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Investment Newsletter – June 2018

This quarter we will discuss how valuations effect future risks and expected returns. We also demonstrate how long term investing reduces risk compared to shorter horizons.

Managing Risk and Return for Long Term Investors

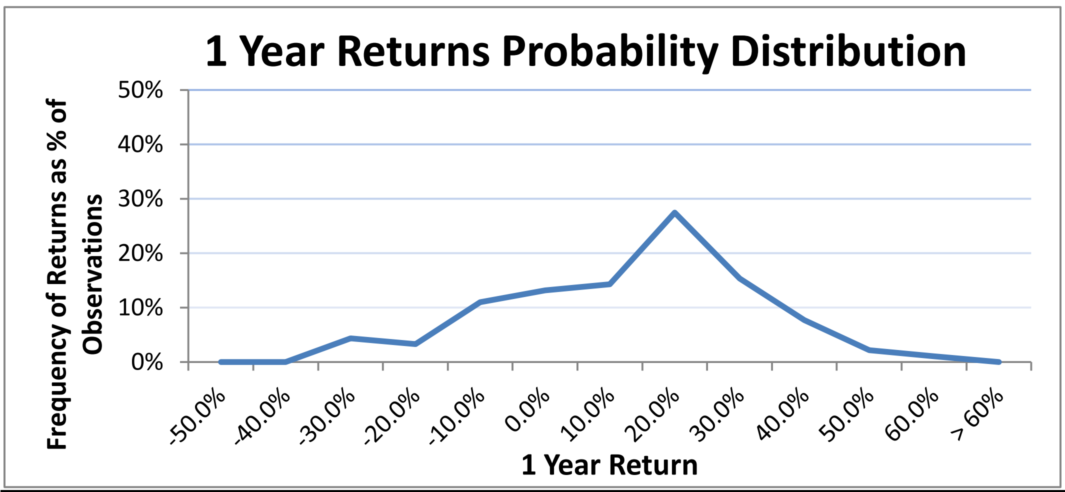
Many investors consider Warren Buffett, chairman of Berkshire Hathaway, one of the greatest investors of all time. In this year's letter to his shareholders, Buffett had this to say about investing risk:

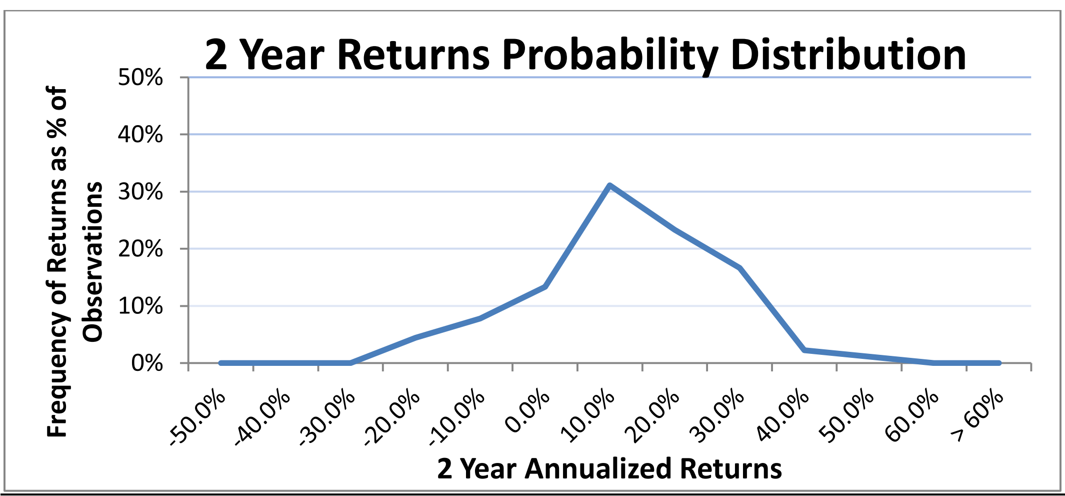
"*Investing is an activity in which consumption today is foregone in an attempt to allow greater consumption at a later date. "Risk" is the possibility that this objective won't be attained*."

