Predictable Dividends and Returns

Job Market Paper

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Abstract

The conventional wisdom is that the aggregate stock price is predictable by the lagged price-dividend ratio, and that aggregate dividends follow approximately a random-walk. Contrary to this belief, this paper finds that variation in the aggregate dividends and price-dividend ratio is related to changes in expected dividend growth. The inclusion of labor income in a cointegrated vector autoregression with prices and dividends allows the identification of predictable variation in dividends. Most of the variation in the price-dividend ratio is due to changes in expected returns, but this paper shows that part of variation is related to transitory dividend growth shocks. Moreover, most of the variation in dividend growth can be attributed to these temporary changes in dividends. I also show that the price-dividend ratio (or dividend yield) can be constructed as the sum of two distinct, but correlated, variables that *separately* predict dividend growth and returns. One of these components, which could be called the expected return state variable, predicts returns better than the price-dividend ratio does.

1 Introduction

Are innovations to the aggregate stock price related to changes in expected future aggregate dividend growth? Theoretically, the aggregate stock price is the value of the expected future dividends discounted with a constant or time-varying discount rate. In the case of constant expected returns, the present-value model says that all variation in stock price is due to changes in current dividend growth and expected future dividend growth. If the discount rate is constant, a change in the aggregate price-dividend ratio is caused by a change in expected dividend growth. Nevertheless, the empirical literature cannot identify the key prediction of this simple present value model. Almost all variation in the aggregate stock price and price-dividend ratio is associated with changes is expected returns. Moreover, variation in dividends that does not coincide with a change in current stock price does not add more information about the future evolution of dividends, but predicts the future path of stock prices. Hence, the conventional wisdom is that aggregate dividends are close to random-walks and that the aggregate stock price is predictable by the lagged price-dividend ratio. Contrary to this belief, this paper finds that variation in dividends and price-dividend ratio is related to changes in expected dividend growth.

The purpose of this paper is to present an analysis of dividend growth predictability and its relation to stock prices. Most of the empirical literature on time-series predictability has focused on the variability of expected returns, because of the strong evidence that stock prices do not predict dividends[1]. For instance, Cochrane (1994) shows that a permanent dividend growth shock effectivelly explains all variation in dividend growth and a small fraction of the variance in stock price growth. The remaining variation in aggregate stock price growth is explained by changes in expected returns. A large literature has confirmed the absence of dividend growth predictability and the economic importance of the variability in expected return[2]. On the other hand, the statistical significance of the expected return predictability has also been questioned by recent work[3].

[1] Other contemporaneous papers present empirical evidence that dividends are predictable. Lettau and Ludvigson (2002) show that there is predictability in dividends growth, but they do not find that innovations to price-dividend ratio convey information about future dividends. Ang and Bekaert (2002) also claim that dividends are predictable if different data sets are considered.

[2] For example, Campbell and Shiller (1988), Campbell (1991), Cochrane (1991), Lamont (1994), Cochrane (1997), Campbell and Shiller (2001), Lewellen (2001).

[3] Campbell and Yogo (2002), Stambaugh (1999) and Valkanov (2001) are examples of the more recent work on

The empirical literature on the present-value models has identified the presence of two shocks to prices and dividends: an expected return shock and a permanent dividend growth shock. In this paper, I identify a transitory dividend growth shock, which could be interpreted as an expected dividend growth shock. I augment the conventional vector autoregression to account for the existence of broadly defined cash flow shocks. Specifically, I include the aggregate labor income in the cointegrated vector autoregression of aggregate stock price and dividends[4]. This allows me to identify temporary changes in dividends, since they are not accompanied by changes in labor income and stock price. The reason could be that the shocks to the aggregate cash flow in the economy do not have a uniform and simultaneous impact on cash flows to inputs like labor and capital. It is reasonable to believe that stock prices may not react to changes in dividends that are not expected to persist. I present empirical evidence that this expected dividend shock can explain an economically significant fraction of the variance of the dividend growth and the variance of the innovations to the price-dividend ratio.

In a recession, dividends may fall more than labor income. Dividends will then rise more in the recovery. The low dividend-labor income ratio in the recession forecasts high subsequent dividend growth. If this were the only effect, the price-dividend ratio would be higher in recessions. However, in the depth of the recession, expected excess returns are also high. Even though dividends are expected to grow at a faster rate, the price-dividend ratio may not be much affected. In this simple situation, the expected dividend growth and the expected return are perfectly correlated and the correlation is motivated by business cycle fluctuations. Even if they are less than perfectly correlated, the price-dividend ratio may not forecast dividend growth, because of the higher variance of the expected return shock. Conditioning on an enlarged information set that includes labor income, I can show that variation in the price-dividend ratio is due to dividend growth. Even if the shocks are orthogonalized, I can still show that a significant fraction of the price-dividend variance is explained by dividend growth.

This evidence on dividend growth predictability apparently contradicts the usual results of regressions that use lagged (log) price-dividend ratios to predict future prices (or returns) and

the statistical problems with the commonly used predictive regressions.

[4] Other cash flow data could have been used here such as the national income, but this measure also includes dividends as one of its components. Labor income is relatively more "exogenous" with respect to dividends.

dividends. In these regressions, lagged price-dividend ratios tend to predict returns (and changes in stock price) but not dividend growth. However, I show that even if price-dividend contains information about variation in expected dividend growth, it may not predict future dividends. In fact, the aggregate price-dividend ratio is the sum of two variables that *separately* predict dividends and returns. Once the price-dividend ratio (or dividend yield) is decomposed into these two variables, it is possible to identify the two regressors that predict future dividend growth and returns. I also show that one of these forecasting variables, the expected return state variable, predicts returns better that the price-dividend ratio (or dividend yield). Even if these two variables were completely independent, the price-dividend ratio would not necessarily be able to predict future dividend growth, since the price-dividend ratio could be described as the relevant independent variable plus measurement error represented by the expected return variable. This measurement error problem can make the regression coefficient on lagged the price-dividend ratio statistically insignificant. Since these two state variables are correlated, the coefficient on the lagged price-dividend ratio may have the unexpected sign, exactly the result found in the empirical literature.

The paper is organized as follows. Section 2 introduces the data and explores the past results found in return and dividend growth predictive regressions. Section 3 presents the estimated vector autoregressions and shows the benefits of the inclusion of labor income to the econometric model. Section 4 shows the results of the price-dividend ratio variance decomposition including labor income in the information set. Section 5 proceeds with the identification of the orthogonalized shocks, and presents the results of the respective variance decompositions which show again that dividend growth affects price-dividend ratio. Section 6 analyzes the results with univariate regressions in the light of the more general approach presented in this paper. Section 7 concludes.

2 Predictive Regressions

This section presents the results with the commonly used return and dividend growth predictive regressions and a discussion about the reasons why dividend growth does not seem to be predictable in these regression. I will return to this discussion in section 6, after I introduce in detail the reasons why these regressions cannot identify the existence of dividend growth predictability.

First, I briefly describe the data. The dividends and aggregate stock price come from the NYSE data available in the CRSP files. The annual sample begins from 1929 and ends in 2000. I use the implicit deflators from the national accounts to calculate the real values for the variables. The log real aggregate stock price, p_t, is the natural logarithm of the real value-weighted stock index calculated with all the shares in the NYSE at the end of the period. This stock price index is calculated as the accumulated return without dividend reinvestment. The log real aggregate dividend d_t is built from the stock price index and the information about dividend yield obtained with the annual return and the annual return without dividends. I constructed an earnings series using the information about earnings per share from the S&P Composite Index. The earnings variable was calculated considering the ratio between earnings and dividends calculated using only the stocks in the S&P500. Besides the stock market data, the real per capita labor income and consumption data were obtained from the national accounts. I express these variables in terms of their natural logarithm and are represented by l_t and c_t. Appendix A has detailed definitions of the data and methodology used to calculate these variables.

Table 1 presents the results with the most commonly used predictive regressions of excess returns, real returns and real dividend growth on the lagged dividend yield. Three different samples are considered: 1929-2000, 1929-1990, and 1950-2000. If I exclude the nineties from the sample, both excess returns and real returns are predicted by the dividend yield. This result holds for different horizons where the accumulation of returns or growth rates varies from one to five years. The inclusion of the nineties makes the real returns statistically unpredictable. If only the last fifty years of data are considered, the predictability becomes even weaker. On the other hand, the real dividend growth does not seem to be predictable for any sample choice. Since high prices could imply that there is expectation of higher future dividends, the sign of the coefficient is expected to be negative in this regression. But the coefficient on the lagged dividend yield rarely has the predicted sign.

A simple view of this commonly used predictive regressions is that the dividend yield (or price-dividend ratio) is related to the mean of the processes that govern stock returns and dividend growth. However, these regressions may not reveal dividend predictability if the expected returns are extremely volatile. Since the innovations to expected dividend growth and expected returns (or their levels) may be correlated, it is even more difficult to identify in the variation of price-dividend ratio what is related to news about expected returns or expected dividend growth. It is necessary to introduce more information into the traditional autoregression, because the price-dividend ratio may only summarize the contribution of two distinct variables that may individually explain expected dividend growth and expected returns.

The objective is to identify the expected dividend component of the price-dividend ratio variation. The main idea of this paper is that prices may react to news about cash flows that do not impact dividends immediately, or that there may be changes in dividends which are temporary because they are not instantly followed by other cash flows. These additional cash flows should not be perfectly related to the stock market cash flow data, but they should share a common growth component. If this is true, stock market information is not enough to identify these particular innovations to aggregate stock price and aggregate dividend. Therefore, the vector autoregression that describes the evolution of prices and dividends should include other variables that may reveal both the temporary and permanent components of dividends. Stock prices may react to news to these other cash flows that are not directly related to the stock market (for example, private companies's profits, labor income, etc.), if market believes that these news, whether good or bad, will impact dividends later on. Future dividends will be affected if the news are related to the common stochastic growth component.

A natural candidate for this additional variable is aggregate labor income, since it accounts for the largest share of the total income. Consequently, it may be extremely important to consider the effect of the existence of a long-run relation between (log) labor income and (log) dividends, even when analyzing the relation between prices and dividends. It is reasonable to assume that log labor income and log dividends are cointegrated with a unitary cointegrating vector[5], because we may believe that the ratio of dividends to labor income is stationary. This property is related to the idea that the share of dividends to the total income is stationary. I will also consider the assumption that the price-dividend ratio is stationary, which is more common in the literature.

The ratio of consumption to dividends could also be used to predict future dividend growth. However, the changes in this ratio could also be related to changes in expected returns. Table 2 shows results of dividend growth and excess returns predictive regressions on different candidates

[5]A unitary cointegrating vector implies that all coefficient of the cointegrating vector are unitary. In the case of common deterministic trends, the log dividend-labor income ratio is stationary.

for dividend growth predictor. I consider the labor income-dividend ratio, earnings-dividends ratio and consumption-dividend ratio as possible predictors. Earnings-dividends ratio does not predict future dividend growth. Since the consumption-labor income ratio has been very stable in the last fifty years, both labor income-dividend ratio and consumption-dividend ratio predict future dividends with similar performance. Using full sample, the consumption-dividend ratio tends to perform better, since the labor income-dividend ratio is more variable in the beginning of the this sample. Nevertheless, the consumption-dividend ratio also predicts excess returns[6], especially at long horizons. The consumption-dividend ratio explains an economically significant fraction of the variation in expected return. In the five-year horizon regressions, the r-squared of the regression of excess returns on the lagged consumption-dividend ratio is 0.24 (0.21 if sample is 1950-2000), while the r-squared with labor income-dividend ratio is only 0.08 (0.10). The coefficients of return regressions on these lagged variables is statistically more significant when the consumption-dividend ratio is used. Therefore, the labor income-dividend ratio tends to predict mostly dividend growth, while consumption-dividend ratio predicts both expected returns and dividend growth[7]. I choose the log labor income-dividend ratio, since the objective is to identify the determinants of variation in price-dividend ratio and not to find the best predictor of dividend growth.

