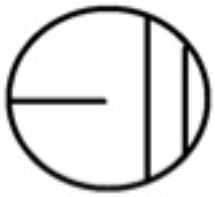

EII Financial Markets Analysis 19-01

Justified Stock Market Price, January 2019

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Abstract

Major political and economic uncertainties contributed to a sharp correction of the US stock market in the fourth quarter of 2018, to levels well below those indicated by the JSMP model. Application of the model to macroeconomic and earnings forecasts suggests substantial room for appreciation by end-2019, even after allowing for a significant price discount from political risk.

The Fourth-Quarter Correction of 2018

From the end of September to the end of December, the S&P500 index fell by 14 percent. Ending the year at 2506.85, the index fell by 6.2 percent from the end of 2017. The only other annual decline in the long bull market that began in early 2009 was in 2015, when the index eased only marginally (0.7 percent) from the end-2014 level.[2] Several factors contributed to the decline.

Trump2 Discount – Arguably the principal factor depressing the market was heightened uncertainty from a new phase of intensified confrontations by President Trump. In 2017 the market-friendly part of his agenda had dominated, most notably the corporate tax cut. The 19.4 percent rise in the S&P500 from end-2016 to end-2017 reflected the prospective outsized gains in corporate profits from the cut. In contrast, in 2018 Trump's policy focus shifted to his trade war with China and his pledge to build a wall along the border with Mexico. There is information in the fact that on the day (December 4) that Trump tweeted he was a "tariff man" because "It will always be the best way to max out our economic power," the S&P500 fell 3.2 percent.[3]

The shutdown of approximately one-fourth of the US government in an attempt to obtain some $5 billion in funding to build the border wall in the face of opposition by the new House of Representatives controlled by the Democrats has likely been another factor depressing the equity market. When and how the shutdown standoff would be resolved remained unclear as of mid-January.

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[2] FRED (2019a).
[3] Jen Kirby, "Trump called himself 'Tariff Man.' The internet did the rest." *Vox*, December 4, 2018.

However, the uncertainty from conflict with the new House leadership could be a source of ongoing downward pressure on stock prices, notably in the area of legislation raising the debt ceiling and, more dramatically, in possible impeachment.[4]

Recession Risk? -- A second possible cause of the fourth-quarter correction may be the perception of increasing risk of recession. Historically most post-war US recessions were caused by increases in interest rates to curb high inflation. The most vivid example was the recession of 1982, after the Volcker shock to interest rates to halt high inflation in the late 1970s. The Great Recession was a major exception, as it was caused by a financial crisis rather than the need to halt high inflation. Given the still low level of inflation, there is no particular reason to anticipate a recession in the near future, at least not one triggered by the usual cause, high inflation.

Model Framework

The Justified Stock Market Price (JSMP) model identifies the level of the S&P index that would be justifiable based on the price-earnings ratio that would be expected from key macroeconomic variables, combined with the level of earnings. The model uses three macro variables: the 10-year Treasury note interest rate, the level of unemployment, and the rate of inflation.

Economic theory states that the price of a stock today should equal the value, after appropriate discounting, of its expected future stream of earnings. On this basis, if there were no risk at all and if all future earnings were expected to be unchanged from the current year's earnings, the appropriate price of the stock would be the amount of the annual earnings divided by the discount rate (the appropriate way to discount over an unlimited time horizon). For example, if the stock is earning $20 per share annually, earnings are not expected to rise, and the interest rate is 4 percent, the stock would be worth $500 per share (20/0.04).

If the company is expected to achieve growing earnings over time, the stock would be worth more. The proper way to discount, in that case, is to use a net discount rate that subtracts the growth rate of earnings from the discount rate. For example, if earnings are expected to grow at 2 percent annually, the proper long-term net discount rate would be 2 percent (4 percent discount rate minus 2 percent earnings growth rate). In this case, the stock in the example would be worth $1,000 (20/0.02). However, if the firm's future earnings have a significant range of risk, then it is also necessary to add a risk factor to the discount rate, reducing the price of the stock.