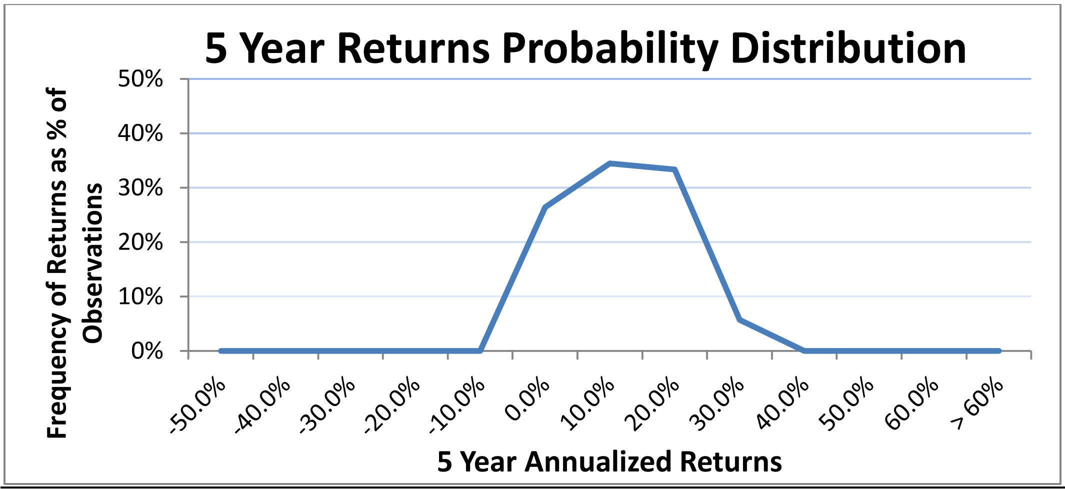
It is a common sense statement that is easily overlooked when focusing on day to day moves in the market. This newsletter has often described our clients as having long investing horizons and our strategies as long term strategies. If we see Buffett's definition of investing and risk in terms of investors' goals for funding their retirement or their children's college education, it is clear that these objectives dictate that we care about these end results – typically years in the future. It's also worth pointing out that over such long time frames, holding too much cash increases your risk (using Buffet's definition of risk) because inflation over the years will reduce our ability to consume in the future using a fixed amount of cash. We still need to hold cash against the possibility of needing it in a shorter time frame, but for long term goals, cash only helps us if we can eventually invest it in better opportunities than we have today.

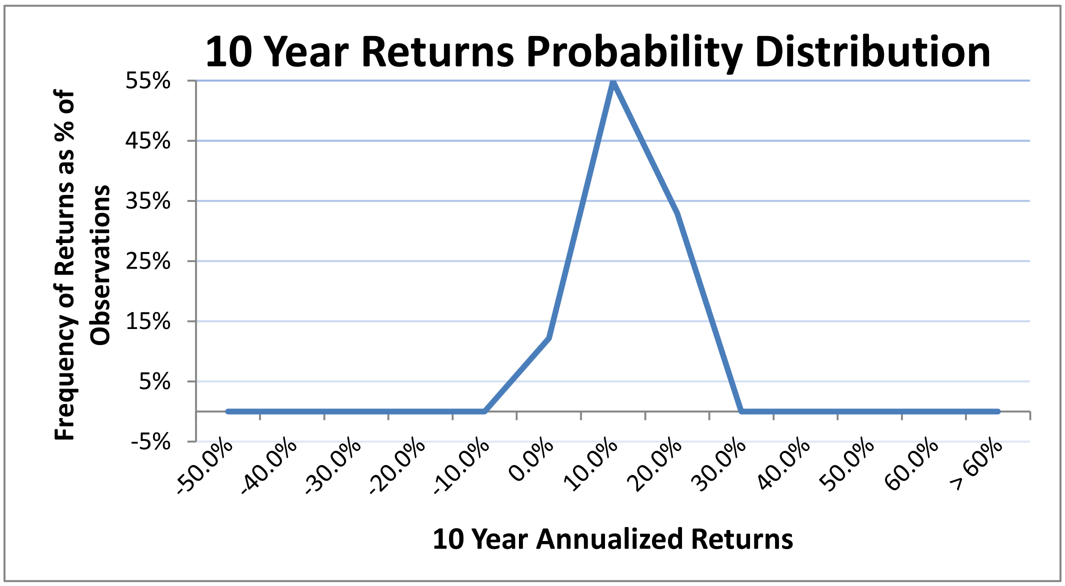
Investing in securities means accepting uncertainty of returns; we must consider the probabilities of various possible outcomes in order to choose investments that improve our chances of meeting our goals. Therefore to manage risk means to link our investment decisions to information about probabilities of the various possible results – over some time horizon. This is inherently an analytical exercise but it need not be complex. Many of you make these assessments automatically without doing any conscious calculations. My goal in this newsletter is to explicitly explain a simple version of such calculations to show the links between risk, return, time horizon, and investment characteristics to illuminate the investment risk management process as I see it.

As a starting point for considering how Buffet's definition of risk is determined by investment horizon, let's look at the probability distributions of inflation adjusted (real) returns for four different horizons: 1 year, 2 years, 5 years, and 10 years. The graphs below are empirical distributions meaning they are simply tabulations of the 91 actual calendar year S&P 500 index returns for 1927 to 2017. On each graph, the range of potential returns for the given investment horizon are shown on the horizontal axis and the historical relative frequency (probability) of observing the returns (for that investment horizon) are measured on the vertical axis so that the higher the line, the greater the chance of observing that particular return.









