The Shiller CAPE Ratio:
A New Look

by

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Abstract

Robert Shiller's Cyclically Adjusted Price-Earnings Ratio, or CAPE Ratio is the single best forecaster of long-term future stock returns. But research presented here suggests that over the last several years CAPE ratio forecasts have been too pessimistic because recent FASB rulings, particularly mark-to-market rules, have biased Standard and Poor's reported earnings sharply downward. When alternative earnings series, particularly after-tax NIPA corporate profits are substituted for S&P reported earnings, the forecasting ability of the CAPE model significantly improves and the overvaluation of the current market largely disappears. [1]

Overview

In 1998, Robert Shiller and his coauthor John Campbell published a path breaking article, "Valuation Ratios and the Long-Run Stock Market Outlook." This article, following up on some of their earlier work on stock market predictability, established that long-term stock market returns were not random walks but could be forecast by a valuation measure called the Cyclically Adjusted Price-Earnings ratio, or CAPE ratio. [2] The CAPE ratio was calculated by taking a broad-based index of stock market prices, such as the S&P 500, and dividing by the average of the last ten years of aggregate earnings, all measured in real terms. The CAPE ratio was then regressed against the future ten year real returns on stocks, establishing that the CAPE ratio was a significant variable predicting long-run stock returns.

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[1] I want to thank Cathy Schrand of the Accounting Department at Wharton for the interpretation and use of many current accounting practices.

[2] Campbell, J. Y., Shiller, R. J., Winter, 1998, Valuation Ratios and the Long-Run Stock Market Outlook, *Journal of Portfolio Management*, 11-26. Their earlier paper was Campbell and Shiller, "Stock Prices, Earnings and Expected Dividends," *Journal of Finance*, (July 1988) 43 (3), 661-76. Robert Shiller posted a paper, "Price Earnings Ratios as Forecasters of Returns: The Stock Market Outlook in 1996" on his website on 7/21/96 which served as the basis for his presentation to the Federal Reserve.

The predictability of real stock returns implied that long-term equity returns were mean reverting. In other words, when the CAPE ratio was above its long run average, the model predicted below-average real returns for stocks over the next decade and the model predicted above-average returns when the CAPE ratio was below its average. The CAPE ratio from 1871 through 2012 is plotted in Figure 1 along with the forecast ten-year real stock returns from the model against the actual ten year returns.[3] The CAPE model is able to explain just under one-third of the variation in future 10-year real stock returns.

Figure 1

The Shiller CAPE Ratio and Forecast and Actual Returns

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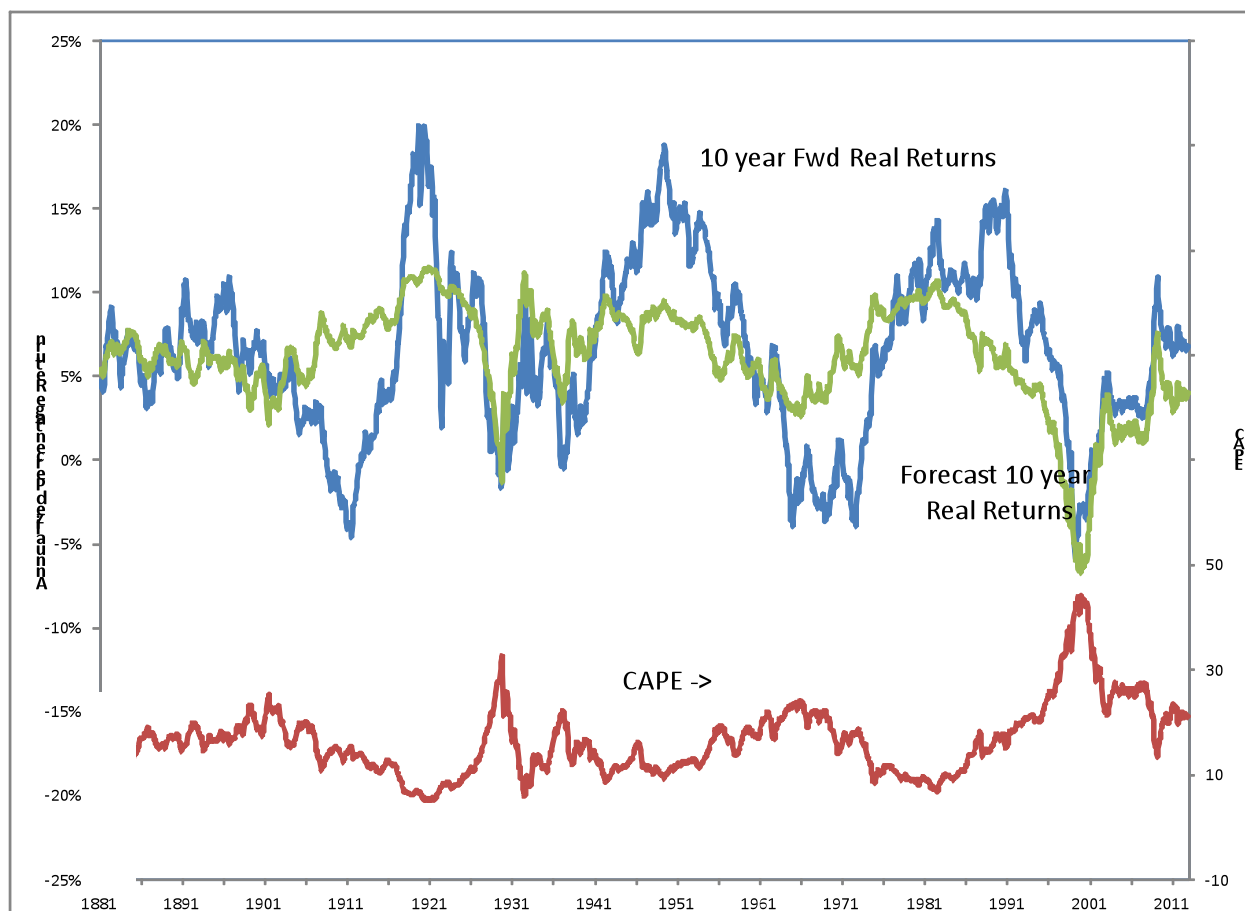
[3] Real stock returns from January 2013 forward are put at 6.54%, the long-run historical average. The Shiller CAPE model predicts a real return of 4.16%. In the Shiller prediction is substituted for the next ten years, the 10-year forward return would converse to the forecast return during the 2003-2012 period.

