



MEAN REVERSION: UNIVERSAL
TRUTH OR DANGEROUS
DELUSION!

History repeats itself, until it does not!

The Essence of Mean Reversion

- In statistics, mean reversion is the term used to describe the phenomenon that if you get an extreme value (relative to the average) in a draw of a variable, the second draw from the same distribution is likely to be closer to the average.
- In markets and in investing, mean reversion has not only taken on a much bigger role but has arguably had a greater impact than in any other discipline.
 - Jeremy Siegel's argument for why "stocks win in the long term" is based upon his observation that over a very long time period (more than 200 years), stocks have earned higher returns than other asset classes and that there is no 20-year time period in his history where stocks have not outperformed the competition.
 - Many "value" investing strategies (buy low PE stocks, low PBV stocks etc.) are based upon the presumption of mean reversion.

The Counter to Mean Reversion

- Just as there are a plethora of strategies built around mean reversion, there are almost as many built on the presumption that it will not happen, at least during a specified time horizon.
- Many momentum-based strategies, such as buying stocks with high relative strength (that have gone up the most over a recent time period) or have had the highest earnings growth in the last few years, are effectively strategies that are betting against mean reversion in the near term.
- While it is easy to be an absolutist on this issue, the irony is that not only can both sides be right, even though their beliefs seem fundamentally opposed, but worse, both sides can be and often are wrong.

Forms of mean reversion

- In time series mean reversion, you assume that the value of a variable reverts back to a historical average. This, in a sense, is what you are using when looking at the CAPE today at 27.27 (in August 2016) and argue that stocks are over priced because the average CAPE between 1871 and 2016 is closer to 16.
- In cross sectional mean reversion, you assume that the value of a variable reverts back to a cross sectional average. This is the basis for concluding that an oil stock with a PE ratio of 30 is over priced, because the average PE across oil stocks is closer to 15.
- At the risk of over generalizing, market timing strategies are more likely to be built on time series mean reversion whereas stock picking strategies often revolve around cross sectional mean reversion.

Mean Reversion: The Questions

1. Measurement Questions

- The Mean can be very different depending not only on the time period that you look at but also on how you compute it
- On Reversion, there can be differences about when it will happen and how.

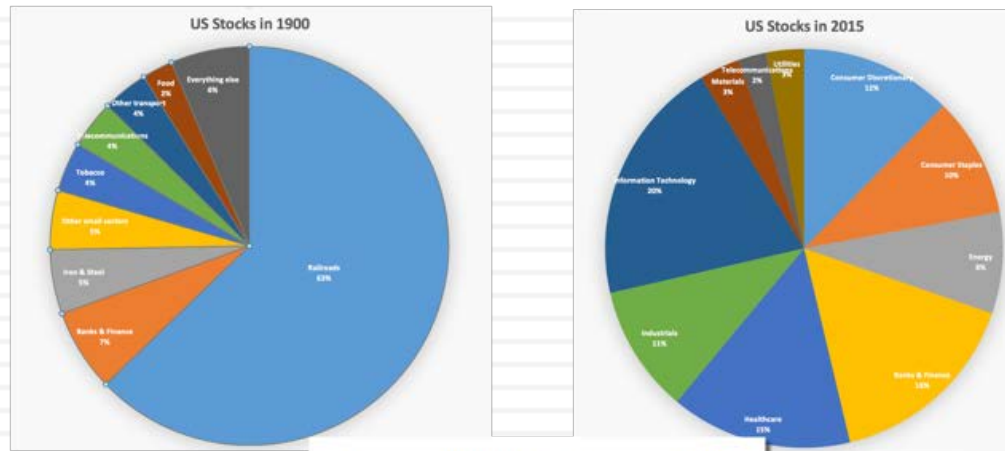
2. Fundamental Questions

- Mean reversion is built on the presumption that the underlying process is stable (and therefore reverts back to historic norms)
- If there is or has been a large structural change in the underlying process, mean reversion will no longer work.

