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Planning Allocation Strategies and Asset Valuations

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"You don't need to be a rocket scientist. Investing is not a game where the guy with the 160 IQ beats the guy with 130 IQ."
—**Warren Buffet**, *America's richest investor*

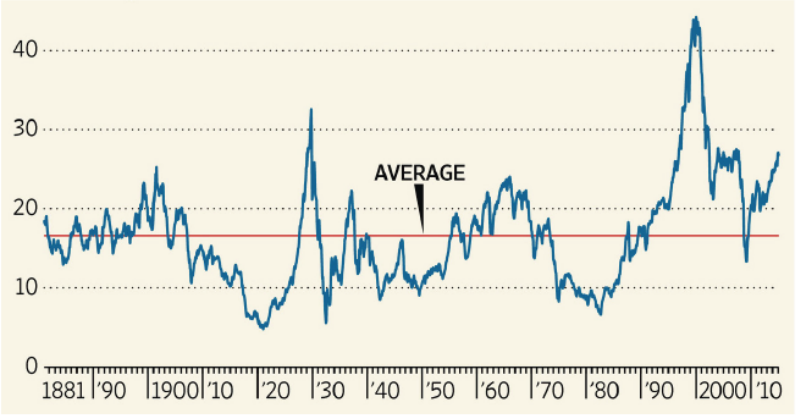
In his recent best-seller *Capital in the 21st Century*, French economist Thomas Piketty argues that "r › g": "r" is the return on capital and "g" is the growth rate of the economy. Piketty's thesis is that recently the return on investment has been greater than underlying growth of companies within world economies. Sometimes government intervention appears to work, but that's not how capitalism creates wealth. Outside of the French utopia, Piketty's opus has been questioned on theoretical and statistical grounds.[i]

Back in the United States which owns about half of the world's wealth by market capitalization, major pension trusts such as CalPERS have lowered return expectations for pension returns. Some suggest that CalPERS projected 7.5 percent return model may be too optimistic.[ii] Indeed, while the S&P 500 index of U.S. large stocks has tripled from its 2009 low during the financial crisis, it's still only up 200 percent from the beginning of 2008. Since the global tech bust 15 years ago, the S&P 500 return has been only 4.0 percent annualized. For one year, the S&P 500 index is flat, compared to 10.1 percent since 1926.

Exhibit 1

SHILLER'S CAPE MODEL: ARE U.S. STOCKS TOO HIGHLY VALUED?

A well-known stock-market valuation from a Nobel laureate, the 10-year Cyclically-Adjusted Price/Earnings ratio, at a P/E of 27, is well above its historical average of 16, but well below it's all-time peak.



NOTE: Calculations based on monthly averages of S&P 500 Index and a comparable index of U.S. large company stocks.
Source: Robert J. Shiller, Yale University. http://www.econ.yale.edu/~shiller/data.htm

To put the retirement returns challenge investors face in better perspective, a broad market global stock index, the MSCI All Country World Index, increased only 3.8 percent over the last 15 years.[iii] Seeking higher returns from traditional approaches yet disappointed with hedge fund solutions, many big advisory firms are allocating away from U. S. stocks into international stocks and emerging markets in the hopes of better returns. The belief is that U. S. stocks, while having done well since the financial crisis years, now offer fewer "opportunities" for large returns in the future. The theory is that based on financial valuations, non-U.S. stocks, particularly those in emerging markets, have better expected returns compared to U.S. equities. That is, they think expected return "r" is higher even though growth "g" may be lower relative to the U. S. Is that theory supportable for planning a sensible strategy?

The financial media once again has unsettled investors with periodic news pieces about a U.S. economy trending toward recession, economic troubles in Europe and China, a decline in American power and prestige abroad as Russia opportunistically supports failing Middle Eastern countries. The suggestion is that slower future growth of the world's largest economies—especially the U. S. and China—will result in lower future investor returns, creating issues for those retired, for those who hope to retire soon, or for their children as they plan for the future. **But the common belief that growth drives equity returns simply is not true.** Risk, not growth, explains expected returns, and better explains data Piketty uses.

Before our study begins, we note that the U.S. economy still grows at a rate that is relatively stronger than most major countries (albeit slower than during any past period for many decades). China still accounts for only 3 percent of the world's equity capitalization, and Greece—nearly as bankrupt as Argentina for similar profligate government policies—accounts for only a tiny fraction of total wealth.

The quandary of "high" US stock valuations

Charts of Robert Shiller's familiar "**Cyclically Adjusted Price/Earnings 10-Year Ratio**" (CAPE) are published frequently by the media and used by financial advisors since the professor received his Nobel-laureate in 2013.[iv] *Exhibit 1* shows that shares of the largest 500 U.S. public companies currently trade near historically high valuations relative to their prior 10 year-earnings. Respected pundits suggest that "the market" may be seriously "overvalued" and subject to a "correction," similar to that of 2000 or 2008.

CAPE is based on the notion that stock markets function within a valuation equilibrium, and so current stock prices are likely to move, sooner or later, strongly downward toward their "long-term average"—and possibly remain there for many years. Industry gurus who promote this model suggest those who fail to heed their wisdom and adopt various "smart beta" active investment products they offer may have outcomes ranging from disappointing to disastrous. Many salesmen recommend "smart beta" versions of various "factor models" based on CAPE to replace older investment methods that are not working well.

The underlying conceit behind promoters and purveyors of CAPE valuation approaches is a fundamental belief in "reversion to the mean": This notion extends the Gaussian normal distribution of large numbers in statistical theory, and presumes that a large number stocks in group comprising an asset class, such as large U.S. companies comprising the S&P 500 index, have an inherent and strong tendency to revert to an unspecified "historical mean." CAPE, then, is based on assumptions not grounded in financial science.

Using Professor Shiller's well-known data series, the CAPE average mean for large U. S. stocks is 16.6.[v] The theory is an asset class like U. S. large stocks with P/Es above 16.6 are negatively "valued" and likely to increase less or even decline substantially in price levels relative to other asset classes. And asset classes in equilibrium below the golden mean are positively "valued" and more likely to reward investors from pervasive price increases. To put U.S. stocks in perspective using the CAPE, the current ratio is 27, or 50 percent above the historical mean. Thus, the implication is that future expected returns are low.