The CAPE ratio gained attention when the authors presented a preliminary version of their 1998 paper at the Board of Governors of the Federal Reserve on December 3, 1996 and warned that stock prices in the late 1990s were running well ahead of earnings. Greenspan's "Irrational Exuberance Speech," delivered one week later, was said to have been based, in part, on their research.[4] At the top of the bull market in 2000 the CAPE ratio hit an all-time high of 43, more than twice its historical average and correctly forecast the poor equity returns over the next decade.

In January 2013, the CAPE ratio reached 20.68, about 30% above its long-term average and predicted a ten-year future annual real stock return of 4.16%, about 2 ½ percentage points below its long run average. This has created concern among many stock market forecasters that the current stock market rally is unsustainable and that another bear market might be forthcoming.[5]

But closer analysis suggests that the CAPE ratio may be giving too bearish a forecast. The persistent bearishness of the CAPE model in recent decades – there have been only 9 months since January 1991 when the CAPE ratio has been below its long-term average – has not been borne out by actual stock returns. In 380 of the 384 month from 1981 through 2012, the actual 10 year real returns in the stock market have exceeded forecasts using the CAPE model even if we assume the next ten year's stock returns exactly match the 4.16% real return predicted from using reported earnings in the CAPE model.

The research in this paper suggests that the CAPE model is chronically understating future stock market returns for two reasons: the first, and most significant, is the distorted level of earnings reported by Standard and Poor's for it benchmark S&P 500 Index, particularly in the last three recessions, and (2) the increase in the trend growth rate of real per-share earnings that has occurred after 1945. I find that when after-tax real corporate profits (share adjusted) from

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[4] In that July paper, Shiller forecast the real S&P 500 would decline by 38.07% over the next ten years. Although the S&P500 appreciated by 41% after inflation over that period and real stocks returns were 5.6%, the CAPE ratios warnings became more accurate as time progressed. In fact from March 1999, real S&P 500 index fell by more than 50%, vindicating Shiller's bearishness.

[5] Although a 4.16% real return is still very attractive and is about 5 percentage points above the TIPS yield, a greater margin than the 3.1% historical average from 1871 through 2012.

the National Income and Product Accounts (NIPA) are substituted for S&P reported earnings in the CAPE model, not only does that forecasting ability of the CAPE model improve, but the January 2013 CAPE ratio is actually below its long-term average. Other biases in S&P index earnings are also discussed.

Earnings Series

Figure 2 plots after-tax per share earnings recorded by three different series: (1) the *reported* earnings series published by Standard and Poor's and used in the Shiller-Campbell analysis, (2) the *operating* earnings, a companion series also published by Standard and Poor's and first released in 1989, and (3) real after-tax corporate profits as published in the national Income and Products accounts adjusted for changes in the number of shares outstanding.[6]

