Economics 435
Spring 2014
University of Wisconsin-Madison

Menzie D. Chinn
Social Sciences 7418

Fads

Shiller *American Economic Review* (1981)

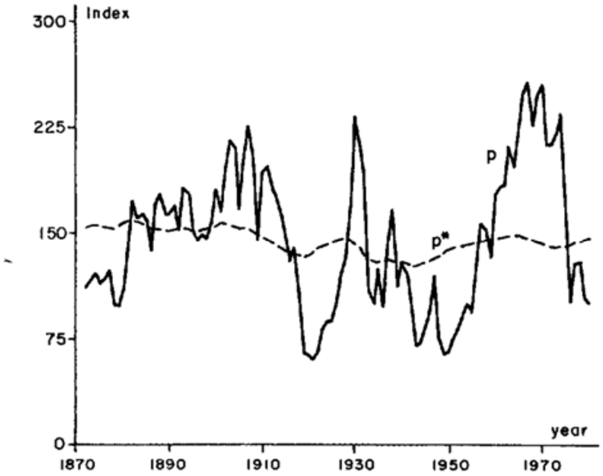

FIGURE 1
Note: Real Standard and Poor's Composite Stock Price Index (solid line p) and *ex post* rational price (dotted line p^*), 1871–1979, both detrended by dividing a long-run exponential growth factor. The variable p^* is the present value of actual subsequent real detrended dividends, subject to an assumption about the present value in 1979 of dividends thereafter. Data are from Data Set 1, Appendix.

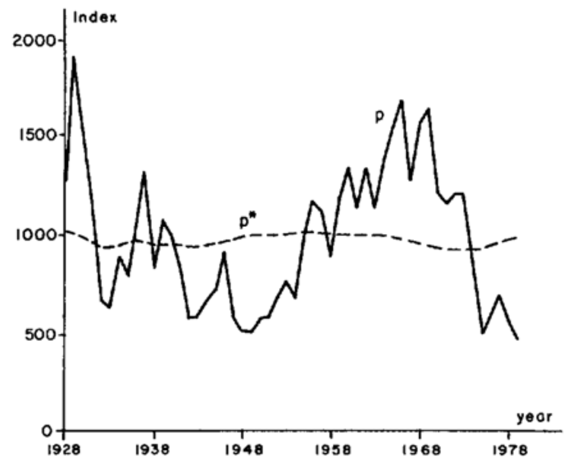

FIGURE 2
Note: Real modified Dow Jones Industrial Average (solid line p) and *ex post* rational price (dotted line p^*), 1928-1979, both detrended by dividing by a long-run exponential growth factor. The variable p^* is the present value of actual subsequent real detrended dividends, subject to an assumption about the present value in 1979 of dividends thereafter Data are from Data Set 2, Appendix.

If one uses the principle from elementary statistics that the variance of the sum of two uncorrelated variables is the sum of their variances, one then has $var(p^*)=var(u)+var(p)$. Since variances cannot be negative, this means $var(p)\leqslant var(p^*)$ or, converting to more easily interpreted standard deviations,

(1) $$\sigma(p)\leqslant\sigma(p^*)$$

Summers *JoFinance* (1981)

$$P_t = P_t^* = E\left[\sum_{s=t}^{\infty}\frac{D_s}{(1+r)^{s-t}}|\varphi_t\right]$$

$$P_t = E\left(\frac{P_{t+1}}{1+r}\right) + E(D_t)$$

$$E(R_t) = E\left(\frac{P_{t+1}}{1+r} - 1 + \frac{(1+r)_t}{P_t}\right)$$

$$R_t = r + e_t$$

In contrast assume a "fad"

$$P_t = P_t^* + u_t$$
$$u_t = \alpha u_{t-1} + v_t$$

Table 1

Theoretical Autocorrelation of Excess Return Assuming Market Inefficiency

$\frac{\sigma_e^2}{\sigma_u^2}$	α				
	.75	.90	.95	.99	.995
1.0	−0.042	−0.008	−0.003	0.000	0.000
0.5	−0.062	−0.014	−0.004	0.000	0.000
0.25	−0.083	−0.022	−0.007	0.000	0.000
0.1	−0.104	−0.033	−0.012	−0.001	0.000
0.05	−0.113	−0.040	−0.017	−0.001	0.000
0.01	−0.122	−0.048	−0.023	−0.003	−0.001

Note: Calculations are based on Equation (8).

equations (3), (4) and (5) imply that excess returns $Z_t = (R_t - r)$ follow an ARMA (1, 1) process.[8] That is:[9]

$$Z_t = \alpha Z_{t-1} + e_t - \alpha e_{t-1} + v_t - v_{t-1}. \tag{6}$$

Granger and Newbold [7] show that since Z_t can be expressed as the sum of an ARMA (1, 1) process and white noise, ARMA (0, 0), it can be represented as an ARMA (1, 1) process. Equation (6) can be used to calculate the variance and the autocorrelations of Z_t. These calculations yield:

$$\sigma_z^2 = 2(1 - \alpha)\sigma_u^2 + \sigma_e^2 \tag{7}$$

$$\rho_k = \frac{-\alpha^{k-1}(1-\alpha)^2\sigma_u^2}{1(1-\alpha)\sigma_u^2 + \sigma_e^2} \tag{8}$$

where ρ_k denotes the kth-order autocorrelation. Note that the model predicts that the Z_t should display negative serial correlation. When excess returns are positive, some part is on average spurious, due to a shock, v_t. As prices revert to fundamental values, negative excess returns result.

Weak form efficiency: Can be tested by H_0: $\rho_k = 0$.
Note that standard error of an autocorrelation coefficient is $1/\sqrt{(n-3)}$, assuming constant variance of excess returns, and Normality of *e*. For n=600 (monthly obs), s.e.≈ 0.042. Using more reasonable assumptions, it would take 5000 years to have a 50% chance of rejecting null.