But outcomes may be much worse. Shiller remarked in an interview back in late 2014 when the CAPE ratio was 26.3: "There's only three major occasions in US history back to 1881 when it was higher than that. One is 1929, the year of the crash. The other is 2000, which I call the peak of the millennium bubble, and it was also followed by a crash. And then 2007, which was also followed by a crash."[vi]

The predictive implications for investors relying on Shiller's CAPE at high price/earnings are indeed troubling. While the CAPE metric is not close to the peak level of 44 reached during the tech bubble in 1999, Shiller's model does imply that cumulative forward returns on U.S. stocks for a number of years are very likely to be much lower than historical averages—perhaps, somewhere close to a 1% real return. *Exhibit 2* from Research Associates, a large highly regarded firm in the financial industry that advises many billions of dollars, is a study predicting poor results not only for large U. S. stock asset classes, but also for small U. S. stock asset class. Research Associates uses CAPE to argue that large international stocks in developed countries and emerging market stock asset classes have better return expectations.

EXHIBIT 2

ESTIMATING EXPECTED RETURNS IN GLOBAL MARKETS FROM SHILLER'S CAPE RATIO

	U. S. Small Cap Market Russell 2000 Index	U. S. Large Cap Market S&P 500 Index	Non-U.S. Developed Markets MSCI EAFE Index	Non-U.S. Emerging Markets MSCI EM Index
Current CAPE 10-Year Ratio	**47**	**25**	**14**	**11**
Historical Maximum	52	44	40	35
Historical Median	40	16	22	19
Historical Minimum	18	5	11	11
Expected Return	**0.4%**	**1.1%**	**5.3%**	**7.9%**
Volatility	*20%*	*15%*	*17%*	*24%*
EPS Inception	*1978*	*1871*	*1972*	*1995*

Sources: Calculated by Research Affiliates LLC, https://www.researchaffiliates.com/AssetAllocation/Pages/Equities.aspx. Based on data from Robert J. Shiller website, Morgan Stanley Capital International Inc., and Bloomberg Finance LP.
Forecasts are forward-looking statements based upon the reasonable beliefs of Research Affiliates and are not a guarantee of future performance. Volatility is measured as standard deviation. Past performance is not a guarantee of future performance.

A Vanguard study on forecasting methodologies examined 15 valuation techniques often used to predict stock market returns.[vii] While analysts found none had statistically significant short-term predictive power, they found the best long-term predictor was Shiller's CAPE, observing its statistical significance was low. Shiller's Nobel Prize may have been influenced by extremely fortuitous timing of publication of his two popular books using CAPE anticipating both the 2000 tech bust and the 2008 financial panic.

Shiller himself urges caution using his metric, and emphasizes that the CAPE model is not a tactical allocation tool like Research Associates is applying it. The professor is careful to point out that even when CAPE is high, the market can keep rising, or the market can keep falling even when the CAPE is low. Professor Shiller likely recalls his 1996 meeting with Federal Reserve Chairman Alan Greenspan, who coined the phrase "irrational exuberance" during a Congressional meeting after his first introduction to Shiller's now famous chart. The US stock market's exuberance continued strongly upward for most of four years until early 2000, causing much misery for those relying on the CAPE model. Investors prematurely reduced equity allocations, anticipating a market decline and planning big repurchases at much lower prices. Historic events gave an ironic twist to the oft-quoted phrase, "irrational exuberance."

Not surprisingly, the methodology of Shiller's CAPE is questioned both in academic and financial circles, note only due to its notoriety that gave it public attention, but also ue to the number of investing strategies supposedly based on it. Some academics are using CAPE to justify investing in U. S. stocks despite today's historically high valuations. Warton Professor Jeremy Siegel, author of *Stocks for the Long Run* and leading authority on stock-market history is among them. He believes high numbers are justified by the dramatic reduction in interest rates since the financial crisis.[viii] Shiller himself knows that CAPE can be easily misapplied as well as misunderstood. In a *Bloomberg* article, Shiller remarked: "I've been very wary about advising people to pull out of the market even though my CAPE ratio is at one of the highest levels ever in history. Something funny is going on. History is always coming up with new puzzles."[ix]

Puzzling CAPE valuation periods

U.S. data dating to the 1870s includes distinct economic eras as America grew in population and power. Each era had a different cost of capital. For example, prior to 1900, the United States was similar to emerging market countries today. But later after its involvement and victory in two world wars, the US emerged first as a dominant world power competing with Britain, and finally after the Cold War ended as the sole superpower. As the U. S. grew in population and commerce, the cost of equity capital would have declined. Stock market returns also were magnified in many developed countries as high equity risk premiums demanded by investors back in 1900 progressively declined over the course of the 20th century.

Using U. S. data before 1950 with two transformative world wars transforming and a Great Depression not since repeated, provides a data set too dissimilar from the period after 1950 for useful valuation comparisons. Relatively few U. S. stocks traded on public exchanges before World War 1 (the dominant market was British). There was no government agency like the SEC or FINRA to protect investor interests before 1930. No mutual funds or pension trusts with vast holdings existed much before 1940. Stock trading costs were enormously higher before fixed commissions were eliminated in the 1970s, and clearing of trades was much slower in an era before computers traded shares in milliseconds.

Even using a data set beginning in 1950 may be unreliable. In 2001, the Financial Accounting Standard's Board (FASB) changed the rules regarding how goodwill is written off by companies. Rather than forcing companies to write off goodwill over 40 years, a new annual test applies that dramatically impacts earnings statements. While the FAS 142 accounting rule may be better practice, its inconsistency with previous methodology makes CAPE's price-earnings ratios since 2001 appear more expensive relative to ratios derived from pre-2001 financial statements. Meticulous adjustments on a company level are needed, an involved empirical effort Professor Shiller never rigorously attempted .

Even further adjustments in calculating CAPE should be made—although rarely done—to account for the change in corporate dividend paying practices since the 1950s.[x] From 1954 through 1995, the S&P 500 index dividend ratio declined an average of 52 percent. Then from 1995 through 2013 the S&P 500 index declined *another* 34 percent on average. Presumably, the higher retention of corporate earnings, including buybacks of shares, should result in faster growth as firms reinvest more retained more earnings.