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[6]The actual S&P divisor (published on Standard and Poor's website) is used for the period 1988 through 2012. The average change in the divisor is 0.9939% per year and this is extended back to the beginning of the NIPA series in 1928. The most comparable NIPA profit series (as indicated by Hodges, (see footnote 13) are taken from Table 1.12 of the National Income and Product Accounts, line 45 and deflated by the same inflation measure used by Shiller in the CAPE ratio and the S&P divisor described above. The cumulative change in the divisor reduces real NIPA profits in 2012 by a factor of 2.27.
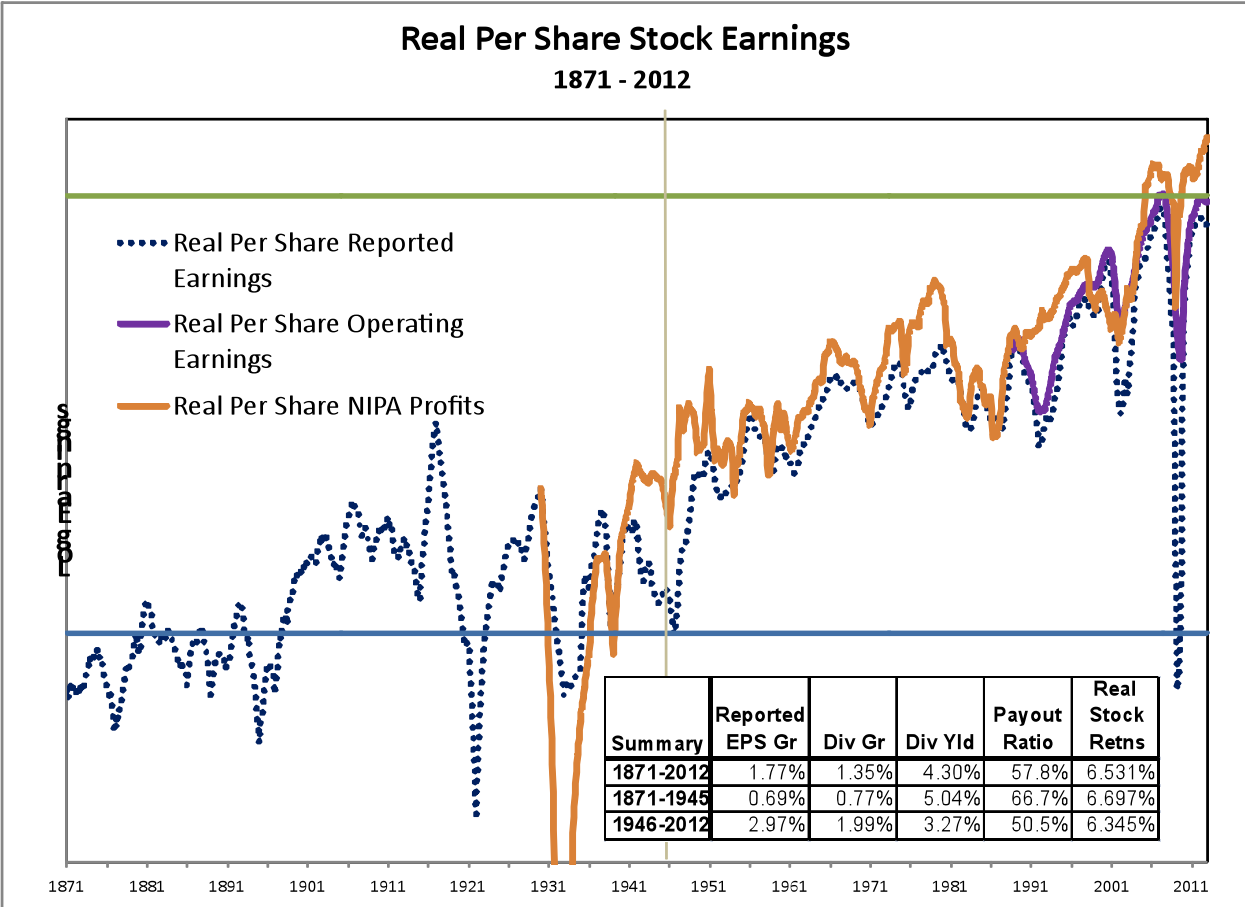
Figure 2

Real Per Share Stock Earnings
1871 - 2012

Summary	Reported EPS Gr	Div Gr	Div Yld	Payout Ratio	Real Stock Retns
1871-2012	1.77%	1.35%	4.30%	57.8%	6.531%
1871-1945	0.69%	0.77%	5.04%	66.7%	6.697%
1946-2012	2.97%	1.99%	3.27%	50.5%	6.345%

Legend:
- Real Per Share Reported Earnings
- Real Per Share Operating Earnings
- Real Per Share NIPA Profits

Table 1
Cyclical Behavior of Reported, Operating, and NIPA Profits

Recession		Change in After Tax Real Earnings		
Peak	Trough	NIPA	S&P Reported	S&P Operating
Aug29	Mar33	-126.3%	-66.6%	
May37	Jun38	-41.3%	-47.4%	
Feb45	Oct45	-24.1%	-21.8%	
Nov48	Oct49	-22.9%	-2.8%	
July53	May54	-25.0%	-1.6%	
Aug57	Apr58	-32.5%	-27.7%	
Apr60	Feb61	-22.3%	-13.6%	
Dec69	Nov70	-28.7%	-20.6%	
Nov73	Mar74	-24.8%	-21.1%	
Jan80	Jul80	-28.7%	-16.0%	
July81	Nov82	-33.9%	-23.7%	
Jul90	Mar91	-4.0%	-42.8%	-32.1%
Mar01	Nov01	-24.3%	-55.3%	-33.3%
Dec07	Jun09	-53.0%	-92.1%	-58.2%
Average 1871-1989		-37.3%	-23.9%	
Average 1989-2002		-27.1%	-63.4%	-41.2%