For the stock market as a whole the market index price should equal earnings per share divided by a discount rate that is the sum of the risk-free interest rate, plus the "equity risk premium," minus the expected growth rate for earnings. The JSMP model is a statistical relationship of the price-earnings

[4] The Bipartisan Budget Act of 2018, signed February 9, 2018, suspended the debt ceiling (then at $20.5 trillion) until March 1, 2019 (when federal debt will be about $22 trillion). The April revenue surge and extraordinary funding measures are expected to delay the "drop-dead" date when federal spending would have to be suspended, but only until perhaps August. Bipartisan Policy Center, "New Congress to Face Record High Debt Limit," November 8, 2019; Alex Harris and Liz McCormick, "Wall Street Eyes August as Possible Drop-Dead Date for Debt Ceiling," *Bloomberg*, January 9, 2019.

ratio to three macro-economic variables. For the first, the safe discount rate, the 10-year Treasury note interest rate is applied. The model uses the rate of unemployment and the rate of inflation (consumer price index) as the two other macroeconomic variables affecting market valuation. Higher unemployment tends to reduce future earnings from levels otherwise expected, reducing the earnings-growth factor being subtracted in the denominator. Higher inflation tends to increase risk and thereby raise the equity risk premium included in the denominator. It turns out that a model using these three macro-economic influences does a relatively good job of explaining the price/earnings ratio for the S&P500 over the past 6 decades, except for the period of the dot-com stock bubble.

The Model

Model 1: S&P Operating Earnings -- A simple regression of the price-earnings ratio for the S&P500, for the period 1960-2018, yields the following results:

$$1)\ PE = 23.97 - 0.2571\ i_{10} - 0.5594\ u - 0.8327\ inf + 8.298\ D_{9701}$$

where *PE* is the ratio of the end-of-year S&P500 index to the trailing 12-months operating earnings per share for the index as calculated by Standard and Poor's; i_{10} is the average interest rate on the 10-year Treasury note during the year; *u* is the average unemployment rate during the year; *inf* is the percent increase in the consumer price index for the year above the previous year; and D_{9701} is a "dummy variable" set at "1" for 1997 through 2001 and "0" otherwise.[5]

The final term indicates that during the dot-com bubble the price-earnings ratio was higher than otherwise justifiable by about 8, at an average of about 26 instead of a level of 18 that could otherwise be explained.[6] The coefficient on the long-term interest rate indicates that a 100 basis point increase in the 10-year Treasury rate reduces the price-earnings ratio by 0.2571 (e.g. from 18 to 17.7429). Similarly, a rise in the unemployment rate by 1 percentage point reduces the PE ratio by 0.5594, and a rise in the inflation rate by 1 percentage point reduces the PE ratio by 0.8327. These impacts are all in the right direction, although the size of the coefficient on the interest rate is smaller than might have been expected.