3 Vector Autoregressions

All these series in levels are integrated of order one and they may share a common stochastic growth component. In accordance with the Granger representation theorem, the vector autoregressions should include the first differences of these series and the lagged cointegrating errors in the error correction form. Hereafter I consider only two possible candidates for cointegrating

[6] I performed the same calculations with real returns, but they are excluded since the qualitative results are similar.

[7] Additionally I regress dividend growth, excess returns and real returns on the lagged values of $c_t - l_t$ and $l_t - d_t$ simultaneously. The idea is that $(c_t - d_t) = (c_t - l_t) + (l_t - d_t)$ can capture the effect of changing expected returns and changing expected dividend at the same time, but $(c_t - l_t)$ mostly captures expected returns (Santos and Veronesi (2001), while the remaining part captures the variation in expected dividend growth. The dividend predictive regression shows that only $(l_t - d_t)$ predicts dividend growth, since $(c_t - l_t)$ is statistically insignificant. At the same time, the real returns regression shows that $(c_t - l_t)$ predicts returns, while $(l_t - d_t)$ is statistically and economically insignificant. The correlation between $(c_t - l_t)$ and $(l_t - d_t)$ is only 8.6%. These particular results hold for the sample 1950-2000.

vectors. I assume that the log price-dividend ratio and the log dividend-labor ratio are stationary. This assumption is equivalent to the existence of two unitary cointegrating vectors. The notation for the additional terms are $p_t - d_t$ and $d_t - l_t$, but both log ratios are demeaned and have the interpretation of cointegrating errors.

Hence, the econometric model is:

$$y_t = A + B(L)y_{t-1} + Cx_{t-1} + u_t \tag{1}$$

where the vector $y_t = [\Delta l_t \ \Delta p_t \ \Delta d_t]^T$ and $x_t = [p_t - d_t, d_t - l_t]$. The vector of errors u_t has constant variance-covariance matrix Σ_u. In the specification with earnings, d_t is replaced by e_t.

Taking as given the available evidence that all the variables in levels are I(1), I test the existence of the cointegration between different pairs of variables. Table 3 provides unit root tests for the log ratios of pairs of variables, which can be interpreted as cointegration tests, if I only allow unitary coefficient. The tests based on unit roots as a null hypothesis show that the bivariate relations between all the cash flow variables - dividends, earnings and labor income - seem to be stationary, since it is possible to reject the existence of unit roots in all cases. This result can be confirmed with the tests based on stationarity as a null hypothesis in the case of the dividend-labor income ratio. The autocorrelations also decay much more rapidly in the case of dividend labor income ratio. However, it is more difficult to claim stationarity in the case of the price ratios.

Table 4 presents trivariate and bivariate cointegration tests that restrict the attention to unitary cointegrating vectors[8]. I test a null hypothesis that there is no cointegration against an alternative hypothesis that the variables are cointegrated with unitary vectors, which are supposed to be known. These tests use the procedure in Horvarth and Watson (1995). The advantage of imposing known cointegrating vectors is that the test becomes more powerful. In the case where all coefficients are predetermined, the Horvarth-Watson test is the standard Wald test for the presence of the cointegrating errors in the system. The test rejects the null of no cointegration when stock price, dividends and labor income are considered. The Horvath-Watson

[8] Alternatively, I followed the Johansen procedure to obtain the estimates of the cointegrating vectors for two pairs: dividends-labor income and earnings-labor income. In both cases, one can reject the null of no cointegration. Moreover, it is not possible to reject the hypothesis that there is a unitary cointegrating vector in both cases.

test was applied to pairs of variables and the only pair to reject the hypothesis of no cointegration were labor income-dividends. Figure 1 shows the plot of the log dividend-labor income and log dividend-price ratio. The visual analysis of the data shows that the log dividend-labor income seems to be stationary.

I present the results of the vector autoregression estimation. First, I analyze regressions without lags, which is the common approach of predictive regressions. This representation is possibly a restricted version of the true VAR model. If I only included price and dividends equations in the system, both Akaike and Schwartz model selection criteria would recommend the exclusion of lag terms. The main reason for inclusion of lags in the system is the labor income equation, since the log growth rate of labor income seems to depend on its past realization.

Table 5 presents the results of the regression without lags for three time periods which are the full sample (1929-2000) and two additional sub-samples (1929-1990 and 1950-2000). I show that $d_t - l_t$ predicts the future changes in both log labor income and log dividends. This result is statistically significant in all samples and both equations. The economic effect of the lagged $d_t - l_t$ is more relevant in the case of the dividend equation, since the speed of reversion is considerably larger and dividends tend to revert much more quickly to the long-run relation between dividends and labor income. The speed of mean reversion of dividends to this long-run relation is the coefficient on the lagged $d_t - l_t$. It varies from -0.185 to -0.527 depending on the sub-sample used. By comparison, the same coefficient for labor income equation is between 0.059 and 0.073 across sub-samples. The stock price equation shows that the log price-dividend ratio predicts future changes in log prices, but it is not clearly statistically significant. The lagged dividend-labor income ratio does not explain much of the variation in stock price growth. The log price-dividend ratio does not predict future dividend growth.

The basic result of these autoregressions does not change even after adding lags. The statistical significance of the coefficients is affected due to the possible collinearity of the additional regressors. Table 6 shows the results of the vector autoregression of order one. This is the order of autoregression which is suggested by the Schwartz criterium. The only variable that seems to be explained by its own lag is the log labor income growth. The coefficient on the lagged log dividend-labor income ratio in this equation becomes smaller, and it is very close to zero in the sub-sample 1950-2000. The lagged log dividend-labor income ratio has roughly the same effect as in the no-lag regression on the evolution of future changes in log dividends. Consequently, dividend growth appears to be responsible for most of the adjustment to the long-run equilibrium relation between dividends and labor income. The changes in log prices are still predictable by the lagged log price-dividend ratio. In general, the significance of the coefficients decreases because of the change in standard errors.

4 Price-Dividend Ratio Decomposition

The price-dividend ratio summarizes information about conditional expected dividend growth and conditional expected returns. Since the inclusion of labor income may reveal transitory variation in dividend growth rate, the variance of the expected dividend growth could increase. Following Campbell and Shiller (1988), the demeaned log price-dividend ratio can be represented as

$$p_t - d_t = E_t \sum_{j=1}^{\infty} \rho^{j-1} \left(\Delta d_{t+j} - r_{t+j} \right). \tag{2}$$

Given the proposed VAR, I can compute the conditional expectation of both the discounted dividend growth and discounted return:

$$s_{d,t} = E\left[\sum_{j=1}^{\infty} \rho^{j-1} \Delta d_{t+j} \middle| z_t \right], s_{r,t} = E\left[\sum_{j=1}^{\infty} \rho^{j-1} r_{t+j} \middle| z_t \right] \tag{3}$$

and they should satisfy the following restriction

$$p_t - d_t = s_{d,t} - s_{r,t}. \tag{4}$$

The information set z_t may include the cointegrating errors and all the variables with respective lags:

$$z_t = [\Delta d_t, \Delta d_{t-1}, ..., \Delta l_t, \Delta l_{t-1}, ..., \Delta p_t, \Delta p_{t-1}, ..., l_t - d_t, p_t - d_t]^T \tag{5}$$

and has a first-order VAR representation

$$z_t = D z_{t-1} + \widetilde{u}_t. \tag{6}$$

where the matrix D is composed of the elements of the matrices B and C and $\widetilde{u}_t$ is also a combination of the elements of the error vector u_t in equation (1).

Both conditional expectations depend linearly on the vector z_t :

$$s_{d,t} = E\left[\sum_{j=1}^{\infty} \rho^{j-1} \Delta d_{t+j} \middle| z_t\right] = e_{\Delta d_t} D(I - \rho D)^{-1} z_t = S_d z_t \tag{7}$$

$$s_{r,t} = E\left[\sum_{j=1}^{\infty} \rho^{j-1} r_{t+j} \middle| z_t\right] = (\rho e_{p_t - d_t} D + e_{\Delta d_t} D - e_{p_t - d_t})(I - \rho D)^{-1} z_t = S_r z_t \tag{8}$$

where e_x is a row vector with 0's everywhere and 1 for one particular element, satisfying the condition $e_x.z_t = x$. The row vectors S_d and S_r represent the loadings of the conditional expectation on each of the elements of the information set z_t and satisfy the condition $(S_d - S_r).z_t = p_t - d_t$. If the labor income information is included, S_d always has a positive loading on the term $l_t - d_t$. All the other loadings are very small, except for the lagged labor income growth if the first-order lags are included. But most of the variation in the conditional expectation of the discounted dividend growth is due to changes in the labor income-dividend ratio. Figure 2 depicts the values for $s_{d,t}$ and $s_{r,t}$ estimated for the sub-sample 1950-2000 assuming that (1) is a cointegrated VAR(1). The results are not sensitive to alternative specifications.

The variance of the price dividend ratio could be decomposed into three terms: the variance of each one of the conditional expectation terms and their covariance:

$$var(p_t - d_t) = var(s_{d,t}) + var(s_{r,t}) - 2cov(s_{d,t}, s_{r,t}). \tag{9}$$

If labor income is included, the terms $var(s_{d,t})$ and $cov(s_{d,t}, s_{r,t})$ increase significantly in absolute terms. The increase in the first term is consistent with the idea that dividends are predictable, but the conditional expectation of the discounted dividend growth seems to be positively correlated with the conditional expected returns. Therefore, the covariance term also increases. Table 7 presents the results of the variance decomposition in equation (9) and the correlation between $s_{d,t}$ and $s_{r,t}$. If labor income growth and labor income-dividend ratio are excluded from the process (1), the fraction of the total variance that is explained by dividend growth is never above 4.7%, considering alternative specifications and sub-samples. If labor income is include, this number can reach 32.3%. There is a simultaneous increase in the covariance term, which is due to the possible correlation between expected returns and expected dividend growth. But the correlation between these two variables is never above 60%.

A similar result holds if the variance of the innovation to the price-dividend ratio is decomposed into the variance of the innovations to the conditional expectations $s_{d,t}$ and $s_{r,t}$ and their covariance:

$$var((E_t - E_{t-1})(p_t - d_t)) = var(S_d\widetilde{u}_t) + var(S_r\widetilde{u}_t) - 2cov(S_d\widetilde{u}_t, S_r\widetilde{u}_t). \quad (10)$$

The top panel of table 8 shows the results of this variance decomposition. Interestingly, the contribution of dividend growth is even higher with this alternative variance decomposition. The correlation between $S_d\widetilde{u}_t$ and $S_r\widetilde{u}_t$ is not much different than the one obtained in the previous variance decomposition.

It is also possible to decompose the variance of the unexpected return, which is defined as:

$$r_t - E_{t-1}r_t = (E_t - E_{t-1})\Delta d_t + (E_t - E_{t-1})\left[\sum_{j=1}^{\infty}\rho^j \Delta d_{t+j} - \sum_{j=1}^{\infty}\rho^j r_{t+j}\right] \quad (11)$$

$$\begin{aligned} var(r_t - E_{t-1}r_t) &= var(e_{\Delta d_t}\widetilde{u}_t) + var(\rho S_d\widetilde{u}_t) + var(\rho S_r\widetilde{u}_t) + 2cov(e_{\Delta d_t}\widetilde{u}_t, \rho S_d\widetilde{u}_t) \\ &\quad -2cov(e_{\Delta d_t}\widetilde{u}_t, \rho S_r\widetilde{u}_t) - 2cov(\rho S_d\widetilde{u}_t, \rho S_r\widetilde{u}_t). \quad (12) \end{aligned}$$

Because of the contemporaneous correlation between returns and dividends, the first term of this variance decomposition become economically significant. The bottom panel of table 8 also shows that the dividend growth conditional expectation contributes to the variance of the unexpected returns.

