Robert A. Weigand (USA), Robert Irons (USA)

The relative valuation of US equities at bear market bottoms: a perspective on the equity risk premium

Abstract

This paper investigates stock returns, earnings growth, interest rates and the relative valuation of US equities following the 22 major bear market bottoms from 1881 to 2011. The authors find that large, sustainable bull market returns are associated with market bottoms where stocks' earnings yield expands significantly (as P/E ratios compress below average). Market bottoms since 1950 have been associated with shorter bear markets, lower average market earnings yields and slower real earnings growth following the market bottom, but *higher* real stock returns over the next 10 years. Since 1950, equity values have grown significantly faster than earnings, resulting in compression of the market earnings yield and stock-over-bond risk premium. Stock returns have become gradually disconnected from earnings to the point that the earnings yield is no longer reliably mean-reverting, and thus no longer predictive of future equity returns. Although we estimate the real equity risk premium to be only 0.5% below its post-1950 average, in the low-inflation, low-yield environment, US equities are priced to deliver below-average real returns of approximately 3.5% per year for the coming decade.

Keywords: forecasting models, stock returns, earnings yields, bond yields.
JEL Classification: C22, C53.

Introduction

We investigate stock returns, earnings growth, interest rates and the relative valuation of US equities following the 22 major bear market bottoms from 1881 to 2011. Our study provides insight into two issues of importance to investors: (1) the sustainability of the most recent bull market (which began in March 2009, but stalled in the summer of 2011), and (2) how the predictability of long-term stock returns based on their relation with earnings has been changing over the past 130 years.

We begin with a description of these 22 bear markets, comparing the most recent bear of 2008-2009 with the all-time greats from stock market history. Beyond being descriptive, however, our study's main focus is stocks' relative valuation at market bottoms − in particular, how changes in stocks' earnings yield are related to the bull market returns that follow, and how equities currently measure up in this regard as well. As elaborated on in the following section, a large literature suggests that the market earnings yield (the E/P ratio using 10-year average earnings, hereafter E10/P) is one of the most reliable predictors of long-term stock returns, especially in the US. We, therefore, examine trends in market earnings yields leading up to and following bear bottoms over the past 130 years.

Our results indicate that large, sustainable bull market returns are associated with bear market bottoms where the market earnings yield expands significantly (indicating substantial compression in stocks' P/E ratios). Additionally, we find that market bottoms since 1950 have been associated with shorter bear markets and less pronounced declines in equities preceding the market bottom; lower earnings yields (E10/P ratios) and slower real earnings growth following the market bottom; but *higher* real stock returns over the next decade.

Finding lower average E10/P ratios at bear market bottoms implies that stocks become less of a bargain over time, beginning around 1950. The E10/P market earnings yield and stocks' earnings yield relative to interest rates (the stock-over-bond risk premium) have gradually compressed as equity values have grown faster than the long-term trend in earnings for several multi-decade periods. Despite this persistent compression in average market E10/P ratios (a gradual lowering of *expected* returns), stocks have delivered higher *realized* returns, however. Equity values have, therefore, become increasingly disconnected from earnings in the post-World War II period, to the extent that the market earnings yield is no longer predictive of future returns as it was pre-1950. Our findings suggest that, even after the summer correction of 2011, US equity values remain inflated compared with the earnings US companies will most likely be capable of generating.

1. The market earnings yield and future equity returns

The idea that unusually high or low market valuation ratios lead to large future stock price changes is well established in the literature. For example, Campbell and Shiller (1998, 2001) show that an extremely low market dividend yield and/or earnings yield provide reliable forecasts of below-average future stock returns. Most studies focus on the predictive power of stocks' earnings yield, as firms' payout ratios are influenced by a variety of other factors (Domian and Reichenstein, 2009). The high volatility of short-term earnings has led to widespread use of the earnings yield based on a 10-year moving average of earnings (the E10/P ratio) to determine the relative valuation of stocks and predict future long-term returns, as originally proposed by Graham and Dodd (1934) and developed more extensively by Campbell and Shiller (1998, 2001) and Shiller (2002, 2005). Research by Salomons (2009) confirms that the E10/P ratio is best for forecasting long-term returns, while a related variable, the earnings yield (based on 1-year trailing earnings) over bond yield spread (E/P – Y, often referred to as the Fed Model), is best for shorter-term tactical asset allocation decisions.

The E10/P ratio is predictive of future returns because investors use the metric as an easily-observable proxy for the equity risk premium, and the ratio is thought to display mean-reverting properties (Domian and Reichenstein, 2009). Extreme values of the market E10/P reliably predict future long-term returns because mean reversion of the market E10/P occurs mainly via an adjustment of stock prices rather than earnings (Campbell and Shiller, 1998). Coakley and Fuertes (2006) and He (2009) describe how a mean-reverting earnings yield forecasts returns: at market tops (bottoms) the average E10/P is compressed (expanded) due to inflated (depressed) stock prices. Thus, unusually low E10/Ps predict below-average future returns as high stock prices subsequently correct downward, and unusually high E10/Ps predict above-average future returns as stock prices recover from their depressed levels.

Coakley and Fuertes (2006) stress the role of investor sentiment as a factor causing stock prices to rise above their fundamental values during bull markets. In particular, they find that sentiment-based positive shocks have "more pronounced and long-lasting effects than similar shocks in bear markets" (p. 2327). These authors conclude that stock prices become increasingly disconnected from fundamentals during bull markets, but "valuation ratios and prices move toward their equilibrium levels during bear markets" (p. 2325). Our study will, therefore, investigate the extent to which stock prices in recent decades have merely moved *towards* equilibrium during bear markets, vs. fully reverting to (or overshooting) a long-term average expected return and/or risk premium fully concomitant with the risks of equity investing.

Coakley and Fuertes' (2006) finding that stock valuations become increasingly disconnected from fundamentals during bull markets based on investor sentiment (a behavioral factor) makes valuation-based predictability a potentially ephemeral effect. Kim, Nelson and Starz (1991) and He (2009) present evidence that the mean-reverting properties of stock returns (and thus the market E10/P ratio, by implication) have been inconsistent through time. Kim et al. (1991) find no mean reversion in stocks' valuation ratios post-World War II, while He (2009) reports that the ratio is only mean-reverting before and after the 1942-1989 period. Similar results can be found in the work of other researchers, including Carlson, Pelz and Wohar (2002), who find that the average market P/E ratio shifted to a higher mean in recent decades; Manzan (2007), who documents a structural break in the equity premium around 1950; Siegel (2007), who rationalizes that stocks' dividend yield permanently falling below the yield on the 10-year T-note in 1958 did not indicate overvaluation in equities; Weigand and Irons (2008), who report that stock prices and earnings are no longer cointegrated post-1960, implying that a linear combination of prices and earnings, such as the market E10/P ratio, will no longer revert to the mean; and McQuarrie (2009, p. 6), who writes that equity investors need to "put the fear back in investing" (by demanding higher expected returns). All of these studies raise doubts about whether the market earnings yield is consistently mean-reverting.