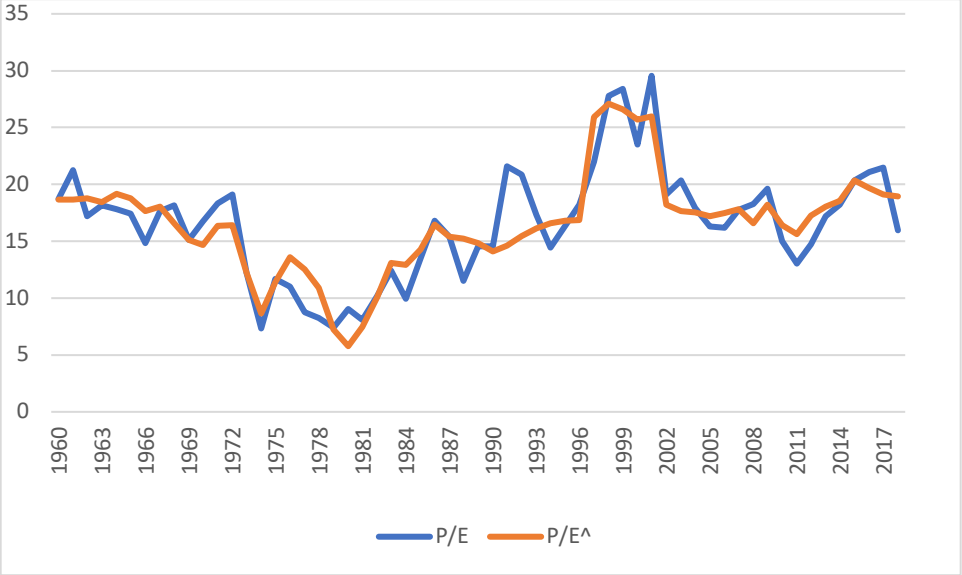
Figure 1 shows the actual price-earnings ratio as well as the model-predicted ratio over the full period. In 2007 the two were practically identical, at 17.79 and 17.80 respectively. In 2008 in the Great Recession, ironically the actual price-earnings ratio rose above the predicted ratio, reflecting a collapse in the denominator (earnings, which fell from about $83 per share to about $50 per share). The actual and predicted values were close once again during 2009 through 2016, except for 2011 when the US debt ceiling standoff caused stock prices to stagnate despite a rise in earnings. Then by the end of 2017 the actual price-earnings ratio was about 12 percent higher than the model-predicted level (at 21.47

[5] The corresponding t-statistics are 18.4, -1.73, -2.63, -6.12, and 7.33, so four of the five variables are highly significant and the variable with the lowest significance (i_{10}) is significant at the 10 percent level. The degree of explanation is relatively high at R^2 *adj.* = 0.786. S&P prices and earnings are from Damodaran (2019) for 1960-2014 and Standard and Poor's (2019) for 2015-18. The ten-year Treasury rate is from Federal Reserve (2019). Unemployment and inflation are from BLS (2018a, b).

[6] For the entire period the average price-earnings ratio was 16.5.

actual versus 19.13 predicted). By the end of 2018, in contrast, the actual price-earnings ratio at 15.97 was 15.8 percent below the predicted ratio of 18.96.

Figure 1
Actual and Predicted S&P500 Price-Earnings Ratio



pe: actual pe^: predicted

Model 2: Alternative Earnings Measure – The operating earnings calculated by Standard and Poor's incorporate adjustments to the operating earnings estimated by the corporations themselves. An alternative set of earnings estimates is maintained by Thomson Reuters. Yardeni (2018, p. 427) considers that "The big difference between the Standard & Poor's and Thomson Reuters measures of operating earnings per share is that the former determines which one-time items to exclude and include in reported earnings, while the latter is based on … industry analysts' consensus on operating earnings, which tends to be the same as the operating numbers reported by the companies in their quarterly filings." The S&P estimates of earnings tend to be somewhat lower than Thomson Reuters estimates. From 1995 through 2018, on average the Thomson Reuters operating earnings were about 8 percent higher than those indicated by S&P. This divergence reached 24 percent in 2001 and 33 percent in 2008, both recession years, and 17 percent in 2015. Higher earnings mean a lower price-earnings ratio.

Estimation of the model applying Thomson-Reuters estimates of trailing operating earnings per share yields the following results:

$$2)\ PE = 22.83 - 0.0918\, i_{10} - 0.5951\, u - 0.8564\, inf + 6.8021\, D_{9701}$$

where the variables are the same as before, the time period is again 1960-2018.[7] Operating earnings per share are once again the S&P estimates for 1960-95, but are the Thomson-Reuters estimates thereafter.[8] The constant term is slightly lower (as expected). The coefficient on the ten-year Treasury

