Dividend-Price Ratios and Stock Returns:
Another Look at the History

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ABSTRACT

One of the prime pieces of evidence supporting the hypothesis that expected stock returns vary over time is that regressions of future returns on dividend-price ratios are highly significant, but future dividend growth is unrelated to the ratio. This paper presents another interpretation of these results that is consistent with constant expected returns based on the economic history of the United States. In so doing, the paper not only provides an alternative interpretation of the regression results, but also highlights the importance of analyzing the historical events responsible for generating financial economic data.
In his Presidential Address to the American Finance Association, John Cochrane (2011) starts with the observation that “Discount rates vary over time.” As support for this observation, he offers evidence provided by simple regressions of future returns and future dividend growth on the dividend-price ratio. He reports, like many before him, that the dividend yield is a significant predictor of future returns, but not future dividend growth. Further, he notes, the return regression has huge economic significance given the size of the slope coefficient. This short paper revisits the relation between dividend-price ratios, future returns and future dividend growth with a focus on the historical context.

Whereas, there is a massive econometric literature on the relation between the variables, the historical analysis is more sparse. It turns out that a different reading of the history leads to a markedly different conclusion.

The starting point of the most all the empirical analysis of the relation between the dividend-price ratio, returns and dividend growth is the path breaking work of Campbell and Shiller (1989). The standard tool relating the variables is their loglinear approximation to the present value relation given by equation (1).

\[ d_t - p_t = \sum_{j=1}^{\infty} \rho^{j+1} r_{t+j} - \sum_{j=1}^{\infty} \rho^{j+1} \Delta d_{t+j} \]  

In equation (1), \( d_t - p_t = \log(D_t/P_t) \), \( r_{t+1} = \log(1+R_{t+1}) \), \( \Delta d_{t+1} = \log(D_{t+1}/D_t) \), and \( \rho \), which is approximately equal to 0.97, is a constant of the approximation. Equation (1) implies that when the log dividend-price ratio is relatively high it must be the case that dividends are expected to grow more slowly or that future returns are expected to be high or some combination of the two.
As Cochrane (2008) notes, if both returns and dividend growth are unforecastable, then equation (1) implies that the dividend-price ratio is constant. Figure 1, which plots the dividend-price ratio from 1926 to 2011, demonstrates that this is not the case. Assuming that dividend-price ratios fluctuate around their equilibrium value, it follows that either the numerator or the denominator must adjust to move the ratio back to more normal levels. If this is so, the proper question is not whether returns or dividend growth are forecastable, but rather how much of each is forecastable?

As noted at the outset, the widely reported result is that dividend-price ratios forecast future returns, not future dividend growth. This results holds even after taking account of econometric problem, raised by Nelson and Kim (1993) and Stambaugh (1999), related to the persistence of the dividend-price ratio. Stambaugh develops procedures for coping with the problem. Because this paper focuses on an entirely separate issue, it is more illuminating to use simple regressions because they highlight the central issues without introducing unnecessary complexity. The regressions are given by equations (2) and (3).

\[ R_{t+1} = a + b(D_t/P_t) + e_{t+1} \]  
\[ D_{t+1}/D_t = a + b(D_t/P_t) + e_{t+1} \]

To estimate the regressions, I use annual CRSP data from 1926 through 2011. In equation (2), the return variable, \( R_{t+1} \), is the real, deflated by the CPI, value weighted return on the CRSP market index. Annual dividends, \( D_t \), are calculated by taking the difference between the CRSP return with and without dividends and multiplying by the market value of the index at the beginning of the year as described by Cochrane (2011). The dividend growth rate, \( D_{t+1}/D_t \), is also deflated by the CPI.
The results reported in Table 1 are similar in form to those reported in previous studies. In the return regression, the slope coefficient of 3.53 is significant both statistically and economically. The t-statistic is 2.28 and, more importantly, the slope coefficient implies that when dividend yields rise by one percentage point prices rise more than three percentage points. The dividend growth regression, on the other hand, shows no relation between the variables. The results are not affected in a meaningful way by transforming the data such as taking logs or netting out the risk-free rate.