What we see in the graphs above is that over longer periods extreme returns tend to offset one another - thus pushing the compounded return over time toward the average. Because stocks have, on average, generated positive returns, the frequency of annualized returns above 0 rises with the investment horizon as follows:

1 Year – 68%
2 Year – 74%
5 Year – 74%
10 Year –88%

The lesson here is that if we want to manage risk, first we need to choose the proper investment horizon over which to manage it.

Terminology – Central Tendency and Conditional Probability

Before we go further we need to cover some terminology. As a starting point let's think about the central tendency of a range of possible investment outcomes. In statistics we use the measures average and median to describe the central tendency. When dealing with a probability distribution of possible returns we use the term *Expected Value* as a substitute for average. Expected Value is defined as the probability weighted average of all possible outcomes. For example if there is a 40% chance of earning $20 on an investment and a 60% chance of losing $5, then the expected dollar return is $20 x .40 - $5 x .60 = $5. Note that even though this investment has a positive Expected Value, there is still a 60% probability that you don't achieve your positive return objective.

The graphs above are unconditional frequency distributions. That means we are using all the data without trying to subdivide it according market conditions observed across time. In order to manage investment risk we can analyze how to use information about current market conditions to estimate more accurate probability distributions for future returns. We call these "conditional probability distributions" because they are the probabilities conditioned on (given) the current state of market variables.

Now let's talk about a phenomenon called mean reversion before we use this in the context of investment risk analysis. Mean reversion refers to the idea that certain variables have a central tendency and although they may move far from that central tendency, over time they tend to revert back. Think of your golf or bowling score. You may shoot far above or far below your average over some hot or cold streak but generally your scores will move back in the direction of your true ability. Suppose your average golf score is 72 and that your scores fall in the range of 66 to 78 about 95% of the time. Then if you shoot a score at the extremes of the range, then the next score is likely to revert back closer to 72.

Here's where this is going: interest rates, economic growth, corporate earnings growth, and investors' required returns are all variables whose probability distributions appear stable over long run periods. For my purposes, we will focus on movements in investors' required returns. When we look at the compensation for risk that is implied by valuation variables in financial markets, we see that there is a central tendency/expected value plus variation around those values according to some probability distribution. The implication is that we can use information about the current states of these variables to adjust our expectations of how they will move through time and thus improve our estimates of risks and returns, i.e. probability distribution of future returns. Next we'll consider the nature of the relationship between risk and returns.

The Value Investor's View of the Risk and Return

Let's consider the contrast between the popular academic view of risk and the fundamental practitioner's reality. Value investor Howard Marks put it this way in chapter 6 of his book The Most Important Thing:

"*Whereas the theorist thinks return and risk are two separate things, albeit correlated, the value investor thinks of high risk and low prospective return* *as nothing but two sides of the same coin, both stemming primarily from high prices. Thus, awareness of the relationship between price and value – whether for a single security or an entire market – is an essential component of dealing successfully with risk.*

Risk arises when markets go so high that prices imply losses rather than the potential rewards they should. In bull markets – usually when things have been going well for a while – people tend to say 'Risk is my friend. The more risk I take, the greater my return will be. I'd like more risk, please.' The truth is, risk tolerance is antithetical to successful investing. When people aren't afraid of risk, they'll accept risk without being compensated for doing so, and risk compensation will disappear."

Investment outcomes vary because cash flows paid out by securities may change over time and because the market value of future cash payouts may change through time. By this I mean the value per $1 of cash flow – this is completely separate from the risk of changes in underlying cash flows of the securities. These are called valuation, or risk appetite, changes because they are changes in the required future returns received as compensation for taking investment risk. Even if future payments to securities holders don't change, we are still subject to market pricing if we sell the security prior to receiving all its cash flows. Looking at history, most of the fluctuations we see in market index level prices are related to fluctuations in valuation rather than fluctuations in underlying cash flows.

When future buyers of your securities are more risk averse they will require higher returns and therefore offer a lower valuation/price when they buy your security. The converse also applies – if future buyers don't care about risk and happily accept lower returns they will bid up valuations and your returns will turn out to be higher than expected.

These valuation fluctuations primarily determine risks and returns and therefore we will focus on linking risk and return to the valuations and their fluctuations over our investment horizon. Specifically returns are determined by cash flows between purchase and sale of a security, plus the change in expected future cash flows in combination with the valuation of expected cash flows – i.e. the sale price.

Over shorter investment periods, the day to day volatility of valuation moves has a large impact on returns relative to fluctuations in underlying investment cash flows. The traditional academic theories use short term volatility as their measure for risk. For long term investors, this volatility is only relevant to the extent that it affects them emotionally.

