



Return Distributions and the Shiller P/E Ratio

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This article expands on ideas developed by Joseph A. Tomlinson in a series of recent articles for Advisor Perspectives on the topic of the Shiller P/E Ratio as a predictor of future returns in the stock market (See Advisor Perspectives: [Shiller P/Es and Modeling Stock Market Returns](#), January 19, 2010). Specifically, this article looks at the distribution of three-year returns in the stock market following different starting points for the Shiller P/E ratio on a monthly basis since 1884 to illustrate that the historical distribution of rolling three-year returns in the stock market is not random.

Imagine if I challenged you to a simple game: I fill a jar with 50 black marbles and 50 red marbles and propose to draw 10 marbles from the jar. For each black marble in the draw, I agree to pay you whatever dollar amount you choose, provided that you will pay me the same amount for each red marble pulled from the jar.

Knowing that the distribution of black and red marbles is 50/50, most rational people would decline to play this game for real money. But what if I agreed to remove 10 red marbles from the jar before we started? With the distribution now 50/40 in favor of black marbles, it becomes sensible, even wise to play this game for money. If I remove 20 red marbles to make the distribution 50/30, a rational person should be willing to raise the value of their wager. And if I remove 40 red marbles before starting the game it becomes sensible to “bet big,” whatever “big” means for the player involved.

The logic of this sequence is straightforward – when the mix of marbles is 50/50, the likelihood of winning or losing the game is purely random, but once a few of the red marbles have been removed from the jar the distribution of possible outcomes becomes skewed – any given draw of 10 marbles is more likely to contain more blacks than more reds. The most probable outcome is no longer random.



A recent article in this publication by Joseph A. Tomlinson reminds readers that the models used by most financial planners assume the distribution of future returns in the asset markets is always random, like drawing marbles from a jar with an equal mix of reds and blacks. Tomlinson goes on to suggest that this assumption of randomness in the asset markets may be flawed. He supports his point with a study of historical correlations between starting valuation and subsequent returns in the stock market over rolling periods of 1 and 10 years.

Tomlinson's work on this subject inspired the studies I will describe in this article, which address the same question – are returns in the stock market random? – in a slightly different way. Rather than measuring correlations between starting valuations and subsequent returns, I have measured the *distributions* of returns that follow various starting-point valuation levels in the stock market. Like Tomlinson's research, the studies in this article measure the valuation of the stock market with the Shiller P/E ratio.¹

The table below shows the distribution of every possible three-year return in the U.S. stock market – measured as of each month-end – between January 1884 and June 2009. This period encompasses 1,506 observations measured over rolling 36-month holding periods.

U.S Stock Market*
1884 – 2009
Rolling 3-Year Holding Periods
1,506 Observations

Average 3-Year Return (annualized)	9.50%
Median 3-Year Return (annualized)	10.63%
% of Periods with Negative Return	15.10%
Best 3-Year Return (total)	194.52%
Worst 3-Year Return (total)	(80.84%)

*U.S. stock market returns for the period 1884 through 1926 are derived from the Shiller market index at www.econ.yale.edu/~shiller/data.htm. Returns from 1926 through 1969 represent the “Large Company Stocks” category from Ibbotson Associates. Returns from 1970 onward represent the S&P 500 Index.

¹ The “Shiller P/E Ratio” was designed by Yale economist Robert J. Shiller to reflect a normalized valuation multiple for the U.S. stock market. It is calculated as the price of the market index divided by the average inflation adjusted earnings for the index over the previous 10-years. The Shiller P/E Ratio is designed to smooth out the short-term swings in corporate earnings caused economic cycles.



Sources: Robert J. Shiller, Standard & Poor's; Ibbotson Associates; Capital Advisors, Inc.

If the experience of the past 125 years is a relevant guide for the future behavior of U.S. stocks, an investor who is willing to hold the market index for at least three years would rationally have the following three-year expectations at any given month-end starting point:

- 1) An annualized return, including dividends, of around 9.5% on average.
- 2) Around a 15% probability of losing money over 3-years, or slightly greater than 1-in-7 odds.
- 3) A possibility, although very remote, of nearly tripling their money.
- 4) A possibility, although very remote, of losing around 80% of their money.

Nothing about this data should look surprising to an experienced investor. Indeed, something very close to this same distribution of possible market outcomes has been programmed into the financial planning software used by most professional investors for at least the past three decades

But what if this is the wrong distribution?

To address this question, I segmented the 125-year history of the market index into quartiles based on the level of the Shiller P/E Ratio as of each month-end dating back to 1884. I then measured the return distributions associated with the lowest and highest quartiles for the Shiller P/E Ratio to search for differences between the two. The difference was material!

The table below compares the distribution of three-year returns that follow a starting Shiller P/E Ratio of 11.54 or less (11.54 is the threshold for the lowest quartile of all monthly observations since 1884) with those that follow periods that begin with a Shiller P/E of 19.20 or more (the threshold for the highest quartile in the data):



U.S Stock Market*
1884 – 2009
Rolling 3-Year Holding Periods
753 Observations

	When the beginning Shiller P/E is...	
	<u>11.54 or less</u>	<u>19.20 or more</u>
Average 3-Year Return (annualized)	16.20%	6.85%
Median 3-Year Return (annualized)	17.03%	7.07%
% of Periods with Negative Return	0.00%	28.10%
Best 3-Year Return (total)	194.52%	134.08%
Worst 3-Year Return (total)	0.85%	(80.84%)

*U.S. stock market returns for the period 1884 through 1926 are derived from the Shiller market index at www.econ.yale.edu/~shiller/data.htm. Returns from 1926 through 1969 represent the “Large Company Stocks” category from Ibbotson Associates. Returns from 1970 onward represent the S&P 500 Index.

Sources: Robert J. Shiller, Standard & Poor’s; Ibbotson Associates; Capital Advisors, Inc.

These data prompt numerous worthwhile questions for professional investors and financial planners. Here are three:

1. Do professionals do their clients a disservice if they offer similar advice about stocks regardless of whether the starting P/E ratio is high or low, as so many financial software platforms prescribe?
2. If presented with this data today, when the Shiller P/E Ratio is over 20, how many investors would knowingly accept a nearly one-in-three chance of losing money over three years in exchange for an expected annualized return of 6.85% with a majority of their savings (taken from the distribution of outcomes associated with a Shiller P/E of 19.20 or higher)?
3. Would it be irresponsible for investment advisors to encourage a widow or a retiree to tilt her portfolio more aggressively toward stocks whenever the Shiller P/E sinks below 12?

To proponents of Efficient Markets and Modern Portfolio Theory, these questions have no meaning because the assumptions needed to “make the math work” in these theories require that market returns unfold randomly, like the flip of a fair coin. These theories, and the financial planning platforms that rely on them, tell investors to wager the same amount on every draw from the “jar of marbles.”



The evidence from the real-world history of asset markets suggests that market returns are *not* totally random. Sometimes “Mr. Market” removes a few red marbles from the jar, and sometimes he removes blacks. Simple indicators like the Shiller P/E Ratio can reveal which marbles have been removed at any given time. It is our job as investors to pay attention and adjust our wagers accordingly.

References

Tomlinson, Joseph, 2010, [Shiller P/Es and Modeling Stock Market Returns](#), (Advisor Perspectives)

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