There are two fundamentally different ways to interpret the results. One is direct. The D/P ratio forecasts future returns because the ratio is high (low) when expected returns are high (low) and, therefore, prices are low (high). The second is indirect and harkens back to the 1970s interpretation which states that the dividend-price ratio forecasts future dividend growth, but with one added twist. The twist is the historical fact that, ex-post, long-run real dividend growth never changes – it mirrors long-run real GDP growth at about 3% per year. Consequently, whenever investors forecast higher (lower) future dividend growth they turn out to be wrong. When investors come to realize their error, prices adjust to bring the D/P ratio back in line with the revised expectations. It is this adjustment of prices that the regression equation picks up. Under such circumstances, the regression will “forecast” future returns even if the expected return is constant.

From one perspective, the second interpretation appears to imply investor irrationality because it requires that each time investors predict particularly high or low dividend growth they turn out to be wrong. However, looked at another way, what is both remarkable and unexpected is the near constancy of economic and dividend growth.
That historical fact colors all the empirical tests. Investors were not necessarily irrational to project markedly higher or lower long-run dividend growth at certain times in history, though behaviorists may argue that the extent of their projections is magnified by the optimistic or pessimistic sentiment of the time, they just turned out to be wrong because the historical data were so unique.

To flesh this argument out further, Figure 2 plots the log of real dividends and real GDP, both indexed to 1.0 in 1926. Despite the impact of the great depression and World War II, among other shocks, the growth of real GDP is remarkably constant over the long-run at 3%. The dividend series is more volatile and grows slightly faster at 3.4%. However, this higher growth rate is due in large part to the expansion of stocks in the CRSP database. Over the course of a almost a century, long-run dividend growth mirrored the steady expansion of the economy.

Nonetheless, there were certainly episodes during which investors apparently anticipated a change in long-run dividend growth. The most recent is the alleged “new economy” of the dot.com years, but that episode is not unique. Every instance in which the dividend-price ratio was markedly high or low was associated with what appeared at the time to be extraordinary historical circumstances as shown in Table 2. In light of those circumstances, investors were not necessarily irrational for concluding that “this time is different” to use Reinhart and Rogoff’s (2009) term. Investors were faced with questions such as: What would be the long-run impact of the great depression? What would be the outcome of World War II? Would the Cold War lead to nuclear conflict? Would communications technology produce to a “new economy?” It can hardly be seen as irrational for investors to alter fundamentally their expectations regarding future long-
run dividend growth depending on how they answered those difficult and historically unique questions. The astonishing fact about American economic history, as least as far as growth is concerned, is that things always turned out to be the same.

It should be noted that changes in dividend growth expectations do not have to be large, if they are permanent, to have a pronounced impact on asset prices. This is particularly true the closer the expected dividend growth rate is to the discount rate. Relatively small, permanent changes in expected future dividend growth are sufficient to produce return predictability of the magnitude shown in Table 1.

Even if most of the variation in the dividend price ratio is due to forecasts of future dividends, there remains an apparent long-run trend that must be associated with a reduction in expected returns because of the long-run constancy of the dividend growth rate. Furthermore, a long-run decline in expected returns is consistent with historical developments during the sample period. Most prominently, those developments include:

- Improvement in capital market regulation and oversight including the establishment of the Securities Exchange Commission.
- Advances in economic theory and policy leading to increased stabilization of the economy.
- Advances in asset pricing and portfolio theory leading to improved risk measurement and investment management.
- The expansion of stock market participation via the invention of mutual funds and the creation of the modern retirement savings system.
- An aging of the U.S. population so that more wealth is held by investors who are willing to accept lower expected returns.
• The collection and dispersion of data on the financial performance of equity investments leading to, among other things, investor appreciation that equities are not an exotic investments.

• Significant technological improvements in transacting and record keeping.

• A decline in the volatility of the return on the market portfolio.

Although the foregoing factors make it reasonable to conclude that the equilibrium dividend-price ratio declined over the sample period, there is no direct evidence as to exactly when that decline may have occurred. Presumably expected returns decline when the aforementioned factors affect investor beliefs. Unfortunately, it is possible that years could pass before a precipitating event produces a change in beliefs. For example, the major innovations in the securities laws in 1933 and 1934 might not have affected required returns until sufficient time had passed for investors to conclude that those laws reduced equity market risk. The same uncertain lag applies to all the other factors as well. Furthermore, the impact of the factors most likely varies. Some of the listed factors may not affect expected returns at all. For these reasons, while it is reasonable to conclude that the equilibrium D/P ratio declined over the sample period, the time path of the decline is unknown.