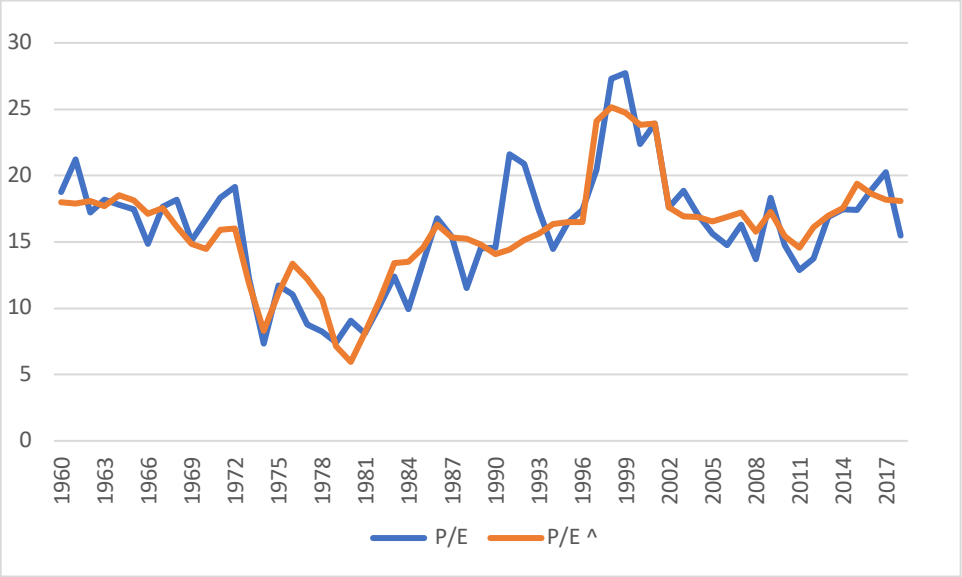
[7] The t-statistics are respectively: 17.8, -0.62, -2.83, -6.37, and 6.08, and R^2 *adj.* = 0.747.
[8] As reported in Yardeni and Quintana (2019, p. 1) and Yardeni and Abbott (2018, p. 1).

rate is much smaller and is not statistically significant. The coefficients on unemployment and inflation are somewhat larger and remain statistically significant; the coefficient on the dot-com dummy variable is somewhat smaller.

Figure 2 shows a comparison between model-predicted and actual PE ratios when using the Thomson-Reuters operating earnings. The profile of this chart is very similar to that of figure 1. The most noticeable exception is for 1998-99, when there is a larger excess of the actual over the model-predicted estimate, reflecting the somewhat smaller dot-com dummy variable. Both figures show the same pattern of market levels above prediction at the end of 2017 but below prediction at the end of 2018. In model 2) using the Thomson-Reuters earnings data, the actual PE at the end of 2017 (20.26) was 11.4 percent above the model estimate, whereas at the end of 2018 the actual PE (15.47) was 14.5 percent below the model estimate.

Figure 2

Actual and Predicted S&P500 Price-Earnings Ratio
Using Thomson-Reuters Earnings Estimates



Model 3: Constrained Estimates – The first model and especially the second model have the limitation that their estimates of the coefficient on the long-term interest rate seem too low for consistency with theory. The price-earnings ratio should be the inverse of the net discount rate, which equals the interest rate minus the earnings growth rate plus the equity risk premium rate. With an average price earnings ratio of about 16 (for trailing earnings), the net discount rate must be about 6.25 percent (1/16 = 0.0625). So an increase of the discount rate by one percentage point should reduce the price-earnings

ratio by about two points, from about 16 to about 14.[9] Yet the coefficient on the interest rate in equation 1 is only -0.26, and in equation 2 it is only -0.09 (and is insignificant).