5 Impulse Response Functions

The Campbell-Shiller decompositions above are not based on orthogonalized components. In this section, I identify orthogonalized shocks that affect the time-series behavior of the aggregate stock price, dividends and labor income. The objective is to identify shocks that have particular long-run properties. The procedure has two steps. First, a transformation is applied to the VAR innovation vector is such a way that guarantees that these modified, but still unorthogonalized, shocks have some desired long-run properties. After the first transformation, the shocks cannot be interpreted as shocks to each one of the equations anymore, since they become linear combinations of the original innovations. Second, the Choleski decomposition is applied to the variance-covariance matrix of the modified shocks, since these modified shocks are not necessarily orthogonal. Appendix B describes the two-step procedure used to calculate these impulse response functions in more detail. Figures 3 to 8 present the impulse response functions of the three variables to each one of the orthogonalized shocks. To avoid excessive information, I only present the responses with full sample and the last fifty years of data, but similar results obtain in other samples. I will name each of the shocks according to the economic interpretation that best suits them.

Figures 3 and 4 depict the impulse response function of a permanent dividend shock. This shock corresponds to a positive change to labor income, dividends and stock prices in a combination that guarantees that the initial change to dividends persists indefinitely. The small decrease in the effect of the dividend innovation in the first years is due to the autoregressive component in the labor income process and to the economically significant reversion of the dividend process to the long-run equilibrium relation between labor income and dividends.

The response of the variable to a negative expected dividend shock is plotted in figures 5 and 6. This shock could also be interpreted as a transitory shock to dividends, since it is a positive change to dividends that is not expected to fully persist in the future. In the sub-sample 1950-2000, this positive change in dividends is expected to completely disappear in the long run. In most of the sub-samples, this change in dividends is accompanied with a small positive change to stock prices, that will also disappear in the long run. The expected returns shock is essentially a change in prices that has no immediate effect on dividends and labor income, as shown in figures 7 and 8. Therefore, stock prices exhibit reversion to the original level, which is determined by these two cash flow variables.

It is evident that labor income has an important role in identifying the shocks to prices that have information about future dividends. For example, a fraction of the good news in the labor market, that do not affect dividends instantaneously, may be immediately associated with stock price increases. The aggregate stock price may increase if the financial market believe these good news will affect dividends later. It is possible to create this type of shock by combining a positive expected dividend shock (a temporary decrease in dividends) and a positive current dividend shock (a positive and permanent innovation to stock price, dividends and labor income) in certain proportions. This combination of shocks correspond to the situation where both labor income and aggregate stock price increase without an immediate change in dividends. To my knowledge, this type of shock has not been shown in the past literature. However, it is important to verify whether the temporary shocks to dividends produce economically significant variation in dividends and price-dividend ratios.

Table 9 presents the forecast error variance decomposition of stock price growth, dividend growth and labor income growth in terms of the orthogonalized shocks: the expected return, the transitory dividend growth and the permanent dividend growth shocks. The qualitative results do not depend on the sample or the order of the autoregressions. I considered four different samples: 1929-2000, 1929-1990, 1950-1990 and 1950-2000. A large share of the dividend growth variance is related to temporary shocks to dividends. The calculations show that across the used sub-samples at least 50.5% of the variance of log dividend growth can be attributed to temporary dividend growth shocks. On the other hand, most of the variation in prices is driven by changing expected returns. The temporary dividend growth shocks do not impact stock prices significantly, but the permanent dividend shocks do.

Cochrane (1994) has shown that almost all variation in price-dividend ratio is related to changing expected returns. However, the calculations with the model that includes labor income show that a fraction of this variation is due to changing future dividends. If the full sample is used, the fraction of the variance of the unexpected changes in price-dividend ratio, as in equation (10), that can be attributed to expected dividends is 13.0%, while expected returns explain the remaining variation[9]. In the sub-sample 1950-1990, the contribution of expected dividend to price-dividend ratio unexpected changes increases to 35.2%.

Campbell (1991) presented the variance decomposition for unexpected returns, which was

[9] The numerical calculation shows that the current dividend shock explains at most 0.5% of the price-dividend ratio variance. Theoretically, this number has to be zero, but this is not imposed. This result shows that the correct orthogonalization of the variance-covariance matrix was identified.

presented in equation (11). In this formula, the summation of the dividend term start at j=0, since a positive shock to current dividend affect returns instantaneously. Thus, the current dividend shock should explain a significant part of the variance of unexpected returns. At the same time, the importance of the expected dividend shock must decrease. Table 10 shows that the contribution of the current dividends to the variance of unexpected returns can be as large as 18.5% if the nineties are excluded from the sample. The inclusion of the nineties makes the contribution of the expected return shock much larger. In the sample, 1950-2000, the expected return shock explains basically all variation in unexpected returns, 96.4%. In the sample 1929-2000, only 5.3% of the variance is explained by the expected dividend shock. Similar results are obtained for all the above decompositions, if earnings are used instead of dividends, as seen in Table 11.

6 Predictive Regressions Revisited

In this section, I will focus on a simple VAR representation to better understand the effect of the previous results on the estimation of predictive regressions. This section is not based on any particular assumption about the orthogonalization of the VAR variance-covariance matrix. I showed that part of the variation in price-dividend ratio is related to changes in expected dividend growth, but this result seems to inconsistent with the predictive regression presented in section 2. Here I show that this result is not inconsistent, because the price-dividend ratio is not the variable that determines the mean of the dividend and stock price growth. Here I show that the variation in price-dividend ratio or dividend yield may be determined by two state variables that separately determine the evolution of dividends and returns. I will call these processes state variables, since they summarize all the relevant information about expected dividend growth and expected returns.

In order to present these ideas more clearly, I will focus on a restricted version of the model in section 3. This model is a good approximation of the true representation under the assumption that the lag of the variables do not provide relevant information about expected returns and expected dividend growth. But the same conclusions are obtained under alternative specifications. I assume that there are two state variables, x_t and y_t, that govern the behavior of expected returns and expected dividend growth respectively. Both of them follow a simple autoregressive form and all variables are demeaned.

$$x_t = bx_{t-1} + \delta_t \tag{13}$$

$$y_t = ay_{t-1} + \theta_t \tag{14}$$

Consequently, log returns and log dividend growth are driven by the following processes:

$$r_{t+1} = x_t + \varepsilon_{r,t+1} \tag{15}$$

$$\Delta d_{t+1} = \pi y_t + \varepsilon_{d,t+1} \tag{16}$$

I will also assume that labor income growth is not affected by any of the state variables.

$$\Delta l_{t+1} = \varepsilon_{D,t+1} \tag{17}$$

I showed previously that the log labor income ratio forecast dividend growth, but does not seem to be directly related to expected returns. If the conditional expectation of the discounted dividend growth is calculated, almost all the weight is given to the lagged labor income-dividend ratio. Therefore, I will assume that

$$y_t = (l_t - d_t) \tag{18}$$

I can apply the approximate relation between the log price-dividend ratio and the discounted difference between expected dividend growth and returns to obtain the following equation:

$$\begin{aligned} p_t - d_t &= E_t \sum_{j=1}^{\infty} \rho^{j-1} \left(\Delta d_{t+j} - r_{t+j} \right) \\ &= \pi \frac{(l_t - d_t)}{1 - \rho a} - \frac{x_t}{1 - \rho b} \end{aligned} \tag{19}$$

Now the price-dividend ratio is determined by both state variables. It is also possible to show that there are representations of returns, changes in log stock prices and dividend growth as functions of these state variables.

$$r_{t+1} = x_t + \varepsilon_{D,t+1} - \rho\frac{\delta_{t+1}}{1-\rho b} \tag{20}$$

$$\Delta p_{t+1} = \frac{\pi[(1-\rho)a)]}{1-\rho a}(l_t - d_t) + \frac{[(1-b)]}{1-\rho b}x_t + \varepsilon_{D,t+1} - \frac{\delta_{t+1}}{1-\rho b} + \pi\frac{\theta_{t+1}}{1-\rho a} \tag{21}$$

$$\Delta d_{t+1} = \pi(l_t - d_t) + \varepsilon_{D,t+1} - \theta_{t+1} \tag{22}$$

The stock return process is solely determined by the expected return state variable because of the assumption in equation (15), but changes in log stock prices are also affected by the expected dividend state variable. Consistent with the idea of the previous sections, three different shocks affect all these variables. The shock $\varepsilon_{D,t+1}$ is the permanent dividend shock at time t+1, because it affects stock price, dividend and labor income and it is persistent. The realization of the shock δ_{t+1} corresponds to the expected return innovation at time t+1. While θ_{t+1} captures the innovations to expected dividend growth or the temporary shock to dividends. Similar representation can be found for the price-dividend ratio innovations.

$$p_{t+1} - d_{t+1} = \pi\frac{a(l_t - d_t)}{1-\rho a} - \frac{bx_t}{1-\rho b} + \pi\frac{\theta_{t+1}}{1-\rho a} - \frac{\delta_{t+1}}{1-\rho b} \tag{23}$$

Therefore, it is possible to represent the unexpected shocks to returns and price-dividend ratio as:

$$(E_{t+1} - E_t)r_{t+1} = \varepsilon_{D,t+1} - \rho\frac{\delta_{t+1}}{1-\rho b} \tag{24}$$

$$(E_{t+1} - E_t)(p_{t+1} - d_{t+1}) = \pi\frac{\theta_{t+1}}{1-\rho a} - \frac{\delta_{t+1}}{1-\rho b} \tag{25}$$

which was the approach of the decomposition in the previous section.

The price dividend ratio is determined by two different state variables, but only one of them predicts future dividend growth. If the variable that predicts dividend growth is correctly identified, it is possible to identify the state variable that predicts returns. Let's define the cash flow and expected return state variables respectively as:

$$cf_t = \pi\frac{(l_t - d_t)}{1-\rho a} \tag{26}$$

$$er_t = \frac{x_t}{1 - \rho b} \tag{27}$$

and

$$p_t - d_t = cf_t - er_t \tag{28}$$

The expected return state variable is obtained using equation (19). The necessary parameters are estimated using equations (14) and (16). I assume that ρ is equal to 0.96 in these calculations, but results are not sensitive to different choices. Similar state variables are obtained if a cointegrated VAR(0) is estimated and the conditional expectations in section 3 are computed. The following results are not specific to the order of the VAR. Future versions will include the results with alternative specifications.

The basic idea is that the price-dividend ratio is a noisy variable for each one of the predictive regressions. In the dividend growth predictive regression, it is expected that cf_t should predict dividend growth. But the variable $p_t - d_t$ is cf_t plus a measurement error. Since expected returns are much more variable than the cash flow state variable, the measurement error is large. Therefore, the coefficient of the dividend growth regression on the lagged price-dividend ratio (or dividend-yield) is expected to be close to zero. If the cash flow and expected return state variable are positively correlated, the coefficient can even have the unexpected sign. The same logic could hold in the case of the return predictive regressions. Because the measurement error problem is relatively less important, the coefficient will not necessarily be significantly biased. However, returns become more forecastable if the expected return state variable is used instead of the price-dividend ratio, independently of the assumptions for its identification..

Tables 12 and 13 report the results of return predictive regressions for one to five-year horizons with three different sets of regressors: dividend yield; expected return state variable; and both expected return state variable and cash flow state variable. Table 12 presents results with the full sample, while table 13 concentrates on the last fifty years of available data. Each panel includes regressions with excess returns and real returns as dependent variables. Panel A presents OLS regressions of returns on the dividend yield, while panel B provides OLS regressions with the expected return variable. For both excess returns and real returns, we see an increase in the statistical significance of the regressor, when the expected return state variable is used. If the expected return variable is used instead of the dividend yield, the R-squared of the short-horizon regressions almost doubles. It is important to note that the increased statistical significance of the regressor is due to a reduction of standard error when I use the expected return state variable, since the coefficients tend to become smaller. The standard errors decrease in every regression with the expected the return state variable for both samples. If the expected return state variable is correctly identified, the addition of the cash flow (or expected dividend) state variable should not impact the results.