We, therefore, examine stock returns and earnings growth around bear market bottoms, and report on the extent to which stocks' earnings yield fully or partially expands at these market turning points. We place particular emphasis on how the stock price/earnings connection has been changing over the past 60 years, and the implications of these changes for the predictability of long-term returns. Our main findings are that bear markets are shorter, stock prices fall by less, and the market E10/P ratio no longer expands as generously at bear market bottoms as it did pre-1950. The extent of the stock price/earnings disconnect is so profound that the market earnings yield is not predictive of future stock returns as it was pre-1950. US equities have, therefore, become increasingly overvalued in the post-World War II period, and remain over valued even after the sharp correction in stocks in the summer of 2011.

The remainder of the paper is organized as follows. We describe our data and methodology in the next section, and then report our empirical findings regarding stocks' relative valuation and the long-term relation between earnings and stock prices in the sections that follow. Conclusions and implications of our results are contained in the final section.

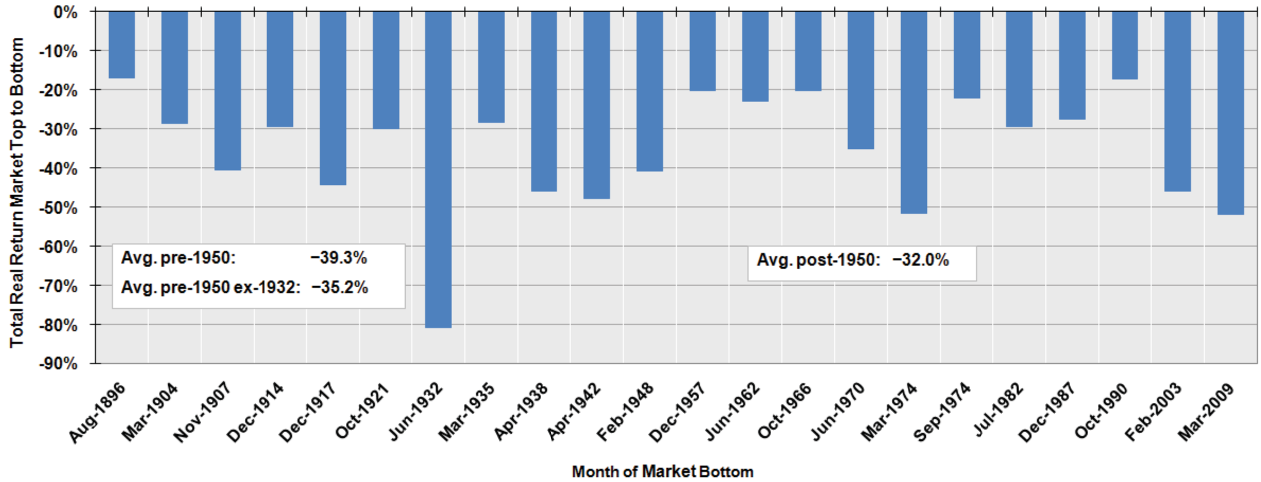
2. Data and methodology

The stock price index, dividend, earnings and interest rate data used in the study are taken from the database generously maintained and updated by Shiller (2011). These data are available for download from his website. The data are adjusted for inflation as shown by Shiller (2011). Unless otherwise specified, all references to stock returns and earnings refer to real values of these variables. The data, at the time they were accessed for this study, extend from January 1871 to June 2011. We use all the observations in the database. Our time period labels indicate the beginning of a 10-year period, so the label 1950-2000, for example, refers to the 10-year periods beginning in 1950 through 2000 (with the last 10-year period ending in 2010).

We compute average annual buy-and-hold returns over 10-year horizons with aggregate market dividends reinvested at the same percentage change in the stock price index. All reported returns, therefore, include the effect of reinvested dividends. As previously mentioned, our market earnings yield (E10/P ratio) is based on a 10-year moving average of earnings divided by the most recent value of Shiller's stock price index. Additionally, we calculate an E10/P – Y stock-over-bond yield spread using both a 10-year moving average of earnings *and* bond yields to better represent a long-term equity risk premium. Lastly, because there is no formal rule regarding what constitutes a bear market (beyond the widely-accepted − 20% decline in nominal stock prices), we identify bear market bottoms as outlined in Pagan and Sossounov (2003).

3. From market top to bear market bottom

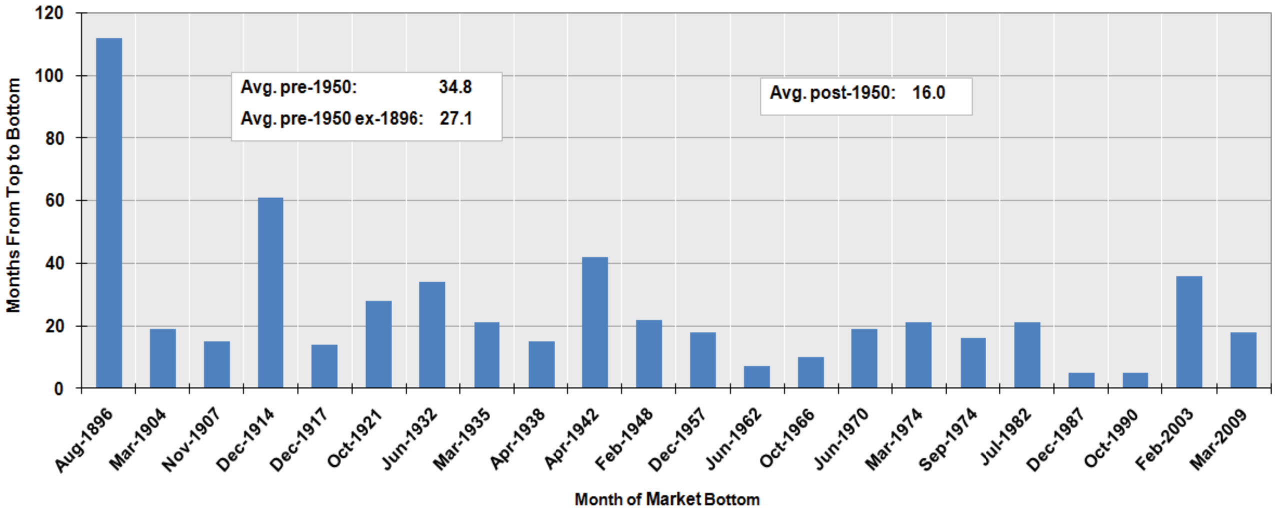
Figure 1 depicts total real stock returns from the month of the preceding bull market top until the month in which the market reaches its new bear market bottom. The mean percentage decline pre-1950 is -39.3%, vs. -32.0% post-1950. This difference is statistically significant at the 10% level based on a difference-between-the-means *t*-statistic. The unusually severe decline of -80% in 1932 skews these results, however. Omitting 1932, the pre-1950 mean is -35.2%, and the difference pre- and post-1950 is no longer statistically significant. Overall there is marginal evidence that US stocks find bottom after less severe declines post-1950.



Note: This figure depicts the total return to the S&P 500 from the previous market top to the market bottom.