As discussed in Appendix A, when the PE is regressed on only the ten-year interest rate, the coefficient is indeed considerably larger, at almost -1. It turns out that a regression of the PE on only the unemployment rate also gives a coefficient of about -1. The third model thus forces these two coefficients to have coefficients of -1. The resulting constrained regression, using the S&P earnings estimates (as in model 1), then yields the following results:[10]

$$3)\ PE = 28.66 - 1.0\ i_{10} - 1.0\ u - 0.247\ inf + 8.338\ D_{9701}$$

The intuitive economic implications of this constrained equation are more plausible regarding the prospective impact of a rise in the long-term interest rate. With the PE predicted by model 3 at about 21 for end-2018, an increase of the long-term rate by 100 basis points would imply a reduction in equity prices by about 5 percent rather than only about 1.2 percent.[11] In the light of ongoing financial market (and presidential) angst about rising interest rates, the larger effect seems more likely than the smaller. It is likely that the very high inflation in the early 1980s causes the unconstrained results to attribute a larger portion of the adverse impact of high interest rates and high unemployment on the PE in 1980-82 (when the PE was only about 10) to inflation than is warranted, reducing the size of the coefficients on the interest rate and unemployment. This inference is supported by the considerable shrinkage of the coefficient on inflation in model 3 (to -0.247, compared to -0.83 in model 1).

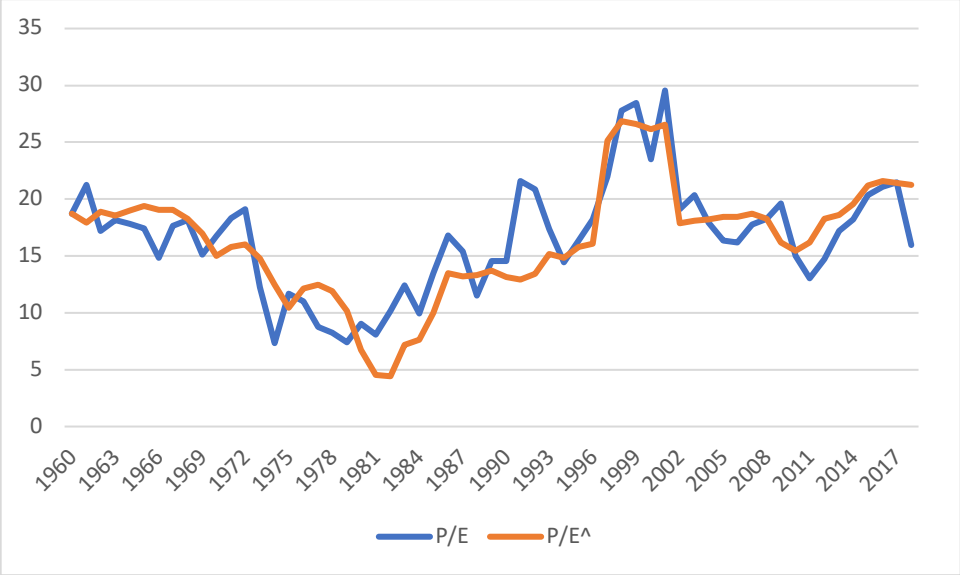
Figure 3 shows the actual and model-predicted price-earnings ratios using the constrained model 3. The overall fit is relatively good, if not as tight as in the unconstrained models, especially in the high-inflation decade of 1974-85. Thus, model 3 explains 63 percent of variation in the PE, whereas model 1 explains 80 percent, and model 2 explains 77 percent.[12]

Using the constrained model 3, the predicted PE for the end of 2017 (21.40) was virtually the same as the actual PE (21.47), indicating that the market was not overvalued at that time (in contrast to the diagnosis of overvaluation by 12 percent in model 1 and 11 percent using model 2). Correspondingly, model 3 shows the degree of undervaluation at end-2018 even greater than found using the two other models. With an end-2018 prediction of the PE at 21.23, model 3 places the undervaluation of the actual ratio (15.97) at 24.8 percent, compared to undervaluation of 15.8 percent found in model 1 and 14.5 percent found in model 2.