Table 1 shows the percentage decline in each of the three measures of real corporate after tax earnings during the NBER business cycles from 1929 to the present. One can see that the cyclical nature of S&P reported earnings has changed dramatically in the last 3 business cycles. Before 1990, the decline in S&P reported earnings was *less than* the decline in NIPA profits in every recession except 1937-38. The average magnitude of the earnings decline in recessions was 23.9% for the S&P reported earnings while it was 37.3% for NIPA profits. But in the last three recessions, S&P reported profits fell by more than twice as much as NIPA profits. In the 1990 recession, S&P reported profits fell 42.8% while NIPA fell only 4%, in the 2001 S&P reported profits fell 55.3% while NIPA declined 24.3%, and in the Great Recession, NIPA fell 53% while S&P reported earnings declined 92.1%. It is particularly puzzling that the decline in S&P reported earnings in the 2008-2009 recession, where the maximum decline in GDP was just over 5% was much greater than the 63.4% decline in S&P's recorded earnings in the Great Depression, which was five times as deep. In fact NIPA corporate profits were negative in 1931 and 1932, far more in line with other economic data. These disparities suggest that there has been

a change in the S&P methodology from likely understating earnings declines in recessions to significantly overstating these declines.

Earnings Concepts

To achieve a better understanding of the accounting changes that have been made, it is important to review current practice with regard to reporting earnings. There are two principal ways that firms state their earnings. *Net income* or *as reported earnings* are those earnings sanctioned by the Financial Accounting Standards Board (FASB), an organization established in 1973 to establish accounting standards. These standards are called the *Generally Accepted Accounting Principles* (GAAP), and they are used to compute the earnings that appear in the annual report and are filed with government agencies.[7]

According to Standard and Poor's, "as reported income" (sometimes called GAAP earnings) excludes both income from discontinued operations and extraordinary income. Operating income usually excludes 'unusual' items from that value. But operating income is not defined by FASB. This permits individual companies to interpret what is and what is not 'unusual'. The result is a varied interpretation (by companies) of items and charges, where the same specific type of charge may be included in operating earnings for one company and omitted from another.[8] Operating earnings often exclude restructuring charges (for example, expenses associated with a firm's closing a plant or selling a division), investment gains and losses, inventory write-offs, expenses associated with mergers and spin-offs, and depreciation or impairment of "goodwill."

Over the entire period 1989 through 2012 for which Standard and Poor's have been collecting data on both earnings concepts, reported earnings have averaged 85.7% of operating earnings. During economic expansions, reported earnings averaged 92% of operating earnings. But the ratio of reported to operating earnings dropped precipitously in the last two recessions.

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[7] Although earnings filed with the IRS often differ from either reported or operating earnings.
[8] These are definitions supplied to me by Standard and Poor's.

In the 2001 recession reported earnings fell 30% below operating earnings and during the 2008-2009 recession reported earnings fell to only one-half the level of operating earnings.

It is often assumed that "reported earnings" better represents the true earnings of a firm than operating earnings. But that is not necessarily true. In fact, the increasing conservatism of FASB standards, especially as related to the forced write-down of asset values, has resulted in severe downward biases to reported earnings. This bias is especially severe in recessions and periods when market prices are depressed.[9] The write-down of asset values was mandated by SFAS (Statement of financial Account Standard) Rules 142 and 144 issued in 2001 which mandated that any impairments to the value of property, plant, equipment and other intangibles (such as goodwill acquired by purchasing stock above book value) also be marked to market, and in 1993 by Rule 115 which stated that securities of financial institutions held for trading or "available for sale," were required to be carried at fair market value.[10]

These new accounting standards greatly increased the magnitude and number of write-downs that firms were required to report without making any offsetting allowances for increases in the value of assets that recovered or rose in value.[11] Firms are not allowed to write depreciated assets back up, even if they recover in value, unless they are sold and recorded as "capital gain" income.[12]

These new rules have had major net negative impact on both reported and operating earnings. A striking example is Time-Warner's purchase of America online (AOL) in January 2000 for $214 billion at the peak of the internet boom. AOL, a member of the S&P500 Index at that time, experienced a huge capital gain when the firm was acquired by Time Warner as the purchase price was far above book value. But that capital gain to AOL shareholders was excluded from all the S&P earnings data. In 2002, after the internet bubble popped, Time

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[9] See Givoly, Dan and Hayn, Carla, Rising Conservatism: Implications for Financial Analysis, *Financial Analysts Journal, v* .58, No.1 (Jan-Feb. 2002), pp. 56-74.