Fig. 1. Real stock returns from market top to bottom (1896-2009)

Figure 2 depicts the number of months it takes for stocks to bottom out following their previous bull market highs. The pre-1950 average is 34.8 months, but once again this average is heavily influenced by the 112 months it took stocks to finally find bottom in 1896. Excluding 1896, the pre-1950 average is 27.1 months, vs. 16.0 months post-1950; this difference is statistically significant (p = 0.03). These findings are helpful in interpreting Figure 1 − one reason stocks fall by less at market bottoms post-1950 is that they bottom out an average of 13 months sooner. And, by implication, if stocks spend less time in bear mode post-1950, they must be spending more time in bull mode. These findings also provide a complementary perspective on the results reported by He (2009), who finds that stock returns steadily increase from the 1880s-2000s, and Coakley and Fuertes (2006), who conclude that the effects of positive shocks on stock prices are "more pronounced and long-lasting" than the negative shocks in bear markets. Note that progressively longer bull markets, steadily increasing returns, and a stronger reaction to positive shocks support the idea that the market earnings yield does not revert to the same mean value consistently over time.

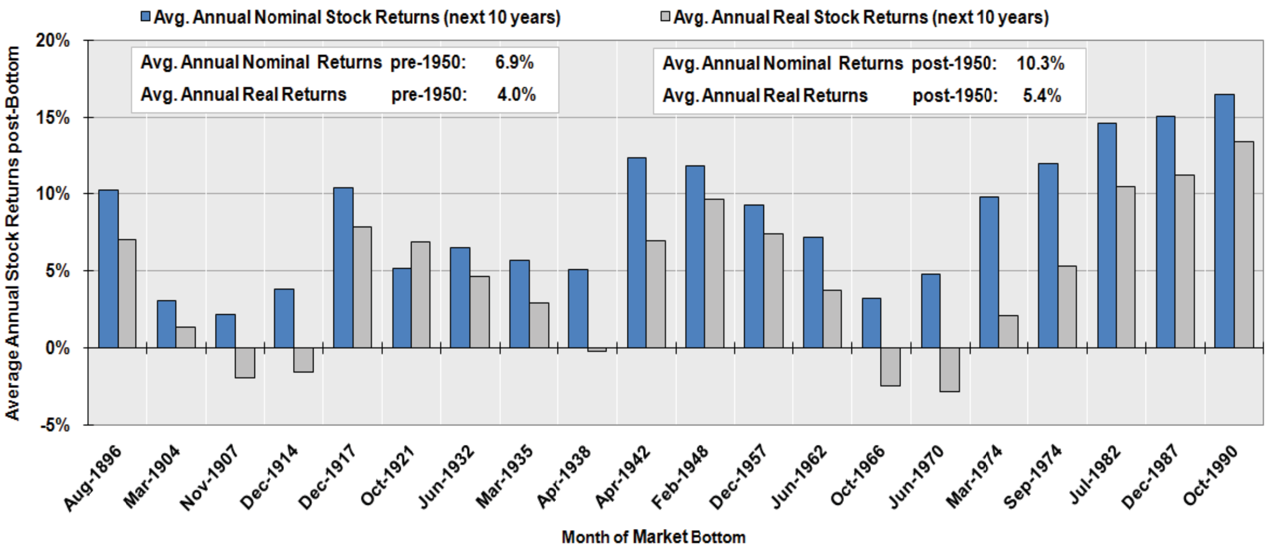


Note: This figure depicts the number of months it takes US stocks to decline from bull market top to bear market bottom.

Fig. 2. Months from top to bottom (1896-2009)

4. Stock returns, earnings growth and expected returns

Figure 3 depicts the average annual real and nominal stock returns for the 10-year period following bear market bottoms from 1896-1990 (the 2003 and 2009 bottoms are omitted from the forward-looking exhibits because a full 10 years of data post-bottom are not available). Nominal returns averaged 6.9% per year for the decade following a bear bottom before 1950, but 10.3% per year after 1950. Real returns averaged 4.0% and 5.4% pre- and post-1950, respectively. These differences are statistically significant (p-values = 0.02 and 0.05). The five bull markets that started in the 1970s-1990s period each delivered higher nominal and real returns than the preceding bull market, a first-time occurrence in the history of investing.



Note: This figure shows average annual compound stock returns (with dividends reinvested annually) following each bear market bottom from 1896-1990. The 2003 and 2009 bear bottoms are omitted because 10 full years of data following these market bottoms are not available.

Fig. 3. Average annual stock returns for ten years following a market bottom

Figure 4 depicts average annual 10-year real returns following a bear bottom compared to the average annual growth in real earnings for the same 10-year period. Real earnings grew an average of 2.8% per year following a market bottom pre-1950, but only 1.7% post-1950. While real and nominal stock returns have been *higher* after each bear bottom post-1950, real earnings have grown more *slowly* following these market bottoms. This finding anticipates our major results that follow. The key point for market valuation is that stock returns have become increasingly disconnected from growth in real earnings for an extended period of time.

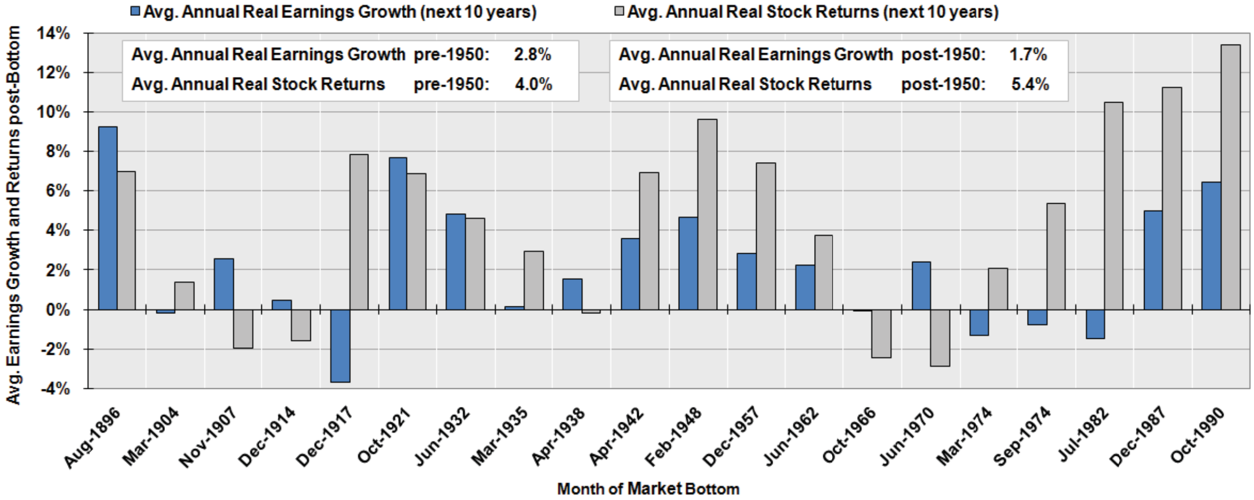


Fig. 4. Average annual growth in real earnings and real stock returns for the decade following a market bottom

We take a closer look at the long-term relation between returns and earnings in Figures 5 and 6, which depict cumulative compound real stock returns and earnings growth from 1881-1949 and 1950-2011, respectively. Perhaps the most surprising finding from Figure 5 is that both stock returns and earnings make a big round trip back to zero from 1881-1946. One cannot help but wonder how contemporary investors, who have bemoaned the recent "lost decade", where stocks have generated negative real returns since 2000 and been outperformed by bonds for the past 40 years (Arnott, 2009), would cope with a 65-year round trip back to zero in real terms? …with dividends reinvested?