Panel C of tables 12 and 13 provide OLS regressions with both state variables as regressors. The cash flow state variable is always statistically insignificant. The coefficient estimate on the expected return state variable is not economically affected in long horizons. The R-squared does not change considerably if the cash flow state variable is added. The standard errors of the expected return tends to increase, since these state variables have correlation of 0.30 in full sample. Therefore, expected returns are more predictable than past literature showed, if one focus on the expected return component of the dividend yield.

Tables 14 and 15 provide OLS predictive regressions of future dividend growth on three different sets of regressors: dividend yield; cash flow state variable; and both cash flow state variable and expected return state variable. Panel A shows the commonly used regressions of dividend growth on the lagged dividend yield. Once again, I would expect a negative sign if high prices indicated higher expected dividend growth, but coefficients are positive. Of course, panel B in both tables shows that future dividends are predicted by the lagged cash flow state variable. These results are much stronger if the sample 1950-2000 is considered. Panel C in both tables shows that the inclusion of the expected return state variable does not affect the statistical significance of the cash flow state variable.

7 Conclusion

This paper shows that there exists economically significant variation in expected dividend growth. I find that changes in aggregate dividends that do not coincide with changes in labor income are mostly short-lived. Hence, it is feasible to recognize the permanent and transitory components of dividend growth. Expected dividend growth, or the transitory component of dividend growth, explains a significant part of the variation in the price-dividend ratio, if I take into account the fact that the labor income-dividend ratio predicts dividend growth. Most of the variation in dividend growth can be attributed to changes in expected dividend growth.

I show that these results do not contradict the implications of the commonly used predictive regressions. The dividend yield (or price-dividend ratio) summarizes information about two separate variables: the expected return and cash flow state variables. The expected return state variable is much more variable and also positively correlated with expected dividend growth (or cash flow state variable). These properties obscure the predictive effect of lagged price-dividend ratio on dividend growth. This decomposition of the price-dividend ratio into these distinct variables reveals that its expected return component predicts returns better than the price-dividend ratio does.

8 Appendix A - Data

This section provides the data definitions that were used in this paper, including the data source. I also provide the methodology used to compute some of the variables.

Price Index - In order to calculate the real value of all variables, I used the implicit deflator from the National Accounts. In the specific case of consumption, the implicit price deflator of the personal consumption expenditures was used. Source: U.S. Bureau of Economic Analysis.

Population - Total Population. Source: U.S. Bureau of Census.

Real Stock price index - Two alternative variables were considered. First, the stock price index associated with returns excluding dividends in real terms based on the annual NYSE data available from CRSP files (stock price index). Second, the total market value of all securities based on the annual NYSE data also available from CRSP, in real per capita terms (dollar value of all stocks per capita).

Real Return - natural log of gross real returns including dividends based on the annual NYSE data available from CRSP files.

Excess Return- difference between nominal returns including dividends based on the annual NYSE data available from CRSP files and annualized one-month treasury bill returns available at Prof. Kenneth French's web site: http://mba.tuck.dartmouth.edu/ pages/ faculty/ ken.french/ data_library.html

Real Dividends - Two alternative variables were considered. First, the dividend index calculated with returns excluding and including dividends. With this information, it is possible to calculate the dividend yield $(D_t/P_{t-1}) = ((P_t + D_t)/P_{t-1}) - (P_t/P_{t-1})$, which is multiplied by the stock price index to obtain the dividend index (dividend index). Second, the other representation is dividend index multiplied by the dollar value of all stocks per capita, divided by the stock price index (dollar value of dividends).

Real Dividend Growth - natural log of the gross dividend growth rate based on the dividend index.

Real Earnings - earnings index was calculated using the information about earnings and dividends from the S&P Composite Index and the dividend index. It was calculated by multiplying the ratio between earnings and dividends calculated using only the stocks in the S&P500 by the dividend index. This information was obtained on Prof. Robert Shiller's website, where an updated version of the data appendix from Robert J. Shiller, "Market Volatility," MIT Press, Cambridge MA, 1989 can be found. http://aida.econ.yale.edu/~shiller/data/chapt26.html.

Real Earnings Growth - natural log of the gross earnings growth rate based on the earnings index.

Real Consumption - Total personal consumption expenditures in real terms. Source: U.S. Bureau of Economic Analysis.

Real Labor Income - Compensation of Employees deflated with the price index and represented in per capita terms (divided by total population). Source: Bureau of Economic Analysis.

Dividends and Labor Income Cointegration Error - difference between the natural log of real dollar value of dividends per capita and the natural log of real labor income per capita. There exists a downward trend in the difference between the natural log of real dividends based on the stock price index and the natural log of real labor income per capita. A previous version of this paper included a deterministic trend is introduced in this cointegrating error. Similar results are obtained for both definitions. The downward trend seems consistent with the evidence of disappearing dividends found in Fama and French (2001b). The deviations from this trend provide economically relevant variation which is independent of the particular definition used.

Stock Price and Dividends Cointegrating Error - difference between the natural log of stock price index and natural log of real dividends based on the stock price index. In this case, I ignored the presence of a possible upward trend, which is consistent with the idea that expected returns are lower than in the paper. See Heaton and Lucas (1999) and Fama and French (2001a) for discussion.

9 Appendix B - Impulse Response Function Identification

This procedure identifies the relevant shocks in two steps. Instead of directly identifying the effect of orthogonalized errors on each one of the variables, the shocks are first modified in order to present them in more intuitive economic terms. The final objective is to create error terms that capture the effects of three different shocks: changes in expected dividend growth, changes in expected returns and changes in dividends which are not related to changes in expected dividend growth and expected returns, or permanent changes in dividends. Therefore, before the shocks are orthogonalized, they are first represented in a form that must be closer to the expected final orthogonalization. Let Σ_u be the variance-covariance matrix of the error terms of the VAR representation. I claim that there exists a matrix V such that $V\Sigma_v V^T = \Sigma_u$ and

$$v_t = V^{-1}u_t$$

where v_t has this specific economic interpretation. The variance-covariance matrix of the new error terms is not necessarily diagonal. Therefore, it may need to be orthogonalized, if we want to give an economic interpretation to the results.

The cointegrated VAR can now be represented by

$$y_t = B + C(L)y_{t-1} + Dx_{t-1} + Vv_t \tag{29}$$

The impulse response function for each shock can be obtained by simulating the above model with the assumptions that all variables are initially set to zero and only one component of the error vector has a unit-standard deviation shock. I only consider the first 200 terms of the simulation leading to a truncated Wold moving average representation,

$$y_t = \mu + H(L)v_t$$

Let's define v_{er}, v_{ed} and v_{cr} as the unorthogonalized shocks to satisfy the constraints below.

$$\begin{bmatrix} \Delta l_t \\ \Delta p_t \\ \Delta d_t \end{bmatrix} = \mu + \begin{bmatrix} H_{l,er}(L) & H_{l,ed}(L) & H_{l,cd}(L) \\ H_{p,er}(L) & H_{p,ed}(L) & H_{p,cd}(L) \\ H_{d,er}(L) & H_{d,ed}(L) & H_{d,cd}(L) \end{bmatrix} \begin{bmatrix} v_{er,t} \\ v_{ed,t} \\ v_{cd,t} \end{bmatrix} \tag{30}$$

In order to find the unorthogonalized shocks with the desired economic interpretation, one should find the appropriate matrix V. Let's define the unorthogonalized shock to expected dividends as the shock u_t that has no immediate effect on dividends, $\Delta d_t = 0$, or on future expected returns, $E[\sum_{j=1}^{\infty} \rho_{t+j}^j r_{t+j}] = 0$ (discounted total effect on expected returns), but has effect on future expected dividends defined as the total discounted value of the future changes in log dividends, $E[\sum_{j=1}^{\infty} \rho_{t+j}^j \Delta d_{t+j}] \neq 0$. The unorthogonalized shock to current dividends is the shock u_t that has no effect on future expected dividend, $E[\sum_{j=1}^{\infty} \rho_{t+j}^j \Delta d_{t+j}] = 0$, or future expected returns, $E[\sum_{j=1}^{\infty} \rho_{t+j}^j r_{t+j}] = 0$, but has effect on current dividends, $\Delta d_t \neq 0$. And the shock to expected returns is the shock u_t that has no effect on current dividends, $\Delta d_t = 0$, or labor income, $\Delta l_t = 0$, but has effect on expected returns. The last shock is not neutral with respect to expected dividends, but the impact is negligible. The choice does not affect the conclusions of this paper and makes more clear the distinction between these results and the existing literature that tend to identify the above shock as the "discount rate" shock. Since the shocks will be orthogonalized, this assumption has no implication on the final result.

Once again, these modified shocks are not necessarily orthogonal. The second step is the orthogonalization of the variance-covariance matrix Σ_v. I will consider the orthogonalization that preserves similar economic interpretation. The different orthogonalization orders are obtained by changing the order of the equations. I need to find a lower-triangular matrix R such that $RR^T = \Sigma_v$ and define new errors

$$\epsilon_t = R^{-1}v_t$$

with variance-covariance matrix equal to identity matrix, $E[\epsilon_t \epsilon_t^T] = I$.

Therefore,

$$y_t = \mu + H(L)R\epsilon_t$$

Similarly, I can identify a new Wold moving average representation in terms of the orthogonalized errors,

$$y_t = \delta + G(L)\epsilon_t$$

or,

$$\begin{bmatrix} \Delta l_t \\ \Delta p_t \\ \Delta d_t \end{bmatrix} = \delta + \begin{bmatrix} G_{l,er}(L) & G_{l,ed}(L) & G_{l,cd}(L) \\ G_{p,er}(L) & G_{p,ed}(L) & G_{p,cd}(L) \\ G_{d,er}(L) & G_{d,ed}(L) & G_{d,cd}(L) \end{bmatrix} \begin{bmatrix} \epsilon_{er,t} \\ \epsilon_{ed,t} \\ \epsilon_{cd,t} \end{bmatrix} \tag{31}$$

After the orthogonalization, I obtain shocks that are uncorrelated. Interestingly, it is possible to find an orthogonalization that maintains the desired economic interpretation. The only shock that changes significantly is the expected dividend growth shock. This shock can now be interpreted as a temporary shock to dividends, since it is basically a positive shock to dividends that is not expected to persist. The current dividend shock is a permanent shock to dividends. This representation is independent of the sample used.

Since all shocks have unit variance, the unconditional variance of the dividend growth can be decomposed as:

$$var(\Delta d_t) = \sum_{j=1}^{\infty} G_{d,er,j}^2 + \sum_{j=1}^{\infty} G_{d,ed,j}^2 + \sum_{j=1}^{\infty} G_{d,cd,j}^2 \tag{32}$$

where the first term corresponds to variance attributed to the shock to expected returns, the second term gives the variance attributed to the transitory dividend growth shock (or expected dividend growth shock) and the last summation gives the variance attributed to the current, or permanent, dividend shock. I can perform similar calculations for all the variables in the system. The exercise above decomposes the variance of the desired variable in terms of the past shocks. But these shocks were defined in terms of future expectations. I can also use these shocks to decompose the variance of the unexpected innovations to variables like price-dividend ratio and returns.

These calculation were performed for all the selected samples. In all cases, the VAR(1) was chosen by the model selection criteria. In the sub-samples 1950-2000 and 1950-1990, I estimated a restricted VAR for efficiency reasons. I excluded the lags in the stock price and dividend equations, since the this was recommended by the model selection criteria for each one of these regressions individually. The labor income equation still includes the first order lags, since this variable has a much stronger autoregressive component. This choice was motivated by the small sample and the evidence that lags do not affect dividends and returns in longer samples.