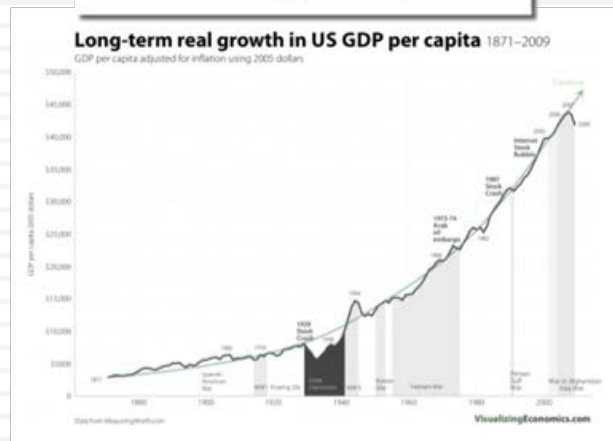
The Causes for Structural Change

- With time series mean reversion, structural change can come from
 - ▣ Aging of either a company, a sector or the entire market, changing its characteristics.
 - ▣ Technology
 - ▣ Investor preferences
- With cross sectional mean reversion, structural change can come
 - ▣ Changes in industry structure
 - ▣ Disruption

The US Equity Market



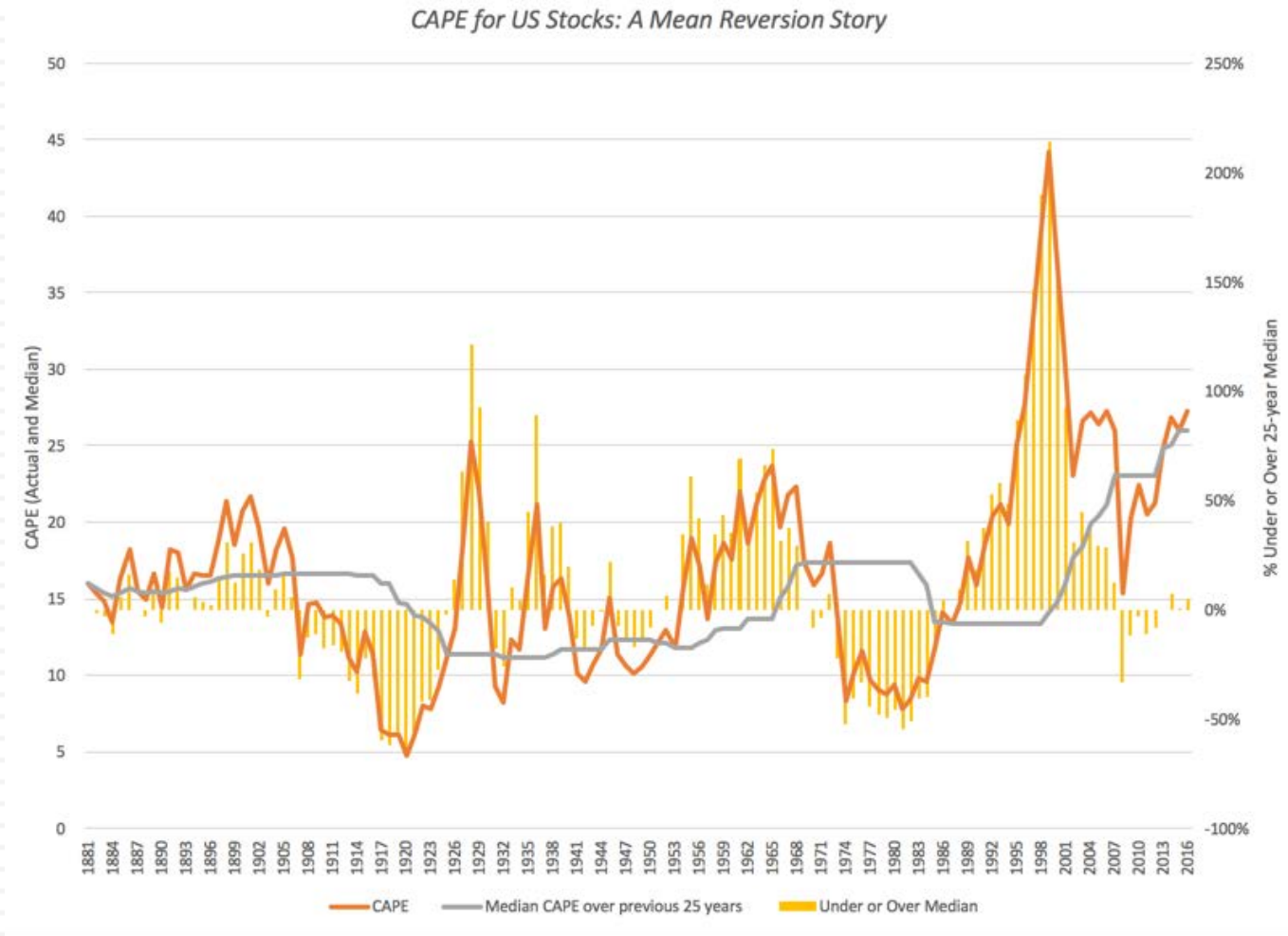
A changing stock market composition in a changing economy.