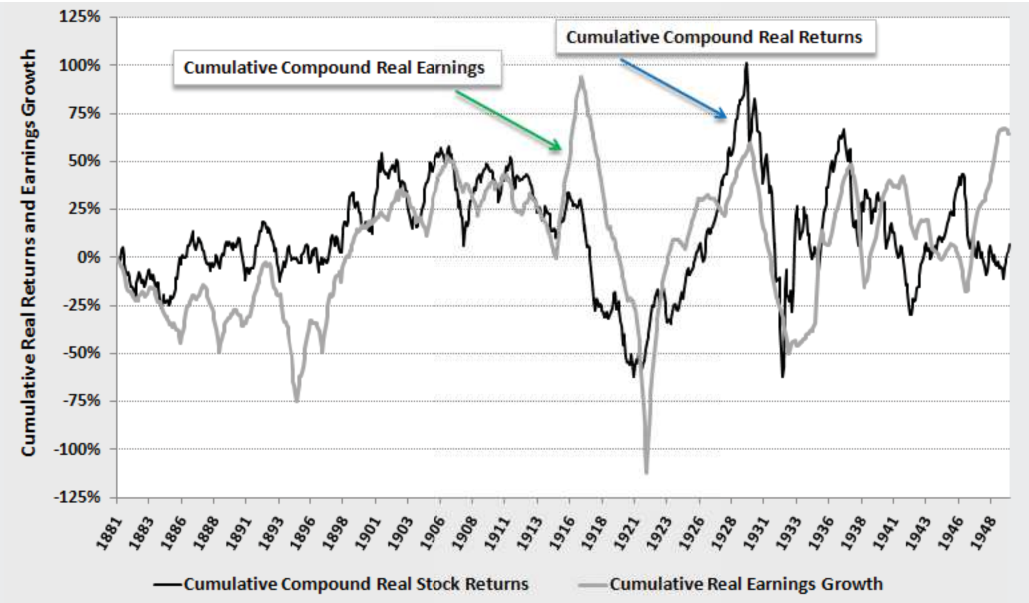


Fig. 5. Cumulative compound real stock returns and earnings growth (1881-1949)

Comparing the long-term compound growth in both series we see that, although earnings are more volatile, stock returns and earnings remain on similar growth paths through 1946, until earnings surge ahead in the period immediately following World War II. Examining Figure 6, however, we see that cumulative stock returns begin outpacing earnings growth after 1950, first during the prolonged bull market that culminated in the "Nifty Fifty" bubble in the 1960s, and by an even greater magnitude in the great secular bull that began in 1982 and ended with the bursting of the technology bubble in 2000.

4.1. Changes in the stock price/earnings relation over time. The divergent growth rates in stock returns and earnings post-1950 have important implications for the time series relation between the two series. Even though the series' correlation is actually stronger post-1950 (+0.53 vs. +0.66), the nature of that correlation is different in the two subperiods. A unique type of time series correlation known as cointegration prevails from 1881-1949 (Campbell and Shiller, 1987; Coakley and Fuertes, 2006; and Weigand and Irons, 2008). Cointegration describes how the E10/P ratio, as a linear combination of two cointegrated $I(1)$ series, is itself $I(0)$, or stationary. When earnings and prices are cointegrated, the two series are nonstationary around the same stochastic trend, and the E10/P ratio displays mean reversion – this is important because the ratio's mean-reverting properties are what give it predictive value regarding future long-term stock returns, and an earnings yield that fully mean-reverts (or overshoots its mean) at bear market bottoms implies a fairly-valued (or undervalued) stock market. Stock prices growing significantly faster than earnings from 1950-2000 results in earnings and prices remaining correlated, however, but not cointegrated (Weigand and Irons, 2008). The nonstationarity of earnings and prices therefore no longer cancel out in the E10/P ratio, implying that the ratio is not mean-reverting, and no longer reliably predictive of future returns. Perhaps most important, equities are left partially overvalued when the market earnings yield fails to completely revert to its mean at bear market bottoms.

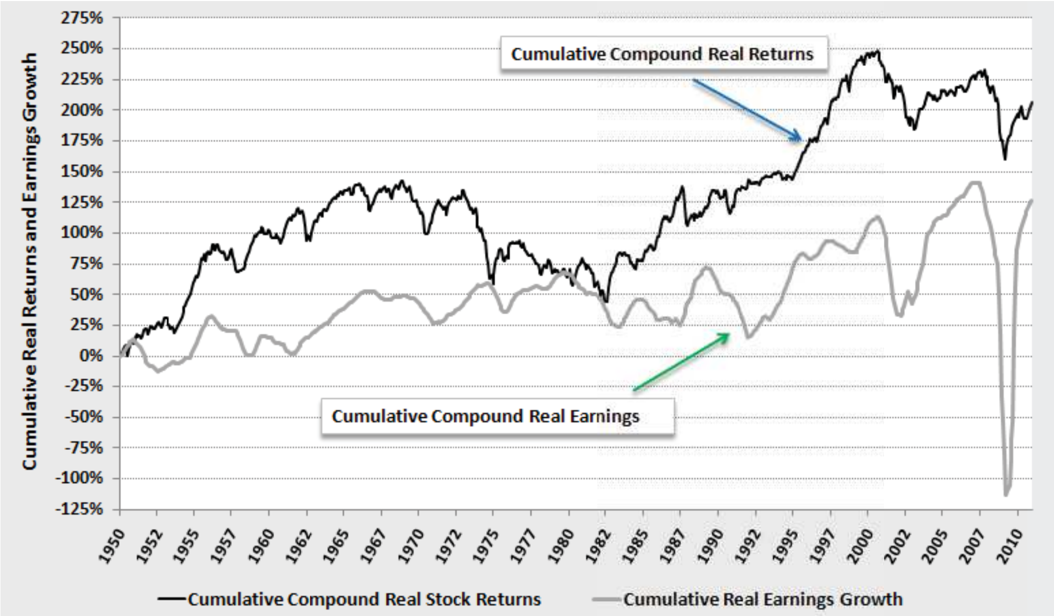
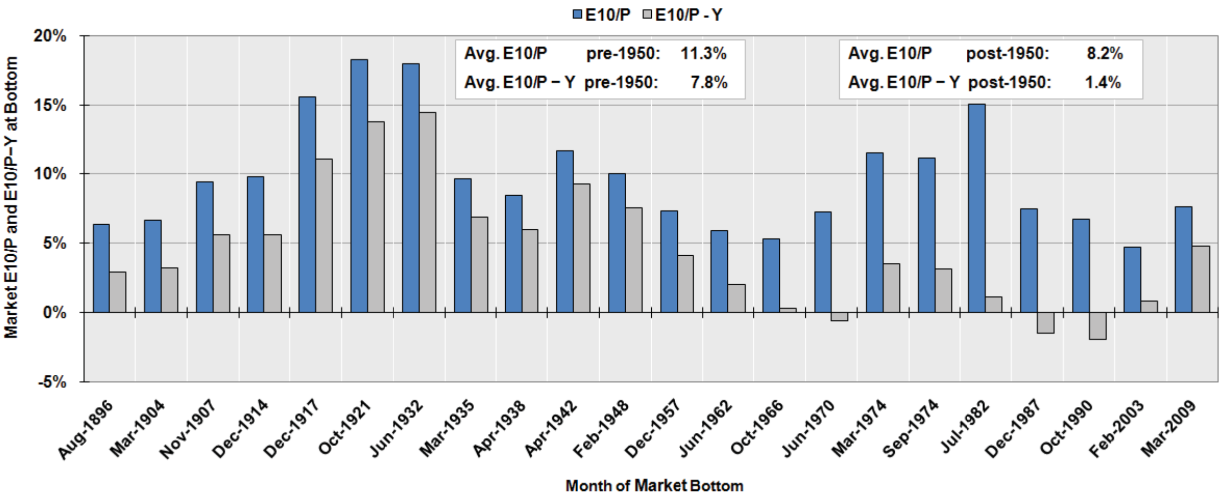