[10] These standards are no long called SFAS. All rules are now organized in one "accounting standard codification) (ASC), and FASB now issue an "accounting standard update" or ASU.

[11] FASB also does not allow write-ups of tangible fixed assets.

[12] International Financial Reporting Standards (IFRS) allow the write-ups of asset values in some situations.

Warner was forced to write down its investment in AOL by $99 billion, at that time the largest loss ever recorded by and American company. The actual profits or market value of AOL and Time Warner were not materially different after the tech bubble than before, but because the capital gains on AOL shares were never counted as earnings, the aggregate earnings of the S&P500 index fell dramatically when AOL's market price tumbled. Large write-downs mandated by similar capital losses were taken by many other firms during that period.

Operating Earnings and NIPA Profits

The out-sized declines in Standard of Poor's reported earnings during the two most recent recession not only differed sharply from its historical pattern but also from the after-tax corporate profits reported by the Bureau of Economic Analysis (BEA), which computes the National Income accounts. These differences in the two series prompted the Bureau to put out a brief entitled "Comparing NIPA Profits with the S&P 500 Profits" in 2011.[13] The BEA defines "corporate profits" as the income earned from the current production by US corporations based on "adjusting, supplementing, and integrating financial based and tax-based source data."[14] Such data generally excludes the revaluation of assets because revaluations do not apply to the profit flow from current production. The BEA confirms that "a key source of the high volatility in the S&P 500 quarterly reported earnings is asset write-downs" and cites the charges taken by AIG and other prominent financial companies in the most recent recession.

In that brief the BEA noted that S&P's operating earnings more closely tracks NIPA profits than S&P reported earnings. Although S&P 500 operating earnings do exclude some of the write-downs (such as from Time Warner), the market losses in assets held by the financial sector, whether they are realized or not, are considered part of operating earnings. And although operating profits generally exclude impairment to good will, they do include changes in the discounted cost of future pension benefits relative to the market value of the underlying assets.

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[13] "Comparing NIPA Profits with AS&P 500 Profits," by Andrew W. Hodge, March 2011, *Survey of Current Business*, vol. 91. Hodges indicates the Table 1.12, line 45 is the most comparable data to the S&P 500 earnings.

[14] In particular, tax accounting measures come from the IRS, *Statistics of Income (SOI): Corporation Income Tax Returns.*

S&P operating earnings are therefore more volatile than NIPA after-tax profits but they are more stable than reported earnings.

The Aggregation Bias

There is a further bias related to the use of aggregate earnings to determine the valuation of the market and it is most severe when using Standard and Poor's reported earnings data. This bias becomes especially large when the large losses of a few firms dominate aggregate data. The S&P methodology adds gains and losses of each S&P 500 together to compute the aggregate earnings on the index and then value the sum of all the earnings against the sum of all the values of the individual stocks. This is identical to how one would value a single firm with 500 divisions, each division reporting its profits and losses, as Standard and Poor's explicitly states.[15]

But, this methodology understates the valuation of a portfolio that contains 500 separate firms.[16] Finance theory states that the value of a stock is an option on the value of the firm and the sum of the value of the 500 options on the value of each firm, which add up to the market value of the S&P 500, must exceed the value of option on the earnings of a single firm with 500 divisions, as S&P states. This is because the value of an individual stock can never go below zero no matter how great the losses since these losses are borne by other stakeholders (such as bondholders) and not by the equity holders of other firms.

The aggregation bias was particularly acute in the last recession. The unprecedented $23.25 *loss* in reported earnings for S&P 500 firms in the fourth quarter of 2008 was primarily caused by the huge write-downs of three financial firms: AIG, Citigroup, and BankAmerica.   AIG recorded a $61 billion fourth quarter 2008 loss. Although AIG had a weight only less than 0.2% in the S&P500 index at the time, this loss more than wiped out the total profits of the 30 most

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[15] This is exactly how S&P described its earnings procedure in a bulleting put up on its website after I published my criticism of S&P's methodology (see footnote 12, below).
[16] See "The S&P Gets Its Earnings Wrong," *The Wall Street Journal*," February 25, 2009, page. A13.

profitable firms in the S&P 500 in that quarter, firms whose market values comprised almost half the index.

The exact size of the aggregation bias is difficult to calculate. During economic expansions when most firms are profitable, the bias is very small. But the bias becomes much larger when a few firms report extreme losses as became the case when FASB introduced the new write-down requirements.[17]

Valuation Using Alternative Earnings Series

Figure 3 shows the CAPE ratio from 1980 through 2012 calculated by each of the three earnings series. One can see that using share-corrected NIPA profits reduces the current valuation of the market below the long-run (1871-2012) average.