[9] Thus: instead of 1/0.0625 = 16, with the higher interest rate the PE ratio would be 1/0.0725 = 13.8.
[10] The statistically estimated terms are highly significant, with t-statistics of -3.06 for inflation and 6.20 for the dot-com dummy variable.
[11] That is: (20-21)/21 = -0.048 (model 3), rather than (20.76-21)/21 = -0.011 (model 1).
[12] Using R^2 unadjusted for degrees of freedom.

Figure 3

Actual and Predicted S&P500 Price-Earnings Ratio
Using the Constrained Model[a]



a. With calibrated rather than estimated coefficients for the interest rate and the unemployment rate.

Outlook

In 2018, the average effective federal funds rate was 1.83 percent, while the average 10-year Treasury rate was 2.91 percent (FRED, 2019a, b). The term premium between the two was 108 basis points, down from 133 in 2017 and 144 in 2016. At mid-January, 2019, the Federal Funds rate stood at 2.40 percent and the 10-year Treasury rate at 2.71 percent (Federal Reserve, 2019), for a sharply-reduced term premium of only 31 basis points percent.

At its mid-December FOMC meeting, median 2019 projections of Federal Reserve Board members were 2.3 percent for GDP growth, 3.5 percent for unemployment, 1.9 percent for Personal Consumption Expenditure inflation, and 2.9 percent for the federal funds rate (Federal Reserve, 2018). If this federal funds rate materialized and the term spread reverted to a slightly more normal 50 basis points, the 10-year rate for 2019 would be 3.4 percent (slightly below the August 2018 Congressional Budget Office projection of 3.6 percent; CBO, 2018). However, in its January survey of 60 economists, the Wall Street Journal found the average projected rate at only 2.96 percent by June and 3.1 percent by December, implying expectation of less than two increases in the Federal Funds rate and/or a further decline in the term premium.[13] The projections here apply a compromise of *3.2 percent* for the average *10-year Treasury rate* in 2019.

[13] *Wall Street Journal*, "Economic Forecasting Survey," January 16, 2019.

Actual CPI inflation was 2.20 percent from the fourth quarter of 2017 to the fourth quarter of 2018 (BLS, 2019). For the past 8 years, CPI inflation has run at 0.22 percent higher annually than CPI inflation.[14] If this increment is added to the Fed Board projection of 1.9 percent for PCE inflation for 2019, the result is 2.12 percent. On this basis, the projections here use *2.16 percent* for 2019 *CPI inflation*. The projections apply the Fed Board's projection of *3.5 percent* for the 2019 *unemployment rate.*

Applying these projections for the 10-year rate, unemployment, and inflation for 2019, the three models yield the following price-earnings levels for the end of 2019: *model 1*, 20.21 (an *increase of 6.6 percent* from the model prediction for end-2018); model 2, 18.6 (an *increase of 2.8 percent* from end 2018); and *model 3*, 21.43 (*an increase of 0.9 percent* from end-2018). These increases are driven by a decline in unemployment, a decline in inflation, and a rise in the ten-year interest rate that does not fully offset these improvements.

The earnings levels to which these price-earnings projections would apply depend on analysts' forecasts as well as appropriate caution about those forecasts. In December, consensus forecasts for 2019 called for an 8 percent rise in earnings in the Thomson Reuters I/B/E/S survey (Yardeni and Abbott, 2018). Factset indicates that analysts project an earnings increase of 6.9 percent for 2019 for the S&P500 (Butters, 2019). Earnings estimates a year in advance have tended to be modestly overoptimistic in recent years (excluding 2018 when there was a strong impact of the tax cut).[15] Accordingly, a reasonable estimate for earnings increase for 2019 is 5 percent.

Table 1 shows the result of applying each of the models to obtain the justified stock market price for the S&P500 at the end of 2017, 2018, and 2019. The resulting comparisons indicate potentially large increases from the actual level at the end of 2018: by about one-third in model 1, one-fourth in model 2, and about 40 percent in model 3. These large potential increases reflect the major shortfalls of the actual prices at end-2018 from the model estimates of justified levels (by about 15 percent in models 1 and 2 and 24 percent in model 3).