Fig. 6. Cumulative compound real stock returns and earnings growth (1950-2011)

We further explore the implications of the disconnect between long-term stock returns and earnings growth in Figure 7, which depicts the average market earnings yield (E10/P ratio) and E10/P – Y risk premium at bear market bottoms from 1896-2009. At each of the seven bear bottoms through 1932, stocks' expected returns are reset at increasingly higher levels as pessimism associated with bank panics, numerous failed attempts at creating a Federal Reserve system, the uncertainty over World War I, and the crash of 1929 and ensuing depression influenced attitudes about equity investing. These large expected returns and risk premia reflect the fear that McQuarrie (2009) asserts is missing from investors' mindset in the 21st century.



Note: This figure shows the average market earnings yield (E10/P ratio) and equity premium over 10-year interest rates (E10/P – Y) at month-end of each bear market bottom from 1896-2009.

Fig. 7. Average market earnings yield (E10/P) and equity premium (E10/P – Y) at market bottom (1896-2009)

Equity expected returns fail to exhibit similar expansion from the mid-1930s through the 1970 bear, however. Only the bear bottoms in 1974 and 1982 result in a full reset of equity expected returns above 10% − but note that stocks' expected return vs. interest rates (the E10/P – Y spread) never fully resets. As described by previous studies (e.g., Modigliani and Cohn, 1979; and Asness, 2003), higher inflation post-WWII confounds investors with "money illusion" and they fail to see that, even if stock prices fall by 30%, forward-looking expected returns may still be inadequate when compared with bond yields. Stocks need to fall by even more when inflation and interest rates are higher so that their real expected return is appropriately competitive with bonds and other asset classes. Because the stock-over-bond risk premium never fully resets, each successive bull market layers ever-larger returns on top of an increasingly inadequate risk premium. As illustrated by Figure 6, over the course of multiple bull-and-bear cycles, faster-growing stock prices become progressively disconnected from slower-growing earnings through the 2000s. Moreover, despite the disappointing returns earned by US equities 2000-2011, the reset of the stock price/earnings/interest rate relation remains incomplete, given the risks inherent in markets today. In the next section we take a closer look at the behavior of the stock-over-bond risk premium over time and around the March 2009 market bottom.

4.2. The E10/P – Y risk premium. Comparisons such as those in Figure 7, compelling as they are, do not convey the cumulative effect of compounding stock prices and earnings at different rates for multi-decade periods. The implications of these divergent growth rates are further elaborated on in the figures that follow, beginning with Figure 8, which depicts the E10/P – Y risk premium and the cumulative real compound return to stocks from 1881-1949. Note how the stock-over-bond risk premium varies inversely with bull and bear market conditions, but almost never dips below 2%, except briefly in the late 1890s through early 1900s and again during the 1929 bubble. Moreover, despite wild swings from World War I through the Great Depression, the equity risk premium varies around a stable mean and moves proportionately with stock values.

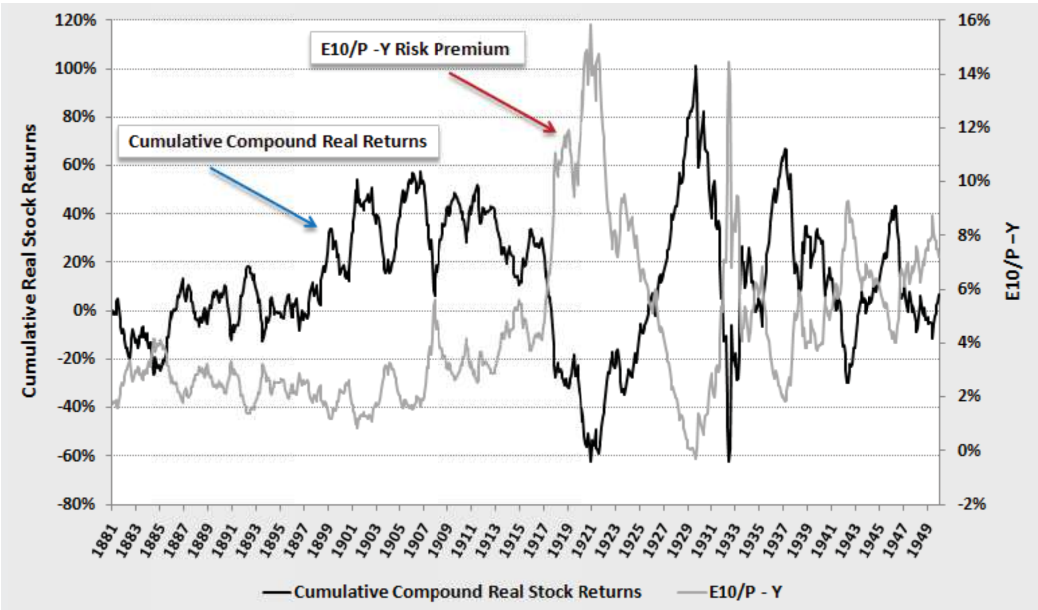


Fig. 8. Cumulative compound real stock returns and the E10/P – Y risk premium (1881-1949)

Figure 9 compares the E10/P − Y risk premium vs. the cumulative real compound return to stocks from 1950-2011. Even a casual examination of the graph reveals that the post-1950 period is significantly different. First, the stock-over-bond risk premium is no longer stationary around a single mean value; the series is in an easily-discernable downtrend from 1950-2000. Moreover, all the real returns earned by US equities over the past 130 years occurred during this period, peaking in 2000. These outsized returns fluctuate through bull and bear swings, but the bear market corrections do not reset the risk premium in the same manner as pre-1950. Instead, the E10/P − Y spread only partially expands before being further depleted in the next bull market. From 1988-2000, the mean equity risk premium is *negative* − despite steadily decreasing interest rates during the same period. Although the bear bottom of March 2009 was characterized as a period of fear bordering on outright panic, the equity risk premium expanded only briefly, and never even reached 5%, before vigorously rising stock prices dragged it all the way back down to a low of 2%. Before 1950, risk premia were only associated with extreme circumstances, such as the 1929 bubble.