Lastly there have been changes in corporate practice related to how much leverage companies use and the increase in recent years of how much cash is held on their balanced sheets. Increasing debt levels lowers the price-earnings ratio, but that increases bankruptcy risk impacting their cost of capital. Holding more cash on corporate balance sheets (now common among large firms after the financial crisis) reduces the bankruptcy risk and the cost of capital while increasing the price-earnings ratios. Relative to historical past, increased cash holdings have increased price-earnings ratios. So presumably the equity premium previously required by investors when more leverage was commonplace has correspondingly declined.[xi]

Does mean reversion apply to expected returns?

The proposition underlying the CAPE model or other valuation models is the notion of "reversion to the mean." As mentioned earlier, mean reversion is a strong tendency for some valuation components or market factors found in asset classes or sectors to fluctuate around some identifiable historical "average." Determining a fundamental mean average for establishing what represents a true "value" is essential for predicting future market movement, either upward or downward. Is there empirical evidence which can be found to support that underlying belief of an inherent tendency of mean reversion for equilibrium in valuation models? If so, can that knowledge be exploited so as to develop profitable trading strategies? An exhaustive study by Dr. James Davis of Dimensional Fund Advisors says the likely answer is no.[xii]

While the empirical evidence is statistically positive for expected return premiums for the market and dimensional factors of size, value and profitability, these premiums have varied widely over time. In fact, realized value and size premiums in the U.S. have been low for the past decade. 80 years of historical data and exhaustive study supports research factors. Yet a prolonged period of variation from historical realized averages has caused some to suggest that dimensional factors may be constants. They are implying that mean reversion for market ,value and size premiums exits, so that high premiums tend to be followed by low premiums and vice versa. If so, this would support the CAPE valuation model.

Returns measured over long horizons should not be as variable as some expect in the absence of mean reversion. True mean reversion implird that future values associated with returns, including dimensional factors, are at least partially predictable—that is, investors can estimate their likely future returns by looking at past historical returns. Unknowns to consider: (1) what the time horizon should be; (2) what the premiums mean should be; (3) how strong the predictability in returns should be.

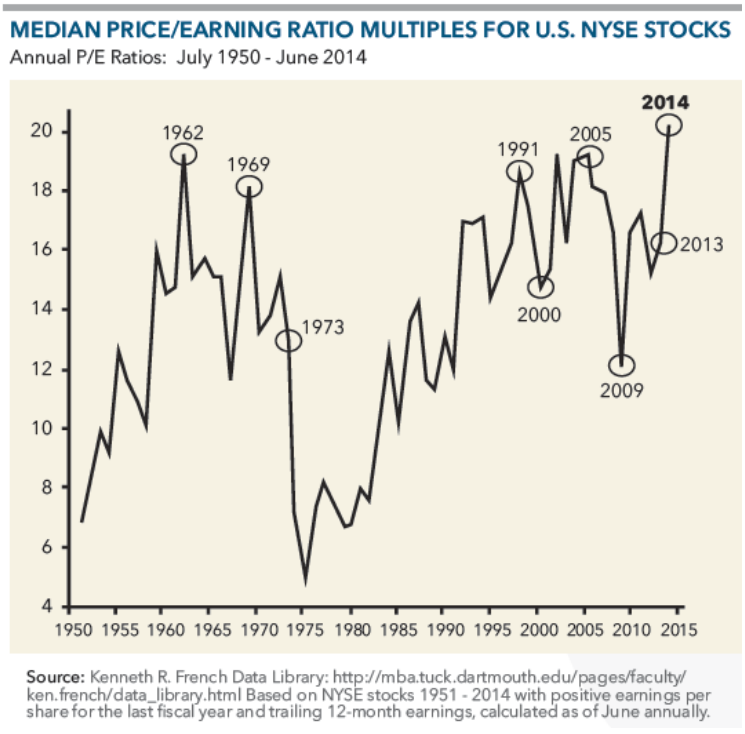
To study this, Dr. Davis explicitly engaged in what is described as "data mining"—trying hundreds of different trading rules in search of some that work in historical samples of U.S. and international security prices. Investors should always be cautious about strategies found by data mining: the success of such findings in historical data easily could be spurious. If you dredge through enough data long enough, someone will always find some strategies that perform well within a particular historical sample. From an academic view, this is interesting only if the same rule generates reliable excess returns in multiple samples while underperforming in only a few samples. Data mining prevails in the financial industry.

Dr. Davis found only slightly more 5 percent of the trading simulations showed reliably positive excess returns, or about the same rate as random chance. Thus, no mean reversion. His sober conclusion: "The most interesting result of this study is that, in spite of vigorous historical data mining, no trading rule was found that consistently generated reliable excess returns across markets and premiums" for any equity dimensional factors.

Returning to our earlier Vanguard paper endorsing Shiller's CAPE model, their researchers found that *all* strategies, including CAPE, had weak and erratic correlations with subsequent returns, even at long investment horizons. Predictor problems included trailing values for dividend yields and economic growth, the difference between the stock market's earnings yield and Treasury bond yields, and—no surprise—*series of past stock returns*. (The warning at the bottom of any advertised investment performance numbers for mutual funds or ETFs invariably states: *Past performance is no guarantee of future results.*)

Commenting specifically about the CAPE model, Vanguard found that Shiller's price/earnings and price/book valuation metrics had an inverse or mean-reverting relationship with future stock market returns—*but only over long time horizons*. Even then, CAPE model statistically "explained" only about 40 percent of the time variation in returns, even using Shiller's 10 year period. A forty percent confidence is not very reliable, and has low predictive value. Further, Vanguard researchers found that when the top 25 percent of top and bottom metrics were excluded, the statistical explanatory power declined by half to the level of noise. This implies: (1) The CAPE valuation ratio is useful for predicting returns only at market extremes, and (2) Professor Shiller was extremely lucky in publishing his books at the right time. The only puzzle left is: what share of Shiller's Nobel Prize should have gone to Eugene Fama in 2013?