Table 1
Justified Stock Market Price for the S&P500 at End of Year

	2017	*2018*	*2019*
Actual	2674	2507	…
Model 1	2382	2975	3330
Model 2	2399	2933	3163
Model 3	2666	3333	3532

Political Risk

[14] Calculated from data for 2010H1 and 2018H1; BLS (2019) and FRED (2019c).
[15] See the midpoints of the "squiggle" lines of successive forecasts over 25 months for each year during 2012-2016 in Yardeni and Quintana (2019).

The simple average for the three models is a justified stock market price of 3342 for the S&P500 at the end of 2019, an increase of 33 percent above the actual level at the end of 2018. In the first half of January the market did stage a modest recovery (with the index returning to 2616 by January 16).[16]

Prudence would suggest, however, that the business-as-usual projection of the justified price is overstated under conditions in which there is abnormal political risk. In effect, a political risk component should be added to the equity risk premium in the denominator of the price-earnings ratio equation. At mid-January 2019 the prospective political dysfunction symbolized by the longest US government shutdown ever, and the risk of a prolonged US-China trade war, would seem to warrant a meaningful political risk premium. A 10 percent discount in the equity market price for political risk would seem appropriate, placing the *justified price at 3008 for the S&P500 at the end of 2019* (using the average for the three models).

[16] Morningstar.

Appendix A

Constraining the Model

As discussed above, the price-earnings ratio should equal the inverse of the net discount rate that takes account of the safe interest rate (10-year Treasury rate) plus the equity risk premium, but deducting a factor reflecting earnings growth. A specified increase in the safe interest rate increases the denominator by a known amount and thus should affect the price-earnings ratio by a predicable magnitude. A PE ratio 16 implies that the overall net discount rate is 6.25 percent (that is, 16 = 1/0.0625). So if the net discount rate is increased by 100 basis points, the PE ratio should fall from 16 to 1/0.0725 = 13.8. The coefficient on the interest rate would thus be expected to be about -2, a far larger impact than the estimates in model 1 (-0.26) and especially model 2 (-0.09).

A regression of the PE on the 10-year interest rate with no additional variables, for the period 1960-2018, yields the following result: PE = 22.44 -0.96 i_{10}. The coefficient is highly significant (t statistic = -3.4). On this basis, and considering that in principle the coefficient could be almost twice as large as even this estimate, the constrained model applies -1 as the coefficient on the interest rate.

The expected influence of the unemployment rate is much less clear, because the motivation for using the rate is that a higher unemployment rate would be expected to reduce expectations of future earnings growth. A regression of the PE on just the unemployment rate yields: PE = 24.09 – 1.26 u. This coefficient is also highly significant (t-statistic of 3.4).

The constrained model thus sets the coefficients on both the long-term interest rate and the unemployment rate at -1. For the full period, the average ten-year rate is 6.12 percent, and the average unemployment rate is 6.0 percent. When the coefficient -1 is applied to both variables, the resulting average contribution to the PE ratio will be -1 x (6.12+6.0) = -12.12. The average PE = 16.54. A synthetic variable "*Z*" is then created, in which for each year, Z_t = -1.0 i_t -1.0 u_t + 12.12. This variable will provide the correct overall average of the PE but captures the varying influence of the interest rate and the employment rate levels for each year.

This synthetic variable is then regressed on the two remaining variables, inflation and the dot-com dummy, in a regression forced to have zero intercept, in order to obtain the incremental contribution of those variables. This regression yields: Z = -0.247 inf +8.34 D_{9701}. Both coefficients are highly significant (t-statistics of -3.1 and -6.2, respectively). The overall constrained model thus yields equation 3) in the main text.[17]

[17] Note that the constant in equation 3 is the actual average price-earnings ratio plus a constant to offset the negative contribution from the average interest rate and unemployment rate, or: 16.54 + 12.12 = 28.66.

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