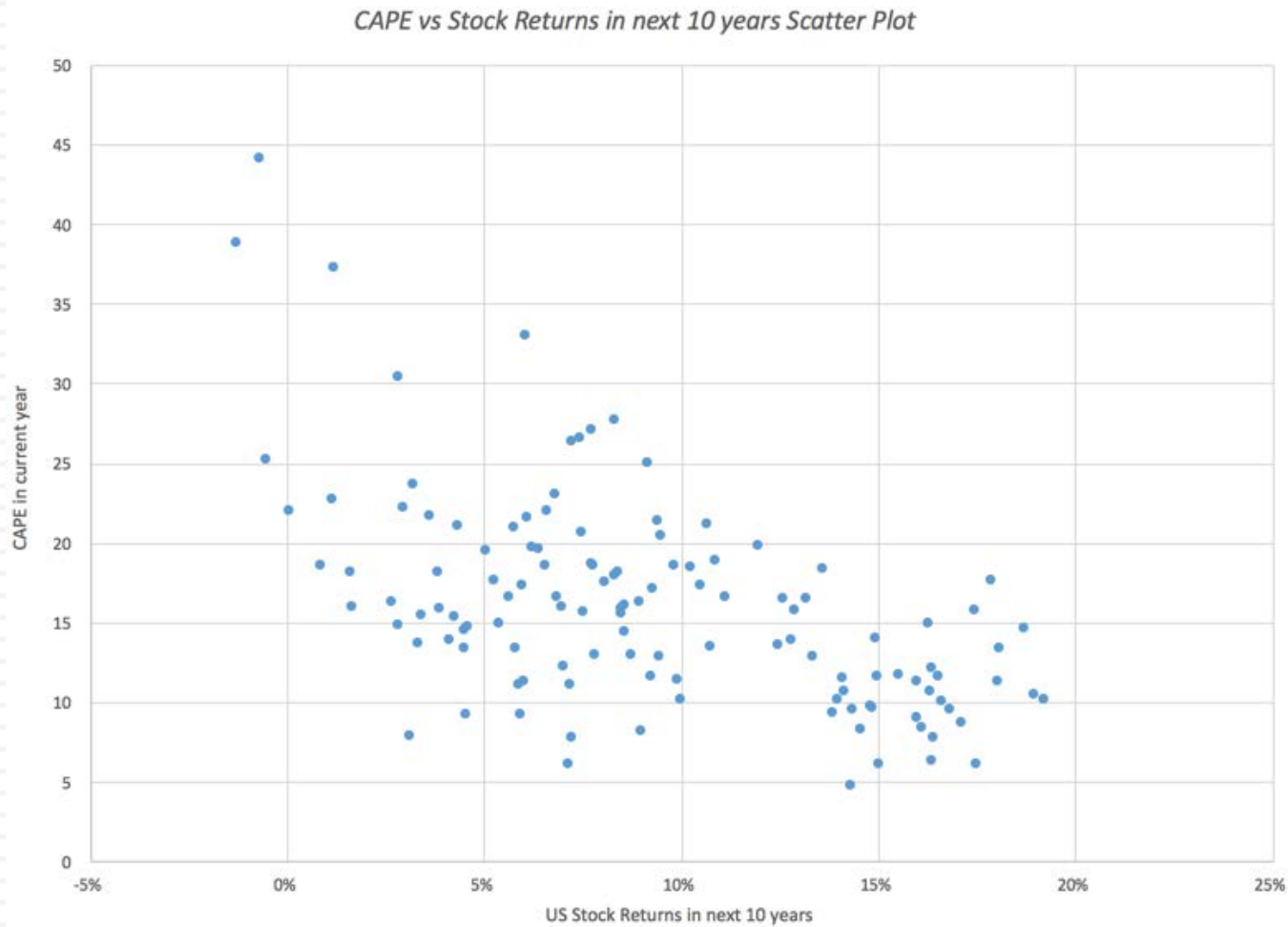
The 2008 Wake Up Call

1. *Globalization is here to stay* and while it has brought pluses, it has already brought some minuses. As I noted in my post on country risk, no investor or company can afford to stay localized any more, since not only do market crisis in one country quickly become global epidemics, but a company that depends on just its domestic market for operations (revenues and production) is now more the exception than the rule.
2. *Financial service firms were at the center of the crisis*, has had long term consequences. Not only has it led to a loss of faith in banks as well-regulated entities, run by sensible (and risk averse) people, but it has increased the role of central bankers in economies, with perverse consequences. In their zeal to be saviors of the economy, central bankers (in my view) have contributed to an environment of low economic growth and higher risk premiums.
3. *Low economic growth and low inflation has resulted in interest rates lower than they have been historically* in most currencies and negative interest rates in some. I know that there are many who believe that I am over reacting and that it only a question of time before we revert back to more normal interest rates, higher economic growth and typical inflation but I am not convinced.