Exhibit 3



Puzzling strategies from valuations

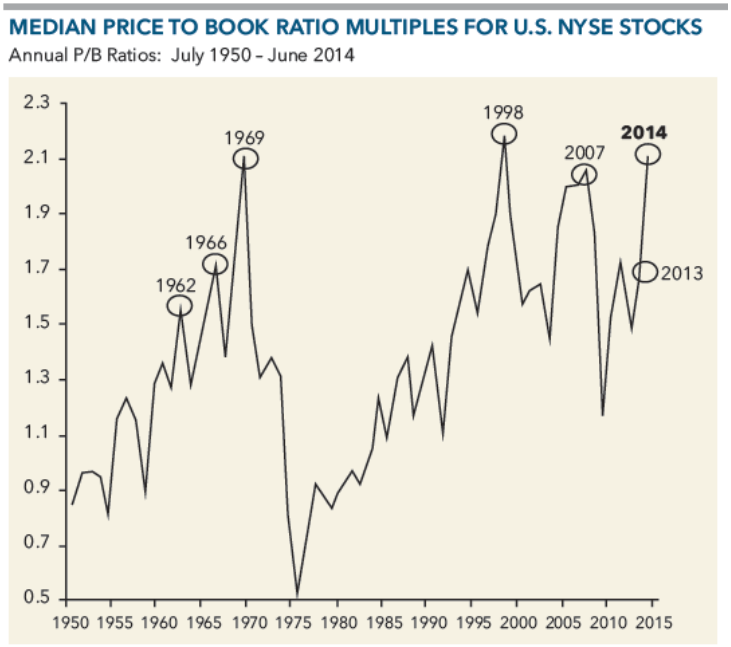
The market-cap weighted S&P 500 P/E valuation is modestly above average when measured year-to-year rather than over 10 years. In contrast, another valuation approach using the *median* (that is, non-cap weighted) U.S. stock shows results much higher than the cap-weighted S&P 500 Index. The New York Stock Exchange (NYSE) median stock is at a postwar record high P/E multiple and near a record high book-to-market multiple based on Dartmouth Professor Kenneth R. French's vast online database.[xiii]

Exhibits 3 and 4 show median (versus the capitalization-weighted mean) NYSE U.S. stocks for differing valuation ratios. As of June 2014, the median U.S. stock was at a post-1950 high of slightly more than 20 times earnings! The median price to book value ratio has only been higher twice since 1950—1969 and 1998, which were followed by large market declines. Using price-to-book metrics (the inverse BTM is similar to Dimensional portfolio strategies) instead of using price/earnings metrics overcomes many of the problematic accounting and financial issues considered earlier.

Median valuation multiples for both exhibits support the notion that U. S. stock valuations are obviously high. 2014 is similar to Cold War era estimates of 1962 and 1969. In 1962, the S&P 500 P/E multiple was only about 16 times earnings but the median stock's P/E, similar to today, was about 20 times! Likewise, in 1969, the median stock sold for about 18 times earnings even though the S&P 500 P/E multiple only averaged 15 times earnings. In both cases, the median stock was highly valued even though the asset-weighted S&P 500 valuation are relatively closer to historical averages.

Record short-term interest rates of nearly zero since 2009 due to $3 trillion spent by the Federal Reserve purchasing longer-term Treasuries and mortgage-back securities during three rounds of "quantitative easing" (QE), has likely pushed down long-term yields and boosted equity prices and their valuations.[xiv] As Piketty noticed, from 2009 through 2015 the S&P 500 index grew 10.9 % while the earning growth rate was 6.9 % annually. More normal was 2003 through 2007 when the S&P 500 index grew 10.8 % while the earning growth rate was 12.9 % annually. Having "r" greater than "g" is not a sound economy.

Exhibit 4



Source: Kenneth R. French Data Library: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html Based on NYSE stocks 1951 - 2014 with positive book equity per share for the last fiscal year, calculated as of June annually.

If well-meaning government financial repression continues to keep interest rates artificially low, as we've seen in Japan for two decades, a permanently higher stock valuation plateau may be occurring. While QE reduces volatility in microeconomic markets, macroeconomic risks leading to shocks may have increased.

How well can markets price potential troublesome political crisis or social events when government interfere with free functioning? While a market downturn is unpredictable, high U. S. stock valuations as we saw in *Exhibit 2* implies that those expecting realized real returns from U. S. equities over the next decade similar to that of the previous five years, need a basic lesson in understanding expected returns.

What drives expected returns?

Investors concerned about meeting future financial goals or market benchmarks typically extrapolate past market performance to predict future performance expectations. "Realized return" and the statistical concept of "expected return" are distinctly different. Realized return is simply published performance. Expected return is *the percentage increase anticipated from an investment based on uncertainty of risk associated with that investment*. Calculated as the mean value of the probability distribution of possible returns, expected return is *not* an "average" return. **It is the *most likely* return for an investment.**

Investors should expect capital markets to compensate them for bearing increased uncertainty of risk, including possible chance of loss—and capital markets work to process information and incorporate that into prices. Firms' accounting fundamentals used for securities valuations are related to stock returns. Researchers have concluded that expected cash flows to investors are informative of average returns.[xv]

The valuation equation, also called the Gordon dividend discount model (DDM), connects the relative price and cash flow dimensions to expected returns. It offers investors a simple equation for expressing stock price valuation when dividends are held constant.[xvi] The DDM is the fundamental framework for understanding equity risk and return relationships for purposes of estimating the cost of capital, as well as for valuation modeling. Finally, it explains how the firm's cost of capital is the investor's return.

The core of the valuation equation expresses the share price as the firm's (or an asset class's) discounted expected future cash flows to investors. That is,

$$price = sum\left(\frac{expected\ future\ cash\ flows}{discount\ factor}\right),$$

where the discount rate is roughly the long-term expected return on the stock. Dividing both sides by book equity, we have the equation expressed in terms of relative price and scaled by cash flows:

$$\frac{price}{book} = sum\left(\frac{expected\ future\ cash\ flows/book}{discount\ factor}\right).$$

Building on the insights from the valuation equation, Fama and French[xvii] investigated its implications for stock returns. If two stocks are expected to have the same cash flows scaled by book, the valuation equation implies that the one with lower relative price should have higher expected return (discount rate)—the value effect. The value effect from the DDM may be understood in terms of "relative price."