If the equilibrium dividend-price ratio is falling during the sample period, then the explanatory power of regression equations such as (1) and (2) should be increased if the difference between the actual and the equilibrium D/P ratio is used as the explanatory variable. To examine this possibility, I reestimate the equations using as the independent variable, D/P*, the difference between the actual D/P ratio and the linear decline shown by the dotted line in Figure 1.
Table 3 reports the results of estimating equations (1) and (2) using D/P*. The basic form of the results remains the same as reported in Table 1, but the explanatory power improves markedly. The slope coefficient in the return regression almost doubles to 6.16 with corresponding increases in the t-statistic and the $R^2$. If anything, the slope coefficient is now implausibly large. A one percentage point increase in the dividend-price ratio forecasts a more the six percentage point higher return! This suggests that the regression is doing something more than just capturing changes in expected returns. It remains the case that the dividend-price ratio is unrelated to future dividend growth.

Part of the sharp increase in the explanatory power and the estimated slope coefficient in the return regression may be a result of “peeking at the data” in the construction of the line. On the other hand, the linear decline is a rough approximation for the drop in the equilibrium D/P ratio. If the equilibrium value could be measured more accurately, it could further increase the explanatory power of the regression.

The impact of the estimated decline in the equilibrium dividend-price ratio on the regression results highlights a difficulty of trying to account for the influence of historical events. Whereas data produced by physical phenomenon are typically stationary, there is little reason to believe that the same is true of data produced by human social institutions. In particular, if the second interpretation is correct there is no reason to believe that the relation between dividend yields and returns will be the same going forward. In the future, investors may alter their forecasting procedures or actual dividend growth may turn out to vary in a manner more consistent with investor expectations rather than always regressing to a stable long-run path. If either occurs, the relation between dividend-price ratios, future dividends and future returns will change. Furthermore, the
decline in the equilibrium D/P ratio cannot continue so to the extent that the decline affected the relation between the variables in the past things will definitely be different in the future.

The second interpretation of the regression results also has other broader implications. For example, Cochrane (2011) notes that the same relation that holds for stocks also holds for other assets such as housing. He states that “High prices relative to rents mean low returns, not higher subsequent rents . . . The housing regressions are almost the same as the stock market regressions.” More generally, he observes that “there is a strong common element and a strong business cycle association to all these forecasts. Low prices and high expected returns hold in ‘bad times,’ when consumption, output and investment are low and unemployment is high.” All of these phenomenon can be explained by the second hypothesis without variation in expected returns simply based on the fact that the U.S. economy always returns to its long-run growth path and drags virtually all asset classes along with it. As a result, high and low expectations regarding asset cash flows invariably turn out to be wrong. The resulting adjustment of prices explains the phenomenon to which Cochrane refers.

Another implication of the second interpretation is that out of sample forecasts are likely to perform poorly as Goyal and Welch (2008) find. According to the second interpretation, the significant slope coefficients are produced by a combination of historical episodes that lead investors to form strongly optimistic or pessimistic forecasts combined with subsequent stable growth. Going forward, there is no reason why this combination necessarily will reoccur.
The second interpretation also implies that the regression results will vary across countries because they depend on the specific history of each country. To the extent that the growth path is not so stable, as it has been in the United States, the predictability of future returns will be muted. This is borne out by evidence presented by Campbell (2003). Campbell finds that there is strong evidence of future return predictability in the US, the UK, and Australia but less so in Canada, France, Germany, Italy, Japan, the Netherlands, Sweden and Switzerland. In the latter group of countries there is evidence of the predictability of future dividend growth. These findings are consistent with the hypothesis that the observed relation between D/P ratios, future returns and future dividend growth depends on a country’s historical experience.

Finally, the second interpretation also provides an explanation as to how short-term bubbles, in which expectations of future price increases unrelated to cash flows, can produce the observed regression results. The basic argument is the same. Because of the stable long-run growth of the U.S. economy, expectations regarding price increases inconsistent with that growth eventually become so unrealistic as to be unsustainable. When that point is reached, prices adjust. The price adjustment returns ratios of cash flow to price to more normal levels. In doing so, it produces the significant slope coefficients in regressions of future returns on the cash flow to price ratio.