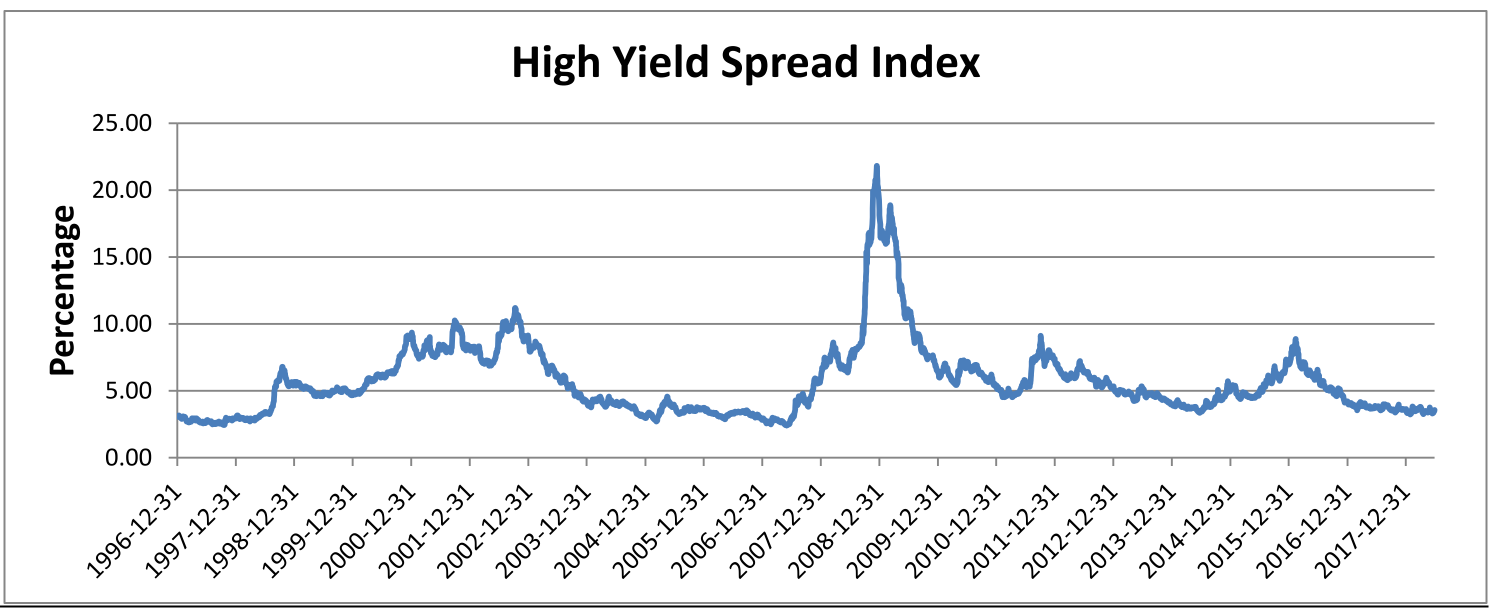
Over longer periods, market valuation variables tend to mean revert toward their central tendency so that, on average, our expected return is driven by a combination of underlying cash flows and the market conditions (i.e. price) at which we bought in.

Assessing Risk and Return Conditional on Current Valuations

To illustrate we start with fixed income. Let's assume for the moment that the expected return of any fixed income security or portfolio is its current yield to maturity. If held to maturity and no default occurs, the actual return will turn out to be exactly the expected return. If we sell a fixed income security before maturity, buyers may require a higher or lower expected return at the time you sell and therefore you may get more or less return than expected if you sell early. Note the direction of how this works: if future buyers of your fixed income security require a higher return than your expected return, this implies a lower price for you and thus a lower return than expected.

Let's say we bought a non-investment grade corporate bond for $100 today and this bond will pay $6 each year plus $100 at maturity in 5 years. The yield to maturity, and thus it's expected return over the 5 year horizon, is 6%. There are two components to the valuation of this bond: 1) the 5 year risk free rate on treasury securities and 2) the credit spread for non-investment grade bonds. The 5 year treasury yield is 2.74% so the spread is 3.26%. If we hold till maturity and there is no default, we don't care about any changes in the valuation of the bond because we receive the principal back in cash: our actual return turns out to be 6% annually. Now let's consider what can happen over different investment horizons.

Since the end of 1996 the median high yield bond spread is 5.01%. Here is the time series of spreads:



We can see that over time the spread fluctuates but reverts towards the median. If the market spread goes back to this central tendency from 3.26%, the price of the bond will decline and we won't be able to sell for 100 prior to maturity. Suppose our investment horizon is 2 years and so we sell the bond 3 years before maturity at the new required yield of 7.75% (same treasury yield + 5.01%). The price would be $95.47 at sale and the holding period annual return would be 3.78% per year. Holding for 3 years gets us a return of 5.01% and a 4 year hold yields 5.63%. This convergence toward the expected return is the pull to par effect. As the discounting period shortens and the final maturity payment draws nearer, the higher yield has a smaller impact on price – but we still end up with a lower return if required returns rise and we sell prior to maturity.