Now suppose that two stocks are traded at the same relative price but one has higher expected cash flows, then it must also have higher expected return for the equation to hold. More specifically, since varying profits increase cash flow (rather than assumed held constant in the simplified DDM model), we should see a positive relation between profitability and expected returns in the cross-section regression after controlling for relative price; likewise, as investments tend to decrease cash flow to shareholders, when accounting for relative price, there should be a negative investment effect across stocks. That is, stock prices should increase when future cash flows are expected to increase, and vice versa.

Expected returns for slow-grow economies

Many investors and commentators believe that poor growth prospects for an asset class or a overall economy like the U. S. imply stock returns must be poor going forward. **This popular notion is wrong.** The DDM states that the price of a stock equals the present value of all expected future dividends passing to the owner. Assuming that expected earnings grow at a constant rate forever and dividends are a fixed fraction of earnings, the dividend discount model can be simplified and expressed as follows:

$$(1) \qquad P_t = \frac{dE_{r+1}}{r-g}$$

In this equation,

P_t = price per share today at time t;
E_{r+1} = expected earnings per share (EPS) next year at time t+1;
d = the constant fraction of earnings paid as cash dividends (payout ratio);
r = the expected rate of return of the stock;
g = the expected long-run, constant rate of earnings growth.

The DDM assumes the expected rate of return is knowable. But expected rates of return for the cost of capital are uncertain: they are not observable and are difficult to forecast even for a single company, much less for an asset class. Only stock prices may be observed accurately as they trade on exchanges. Using earnings forecasts, the payout ratio and a firm's (or an asset class's) projected earnings growth rate, the DDM valuation equation (1) can be rearranged to solve for the expected rate of return:

$$(2) \qquad r = \frac{dE_{r+1}}{P_t} + g.$$

At first glance, equation (2) appears to refute the assertion that expected return and earnings growth are unrelated. Holding dividend yield (or earnings) fixed, high expected growth in earnings implies high long-term expected return. Holding expected growth fixed, high dividend yield or earnings (low price relative to current dividend) also implies high expected returns.

It also would seem to imply that, given the dividend yield, the higher the growth rate, the higher the expected rate of return. But this is **not** a correct interpretation of equation (2). What equation (2) actually shows is the decomposition of the market-determined expected total rate of return into **two portions**: one is **dividend yield** (dE_{r+1}/P_t) and the other is **capital appreciation** (g).

Projected earnings are inversely related to expected returns: the lower the projected earnings, the higher the prospective return. That is, companies (or asset classes) with great prospects have lower expected returns than troubled companies—the very opposite of what most investors believe and how they behave when chasing returns. Where markets work, when news and reports are mostly positive, future returns available going forward will be lower since current owners of securities have benefited from increased stock prices already incorporating that positive news as expected return based on known information.

Where investors are indifferent between a dollar of dividends and a dollar of capital gains, financial markets will equilibrate expected total rates of return for identical risks in stock prices. The breakdown of the total return into its dividend and capital gain components is therefore irrelevant.[xviii] This does not mean "agency costs" may not reduce dividends due to management incentives, say, to materially misstate company earnings. However for investing purposes, for the aggregate of companies in an asset class, diversification of over-and under-statements are offset in price P.

Nobel Prize winners Merton Miller and Franco Modigliani developed the "M&M Proposition" showing that a company's capital structure is immaterial (at least in perfect capital markets without agency costs and with tax neutrality). Investors "see through" the mix of debt and equity and base equity valuations on earnings, not financing details. Companies have two basic ways of acquiring equity risk capital from investors: (a) they can issue bonds (borrow for a loan); or (b) issue stock (surrender participation in future company earnings).

In either case, as we stated earlier in this paper, *the issuing company's cost of capital is the investor's expected return.* The company promises an expected interest rate to the bond investor or an expected stock return to the equity investor. When a company issues stock it forever foregoes keeping the return for itself on that stock—the return it would have kept had it not needed additional operating capital, but return the investor now receives in perpetuity in exchange for contributing his capital.

Exploring CAFÉ's implied return expectations

The CAPE model and similar DDM models have been variously applied for valuations of the U.S. stock market, the stock markets of many international countries, and numerous asset classes or sectors. Substituting an aggregate of corporate earnings in place of dividends for *E*, a national constant growth rate of earnings *g*, and a nationwide market cost of capital *R*, then the valuation of aggregate nationwide market price *P* for a specific country can be described in equation (3):

$$(3) \qquad P = \frac{E}{R - g}$$

U.S. stock prices have increased 200 percent since the beginning of 2008. What are the general implications of that price increase for investors? The DDM would imply that for a 200 percent price increase, either the numerator has to increase by 200 percent or the denominator has to quadruple, or some combination of the two. For example, suppose only one variable changed, either *E*, *R* or *g*. *E* is assumed "normalized" earnings for the market. A *one-time*, 200 percent increase in normalized earnings would result in a *one-time* 200 percent increase in price.

The price-earnings ratio is widely available information, and many sources update it frequently. From rearranging DDM we find the P/E ratio—the opportunity cost of owing equities per dollar of earnings generated. P/E is a proxy for a company's cost of capital *and the investor's expected return.* DDM is useful estimating expected returns when identifying risks that bear compensation, and allocating how much of those risks when structuring a portfolio strategy for an investment policy. We rewrite equation (4):

$$(4) \qquad \frac{P}{E} = \frac{1}{R - g}$$

A high P/E ratio as we have seen above describes a high earnings growth multiple relative to aggregate prices. But, a low P/E ratio describes a low earning growth multiple relative to price. Historically for the US stock market, if real *R* has been about 9 % per year and real *g* has been about 3 % per year, then a "normal" P/E could be 1/(.09-.03) = 1/0.06, or about 16.6 times, or close to the CAPE 16 times calculation.