The Statistical Basis for Mean Reversion – The CAPE Illustration



A More Useful Picture?



More Statistics: Correlation

	<i>CAPE</i>	<i>Stock Returns next year</i>	<i>T.Bond Return in next year</i>	<i>T.Bill return in next year</i>	<i>Stock Returns in next 5 years</i>	<i>Stock Returns next 10 years</i>
<i>CAPE</i>	1.0000					
<i>Stock Returns next year</i>	-0.2348	1.0000				
<i>T.Bond Return in next year</i>	0.0128	0.0210	1.0000			
<i>T.Bill return in next year</i>	-0.1261	-0.0337	0.0626	1.0000		
<i>Stock Returns in next 5 years</i>	-0.4796	0.4259	0.1373	-0.0261	1.0000	
<i>Stock Returns next 10 years</i>	-0.5625	0.3138	0.1365	0.0899	0.6284	1.0000

Statistics Doubling Down: Regressions

Return Period	Linear Regression	R-squared
One year	US Stock Return <small>Next year</small> = 21.03% - .0064 CAPE today	5.51%
Five year	US Stock Return <small>Annualized for next 5 years</small> = 18.56% - .0057 CAPE today	22.40%
Ten year	US Stock Return <small>Annualized for next 10 years</small> = 16.24% - .0044 CAPE today	31.64%

Expected annualized return in next 10 years
= 16.24% - 0.0044 (27.27) = 4.30%

From Statistics to Investing: Market Timing Choices

- Timing threshold: If you decide that you will time markets using a metric, you have to follow through with specifics.
- Asset class alternatives: If you decide to move money out of stocks, you have to also specify where the money will go and you have four choices.
- Holding period: You will have to specify how long you plan to stay with the "market timed" allocation mix.
- Allocation Constraints (if any): The allocation that you have for an asset class can be floored at zero, if you are a long only investor, but can be negative, if you are willing to go short. The cap on what you can allocate to an asset class is 100%, if you cannot or choose not to borrow money, but can be greater than 100%, if you can.

Market Timing Results

Market Timing Results								
	With robot blend			With market timing			Market Timing Payoff	
<i>Period</i>	<i>Average Return</i>	<i>Std Deviaton</i>	<i>Value of \$100 invested at start of period</i>	<i>Annual Return</i>	<i>Std Deviaton</i>	<i>Value of \$100 invested at start of period</i>	<i>% Return</i>	<i>\$ Payoff</i>
1916-2016	8.89%	11.56%	\$277,730	9.07%	11.62%	\$332,147	0.19%	\$54,417
1917-1966	8.33%	12.66%	\$3,847	8.82%	13.30%	\$4,684	0.49%	\$837
1967-2016	9.44%	10.44%	\$7,220	9.33%	9.78%	\$7,092	-0.11%	-\$129

General Conclusions

1. Time Period: The CAPE delivers a positive market timing payoff in the first half of the entire time period (from 1917 to 1966) and a negative one in the second half (1967-2016).
2. Choice of time period for median: Using the lifetime median delivers better results during the "good" period (1917-1966) but worse results during the "bad" period (1967-2016). Using a shorter time periods for the median reduces the outperformance in the first half of the analysis period but improves it in the second half.
3. Buy and Sell: The CAPE's timing payoff is greater when it is used as a buying metric than as a selling metric. In fact, you make a positive payoff from using a low CAPE as a buying indicator over the entire period but using it is a signal of over priced markets costs you money in both time period.
4. Activity: Increasing the degree to which you tilt towards or away from stocks, in reaction to the CAPE, just magnifies the return difference, positive or negative. Thus, in the first half of the century (1917-1966), changing your equity exposure more increases the payoff to market timing. In the second half, it makes the negative payoff worse.

The Bottom Line

- Long Periods of Data: are a blessing and a curse, a blessing because we can extract more information from them and a curse because that information may no longer be relevant.
- Statistics on call: Since we can statistics painlessly, using built in tools, both academics and practitioners have increasingly turned to using statistical evidence as proof that you can beat markets. Correlation is not cash in the bank. Converting statistical significance to investment returns is far more difficult than it looks.