Now suppose you're managing a portfolio where you sell the existing bond at the end of each year and buy a new 5 year bond. We'll assume each new bond has a coupon set to current yield so that it sells at $100 (par) at the beginning. We are starting from a point where the spread compensation for risk is lower than the historical median. Therefore we can expect the difference of 1.75% to amortize to 0 over some period. By this I mean that the spread will on average drift up towards 5.01%. Let's assume that happens at a constant rate over 5 years so that the bond's yield increases by .35% per year. Let's look at that over various investing horizons.

5 Yr Bond Rollover Strategy			**Returns by Year For 6 different Investment Horizons**					
Year	End of Yr. Yield	Par coupon	2	3	4	5	10	15
0	6.00%	6.00						
1	6.35%	6.35	4.80%	4.80%	4.80%	4.80%	4.80%	4.80%
2	6.70%	6.70	5.16%	5.16%	5.16%	5.16%	5.16%	5.16%
3	7.05%	7.05		5.52%	5.52%	5.52%	5.52%	5.52%
4	7.40%	7.40			5.88%	5.88%	5.88%	5.88%
5	7.75%	7.75				6.23%	6.23%	6.23%
6	7.75%	7.75					7.75%	7.75%
7	7.75%	7.75					7.75%	7.75%
8	7.75%	7.75					7.75%	7.75%
9	7.75%	7.75					7.75%	7.75%
10	7.75%	7.75					7.75%	7.75%
11	7.75%	7.75						7.75%
12	7.75%	7.75						7.75%
13	7.75%	7.75						7.75%
14	7.75%	7.75						7.75%
15	7.75%	7.75						7.75%
		Compounded Annual Returns	**4.98%**	**5.16%**	**5.34%**	**5.51%**	**6.63%**	**7.00%**

As the required risk premium spread increases towards its median, yearly returns fall below the initial expected return because the strategy requires selling after yields have increased rather than holding to maturity to get par. The other key point in the table above is that increases in bond yields hurt returns for shorter investing horizons but increase returns for longer horizon investors.

So far we're only talking about gradual moves that affect our expected returns over a holding period. Now let's consider the risk of a move in the spread to 10% as would likely happen during a recession. Such a move would push our bond portfolio value down by 24% by increasing the yield to 12.74%. Of course this higher yield would also mean that by sticking with our strategy we would recoup the entire loss in less than 2 years even without any reversion of the spread back toward its central tendency. But here is a key question – is our bond portfolio riskier when its expected return is 6% or after it has suffered a large loss and the expected return is 12.74%? If we look at the historical data for movements in high yield spreads, I think it's clear that the odds of increases are higher at low spreads while the odds of decreases are higher as spreads rise – i.e. it is mean reverting. Since bond prices drop as spreads rise and vice-versa, the probability of significant loss is much higher when expected returns are low compared to when they are high. More importantly, the longer our investing horizon, the less impact there is on our returns from adverse market moves.

Now let's apply this analysis to equities. In this case we don't have interest payments but we can model the cash flows and earnings of the underlying companies. Combining this with a valuation measure, we will calculate returns. For stocks we'll use the S&P 500 index as our investment. Let's assume that these companies are collectively paying out 60% of their average earnings and that by reinvesting the rest, earnings grow by 6% per year. These numbers are roughly in line with the median values since 1871 in the data collected by Professor Robert Shiller at Yale[1]. Note that this implies the companies can earn 15% on their reinvestment of earnings (= 6%/40%). If there is no change in these cash flows (dividends and returns on earnings reinvestment) and no change in how the market values the cash flows, then the investor will earn a return equal to the starting dividend as a percentage of the index price, plus the 6% growth rate[2]. As with the bond, choosing the purchase price also sets the expected return - assuming the valuation ratio upon which the stock market is valued does not change.