Now, consider a possible change in P/E that does not depend on earnings or growth. Hold *g* constant and let the 50 % decline be the result of a change in *R*: the expected return on stocks, the cost of capital and the investors' return. The expected return on stocks must increase to 33 % from 9 % to double [*R-g*] in order to produce a 50 % drop in stock prices. This result implies that the aggregate of investors require a higher rate of return for bearing equity risk—indicating a major shift in collective risk preferences.

EXHIBIT 5

HISTORICAL AVERAGE REAL RETURN ESTIMATIONS

Description	Estimate	Standard Error	Biases and Concerns
Average real U.S. returns, 1926–2014	8.7%	2.1%	Survival, cost of capital change
Average real U.S. return less ME/BE appreciation, 1926–2014	7.9%	2.1%	Survival
Average real global, 1900–2014	6.7%	1.6%	

Sources: Center for Research in Security Prices, *U.S. Stock & U.S. Index Databases* (Booth Business School, University of Chicago), and The Maddison-Project, http://www.ggdc.net/maddison/maddison-project/home.htm, 2013 version. Bolt, J. and J. L. van Zanden, "The Maddison Project: collaborative research on historical national accounts," *The Economic History Review* (2014), 67 (3): 627–651. Standard error is a version of standard deviation. Past performance is not a guarantee of future performance.

The modeling challenge: Selecting estimators

Stock market prognosticators usually allow that day-to-day fluctuations in share prices are hard to predict, but then claim that long-term returns are "more predictable." The implication seems to be that investors should reflect current long-term return predictions in planning their asset allocation strategies. The degree of predictability of long-horizon returns for planning is a subject for unending debate. The problem is that estimates of expected equity returns are inherently imprecise. Historical returns are noisy, and so expected return estimates from historical data come with a lot of estimation error. Thus applying extrapolations using variations of DDM to a country or sectors for modeling valuations to plan expected returns must involve assumptions which surely limits our confidence in the results. Yet many commentators still recommend tactical asset allocation, regularly adjusting allocations as well as rebalancing periodically. This is a questionable practice given the number of possible estimators.

Methodological issues are important: sample bias due to survival bias and statistical precision. *Exhibit 5* shows possible choices for estimates of historical average real returns for the US and globally. But which one is best? U. S. historical figures are more favorable relative to the rest of the world. But that may due to survivor bias—perhaps the U. S. won the economic lottery. In 1926 the U. S. and Argentina had similar GDPs and populations, but a century later, the two economic conditions are vastly different—different democratic choices elected politicians to power promoting different policies. Failed states are excluded from the sample. Even if we had the wisdom to which estimator to select, the standard error for historical sample we have ranges 2 percent, higher or lower. If the average real U. S. returns are 2 percent lower, for instance, that places them at the average of real global returns for 1900 to 2014.

EXHIBIT 6

POSSIBLE ESTIMATORS FOR VALUATION MODELS

Real Growth Estimator	Estimate E(g)	Standard Error E(g)	Biases and Concerns
Real Dividend Growth, U.S. from 1930 to 2014	3.8%	1.3%	DDM bias
Real GDP Growth, U.S. from 1930 to 2014	3.4%	0.5%	
Real GDP per Capita Growth, U.S. from 1930 to 2014	2.2%	0.5%	
Real Developed Country Capital Appreciation, MSCI 1970 to 2014	3.9%	2.6%	DDM bias, short sample period

Sources: Center for Research in Security Prices, *U.S. Stock & U.S. Index Databases* (Booth Business School, University of Chicago. Standard error is a version of standard deviation. Past performance is not a guarantee of future performance.

Methodological issues further include whether to use nominal returns, real returns or to focus on premiums. *Exhibit 6* considers possible inputs to model a real growth rate "g". How should we estimate the real growth rate "g" our DDM: Real dividend at 3.8%? Real GDP at 3.4%? Or assuming birth rates are predictable and immigration controlled by quotas, then the 2.2% per capital may be more appropriate—noting the results is similar to the U. S. dividend yield (D_0/P_0) of 1.9%. The Real Developed Country growth is highest, but that figure has a short sample period bias. Still, all these numbers may be too low: DDM is downward biased, and ignores gains from the emergence of new technologies yet unknowable.

Given all these uncertainties, what is the explanatory power we may expect for Shiller's CAPE? In another study, Dr. Davis uses Shiller's data for 1871 to 2013 to regress outcomes based on the CAPE model. The R-squared values for average 10-year and average five-year real returns are 32% and 18%, respectively. Compared to bootstrapped outcomes, the explanatory power of CAPE is well below those required to give investors a reasonable probability of success. At a 32% R-squared for 10-year average return from his tables indicates a success rate of 18%.[xix] This is too low to rely on for tactical planning.

The DDM model has conceptual value—it's that it's difficult to arrange any rational set of values for the three variables that **does not estimate an increase** an expected returns for equities. After all, if there is no expected reward for taking risk with stocks, who would risk their capital by investing? If so, then any market decline must be explained due to an increase in *R*, the required rate of return investors

demand to hold equities. Thus valuation models have value in making strategic planning decisions. Because most different asset classes have unreliable estimations, sound investment policy in an uncertain world with uncertain estimators would be *to maintain a consistent asset allocation policy, including assets classes whose expected returns are higher than those of U.S. market asset classes, even if recent performance has been disappointing.*

So "what if" the U. S. follows Japan, and enters a prolonged no-growth period? If we understand DDM aright, at least initially, this actually *increases the cost* that companies must pay to obtain capital—which increases expected returns to a point where investors concerned about safety of their principal after an extended market decline, begin to invest once again. When prices fall, then expected return increases. In the end, holding cash foregoes the greater expected return of equities. Investors fearfully extrapolating permanent losses whenever stocks decline must prove stocks somehow have become less risky.