Table 2 summarizes the results of the CAPE regression using these alternative earnings series against ten-year future real stock returns. Two regressions are calculated for each earnings series: (1) the Shiller formulation that regresses future real annualized stock returns on the CAPE ratio and (2) one that regresses future total real stock returns on the CAPE earnings yields (1/CAPE ratio). Of the four regressions, CAPE and 1/CAPE against annualized and total real returns, the regressions of the earning yield against total stock returns consistently yielded the highest R^2.

Whichever formulation is used, substituting S&P operating earnings, and particularly NIPA profits into the regression equation not only improves the fit but also significantly reduces the overvaluation of the current market. In the Shiller formulation, which regresses future ten-year annualized real returns on the CAPE ratio, the R^2 rises from 31.8% for reported earnings to 33.9% for operating earnings and to 41.9% using per share NIPA profits. The January 2013

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[17]   One procedure to reduce the aggregation bias is to weight the losses or gains of each firm by the market value of the firms, the way that Standard and Poor's does when it calculates returns. In this case, outsized losses of firms selling at low valuations are discounted. As noted, such a procedure has little impact during bull markets but would have increased reported 2008 earnings by nearly 80%.

CAPE ratio is reduced from 20.68 and 17.94 using reported and operating earnings (versus at 15.93 median) to 14.41 (versus a 15.37 median) using share-corrected NIPA profits. Correspondingly, the predicted real stock return from January 2013 rises by from 4.16% for reported earnings to 5.17% for operating earnings to 6.68% using NIPA profits. Using the earnings yield regression, the January 2013 projected return rises from 4.60% using reported earnings to 5.47% using operating earnings, to 6.39% using NIPA profits. Scatter diagrams and t-statistics for the regressions using Reported earnings and NIPA profits are shown in Figure 3.
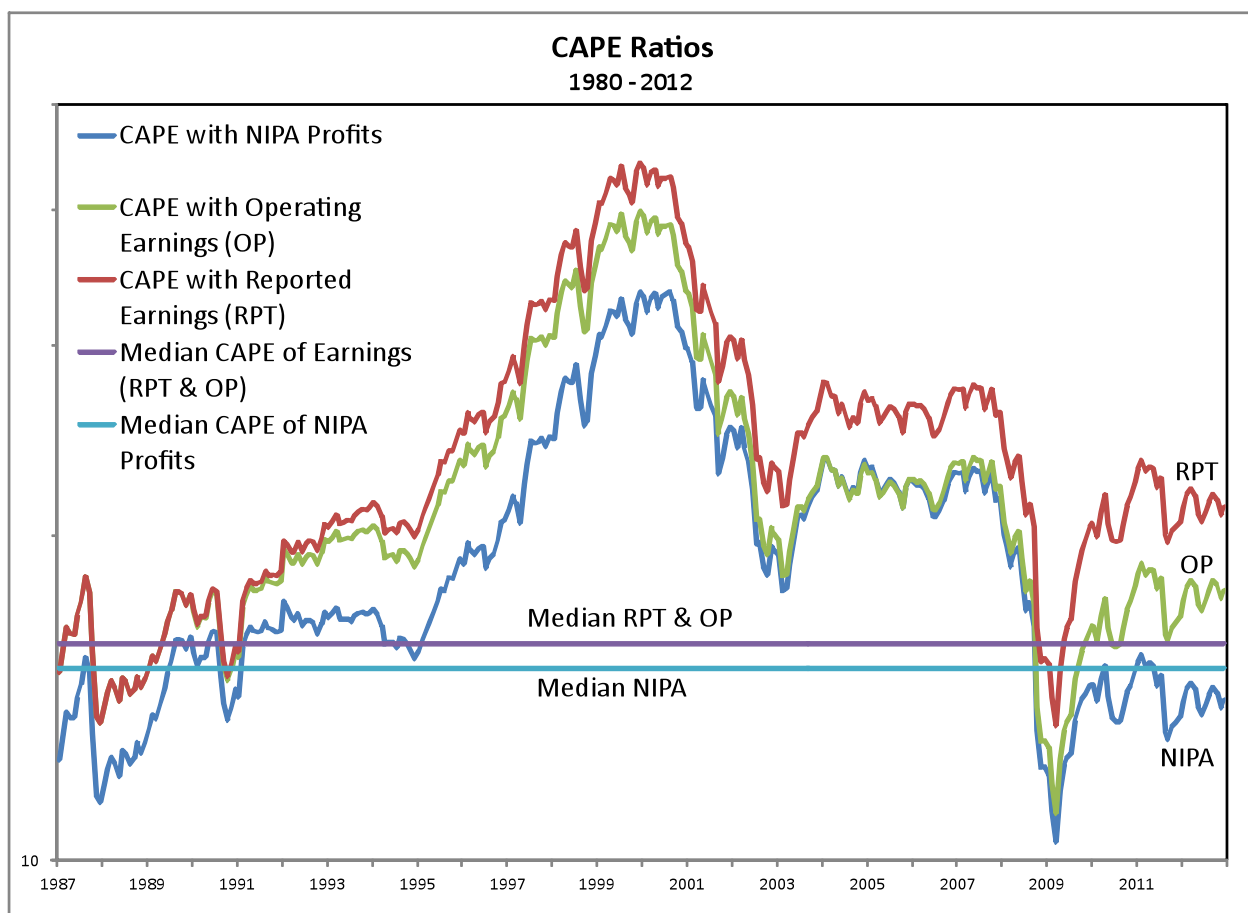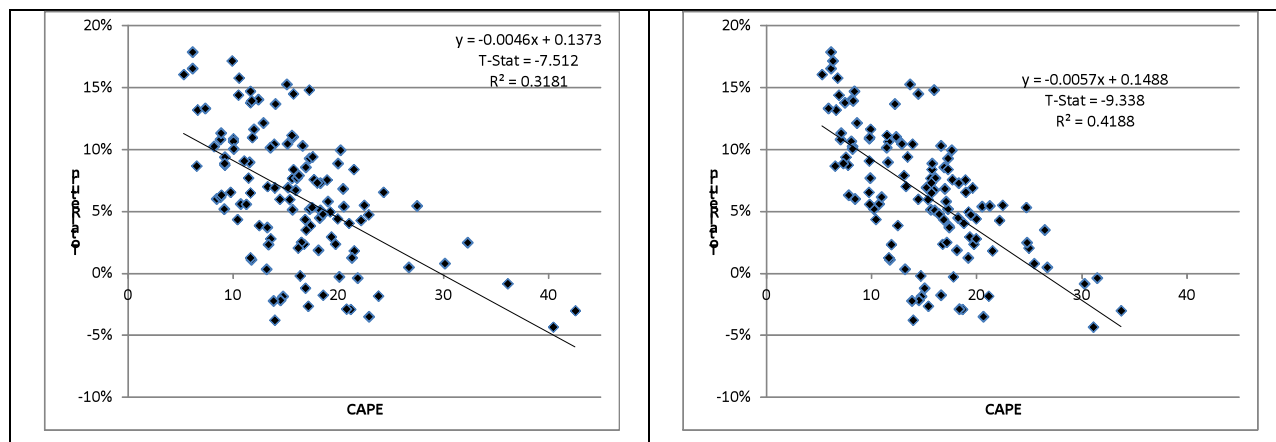
Figure 3