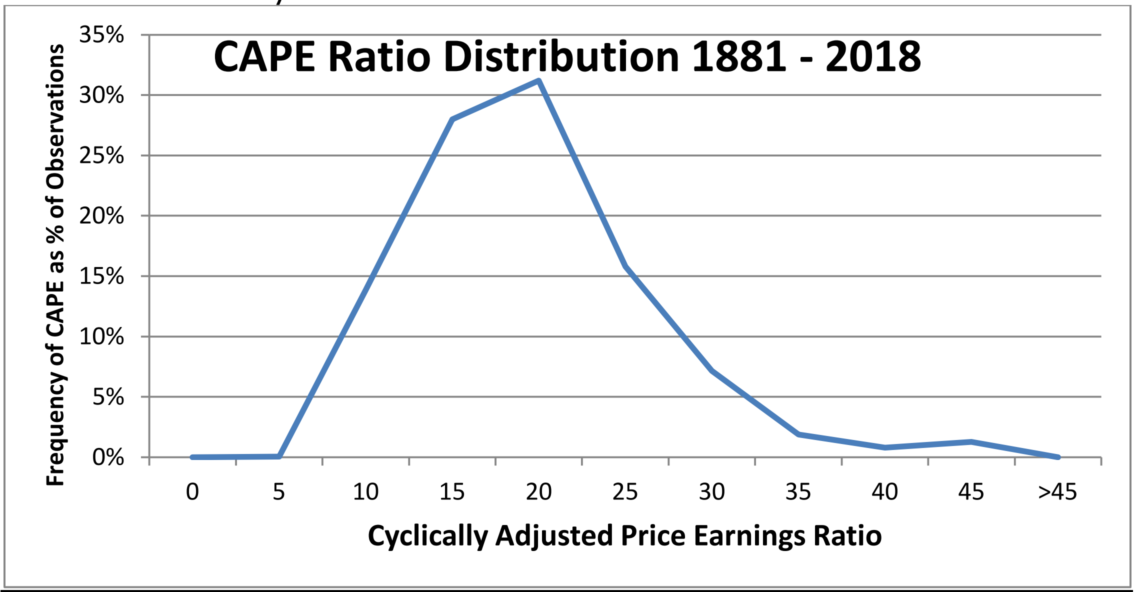
There are many possible valuation statistics we could use but let's use Professor Shiller's Cyclically Adjusted Price Earnings ratio, also known as CAPE for short. This is calculated by dividing the index price by the average of earnings over the last 10 years. All historical numbers are adjusted for inflation so they are the equivalent of current dollars. This measure has close to 60% correlation with returns over the following 12 years. The higher the correlation of the valuation measure with returns, the more information it provides us about the probability distribution of future returns

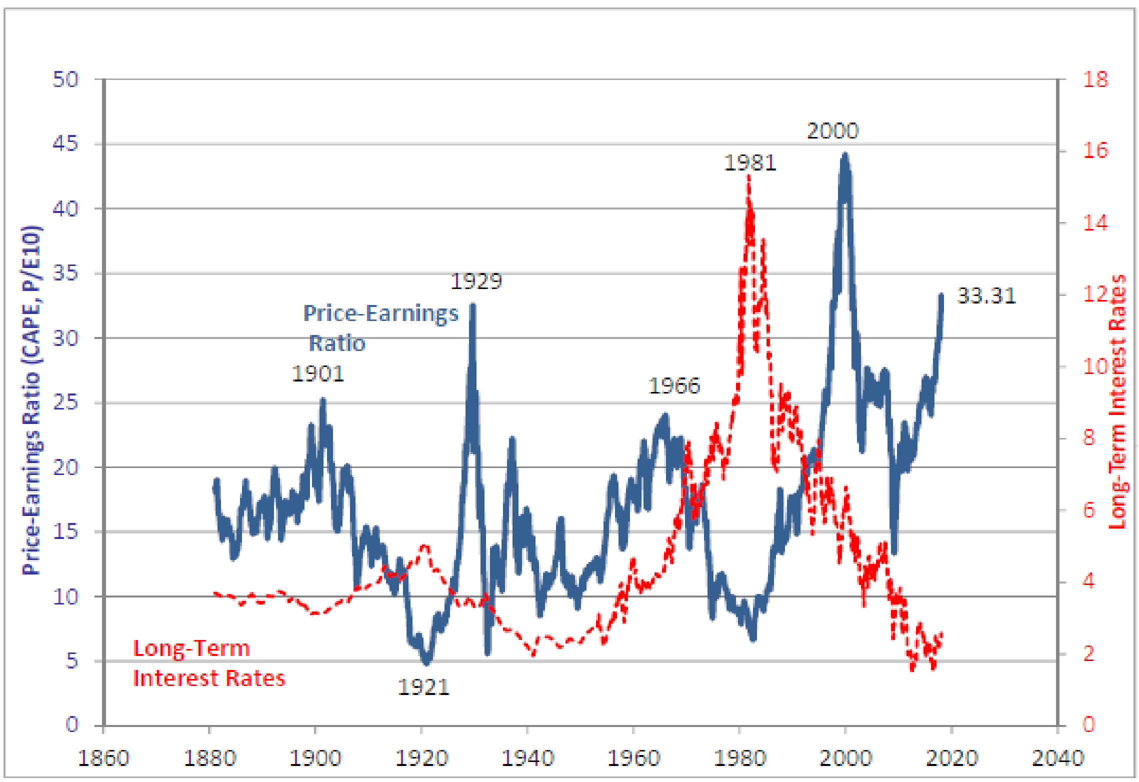
[1] You can find the data here: http://www.econ.yale.edu/~shiller/data.htm

[2] We would need to subtract the inflation rate to get the inflation adjusted (real) return.

conditional on the information contained in the current observation of the valuation measure. The other important characteristic of the measure is that it is mean reverting and thus we know that an extreme value will eventually revert toward the central tendency of the distribution.