Exhibit 7

OVERLAPPING FIVE-YEAR PERIODS OF SELECTED GLOBAL INDEXES

Annualized Return (%) from June 2015

ASSET CLASS DATA SERIES	5 Yrs	10 Yrs	15 Yrs	20 Yrs	25 Yrs
MSCI World Market Index (gross div.)	13.7	7.0	4.2	7.2	7.3
Russell 3000 U.S. Market Index	17.5	8.2	5.1	9.2	9.7
MSCI EAFE International Index (gross div.)	10.0	5.6	3.9	5.5	5.4
MSCI Emerging Markets Index (gross div.)	4.0	8.5	8.4	6.3	8.6
B of A Merrill Lynch 1-Yr U.S. Treasury Note Index	0.4	1.9	2.5	3.3	3.8
Barclays US Aggregate Bond Index	3.3	4.4	5.5	5.6	6.4
Barclays Global Aggregate Bond Index (hedged)	3.7	4.3	5.2	5.7	6.4

In U.S. dollars. Indexes are not available for direct investment. Index performance does not reflect the expenses associated with the management of an actual portfolio. Past performance is not a guarantee of future results, and you may lose money regardless how long you invest. Future performance may be higher or lower than any performance shown.

The illusion of predicting the future from the past

In forecasting returns, many investors suffer from a misguided "**belief in the law of small numbers**." People tend to interpret a relatively small sample in a population as outcomes representative of a broader population of outcomes. Investors do this all the time. Intuitive judgments are frequently unreliable because market predictions are based on what recently happened to get their attention that seems to fit a compelling story—a story often related to getting big returns with little risk. People commonly fail to consider either how reliable the story is or what happened before the event in similar situations.[xx]

Many people are confident they have investment skill due to educational attainments or business success. They study Morningstar reports or internet publications, or read the financial news about stocks, and bonds to "research" investments. They analyze and compare what they've discovered with their own portfolio. Looking only at performance figures—the most readily available data at hand—confirms whether they are "right" in the first place, or motivates making a change. Yet this type of investing analysis, if based solely on past performance without a fundamental framework, is faulty.

Exhibits 7 and *8* suggest how overconfidence may unconsciously occur based on the benchmarks selected. What appears a "smart" or "dumb" decision often depends on which time framework is used. Most investors are forced to compare returns only as overlapping periods from the present backward. In this case, which indexes are relevant? For purposes of comparisons, what are meaningful time periods?

The dominant financial event of the past decade are the enormous returns accruing to U. S. stocks due to unexpected government policy of trillions in QE bond purchases plus interest rate repression causing a one-time dramatic decline in interest rates. Investors affected by a belief in the law of small numbers, tend to focus on recent positive returns in U.S. stocks. They allocate less to internationals and own more U. S. stocks. However, the longer the time period, the less wise such planning appears.

An informed investor understands that he can't own past history—he can only capture future returns. The DDM is valuable in teaching that strong past performance over five or ten years does not necessarily mean those asset class represents a positive expected return tomorrow unless certain factors affecting valuation have changed during the same period. Investors with limited lifespans must be concerned with possible losses. And even if foreign economies look less favorable, what drives expected return? The DDM model makes this very important point: *risk factors and not growth factors* drive expected returns. Today, relative to the U. S., internationals and emerging markets have higher expected returns, and those allocations should be maintained even though we cannot be sure when the premiums will be realized.

Exhibit 8

MANAGING RANDOMNESS OF ASSET CLASS RETURNS

Annual Return (%) from 2000 - 2014

Higher Return ↑ ↓ Lower Return

2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
31.0	14.0	7.6	62.6	34.2	34.5	36.0	39.8	8.8	79.0	28.1	9.4	20.1	38.8	32.0
22.8	12.3	5.1	60.4	33.2	25.5	32.6	8.2	6.6	53.3	26.9	3.4	18.6	34.5	13.7
9.0	8.4	3.6	56.3	29.9	21.1	30.0	7.5	4.7	51.4	24.9	2.3	18.1	32.5	13.5
8.3	7.3	3.4	47.3	26.0	15.1	27.4	6.3	-28.9	37.6	24.5	2.1	18.1	32.4	4.9
7.3	6.4	2.2	46.6	25.0	13.8	23.5	5.9	-33.8	28.5	21.2	0.6	17.9	28.3	4.2
7.0	2.5	-6.0	46.0	22.3	7.0	22.2	5.5	-36.8	27.2	19.2	0.4	17.5	26.0	1.9
-1.6	-2.4	-7.1	36.2	18.3	4.9	19.8	3.6	-37.0	26.5	15.5	-4.2	17.1	22.2	1.2
-3.0	-5.6	-11.4	30.0	16.5	4.7	18.4	2.4	-39.2	20.6	15.1	-5.5	16.3	1.2	0.2
-4.5	-7.7	-15.5	28.7	10.9	4.6	15.8	-0.2	-43.9	19.7	5.4	-11.1	16.0	0.6	-1.8
-6.9	-10.2	-15.6	2.0	2.7	3.1	4.3	-1.6	-45.6	2.3	3.7	-15.5	2.1	0.3	-4.9
-9.1	-11.9	-20.5	1.9	1.3	2.4	4.1	-9.8	-47.8	0.8	2.0	-16.4	0.9	-0.1	-5.0
-30.6	-17.5	-22.1	1.5	0.8	1.3	3.8	-17.6	-53.2	0.2	0.8-	-18.2	0.2	-2.3	-5.4

MARKET ASSET CLASS	DATA SERIES	Early 10 Years 2000-2009	Later 5 Years 2010-2014	Total 15 Years 2000-2014
Global Equity Cap	MSCI All Country World Index (gross div.)	0.9	9.7	3.8
U.S. Large Cap	S&P 500 Index	-1.0	15.5	4.2
U.S. Large Cap Value	Russell 1000 Value Index	2.5	15.4	6.6
U.S. Small Cap	Russell 2000 Index	3.5	15.6	7.4
U.S. Small Cap Value	Russell 2000 Value Index	8.3	14.3	10.2
U.S. Real Estate	Dow Jones US Select REIT Index	10.7	17.0	12.7
International Large Cap Value	MSCI World ex USA Value Index (gross div.)	4.6	5.1	4.8
International Small Cap	MSCI World ex USA Small Cap Index (gross div.)	7.3	7.9	7.6
International Small Cap Value	MSCI World ex USA Small Cap Value Index (gross div.)	9.9	8.1	9.3
Emerging Market Cap	MSCI Emerging Markets Index (gross div.)	10.1	2.1	7.4
One-Year U.S. Fixed Income	BofA Merrill Lynch 1-Year U.S. Treasury Notes Index	3.8	0.4	2.7
Five-Year U.S. Government Fixed Inc	Barclays Treasury Bond Index 1-5 Years	5.0	1.8	3.9
Five-Year Global Fixed Income	Citigroup World Gov't Bond Index 1-5 Years (hedged)	4.7	1.8	3.7

In U.S. dollars. Indexes are not available for direct investment. Index performance does not reflect the expenses associated with the management of an actual portfolio. Past performance is not a guarantee of future results, and you may lose money regardless how long you invest. Future performance may be higher or lower than any performance shown.