Table 2

Valuation of January 2013 Stock Market by Various Earnings Measures

| Regression	Variable	Reported Earnings		Operating Earnings		NIPA Profits	
		w/o Dummy	w/Dummy	w/o Dummy	w/Dummy	w/o Dummy	w/Dummy
Annualized Return versus CAPE	R^2	0.318	0.382	0.339	0.398	0.419	0.422
	Median CAPE	15.93	15.93	15.93	15.93	15.37	15.37
	Jan 2013 CAPE	20.68	20.68	17.94	17.94	14.41	14.41
	Overvalued/(Undervalued)	29.82%	18.10%	12.62%	1.70%	(6.25%)	(7.45)
	Jan 2013 Proj Real Return	4.16%	5.35%	5.17%	6.42%	6.68%	7.01%
Total Return versus 1/CAPE	R^2	0.349	0.425	0.352	0.425	0.51	0.516
	Median 1/CAPE	0.0628	0.0628	0.0628	0.0628	0.0651	0.0651
	Jan 2013 1/CAPE	0.0484	0.0484	0.0557	0.0557	0.0694	0.0694
	Overvalued/Undervalued	22.93%	4.90%	11.20%	(7.20%)	(6.66%)	(5.21%)
	Jan 2013 Proj Real Return	4.60%	6.21%	5.47%	7.00%	6.39%	6.87%
	*Value relative to Median Cape w/o dummy, value relative to Long Term stock return w/dummy						

Figure 4

Annualized 10 Year Return on CAPE (Shiller Regression)

Left: S&P reported earnings; Right: NIPA Profits

Below Total 10-Year Return on 1/CAPE (Earnings Yield)

Left: Reported Earnings; Right: NIPA Profits
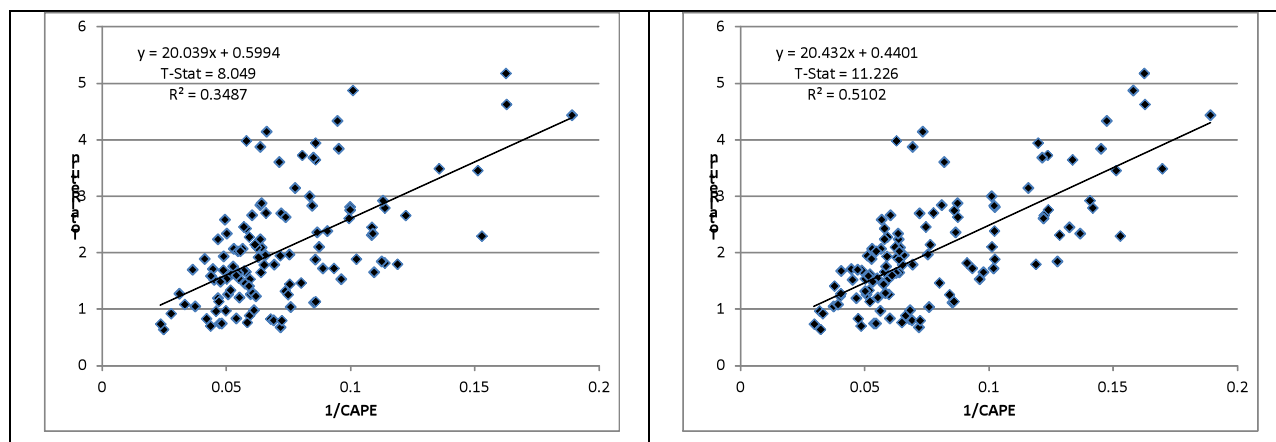
Change in Trend Earnings