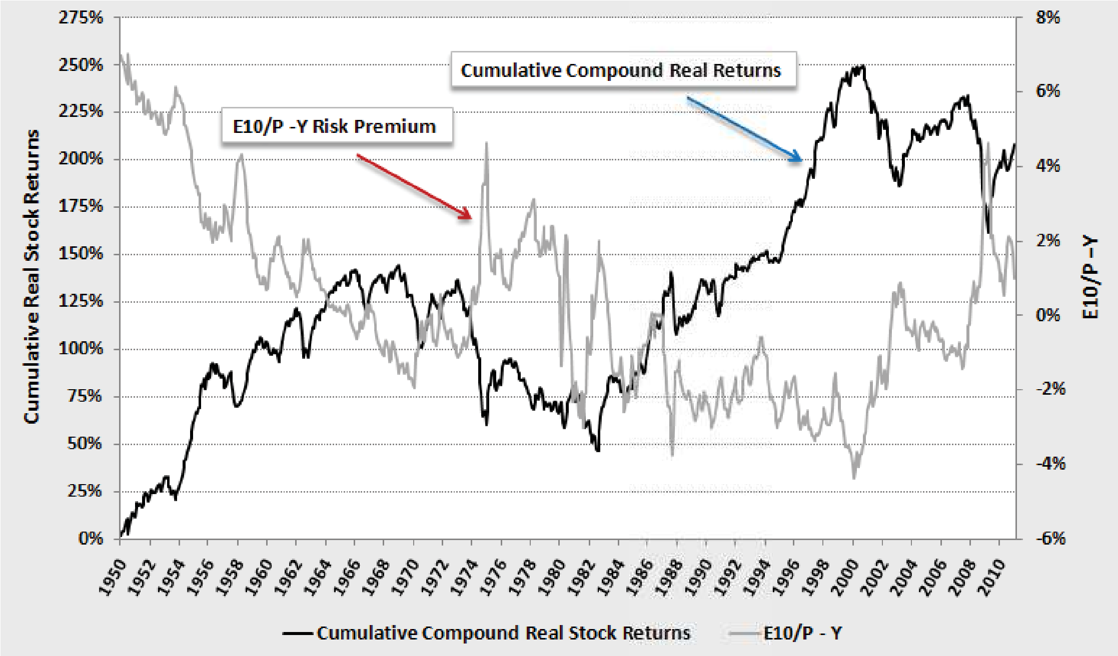


Fig. 9. Cumulative compound real stock returns and the E10/P – Y risk premium (1950-2011)

The evidence we present regarding secularly declining equity expected returns and risk premia are consistent with the findings of other researchers, including Arnott and Ryan (2001), Claus and Thomas (2001), and Siegel (1999 and 2002). Norman and Thiagarajan (2009) propose a variety of reasons overoptimistic investors have failed to properly price in an adequate equity expected return and risk premium in recent years (and may continue to do so), including financial innovation and deregulation, technology-driven increases in access to information, repeal of the Glass-Steagall Act, elimination of the short-sales uptick rule, and Bernanke's ill-timed promotion of the "Great Moderation", which fueled a general decrease in risk aversion.

5. Implications for future stock returns

In this section we examine the implications of our results for future stock returns, as well as the relevance of using the E10/P ratio for predicting returns, in light of the earnings/stock price disconnect we document above. Figure 10 compares the market earnings yield and cumulative real stock returns for the 60 months following the four worst bear markets in history with those of the current US stock market, which is 29 months past its March 2009 bottom at the time of this writing. We see that, for three of the four worst bears – 1932, 1942, and 1974, in which earnings yields at the market bottom expanded to 18.0%, 11.7%, and 11.5%, respectively – total real returns were positive for the next 5 years: 72%, 31%, and 8%. For the 1938 bear, in which the market earnings yield only expanded to 8.5%, total 5-year real returns equalled -6%. Moreover, expansion of the market earnings yield at these major market bottoms forecasts the magnitude of the following 5-year returns – higher earnings yields at unusually severe market bottoms have been associated with monotonically higher total long-term real returns.

Figure 10 also shows the market earnings yield in March 2009 and total real returns for the 29 months following this most recent bear bottom. Although March 2009 was the second worst market bottom in history with a -51.7% decline, the average earnings yield only expanded to 7.6%, slightly less than its post-1950 bear bottom average of 8.2%. Despite this modest expansion in the E10/P ratio, real returns since March 2009 have consistently been the highest compared to the other four major bear bottoms. Even the sharp correction in July-August 2011 only managed to bring the 2009-2011 trend down to that of the 1942 recovery (where the market earnings yield at the bottom was a full 4% higher). The same earnings/price disconnect that gradually developed post-1950 is manifest in stocks' relative valuation at the March 2009 bottom and the returns that follow over the next 29 months. These findings further support the view that stock returns and earnings are not related in the same manner as they were before 1950, and that the long-term returns generated by the contemporary stock market may no longer be as closely related to stocks' relative valuation as they were in pre-1950 period.

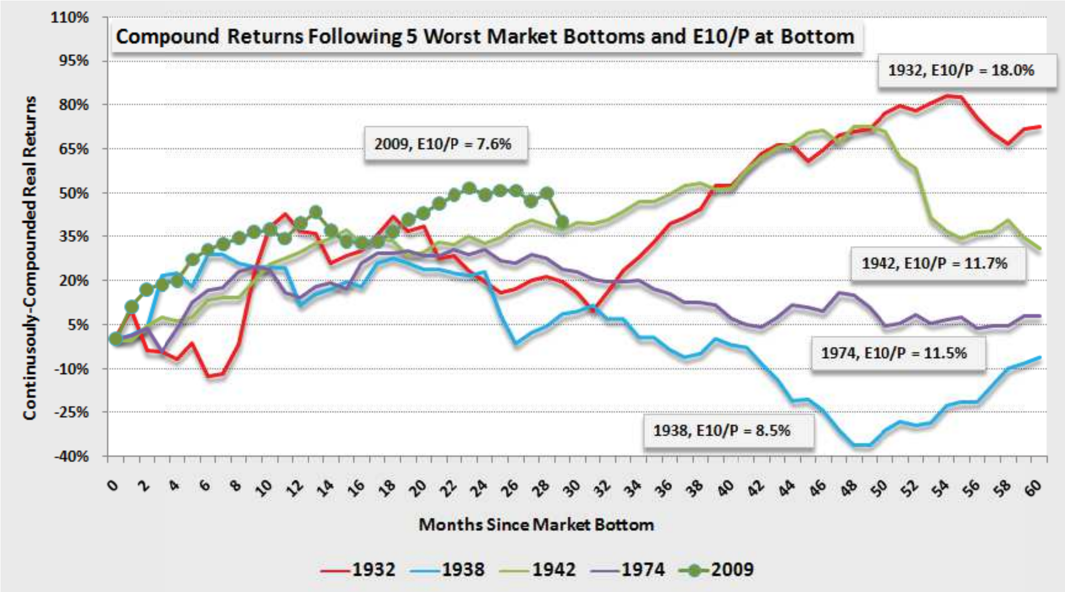


Fig. 10. Stocks' earnings yield and cumulative real stock returns for the 60 months following the five worst stock market declines

