. To account for this potential bias, the TRC incorporates dividends reinvested into the price index.

References and Online Resources

Readings:

Campbell, J,Y, Shiller, R.J., “Valuation ratios and the long run stock market outlook”, The Journal of Portfolio Management, 1998

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Runkevicius, D. “The stock market is the most attractive since 1980, Nobel-winning economist says”, Forbes, 2020

Shiller, R.J., “Irrational Exuberance”, Princeton University Press, 2000

Shiller, R.J., Laurence B., Farouk J., “Making sense of sky-high stock prices”, Project Syndacate, 2020

Web Sites:

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

Through the personal page of Professor Shiller at Yale University, you can access a large amount of information and data and, above all, you can download the now famous database built by the economist containing the US stock market data in Excel format from 1871 to today.

https://indices.barclays/IM/21/en/indices/static/shiller.app

Barclays bank has created, in collaboration with Professor Shiller, some equity indices inspired by the CAPE. Through the link indicated above, it is possible to access studies and articles concerning the CAPE, as well as the historical series of this indicator calculated for the main international stock indices elaborated by MSCI.

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