The median CAPE in monthly data back to 1871 is 16.2; it has ranged from a low of 4.8 to a high of 44.2 (in December 1999). Below are the graphs of the frequency distribution of CAPE, and below that it's time series – which is directly from the Shiller data and includes interest rates.

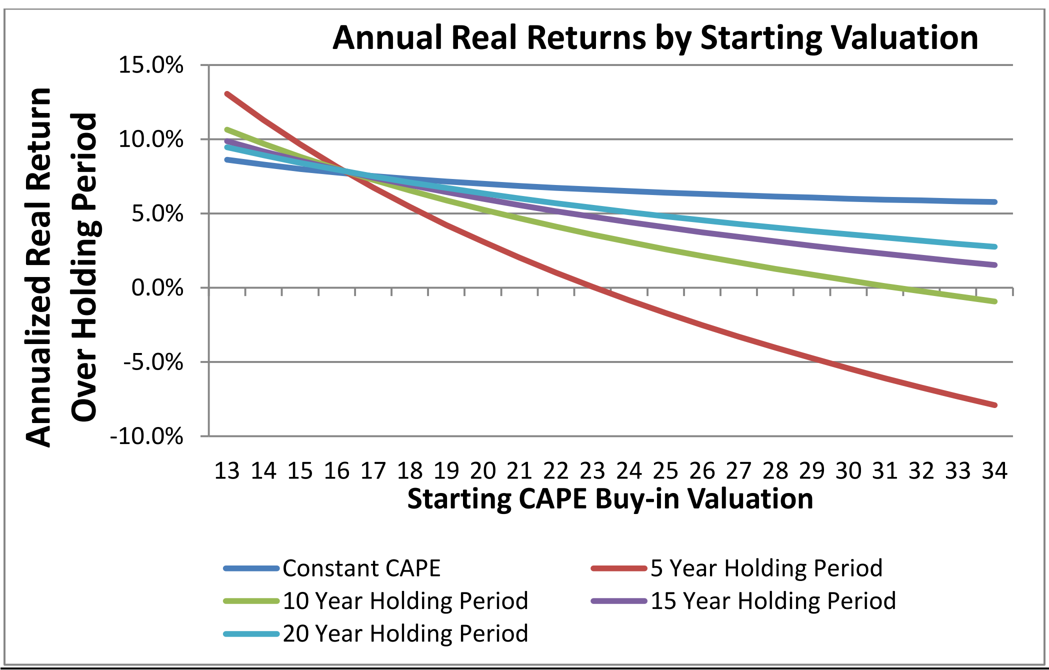




The time series of CAPE (in blue) shows labels for a few extreme market peaks (which were followed by very large losses). The peak CAPE in 2007 before the last downturn was 27.32.

Suppose I buy the S&P index when the CAPE ratio was 16. At this price the dividend yield would be 3.75%[3]. If the CAPE ratio remained constant going forward, then my return would be 9.75% - the dividend yield plus the growth rate in earnings. But of course the CAPE ratio is always moving around and this is what drives the major part of return fluctuations.

Now we are ready to consider the impact of these variations in stock prices, as reflected in the CAPE valuation ratio, on expected returns and risks over varying holding periods. We will assume that earnings and dividends are growing at a constant uninterrupted rate of 6% and constant inflation of 2%[4]. We will look at returns assuming the CAPE ratio is constant and then calculate returns when the CAPE ratio moves smoothly to 16 over the holding period to account for mean reversion. I've chosen 16 as a terminal value for the CAPE ratio because it is close to the long run median value and to help illustrate how big the returns differences are depending on the level of the starting CAPE ratio. Since the late 1990's the CAPE ratio has tended to be much higher than other periods in history (though it did drop to 13.3 in 2009). Based on our assumptions we can calculate and plot the relationship of future returns to the starting CAPE ratio:



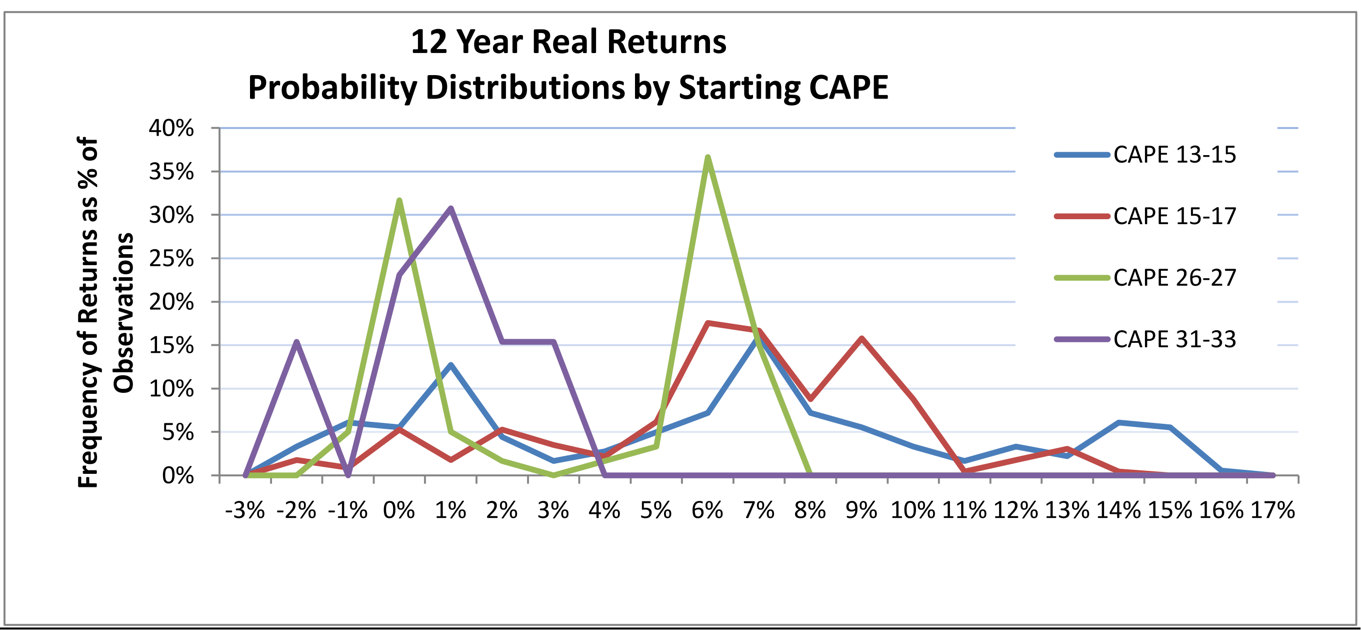
The dark blue line is relatively flat because this assumes that whatever level of valuation we start with continues on regardless of how low or high it is.

[3] Calculated as dividend/price = 60% * earning/(16*earning) = .60/16 = .0375
[4] Thus the real inflation adjusted growth rate is 6% - 2% = 4%.

Looking at the slopes of the other lines we see that the longer the holding period the less the impact starting CAPE ratio has on our returns. This is because we have a longer period for the underlying companies' earnings to make up for any starting valuation premium or discount.

Now let's tie this into risk. Speculators and traders don't care much about long run returns because they are focused on the short run. CAPE ratios won't matter for them; short term returns can be good despite high prices. But at some point sentiment will change and a majority of these traders will be looking to sell. This is when valuations matter. If valuations are near long term norms so that expected returns are high enough to attract value conscious investors, then the sellers will find investors willing to bid for their shares at close to current value. But if CAPE is very high – implying low returns for the risks, the market may have to drop substantially before value conscious investors step in to bid for traders' shares. Thus, as with bonds, we see a positive relationship between future expected returns and risk of loss. When CAPE is low, possible downside moves are small relative to potential returns and conversely when CAPE is high, possible downside moves are large relative to potential future returns. Thus our objective is to adjust our risk taking in accordance with current conditions.

Real markets are much messier that the above simplification. We want to assess the probability distribution of future returns over our holding period conditional on the current valuation. Sticking with the CAPE ratio as our measure of long term risk and return, the graph below shows the historical distributions of 12 year holding period real returns conditioned on the starting buy-in level of the CAPE ratio. I'm using 12 years because that is considered the period over which that starting value of CAPE no longer influences (statistically) the ending value.



The blue and red lines show the relative frequencies of returns for low to moderate vales of CAPE while the green and purple lines show the relative likelihood of returns starting from relatively high valuations as we see today. While the real world data is indeed messy, we can see that the chances for losses are much higher when buying in expensive markets and conversely the chances for the highest returns are much better when buying at the lower CAPE ratios.

I've used data from the market as a whole to illustrate my point but the same analysis applies at the individual stock level: lower prices relative to earnings or other measures of fundamental value correspond with both higher future returns and lower downside risks.

Looking at the risks over a long investment horizon shows that expected returns greatly reduce the downside and that higher returns tend to go with lower risk. But in the shorter term, a sudden drop in valuations may cause a loss of confidence in the strategy and therefore a sale at the point where future returns are highest and further downside is limited. As a result it is important to assess the potential for short term portfolio declines to insure the portfolio is constructed such that these short term fluctuations are unlikely to be large enough to cause us to abandon our long run strategy.

Conclusion

As long term investors our returns will likely be determined by when we buy and therefore we must be disciplined to ensure we buy when expected returns are sufficient for taking on the risks implied by the probability distribution of long term returns conditioned on current market valuations. When we inevitably experience emotionally difficult market declines, we must remember that this is not the time to sell – it means future returns are rising and risk of loss is declining. Conversely, when markets rise to high valuation levels, it is not a time for greed; it is time to take note of the higher risk and the lower returns offered as compensation.

In other words, as Warren Buffett famously says: "Be fearful when others are greedy and greedy when others are fearful"

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