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Table I. Returns and Dividend Growth Predictive Regressions – Regressors: Dividend Yield Only

	Excess Returns			Real Returns			Real Dividend Growth		
H	b	t-stat	R2	b	t-stat	R2	b	t-stat	R2
					1929-2000				
1	0.15	2.09	0.06	0.09	1.28	0.02	0.01	0.27	0.00
2	0.29	2.19	0.10	0.18	1.33	0.04	-0.01	-0.15	0.00
3	0.44	2.43	0.17	0.27	1.45	0.08	-0.01	-0.09	0.00
4	0.58	2.65	0.25	0.36	1.55	0.11	0.02	0.22	0.00
5	0.76	3.26	0.33	0.47	1.80	0.14	0.05	0.40	0.00
					1929-1990				
1	0.29	4.30	0.13	0.24	3.02	0.09	0.01	0.14	0.00
2	0.52	4.62	0.21	0.42	3.17	0.16	-0.01	-0.14	0.00
3	0.72	5.37	0.35	0.56	3.76	0.26	0.00	0.03	0.00
4	0.87	5.72	0.47	0.67	3.89	0.34	0.06	0.44	0.01
5	1.03	7.09	0.54	0.77	4.05	0.37	0.09	0.64	0.01
					1950-2000				
1	0.15	1.94	0.08	0.11	1.44	0.05	0.03	1.06	0.01
2	0.23	1.60	0.10	0.17	1.17	0.06	0.02	0.34	0.00
3	0.29	1.49	0.12	0.23	1.11	0.07	0.02	0.23	0.00
4	0.38	1.53	0.15	0.34	1.28	0.10	0.03	0.42	0.00
5	0.65	2.13	0.26	0.60	1.89	0.20	0.08	0.74	0.02

Notes: These are predictive regressions of excess returns, real returns and real dividend growth on the lagged dividend yield. b is the coefficient on the lagged dividend yield. t-stat and R2 correspond to the t-statistic and R-squared of the regression. H measures the horizon in years.

Table II. Real Return and Dividend Growth Predictive Regressions – Regressors: Log Labor Income-Dividend Ratio, Log Earnings-Dividend Ratio and Log Consumption-Dividend Ratio

Regressor		$l_t - d_t$			$e_t - d_t$			$c_t - d_t$	
H	b	t-stat	R2	b	t-stat	R2	b	t-stat	R2
	Dependent Variable: Log Dividend Growth (1950-2000)								
1	0.53	3.35	0.23	0.11	1.74	0.03	0.51	3.59	0.24
2	0.61	3.87	0.26	0.08	0.97	0.01	0.55	3.63	0.24
3	0.68	4.30	0.28	0.07	0.58	0.01	0.64	3.91	0.28
4	0.75	4.43	0.28	0.04	0.24	0.00	0.73	3.86	0.30
5	0.91	4.67	0.33	0.04	0.27	0.00	0.91	4.33	0.39
	Dependent Variable: Excess Returns (1950-2000)								
1	0.28	1.38	0.02	-0.01	-0.05	0.00	0.38	2.49	0.05
2	0.74	2.84	0.10	0.03	0.18	0.00	0.85	4.25	0.15
3	0.75	2.01	0.09	0.06	0.25	0.00	0.91	2.77	0.15
4	0.84	2.03	0.09	0.00	0.01	0.00	1.09	2.82	0.18
5	1.09	2.09	0.10	-0.12	-0.41	0.00	1.44	3.03	0.21
	Dependent Variable: Log Dividend Growth (1929-2000)								
1	0.18	1.80	0.08	0.06	1.36	0.02	0.33	2.81	0.15
2	0.28	1.89	0.11	0.04	0.46	0.00	0.49	2.79	0.20
3	0.31	1.91	0.12	0.00	-0.02	0.00	0.56	3.40	0.23
4	0.40	2.41	0.17	-0.07	-0.62	0.01	0.68	4.62	0.29
5	0.51	3.82	0.25	-0.11	-0.94	0.02	0.80	5.77	0.36
	Dependent Variable: Excess Returns (1929-2000)								
1	0.27	2.18	0.06	0.01	0.09	0.00	0.31	2.04	0.05
2	0.49	2.31	0.11	-0.07	-0.40	0.00	0.64	2.51	0.11
3	0.43	1.89	0.07	-0.14	-0.69	0.01	0.68	2.76	0.11
4	0.44	2.03	0.07	-0.24	-1.14	0.04	0.92	3.23	0.18
5	0.53	2.43	0.08	-0.37	-2.11	0.07	1.18	3.71	0.24

Notes: These are predictive regressions of excess returns and real dividend growth on the lagged log labor income-dividend ratio, log earnings-dividend ratio and log consumption-dividend ratio. b is the coefficient on the lagged variables. t-stat and R2 correspond to the t-statistic and R-squared of the regression. H measures the horizon in years. Each panel corresponds to a different dependent variable and sample. Each set of three columns corresponds to a regression with respect to a different independent variable.

Table III – Cointegration Test with Prespecified Vector based on Unit Root Tests

	$d_t - l_t$	$d_t - e_t$	$d_t - p_t$	$l_t - e_t$	$p_t - e_t$
			Null - Unit root		
DFGLS(1)	-2.12	-2.93	-1.25	-3.54	-2.69
p-value	<0.05	<0.05	>0.10	<0.01	<0.01
DFGLS(BIC)	-2.30	-2.93	-0.98	-3.26	-2.69
p-value	<0.025	<0.01	>0.10	<0.01	<0.01
PP	-3.19	-2.10	-0.77	-3.02	-2.57
p-value	<0.05	>0.10	>0.10	<0.05	>0.10
ADF(Hall)	-3.12	-2.42	-0.81	-3.67	-2.84
p-value	<0.05	>0.10	>0.10	<0.01	<0.10
			Null – Stationarity		
KPSS(3)	0.10	1.12	0.83	1.32	0.14
p-value	>0.10	<0.01	<0.01	<0.01	<0.01
KPSS(max)	0.17	1.88	1.46	0.84	0.23
p-value	>0.10	<0.01	<0.01	<0.01	<0.01
			Autocorrelation		
1	0.76	0.81	0.84	0.77	0.81
2	0.58	0.60	0.68	0.47	0.60
3	0.44	0.40	0.56	0.28	0.40
4	0.24	0.32	0.47	0.12	0.32
5	0.05	0.30	0.40	0.05	0.30

Note: The sample is from 1929 to 2000. DFGLS(k) is the t-statistics of the Dickey-Fuller GLS test proposed by Elliot, Rothenberg and Stock (1996), where k is number of lags in the DF regression and BIC is the number of lags implied by the Schwartz model selection criterion. PP is the t-statistics of the test proposed by Phillips and Perron (1988) using Newey-West automatic truncation lag selection. ADF is the t-statistics of the Augmented Dickey-Fuller test proposed by Said and Dickey (1984) with the number of lags selected with the *general to specific* rule suggested by Hall (1994). KPSS(k) is the LM statistics of the test of stationarity of the series proposed by Kwiatkowski, Phillips, Schmidt, and Shin (1992), where k represents the number of terms of the Bartlett window for the estimation of the long-run variance and max is the number of terms that lead to largest probability of rejection of stationarity. All tests only allow for the possibility of a constant and linear trends are ignored. The range of p-values for each one of the tests is reported. >10 means that the null hypothesis is not rejected with 10% significance level. And <(j) means that the null hypothesis is rejected with (j)% significance level. The variables d_t, e_t, l_t and p_t are respectively log dividends, log earnings, log labor income and log prices.

Table IV – Cointegration Test with Prespecified Vector – Horvath-Watson

	1929-2000	1929-1990	1950-2000
p_t, d_t, l_t	20.21	26.67	9.57
p-value	<0.01	<0.01	<0.01
d_t, l_t	15.79	13.68	11.27
p-value	<0.01	<0.05	<0.05
p_t, d_t	2.36	10.80	0.46
p-value	>0.10	<0.05	>0.10
p_t, l_t	4.78	10.28	0.94
p-value	>0.10	<0.05	>0.10

Note: The LR statistics of the Horvath-Watson (1995) cointegration test with prespecified cointegrating vectors and the corresponding p-values are reported. Three different samples are considered: 1929-2000, 1929-1990 and 1950-2000. The variables $d_{t,}$, l_t and p_t are respectively log dividends, log earnings, log labor income and log prices.

Table V. Cointegrated Vector Autoregression of Order Zero – Dependent Variables: Labor Income, Price and Dividend Log Growth Rates

	Log Labor Income Growth		
d_{t-1} - l_{t-1}	0.059	0.059	0.073
	(1.99)	(1.85)	(2.64)
p_{t-1} - d_{t-1}	-0.018	-0.036	0.004
	(-1.04)	(-1.44)	(0.46)
R-squared	0.064	0.077	0.137
Adj. R-squared	0.036	0.045	0.101
	Log Stock Price Growth		
d_{t-1} - l_{t-1}	-0.177	-0.152	-0.080
	(-1.46)	(-1.22)	(-0.34)
p_{t-1} - d_{t-1}	-0.043	-0.184	-0.072
	(-0.61)	(-1.88)	(-1.01)
R-squared	0.039	0.090	0.025
Adj. R-squared	0.011	0.059	-0.015
	Log Dividend Growth		
d_{t-1} - l_{t-1}	-0.185	-0.185	-0.527
	(-2.41)	(-2.24)	(-3.76)
p_{t-1} - d_{t-1}	0.003	0.012	-0.012
	(0.07)	(0.19)	(-0.30)
R-squared	0.079	0.080	0.235
Adj. R-squared	0.052	0.048	0.203
Sample	1929-2000	1929-1990	1950-2000

Notes: Each one of the dependent variables is regressed on both lagged cointegrating errors. All t-statistics were calculated using the Newey-West standard errors. The first row has the coefficients of respective regressors and the second provides the t-statistics in parenthesis. Three different samples are considered: 1929-2000, 1929-1990 and 1950-2000. d_t - l_t is the demeaned difference between log dividends and log labor income at time t. p_t - l_t is the demeaned difference between log price and log dividends at time t. Intercepts were included in the regressions, but they are not reported.

Table VI. Cointegrated Vector Autoregression of Order One – Dependent Variables: Labor Income, Price and Dividend Log Growth Rates

	Δl_t	Δd_t	Δp_t	Δl_t	Δd_t	Δp_t	Δl_t	Δd_t	Δp_t
	1929-2000			1929-1990			1950-2000		
d_{t-1} - l_{t-1}	0.059	-0.164	-0.170	0.061	-0.165	-0.142	0.011	-0.407	-0.135
	(2.79)	(-1.95)	(-1.29)	(2.66)	(-1.82)	(-1.04)	(0.36)	(-2.25)	(-0.46)
p_{t-1} - d_{t-1}	-0.015	0.019	-0.043	-0.027	0.029	-0.181	0.002	-0.007	-0.025
	(-1.22)	(0.38)	(-0.56)	(-1.53)	(0.41)	(-1.70)	(0.27)	(-0.16)	(-0.33)
Δl_{t-1}	0.688	-0.063	-0.163	0.686	-0.072	-0.166	0.448	-0.154	-2.139
	(8.60)	(-0.20)	(-0.33)	(7.89)	(-0.21)	(-0.32)	(3.72)	(-0.21)	(-1.80)
Δd_{t-1}	0.003	0.004	0.121	0.000	-0.002	0.077	0.039	-0.006	0.328
	(0.06)	(0.02)	(0.48)	(-0.00)	(-0.01)	(0.29)	(1.34)	(-0.03)	(1.15)
Δp_{t-1}	0.008	-0.103	0.015	0.008	-0.097	0.041	0.022	-0.125	-0.078
	(0.30)	(-0.98)	(0.09)	(0.29)	(-0.85)	(0.24)	(1.14)	(-1.05)	(-0.40)
R2	0.592	0.096	0.036	0.597	0.096	0.085	0.414	0.262	0.127
Adj. R2	0.561	0.026	-0.039	0.559	0.012	0.000	0.348	0.180	0.030

Notes: Each one of the dependent variables is regressed on both lagged cointegrating errors and lagged log growth rates. All t-statistics were calculated using the Newey-West standard errors. The first row has the coefficients of respective regressors and the second provides the t-statistics in parenthesis. Three different samples are considered: 1929-2000 1929-1990 and 1950-2000. d_t - l_t is the demeaned difference between log dividends and log labor income at time t. p_t - d_t is the demeaned difference between log price and log dividends at time t. $\Delta l_{t-1,}$ Δp_{t-1}, and Δd_{t-1} are lagged log growth rates of respectively labor income, price and dividends. Intercepts were included in the regressions, but they are not reported.