**Summary and implications of the analysis**

Regressions of future returns on dividend yields produce slope coefficients that are both statistically and economically significant. A straightforward interpretation of this result is that expected returns vary predictably. However, the economic history of the United States, suggests a second interpretation. In response to economic shocks such
as the great depression or the internet boom, investors forecast significant long-run changes in the rate of dividend growth. In fact, such changes never occurred. Over the entire sample period of almost a century the real growth in dividends and GDP were remarkably constant. As a result, expectations were never fulfilled and the resulting adjustment of prices produced a correlation between dividend-price ratios and subsequent returns. If this second interpretation is correct, the correlation between dividend yields and subsequent returns is an artifact of a certain combination of historical events. If those events are not repeated, there is no reason to believe that the relation will continue to hold.

More generally, the analysis highlights the importance of paying attention to the nature of the historical events that generate financial economic data. In the context of the dividend-price research, Campbell and Shiller (1998) provide a good example regarding the incorporation of historical analysis. The tendency to downplay the specific historical events associated with the generation of the data can be interpreted as an aspect of what Lo and Mueller (2010) call “physics envy.” From the standpoint of this paper, the critical characteristic of the fundamental laws of physics is that they are ahistorical. The wave equation that describes the behavior of an electron, though stochastic, is the same everywhere at all times. History is just the reverse. Every historical event is unique so data generated by an historical process are potentially completely nonstationary. It is possible, of course, that nonstationary historical events produce stationary time series, but whether they do cannot be determined by examining the data alone without explicitly consider the historical events that generated it.
To the extent that behaviorists are right and judgmental biases have an impact on asset prices, history becomes even more important. Whereas rationality is a timeless concept, the activation of judgmental biases is almost certainly affected by historical circumstances. For example, a biases toward over confidence may be expressed in an environment in which the economy is booming, but not be operative during more normal times. Indeed, one of the factors that makes historical events so complex and nonstationary is that there are a multiplicity of human judgment biases all of which are affected by the specific historical context. The activation of those biases, in turn, affects the future evolution of historical events. The rise of National Socialism in Germany provides an example of such an interaction.

In conclusion, the historical events that produce financial data should be considered as part of any statistical analysis of the data. In the case of the relation between dividend yields, returns, and dividend growth, doing so leads to an alternative interpretation of the relation between the variables with markedly different implications.
REFERENCES


Lo, Andrew W. and Mark T. Mueller, 2010, Warning: Physics envy may be hazardous to your wealth, unpublished working pap, Sloan School of Management, MIT.


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<th></th>
<th>a</th>
<th>t(a)</th>
<th>b</th>
<th>t(b)</th>
<th>R²</th>
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<td>-0.05</td>
<td>-0.81</td>
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<td>3.34</td>
<td>0.62</td>
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<td>$D_{t+1}/D_t = a + b(D_t/P_t) + e_{t+1}$</td>
<td>0.03</td>
<td>0.75</td>
<td>0.26</td>
<td>0.24</td>
<td>0.001</td>
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The regressions use annual CRSP data from 1926 to 2011.
Table 2

Return and Dividend Forecasting Regressions Using D/P*

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<th>t(a)</th>
<th>b</th>
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<td>( R_{t+1} = a + b(D_t/P_t)* + e_{t+1} )</td>
<td>0.07</td>
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<td>( D_{t+1}/D_t = a + b(D_t/P_t)* + e_{t+1} )</td>
<td>0.04</td>
<td>2.69</td>
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The regressions use annual CRSP data from 1926 to 2011.
<table>
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<tr>
<th>Historical Episode</th>
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<tr>
<td>Roaring Twenties</td>
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<td>Russian Atomic Bomb, Korean War, Start of Cold War</td>
<td>Low</td>
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<td>Nifty-Fifty Stock Market Boom</td>
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<td>Dot.Com New Economy Enthusiasm</td>
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Figure 1:
Dividend-Price Ratio: 1926 - 2011
Figure 2
Log of Real Dividends and Real GDP: 1926 - 2011

Log of Real Dividends
Log of Real GDP