One can see that from Figure 1 that the rate of growth of both earnings and dividends increased after World War II. The primary reason for the change was the reduction in the dividend payout ratio, which fell from two-thirds to just over 50%. The increase in retained earnings increased the growth rate of earnings per share. This occurred because firms reduced their need to float new shares, increased their buyback of existing shares, or reduced other forms of financing which lower earnings. Theoretically, finance theory predicts that every one percentage reduction in the dividend yield should increase the per share earnings growth by one percentage point and should not have any impact on the real return to shareholders.

These conditions have been closely met by the data. Indeed, from before to after World War II per shares earnings growth increased 2.28 percentage points from 0.69% to 2.97% at the same time firms lowered the dividend yield by 1.77 percentage points to 3.27% from 5.04%. The real returns to stock investors, at 6.70% before World War II and 6.35% after the war changed little.

The CAPE Model is not robust to a change in the growth rate of real per share earnings. The higher the earnings growth rate, the lower will be the average of the past ten years of earnings relative to the current earnings. This will raise the equilibrium CAPE ratio and bias the

forecast of future returns downward based on projections made from data where the growth of per share earnings is lower.

The direct impact of the change in the growth rate of real per share earnings is easy to calculate. If we substitute the 1.74% average annual increase in per share reported earnings over the entire period 1871 to 2013, of 1.77%, then the average of the past ten years of earnings will be 8.35% higher than the initial year. If we substitute the 2.97% average real growth in reported earnings over the post 1945 period, the average of the past ten years of earnings will be 14.48% above the initial year. This implies that in the post 1945 period, CAPE ratios are biased upward by 5.65%. Lowering the CAPE ratio by 5.65% and substituting into the Shiller regression raises his forecast real returns on stocks from January 2013 by 51 basis points.

The current bias in the CAPE ratio may be even higher than computed above. Over the past decade, firms have paid out only about 1/3 of their earnings as dividends and this should further boost earnings per share growth. Since the current dividend yield is currently about 2.0%, to achieve historical the historical real returns of about 6.5%, real per share earnings will grow at a 4.5% annual rate. At that rate of increase the average of ten years of earnings is 22.88% higher than the first year, which is 13.4% higher than the historical average. Reducing the January 2013 CAPE ratio by 13.4% raises the Shiller projection of future real returns to 5.29%, which is 113 basis points above the prediction when no correction is made for trend change.

Another way of taking into account the change in the post 1945 data is to add a dummy variable to the return forecasting equation. The dummy variable is highly significant in every regression, no matter which earnings measure is used and boosts the R^2 of each forecasting equation, as shown in Table 2. Like the trend correction above, the addition of the dummy variable also raises the forecast return for all earnings concepts; by over one hundred basis points for reported and operating earnings, although by less than 40 basis points for NIPA profits. The forecasting equation with the best fit is achieved by adding the dummy variable to NIPA profits, which raises the R^2 of the forecasting equation to .516 and forecasts a 6.87% real stock return

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from January 2013. The addition of the dummy variable to the Shiller specification using NIPA profits, forecasts a future annualized real return of 7.01%.[18]

Summary

The CAPE ratio is a very powerful predictor of long-term real stocks returns. But because of major changes in FASB rulings, the use of S&P reported earnings in the CAPE model has biased estimates of future stock returns downward. Substitution of NIPA profits into the CAPE model and making a correction for the shift in the trend rate of growth of real per share earnings improves the predictability of the CAPE model and eliminates most, if not all of the overvaluation of the stock market in recent years.

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[18] To be sure, the dummy variable will pick up other factors influencing rates of return other than the growth bias indicated above. Factors arguing for higher price earnings ratio are the large drop in transactions costs which enable investors to obtain returns much closer to those represented by the broad-based indexes, tax-favored treatment of capital gains taxes, and lower discount rates caused by slower real growth. In the steady state, a higher price earnings ratio will lead to lower real returns, but in the transition from a lower to a higher price-earnings ratio will temporarily boost returns.

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