Table VII. Price-Dividend Ratio Variance Decomposition

	1950-1990	1929-2000	1929-1990	1950-1990	1929-2000	1929-1990
		VAR(0)			VAR(1)	
			Including Labor Income			
$var(s_{d,t})$	0.1418	0.1541	0.3231	0.1592	0.0779	0.1698
$var(s_{r,t})$	1.2641	1.3453	1.5116	1.302	1.1234	1.2532
$-2cov(s_{d,t}, s_{r,t})$	-0.4059	-0.4994	-0.8347	-0.4612	-0.2013	-0.423
$corr(s_{d,t}, s_{r,t})$	0.4794	0.5484	0.5972	0.5065	0.3403	0.4584
			Excluding Labor Income			
$var(s_{d,t})$	0.0306	0.0053	0.0125	0.0476	0.0111	0.0145
$var(s_{r,t})$	0.9745	1.0189	0.8989	1.2876	0.8459	0.8626
$-2cov(s_{d,t}, s_{r,t})$	-0.005	-0.0242	0.0886	-0.3352	0.143	0.1228
$corr(s_{d,t}, s_{r,t})$	0.0146	0.1653	-0.4186	0.6773	-0.7372	-0.5484

Notes: This table reports the results of the variance decomposition of the price-dividend ratio including or not labor income growth and labor income-dividend ratio in the information set. Three sub-samples are considered: 1950-1990, 1929-2000 and 1929-1990. $var(s_{d,t})$ is the percentage of the total variance that is due to dividend growth. $var(s_{r,t})$ is the percentage of the total variance that is due to returns. $-2cov(s_{d,t}, s_{r,t})$ is the percentage of the total variance that is due to the covariance term. $corr(s_{d,t}, s_{r,t})$ is the correlation between the state variables.

Table VIII. Variance Decomposition of the Innovations to Price-Dividend Ratio and Returns

	1950-1990	1929-2000	1929-1990	1950-1990	1929-2000	1929-1990
		VAR(0)			VAR(1)	
			Price-Dividend Ratio Innovations			
$var(s_{d,t})$	0.617	0.263	0.313	0.641	0.142	0.170
$var(s_{r,t})$	1.743	1.284	1.274	1.615	1.146	1.168
$-2cov(s_{d,t}, s_{r,t})$	-1.360	-0.547	-0.586	-1.256	-0.288	-0.337
$corr(s_{d,t}, s_{r,t})$	0.656	0.471	0.465	0.617	0.357	0.379
			Unexpected Returns			
$var(\Delta d_t)$	0.425	0.442	0.492	0.446	0.433	0.482
$var(s_{d,t})$	0.289	0.168	0.187	0.289	0.087	0.097
$var(s_{r,t})$	0.815	0.822	0.763	0.727	0.704	0.668
$-2cov(\Delta d_t, s_{r,t})$	0.794	0.422	0.472	0.788	0.262	0.289
$-2cov(s_{d,t}, s_{r,t})$	-0.636	-0.350	-0.351	-0.566	-0.177	-0.193
$2cov(\Delta d_t, s_{d,t})$	-0.687	-0.505	-0.563	-0.684	-0.310	-0.343

Notes: Notes: This table reports the results of the variance decomposition of the unexpected changes to price-dividend ratio and unexpected returns including labor income growth and labor income-dividend ratio in the information set. Three sub-samples are considered: 1950-1990, 1929-2000 and 1929-1990. $var(s_{d,t})$ is the percentage of the total variance that is due to dividend growth. $var(s_{r,t})$ is the percentage of the total variance that is due to returns. -2cov(x,y) is the percentage of the total variance that is due to this covariance term. $corr(s_{d,t}, s_{r,t})$ is the correlation between the state variables. $var(\Delta d_t)$ is the percentage of the total variance that is due current dividends.

Table IX – Forecast Error Variance Decomposition of Stock Price, Dividend, Labor Income Growth in terms of Expected Return, Transitory Dividend and Permanent Dividend Shocks

	Permanent Dividend	Transitory Dividend	Expected Return
		1929-2000	
Δp_t	0.150	0.060	0.790
Δd_t	0.362	0.571	0.067
Δl_t	0.803	0.178	0.019
		1929-1990	
Δp_t	0.160	0.049	0.792
Δd_t	0.369	0.561	0.070
Δl_t	0.800	0.170	0.030
		1950-2000	
Δp_t	0.027	0.005	0.969
Δd_t	0.040	0.925	0.035
Δl_t	0.792	0.057	0.151
		1950-1990	
Δp_t	0.033	0.014	0.953
Δd_t	0.072	0.505	0.424
Δl_t	0.760	0.072	0.168

Notes: The variances decomposition is performed for three different samples: 1929-2000, 1929-1990, 1950-1990 and 1950-2000. The first column identifies the variables and each of the three following columns shows the percentage of the variance that is explained by each shock.. $\Delta p_{t,}$ Δd_t and Δl_t are respectively the log growth rates of stock prices, dividends and labor income

Table X –Variance Decomposition of Innovations to Price-Dividend Ratio and Returns in terms of Expected Return, Transitory Dividend and Permanent Dividend Shocks.

	Permanent Dividend	Transitory Dividend	Expected Return
		1929-2000	
$(E_t\text{-}E_{t-1})(p_t\text{-}d_t)$	0.000	0.130	0.870
$r_t\text{-}E_{t-1}r_t$	0.169	0.053	0.779
		1929-1990	
$(E_t\text{-}E_{t-1})(p_t\text{-}d_t)$	0.000	0.111	0.889
$r_t\text{-}E_{t-1}r_t$	0.185	0.052	0.762
		1950-2000	
$(E_t\text{-}E_{t-1})(p_t\text{-}d_t)$	0.000	0.255	0.745
$r_t\text{-}E_{t-1}r_t$	0.031	0.005	0.964
		1950-1990	
$(E_t\text{-}E_{t-1})(p_t\text{-}d_t)$	0.000	0.352	0.648
$r_t\text{-}E_{t-1}r_t$	0.040	0.001	0.959

Notes: The variances decomposition is performed for three different samples: 1929-2000, 1929-1990, 1950-1990 and 1950-2000. The first column identifies the variables and each of the three following columns shows the percentage of the variance that is explained by each shock. $(E_t\text{-}E_{t-1})(p_t\text{-}d_t)$ is unexpected change in log price-dividend ratio. $p_t\text{-}d_t$ is log price-dividend ratio. $r_t\text{-}E_{t-1}r_t$ is the unexpected return.

Table XI – Variance Decomposition of Price- Earnings Ratio, Stock Price, Earnings, Labor Income Growth and others in terms of Expected Return, Transitory Earnings and Permanent Earnings Shocks.

	Current earnings	Expected earnings	Expected return
$(E_t\text{-}E_{t-1})(p_t\text{-}e_t)$	0.059	0.188	0.753
$r_t\text{-}E_{t-1}r_t$	0.305	0.003	0.692
Δp_t	0.271	0.008	0.720
Δe_t	0.413	0.301	0.286
Δl_t	0.799	0.154	0.047

Notes: The variances decomposition is performed with full sample 1929-2000. The first column identifies the variables and each of the three following columns shows the percentage of the variance that is explained by each shock. $(E_t\text{-}E_{t-1})(p_t\text{-}e_t)$ is unexpected change in log price-earnings ratio. $r_t\text{-}E_{t-1}r_t$ is the unexpected return. Δp_t, Δe_t and Δl_t are respectively the log growth rates of stock prices, earnings and labor income.

Table XII – Returns Predictive Regressions Revisited – 1929-2000

Panel A – Regressor: Dividend Yield

	Excess Returns				Real Returns			
H	b	se(b)	t(b)	R2	b	se(b)	t(b)	R2
1	0.147	0.070	2.088	0.057	0.090	0.070	1.277	0.024
2	0.285	0.130	2.191	0.098	0.179	0.135	1.326	0.043
3	0.437	0.179	2.434	0.172	0.269	0.185	1.449	0.077
4	0.582	0.220	2.650	0.252	0.359	0.232	1.550	0.109
5	0.758	0.233	3.256	0.330	0.474	0.264	1.798	0.144

Panel B - Regressor: Expected Return State Variable

	Excess Returns				Real Returns			
H	b	se(b)	t(b)	R2	b	se(b)	t(b)	R2
1	0.167	0.061	2.729	0.092	0.107	0.061	1.749	0.043
2	0.323	0.115	2.801	0.161	0.210	0.119	1.768	0.077
3	0.433	0.142	3.057	0.222	0.262	0.150	1.751	0.096
4	0.549	0.160	3.433	0.299	0.336	0.185	1.823	0.127
5	0.705	0.171	4.111	0.385	0.453	0.217	2.085	0.178

Panel C - Regressors: Cash Flow and Expected Return State Variables

	Excess Returns				Real Returns			
H	b	se(b)	t(b)	R2	b	se(b)	t(b)	R2
1	0.216	0.228	0.951	0.107	0.177	0.244	0.724	0.055
	0.131	0.073	1.782		0.078	0.075	1.041	
2	0.377	0.367	1.027	0.185	0.290	0.396	0.733	0.093
	0.254	0.131	1.934		0.157	0.140	1.122	
3	0.116	0.430	0.270	0.224	0.043	0.479	0.089	0.096
	0.410	0.182	2.255		0.254	0.192	1.323	
4	-0.034	0.486	-0.069	0.299	-0.037	0.568	-0.066	0.127
	0.556	0.226	2.466		0.344	0.240	1.434	
5	-0.104	0.492	-0.210	0.386	0.005	0.612	0.008	0.178
	0.728	0.235	3.098		0.452	0.269	1.681	

Notes: These are predictive regression of excess returns and real returns on three different sets of regressors, described in each panel, for horizon of H years. The returns are accumulated for H years and the regressors are in lagged values. b is the coefficient on the lagged dividend yield. t-stat and R2 correspond to the t-statistic and R-squared of the regression. In the case of Panel C, the first rows correspond to the Cash Flow state variable and the second rows to the Expected Return state variable.