Broad diversification captures valuations

Broad diversification across global asset classes and dimensional premiums—as well as across securities, sectors, industries, and countries—is fundamental to managing investment risk. Investing is all about structuring a disciplined approach for broadly holding of stocks and bonds—and participating in the expected reward over an extended planning horizon. To protect wealth in an uncertain world, possible big mistakes must be limited— the proverbial "not putting all your eggs in one basket." That means maintaining broad diversification within an asset class and among asset classes, so as to avoid concentration risks. Diversification by allocating across the world further minimizes country risks.

Exhibit 8 also provides a useful way to think about navigating the global investment landscape. Opportunities exist not only in U.S. markets, but all around the world. Investors should not concentrate in the U.S., but participate in markets from other economies. Just because U.S. markets out-performed in the last five years for whatever reason that does not mean such outcomes will continue. *Exhibit 8* illustrates how unpredictably asset classes interact. I defy the reader to find a predictable pattern of returns in *Exhibit 8.* As you review columns year-by-year (by covering the columns), attempt to confidently predict the next year's asset class winners simply from the prior returns of the asset classes.

Investors seeking to earn a 10-year return must hold their allocations for 10 years. While this statement is painfully obvious, its implications for dynamic asset allocation schemes are not so obvious. Adjusting portfolio weights annually or more frequently in response to changes in long-run return forecasts is common advice. Without very precise long-run forecasts, however, that approach is unlikely to offer good planning outcomes. The best practice is rebalancing an allocation to a target strategy that is based on investor risk preference, needs and goals, and manages portfolio risk for income during retirement.

Conclusion

There's always risk and uncertainty in planning and investing. Past positive historical results may not be repeated in any market. Nonetheless, markets work. The market constantly prices securities to reflect a positive expected return. Otherwise, no one would invest their capital, and just keep it in banks. And for companies to gather capital, their securities must be priced competitively comparable to other companies competing for capital. Intense competition between buyers and sellers in public markets means that stocks are quickly driven in a fair value, reflecting the general market risk at a particular time and offering investing participants an expected return though the current market price of securities.

Warren Buffet, quoted at the beginning of this paper, observes that great intellect and long-term investment outcomes are not correlated: "The 'know-nothing' investor who both diversifies and keeps his cost minimal is virtually certain to get satisfactory results," he remarked in one annual Berkshire letter. That's only partly true. Working with financial economists, who test great academic ideas, helps us apply the best research, bridging the gap between published science and the real world of investing. As a result, many committed planning clients have positive financial outcomes they never expected.

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[ii] Randy Diamond, "CalPERS looks to lower return expectations," *Pensions & Investments* (July 27, 2015), p. 1. Drop to 7.5%.

[iii] Multifactor portfolio strategies, as clients working with Dimensional already now, have about double those equity returns.

[iv] John Y. Campbell and Robert J. Shiller, "Valuation Ratios and the Long-Run Stock Market Outlook: An Update" (1998)

[v] Robert J. Shiller charts and data found at http://www.econ.yale.edu/~shiller/data.htm

[vi] http://www.businessinsider.com/robert-shiller-cape-crash-but-2014-9#ixzz3PHztNTi9 (September 6, 2014)

[vii] Joseph Davis, Roger Allaga-Diaz, and Charles Thomas, "Forecasting stock returns: What signals matter, and what do they say now?" Vanguard whitepaper (October 2012)

[viii] http://www.bloomberg.com/news/videos/2015-06-02/u-s-stocks-not-overvalued-at-current-levels-siegel

[ix] http://www.theglobeandmail.com/globe-investor/investment-ideas/sp-500-has-a-pe-ratio-of-19-unless-its-actually-27/article25152937/ (June 26, 2015). We might add that academics usually aren't noted for high emotional intelligence.

[x] Eugene Fama and K. R. French, "Disappearing Dividends: Changing Firm Characteristics or Lower Propensity to Pay?" (2000)

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[xii] James L. Davis, "Mean Reversion in the Dimensions of Expected Stock Returns," Dimensional Fund Advisors Research Brief (November 2014).

[xiii] Kenneth R. French website, http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

[xiv] Michael Spence and Kevin Warsh, "The Fed Has Hurt Business Investment," *Wall Street Journal* (October 27, 2015), p. A 13. Dr. Spense is a 2001 Nobel laureate in economics and Mr. Walsh is a former Fed governor.

[xv] Richard Frankel and Charles Lee, "Accounting Valuation, Market Expectation, and Cross-Sectional Stock Returns" (1998), see also Cohen, Gompers and Vuolteenaho (2002), and Titman, Wei and Xie (2004).

[xvi] Myron J. Gordon, "Dividends, Earnings and Stock Prices," *Review of Economics and Statistics* 41 (1959), 99-105. Theoretical aspects were synthesized by Ohlson (1990, 1995).

[xvii] Eugene F. Fama and Kenneth R. French, Dissecting Anomalies (June 2007). CRSP Working Paper No. 610. Available at SSRN: http://ssrn.com/abstract=911960 or http://dx.doi.org/10.2139/ssrn.911960

[xviii] Miller, Merton H. and Franco Modigliani, "Dividend Policy, Growth, and the Valuation of Shares," *Journal of Business*, XXXIV, No. 4 (Oct 1961), 411-33. Dr. Miller was a Nobel laureate in economics and formerly consulted for Dimensional Fund Advisors

[xix] James L. Davis, "Long-Term Predictability and Short-Term Asset Allocation," Dimensional Fund Advisors Purely Academic (August 2015).

[xx] Daniel Kahneman and Amos Tversky, "On the Psychology of Prediction," *Psychological Review* (1973)