5.1. Does the E10/P ratio still forecast future returns? In this section we estimate a typical model used to forecast long-term returns, following studies such as Asness (2000), Weigand and Irons (2007), and Salomons (2009). Estimating the model pre- and post-1950 will provide additional insight into how the stock return/earnings relation has been changing over time, and whether the market E10/P ratio is as relevant for predicting returns as it has been in the past. The model is shown as equation (1) below. The average annual real return to US equities over the next 10 years is modeled as a function of stocks' earnings yield (E10/P ratio) and additional variables featured in the literature. Ibbotson and Chen (2003) identify real earnings growth and inflation as key determinants of equity returns, and Asness (2000) shows that returns are also positively related to investors' long-term expectations of relative stock and bond volatility. Following these authors, we include the average annual growth in real earnings and rate of inflation over the prior 10 years and the standard deviation of annual stock and bond returns over the previous 20 years in the regression.

$$Real\ Ret_{t+10} = \alpha + \beta_1 (E10/P)_t + \\ + \beta_2 (G\ in\ Real\ E)_{t-10} + \beta_3 (Annual\ \Delta CPI)_{t-10} + \\ + \beta_4 (20Yr\sigma_S) + \beta_5 (20Yr\sigma_B) + \varepsilon. \quad (1)$$

Our findings are reported in Table 1. Panel A reports results estimating the model from 1900-2000 (with the last 10-year period ending in 2010). The regression provides a good fit overall, with an adjusted R-squared of 60.3%. The market earnings yield is positively related to future returns. For every 1% rise in the market earnings yield at the beginning of a 10-year period, future returns are, on average, 0.44% per year higher for the next decade. Higher growth in real earnings and higher inflation over the prior decade are also associated with larger future returns. Finally, we see that higher trailing volatility in both equities and bonds results in investors demanding higher future returns from stocks as well.

Panel B reports results from the same regression estimated from 1900-1949, the period in which the market earnings yield and stock-over-bond risk premium exhibited more pronounced mean-reverting behavior. The model fit is improved using data from this subperiod. The adjusted R-squared rises to 70.5%. Also note that the coefficients on the starting E10/P ratio and real earnings growth over the prior decade are larger and more statistically significant. Pre-1950, a 1% rise in the market earnings yield is associated with a 0.73% increase in real returns for the next 10 years. All the remaining variables retain their sign and statistical significance.

Panel C shows the regression re-estimated using data from the 1950-2000 period. The explanatory power of the model declines post-1950, with the adjusted R-squared falling to 55.7%. The most striking result from Panel C concerns the earnings yield and trailing earnings growth variables, both of which are insignificant in the post-1950 subperiod. Trailing inflation and stock and bond volatility account for all the explanatory power of the model. When we re-estimate the model in Panel D omitting earnings yield and trailing earnings growth, the sign and magnitude of the remaining coefficients remain stable, and their statistical significance improves slightly. The adjusted R-squared of the model is unaffected by omission of the earnings yield and trailing earnings growth variables post-1950.

Table 1. Regressions of 10-year real returns on forecasting variables

This table shows the results from regressions of the average annual real return to US stocks for the next 10 years on the starting market earnings yield, average annual growth in real earnings and the change in inflation over the prior decade, and the annual volatility of stocks and bonds over the prior 20 years. Standard errors are computed as in Newey and West (1987).

$$Real\ Ret_{t+10} = \alpha + \beta_1 (E10/P)_t + \beta_2 (G \text{ in Real } E)_{t-10} + \beta_3 (Annual\ \Delta CPI)_{t-10} + \beta_4 (20Yr\sigma_S) + \beta_5 (20Yr\sigma_B) + \varepsilon$$

Panel A: 1900-2000							
	α	β_1	β_2	β_3	β_4	β_5	$\bar{R}^2$
Coefficient	-0.1697	0.4445	0.0828	1.1792	0.4887	0.3151	60.3%
t-statistic	-25.27*	8.41*	2.66*	20.48*	23.03*	9.74*	
Panel B: 1900-1949							
	α	β_1	β_2	β_3	β_4	β_5	$\bar{R}^2$
Coefficient	-0.1683	0.7269	0.1437	0.8551	0.2707	0.9106	70.5%
t-statistic	-27.15*	14.32*	4.57*	14.11*	6.26*	4.41*	
Panel C: 1950-2000 (5 variables)							
	α	β_1	β_2	β_3	β_4	β_5	$\bar{R}^2$
Coefficient	-0.2797	0.1595	−0.0356	1.4373	0.9883	0.6008	55.7%
t-statistic	-8.24*	0.95	−0.51	8.57*	12.77*	4.33*	
Panel D: 1950-2000 (3 variables)							
	α	β_1	β_2	β_3	β_4	β_5	$\bar{R}^2$
Coefficient	-0.2599			1.6130	0.9462	0.5180	55.7%
t-statistic	-13.49*			22.87*	15.10*	6.73*	

Note: * Significant at the 0.01 level.

These findings further support the view that the stock return/earnings relation is significantly different pre- and post-1950. Before 1950, the market earnings yield predictably reverted to the mean, and future equity returns were related to expansion and contraction of this key ratio – a convenient heuristic for the long-term expected return US equities would deliver. Post-1950, we find that the stock return/earnings relation becomes strained as stock prices grow faster than the long-term trend in earnings, eventually resulting in stock prices and earnings losing the cointegrating relation that drove mean reversion in the ratio. In the period following World War II, stock returns have become gradually disconnected from earnings to the point that the earnings yield is no longer reliably mean-reverting, and thus no longer predictive of future equity returns.

We can, of course, still use the model in Panel D of Table 1 to estimate the long-term expected return on US equities based on prior patterns in inflation and market volatility. As of August 2011, the average annual rate of CPI inflation from Shiller's database was 2.69%, and the standard deviation of annual stock and bond returns over the past 20 years was 17.36% and 16.76%, respectively. Plugging these values into the model from Panel D we obtain the following:

$$\begin{aligned} & -0.2599 + (1.6130 \times 0.0269) + \\ & + (0.9462 \times 0.1736) + (0.5180 \times 0.1676) = \\ & = 0.0346. \end{aligned} \tag{2}$$

The estimate is that US equities are priced to deliver long-term real returns of 3.46% per year for the next decade, which is 2% lower than the average real returns stocks delivered from 1950-2000, but only 0.5% lower than the pre-1950 average of 4.0%. With the yield on the 10-year T-note approximately equal to inflation at the time of this writing, this is also the estimate for the real stock-over-bond risk premium. While a 3.5% risk premium is historically low, it is actually 2% higher than the historical average E10/P – Y spread from 1950-2000 (1.4%).