Table XIII – Returns Predictive Regressions Revisited – 1950-2000

	Panel A - Regressor: Dividend Yield							
	Excess Returns				Real Returns			
	b	se(b)	t(b)	R2	B	se(b)	t(b)	R2
1	0.148	0.076	1.944	0.080	0.107	0.075	1.439	0.048
2	0.231	0.145	1.597	0.097	0.174	0.149	1.169	0.059
3	0.287	0.193	1.492	0.115	0.229	0.207	1.108	0.071
4	0.380	0.249	1.525	0.145	0.337	0.263	1.283	0.104
5	0.652	0.307	2.126	0.258	0.599	0.317	1.892	0.204
	Panel B - Regressor: Expected Return State Variable							
	Excess Returns				Real Returns			
	b	se(b)	t(b)	R2	B	se(b)	t(b)	R2
1	0.149	0.070	2.141	0.089	0.104	0.065	1.602	0.051
2	0.259	0.135	1.920	0.136	0.191	0.133	1.435	0.081
3	0.316	0.176	1.792	0.157	0.241	0.179	1.341	0.091
4	0.421	0.213	1.979	0.199	0.352	0.217	1.627	0.132
5	0.689	0.240	2.865	0.321	0.611	0.241	2.536	0.247
	Panel C - Regressors: Cash Flow and Expected Return State Variables							
	Excess Returns				Real Returns			
	b	se(b)	t(b)	R2	B	se(b)	t(b)	R2
1	0.103	0.270	0.380	0.091	0.002	0.290	0.008	0.051
	0.140	0.080	1.739		0.104	0.078	1.327	
2	0.540	0.371	1.456	0.172	0.319	0.419	0.761	0.095
	0.205	0.149	1.376		0.158	0.154	1.026	
3	0.486	0.458	1.062	0.183	0.233	0.540	0.432	0.098
	0.263	0.194	1.354		0.215	0.211	1.018	
4	0.491	0.590	0.832	0.221	0.250	0.693	0.361	0.138
	0.364	0.251	1.451		0.323	0.264	1.221	
5	0.480	0.761	0.631	0.335	0.230	0.864	0.266	0.250
	0.632	0.299	2.110		0.581	0.304	1.915	

Notes: These are predictive regression of excess returns and real returns on three different sets of regressors, described in each panel, for horizon of H years. The returns are accumulated for H years and the regressors are in lagged values. b is the coefficient on the lagged regressor. t-stat and R2 correspond to the t-statistic and R-squared of the regression. In the case of Panel C, the first rows correspond to the Cash Flow state variable and the second rows to the Expected Return state variable.

Table XIV – Dividend Growth Predictive Regressions Revisited – 1929-2000

H	b_{dy}	$se(b_{dy})$	t-stats	R2
Panel A - Regressor: Dividend Yield				
1	0.009	0.035	0.265	0.001
2	-0.010	0.064	-0.155	0.000
3	-0.007	0.079	-0.088	0.000
4	0.024	0.109	0.216	0.001
5	0.050	0.126	0.397	0.005
Panel B - Regressor: Cash Flow State Variable				
H	b_{cf}	$se(b_{cf})$	t-stats	R2
1	0.265	0.147	1.798	0.079
2	0.404	0.214	1.887	0.113
3	0.444	0.232	1.909	0.123
4	0.572	0.237	2.411	0.171
5	0.730	0.191	3.815	0.249
Panel C - Regressors: Cash Flow and Expected Return State Variables				
H	b_{cf}, b_{er}	$se(b_{cf})$, $se(b_{er})$	t-stats	R2
1	0.269	0.137	1.969	0.079
	-0.003	0.035	-0.090	
2	0.442	0.187	2.369	0.116
	-0.030	0.063	-0.480	
3	0.480	0.211	2.277	0.125
	-0.030	0.080	-0.370	
4	0.578	0.249	2.323	0.171
	-0.004	0.122	-0.036	
5	0.712	0.211	3.382	0.249
	0.015	0.138	0.111	

Notes: These are predictive regression of log dividend growth on three different sets of regressors, described in each panel, for horizon of H years. The growth rates are accumulated for H years and the regressors are in lagged values. b is the coefficient on the lagged regressor. t-stat and R2 correspond to the t-statistic and R-squared of the regression. In the case of Panel C, the first rows correspond to the Cash Flow state variable and the second rows to the Expected Return state variable.

Table XV – Dividend Growth Predictive Regressions Revisited – 1950-2000

Panel A - Regressor: Dividend Yield				
H	b_{dy}	$se(b_{dy})$	t-stats	R2
1	0.033	0.031	1.060	0.010
2	0.018	0.054	0.340	0.002
3	0.015	0.067	0.227	0.001
4	0.035	0.083	0.424	0.004
5	0.080	0.109	0.737	0.017
Panel B - Regressor: Cash Flow State Variable				
H	b_{cf}	$se(b_{cf})$	t-stats	R2
1	0.596	0.178	3.346	0.232
2	0.682	0.176	3.866	0.261
3	0.768	0.179	4.299	0.277
4	0.840	0.189	4.440	0.283
5	1.019	0.218	4.666	0.331
Panel C - Regressors: Cash Flow and Expected Return State Variables				
H	b_{cf}, b_{er}	$se(b_{cf})$, $se(b_{er})$	t-stats	R2
1	0.577	0.202	2.851	0.234
	0.013	0.032	0.398	
2	0.689	0.202	3.405	0.261
	-0.005	0.050	-0.103	
3	0.782	0.175	4.464	0.278
	-0.010	0.058	-0.174	
4	0.822	0.145	5.659	0.283
	0.014	0.071	0.201	
5	0.949	0.165	5.768	0.341
	0.062	0.087	0.716	

Notes: These are predictive regression of log dividend growth on three different sets of regressors, described in each panel, for horizon of H years. The growth rates are accumulated for H years and the regressors are in lagged values. b is the coefficient on the lagged regressor. t-stat and R2 correspond to the t-statistic and R-squared of the regression. In the case of Panel C, the first rows correspond to the Cash Flow state variable and the second rows to the Expected Return state variable.

Notes to Figures: All figures present impulse response functions for the following variables: ln(L), log of labor income; ln(D), log of dividends, ln(P), log of stock price; ln(D/L), log of dividend-labor income ratio; and ln(D/P), log of dividend-price ratio. The last two are demeaned.