Summary and conclusions

We investigate stock returns, earnings growth, interest rates and the relative valuation of US equities following the 22 major bear market bottoms from 1881-2011. Our main focus is the extent to which stocks' earnings yield (the E10/P ratio using a 10-year moving average of earnings) fully reverts to or overshoots its mean at bear bottoms, thus incorporating large expected returns into equity prices that are realized in future bull markets. We find that large, sustainable bull market returns are associated with bear market bottoms where the market earnings yield expands significantly. Profound declines in stock prices resulting in robust expansion of the market earnings yield at market bottoms occur mainly before 1950, however. Overall, bear market bottoms since 1950 have been associated with shorter bear markets, lower average market earnings yields and slower real earnings growth following the market bottom, but *higher* real stock returns over the next decade. We further find that the market earnings yield and E10/P – Y risk premium have been undergoing long-term compression since the 1950s (meaning that P/E ratios are generally higher). This compression has been driven by equity values growing faster than the long-term trend in earnings for several multi-decade periods.

Equity values growing faster than earnings for an extended period of time means that the stock return/earnings relation is significantly different pre- and post-1950. Before 1950, the market earnings yield predictably reverted to the mean (often overshooting at bear bottoms), and future equity returns were related to expansion and contraction of this key ratio. Post-1950, we find that the stock return/earnings relation becomes strained as stock prices grow faster than the long-term trend in earnings, eventually resulting in stock prices and earnings losing the cointegrating relation that drove mean reversion in the ratio. In the period following World War II, stock returns have become gradually disconnected from earnings to the point that the earnings yield is no longer reliably mean-reverting, and thus no longer predictive of future equity returns. US stocks' earnings yield and trailing earnings growth are unrelated to future long-term returns post-1950.

Despite all the anxiety about the "lost decade" in stocks, US equity values in 2011 remain inflated compared with the fundamental earnings US companies will most likely be capable of producing, and long-term future expected returns remain low. Although we estimate the real equity risk premium to be only 0.5% below its post-1950 average, in a low inflation, low bond yield environment, our forecast is that US equities are priced to deliver real returns of approximately 3.5% per year for the coming decade.

References

1. Arnott, Robert D. (2009). "Bonds: Why Bother?", *The Journal of Indexes*, 12 (May/June), pp. 10-17.
2. Arnott, Robert D. and Ronald J. Ryan (2001). "The Death of the Risk Premium", *The Journal of Portfolio Management*, 27 (Spring), pp. 61-74.
3. Asness, Clifford S. (2002). "Stocks vs. Bonds: Explaining the Equity Risk Premium", *Financial Analysts Journal*, 50, pp. 96-113.
4. Asness, Clifford S. (2003). "Fight the Fed Model", *The Journal of Portfolio Management*, 30 (Fall), pp. 11-24.
5. Campbell, John Y., and Robert J. Shiller (1987). "Cointegration and Tests of Present Value Models", *Journal of Political Economy*, Vol. 95, pp. 1062-1088.
6. Campbell, John Y., and Robert J. Shiller (1998). "Valuation Ratios and the Long-Run Stock Market Outlook", *The Journal of Portfolio Management*, 24 (Winter), pp. 11-26.
7. Campbell, John Y., and Robert J. Shiller (2001). "Valuation Ratios and the Long-Run Stock Market Outlook: An Update", Cowles Foundation Discussion Paper No. 1295, March, Yale University.
8. Carlson, John B., Eduard A. Pelz, and Mark E. Wohar (2002). "Will Valuation Ratios Revert to Historical Means?" *The Journal of Portfolio Management*, 28 (Summer), pp. 23-33.
9. Claus, James, and Jacob Thomas (2001). "Equity Premia as Low as Three Percent? Evidence From Analysts' Earnings Forecasts for Domestic and International Stock Markets", *Journal of Finance*, 56 (2001), pp. 1629-1666.
10. Coakley, Jerry, and Fuertes, Ana-Maria (2006). "Valuation Ratios and Price Deviations From Fundamentals", *Journal of Banking and Finance*, 30, pp. 2325-2346.
11. Domian, Dale L., and William Reichenstein (2009). "Long-Horizon Stock Predictability: *Evidence* and Applications", *The Journal of Investing*, 18 (Fall), pp. 12-20.
12. Graham, Benjamin and David Dodd (1934). *Security Analysis*, New York: McGraw-Hill.
13. He, Ling T. (2009). "What Can We Learn From 123 Years of Stock Market Fluctuations? Processes of Mean Aversion and Reversion", *The Journal of Investing*, 18 (Winter), pp. 57-71.
14. Ibbotson, Roger, and Peng Chen (2003). "Long Run Stock Returns: Participating in the Real Economy", *Financial Analysts Journal*, 59 (January/February), pp. 88-98.
15. Kim, Myung J., Charles R. Nelson, and Richard Starz (1991). "Mean Reversion in Stock Prices? A Reappraisal of the Empirical Evidence", *Review of Economic Studies*, 58, pp. 515-528.
16. Manzan, Sebastiano (2007). "Nonlinear Mean Reversion in Stock Prices", *Quantitative and Qualitative Analysis in Social Sciences*, 1, Vol. 3, pp. 1-20.
17. McQuarrie, Edward (2009). "The Stock Market's Little Shop of Horrors: And You thought the Aftermath of 1929 Was Grim", *The Journal of Investing*, 18 (Summer), pp. 6-17.
18. Modigliani, Franco, and Richard A. Cohn (1979). "Inflation, Rational Valuation, and the Market", *Financial Analysts Journal*, 35 (March/April), pp. 24-44.
19. Newey, W., and K. West (1987). "A Simple, Positive Semi-Definite Heteroskedasticity and Autocorrelation Consistent Covariance Matrix", *Econometrica*, 55 (May), pp. 703-708.
20. Norman, James H. and Ramu Thiagarajan (2009). "Asset Bubbles and Market Crises", *The Journal of Investing*, 18 (Winter), pp. 6-22.

21. Pagan, A.R., and K.A. Sossounov (2003). "A Simple Framework for Analyzing Bull and Bear Markets", *Journal of Applied Econometrics*, 18, pp. 23-46.
22. Salomons, Roelof (2006). "A Tactical Implication of Predictability: Fighting the Fed Model", *The Journal of Investing*, 18 (Summer), pp. 87-98.
23. Shiller, Robert J. (2002). *Irrational Exuberance*, 2nd ed. Princeton, NJ: Princeton University Press.
24. Shiller, Robert J. (2002). "The Irrationality of Markets", *The Journal of Psychology and Financial Markets*, 3, pp. 87-93.
25. Shiller, Robert J. (2011). Available at http://www.econ.yale.edu/~shiller/data.htm.
26. Siegel, Jeremy J. (1999). "The Shrinking Equity Premium", *The Journal of Portfolio Management*, 26 (Fall), pp. 10-17.
27. Siegel, Jeremy J. (2002). "The Rise in Stock Valuations and Future Equity Returns", *Journal of Investment Consulting* (Summer).
28. Siegel, Jeremy J. (2007). *Stocks for the Long Run*, 4th ed, New York: McGraw-Hill.
29. Weigand, Robert A. and Robert Irons (2007). "The Market P/E Ratio, Earnings Trends, and Stock Return Forecasts", *The Journal of Portfolio Management*, 33 (Summer), pp. 87-101.
30. Weigand, Robert A., and Robert Irons (2008). "Contraction and Expansion of the Market PE Ratio: The Fed Model Explained", *The Journal of Investing*, 17 (Spring), pp. 55-64.