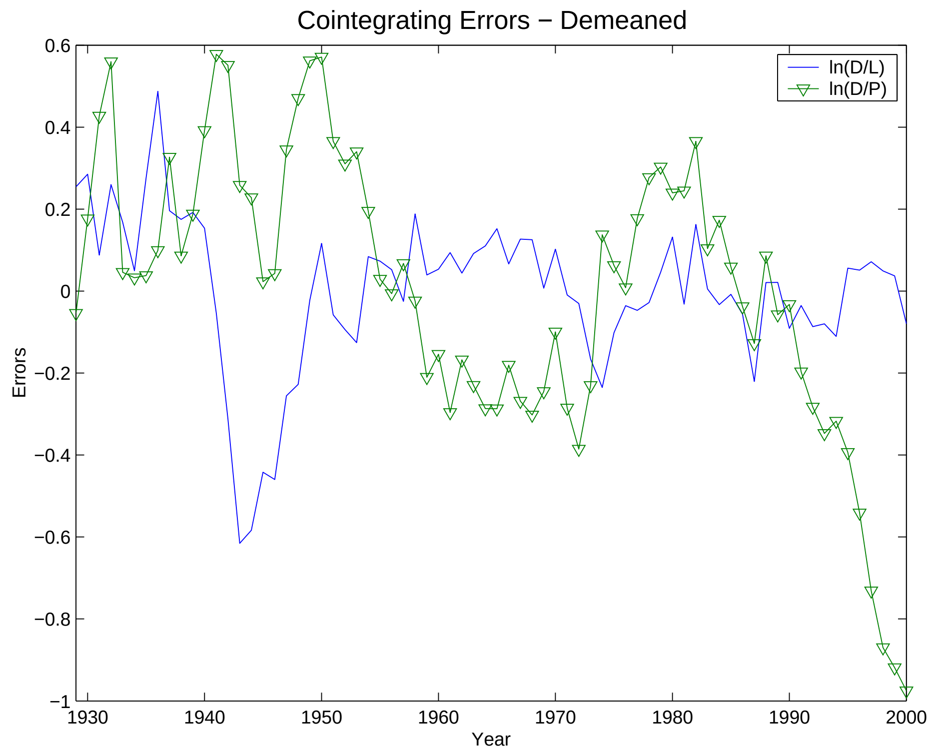

Figure 1

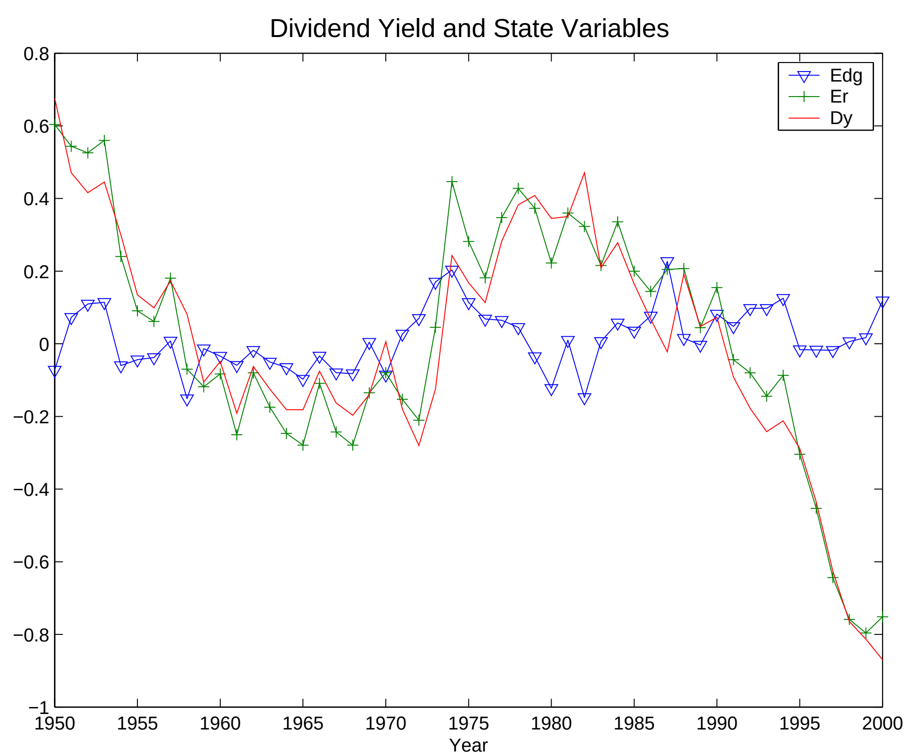

Figure 2

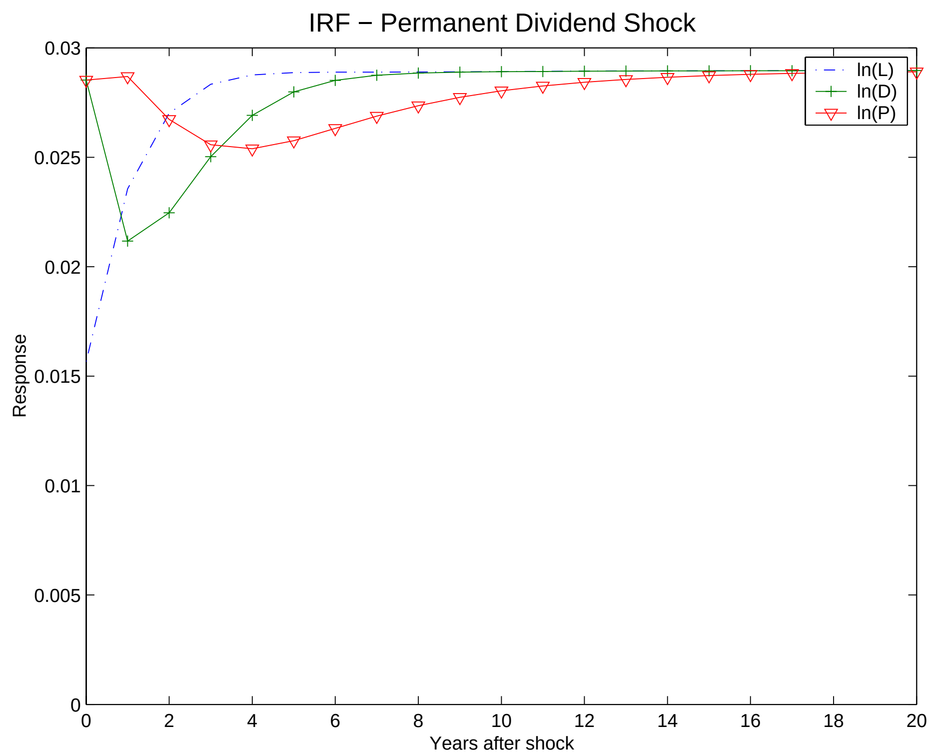

Figure 3. Data: 1950-1990

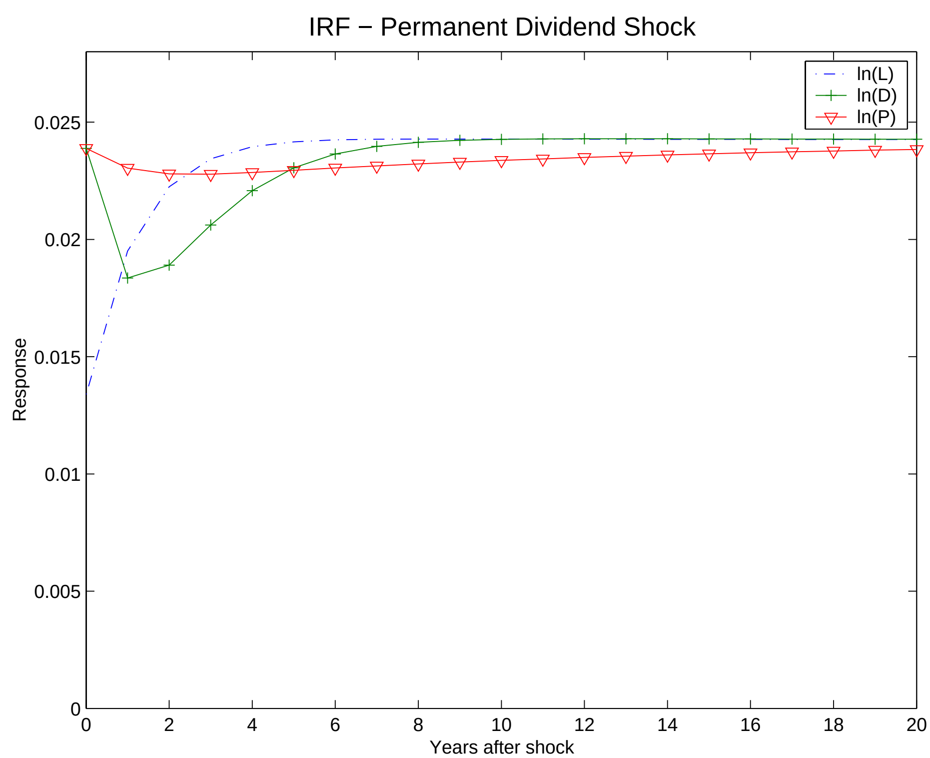

Figure 4. Data: 1950-2000

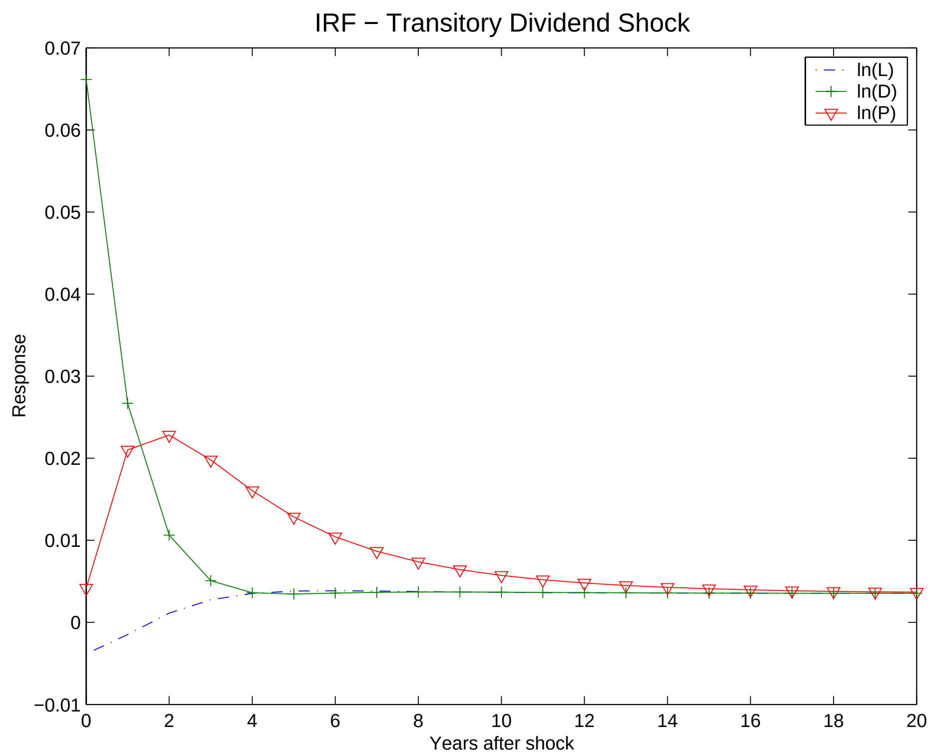

Figure 5. Data: 1950-1990

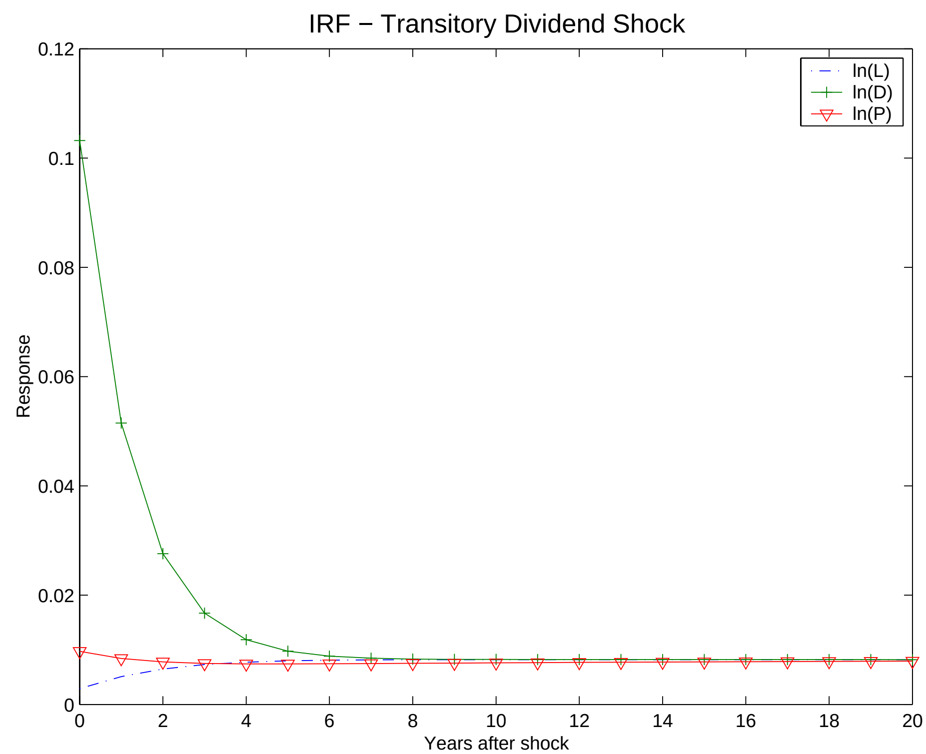

Figure 6. Data: 1950-2000

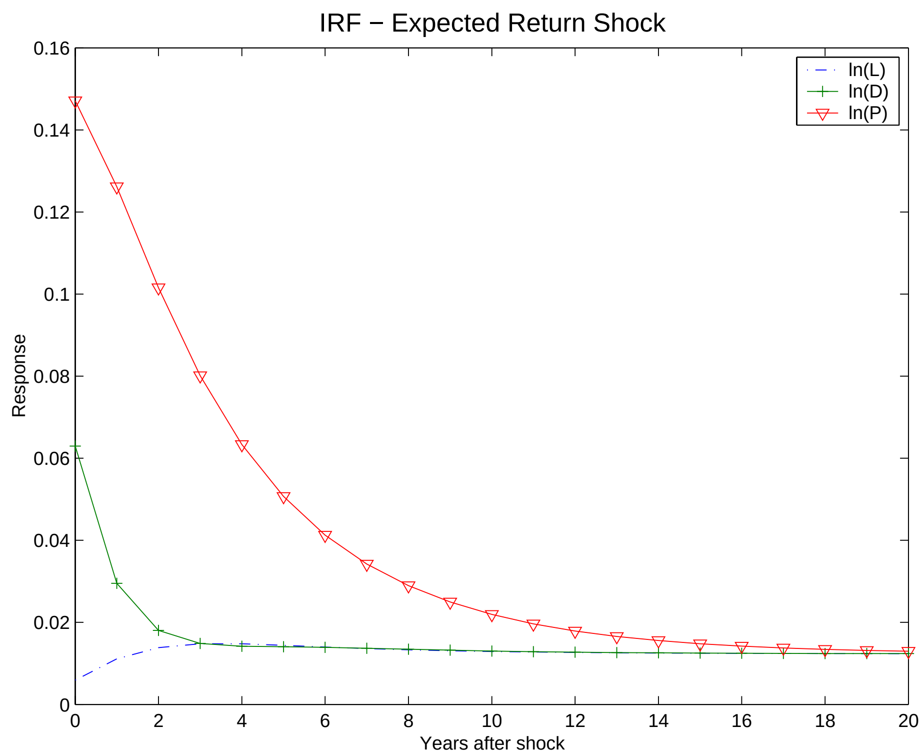

Figure 7. Data: 1950-1990

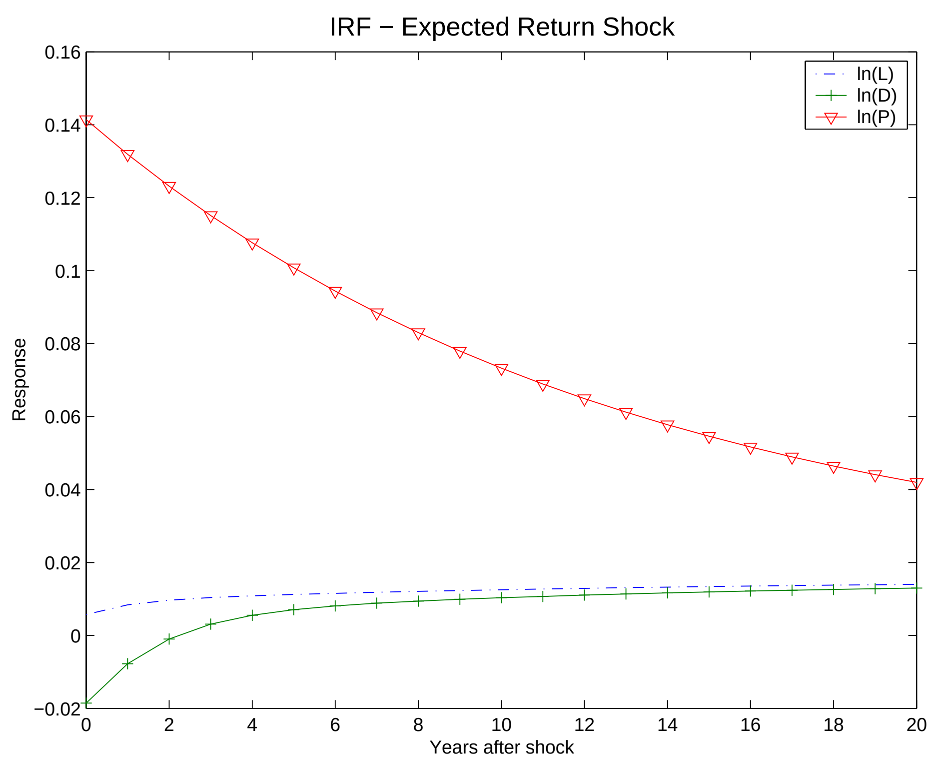

Figure 8. Data: 1950-2000