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ABSTRACT

Previous research showed that the dividend price ratio process changed remarkably during the 1980's and 1990's, but that the total payout ratio (dividends plus repurchases over price) changed very little. We investigate implications of this difference for asset pricing models. In particular, the widely documented decline in the predictive power of dividends for excess stock returns in time series regressions in recent data is vastly overstated. Statistically and economically significant predictability is found at both short and long horizons when total payout yield is used instead of dividend yield. We also provide evidence that total payout yield has information in the cross-section for expected stock returns exceeding that of dividend yield and that the high minus low payout yield portfolio is a priced factor. The evidence throughout is shown to be robust to the method of measuring total payouts.

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I. Introduction

While the irrelevance theorem of Miller and Modigliani (1961) implies that there is no reason to suspect that dividends play a role in determining equity price levels or equity returns, the theorem is silent on the usefulness of dividends in explaining these variables. It is then, perhaps, not surprising that there is a considerable literature exploiting the properties of dividends and dividend yields to better understand the fundamentals of asset pricing. Motivation comes from variations of the Gordon growth model in which dividend yields can be written as the return minus the dividend's growth rate (see, for example, Fama and French (1988)), from consumption-based asset pricing models in which the firm's dividends covary with aggregate consumption (e.g., Lucas (1978) and Shiller (1981)), and so forth.

We argue that this underlying motivation, however, really refers to distributed cash flow going to equity holders, be it dividends, or anything that substitutes for dividends, in particular, repurchases. At first glance the reader might be puzzled, since we can write the per share price in terms of expected future dividends, seemingly leaving no role for repurchases. This viewpoint, however, assumes that the way the firm distributes cash flow is fixed. Treating the per share price as a constant function of future expected dividends implicitly assumes that the firm's dividend policy and its repurchase policy are not related. This is not necessarily the case. For example, consider a firm which substitutes randomly between dividends and repurchases. Taxes and asymmetric information considerations aside, it is clear that there is nothing special about dividends versus other cash flow distributions -- the value of this firm is related to total payouts to shareholders regardless of their form.

To the extent researchers find dividends to be a useful variable for empirically characterizing asset pricing models (e.g., Fama and French (1988), Campbell and Shiller (1988b), Hodrick (1992), and Cochrane (1998)), two potentially important questions are how well do we empirically measure this variable, and what are the implications of any mismeasurement? This issue is not vacuous as there is recent substantive evidence that repurchases have substituted for dividend payments over the last 10 to 15 years (see, for example, Grullon and Michaely (2002), Dittmar and Dittmar (2002), and Brav, Graham, Harvey and Michaely (2003)). Thus, there is reason to believe that dividend and repurchase policies are not independent. It then remains an empirical question whether this change in payout policy is relevant to both time-series and cross sectional tests of asset pricing. Anecdotally, consistent with the last 10 to 15 years of dividend policy, there is an emerging literature arguing that dividend yield has lost some of its allure as a key empirical variable in asset pricing (e.g., Stambaugh (1999), Valkanov (2001), Lettau and Ludvigson (2001), Cochrane (2001), and Goyal and Welch (2003)). This paper provides a comprehensive analysis of the impact of measuring dividends versus payouts on existing empirical asset pricing model results. It also shows that the loss of the predictive power of dividends is related to the appropriate definition of dividends in asset pricing tests.

Measuring the exact portion of repurchases - or any other cash flow for that matter, e.g., equity issuances - that is meant to substitute for dividends is difficult, if not impossible, to discern. In this paper we focus primarily on repurchases and consider two existing measures in the literature, *total repurchase yield* (Grullon and Michaely (2002)), the total value of dollar repurchases normalized by price, and *net repurchase yield* (Fama and French (2001)), a measure based on changes in the treasury stock. The latter method attempts to identify repurchases that are not related to employees' stock option exercise. Figure 1 graphs aggregate dividends, the two repurchase measures and their ratio across the universe of COMPUSTAT firms from 1971 to 2002. Consistent with the literature, Figure 1 shows that payout yields are systematically underestimated if repurchases are ignored. For example, the ratio of *total repurchases* to total payouts hovers between 5% and 15% through the early 1980's, after which the ratio rises to a range of 30% to 50%, depending on the measure, by the end of the sample. We show that this result is not just a bias *per se* but also has potential cross-sectional explanatory power as the rank correlation between firms' dividend yield and firms' payout yield generally decreases over the sample. Moreover, the time series process for dividend yields is different than payout yields, which has important implications for asset pricing in the context of the existing literature. Interestingly, the time series processes for dividend yields prior to the emergence of repurchases as a significant form of distributing cash and that of payout yields after repurchases became dominant look remarkably similar. This supports this paper's thesis that repurchases should be taken into account.[1]

The omission of repurchases introduces a measurement error problem both in the time series as well as cross-sectionally. It introduces two opposite effects when trying to relate dividend yields to stock returns. On the one hand, because payout yields tend to be underestimated when measured as dividend yields, there is a scaling effect that tends to *overstate* the regression coefficient on dividend yields. On its own this has no effect on R^2s and test statistics, though. The second effect is the well-known measurement error problem due to variation in repurchases and the inherent issue of measuring the portion of repurchases substituting for dividends. This second effect tends to *diminish* the regression coefficients, lower the R^2s and lower the test statistics. We show that this measurement error is potentially an important issue from a theoretical perspective. Though, the focus of the paper is to document the empirical importance of measuring total payouts on asset pricing tests.

In particular, this paper looks at time-series regressions and cross-sectional regressions of asset returns on various measures of payout yields. The basic strategy in both cases is to first document the results using dividend yields, then show how the results change as we incorporate repurchases. We report several findings.

First, the evidence of stock return predictability is much stronger using total payout yields, which we sometimes refer to more succinctly as simply payout or total yield.[2] For example, for our sample period, 1926 to 2002, the regression of returns on dividend yields at an annual frequency and horizon generates an R^2 of 4.1% and an insignificant coefficient of 0.133 (with a t-statistic of 1.522). The total payout regression has an R^2 that is 75% higher, namely around 7%, irrespective of the exact repurchase measure used. The regression coefficients hover around 0.20, with highly significant t-statistics well above 2. This suggests that explanations of dividend yield's apparent decline as a predictive

[1] Independent of this work, Robertson and Wright (2003) make a similar point about mismeasurement of dividend yields *vis a vis* repurchases and equity issuance. They find that by accounting for this mismeasurement stronger evidence of time series predictability is present, which is one of our findings as well.

[2] While there are several empirical measures of payout yields, they refer generically to the sum of repurchases and dividends relative to price.

variable based on arguments such as spurious statistics, learning, *et cetera*, may not be valid. The result may simply be an outcome of using dividend yield instead of total payout yield. When the appropriate variable, total payout, is used, the results change. In particular, since in the early period total payout yield and dividend yield were practically synonymous, using the dividend yield as a proxy for payout yield did not cause significant biases and measurement errors. In the later period however, when the total yield and dividend yield are very different, using dividend yield in lieu of total yield not only biases the regression coefficient, but also reduce its explanatory power.

Second, we find very different implications for stock return predictability over long horizons using dividend yields versus payout yields. For instance, the five-year horizon R^2 for the dividend yield regression is 13.2%, while it is almost 50% higher for the total payout regressions, in the range of 19%. This is due to the total payout yield's higher short horizon predictive power, and in spite of its lower persistence. Its first order autocorrelation ranges from 0.87 to 0.90, while that of the dividend yield is closer to unit root, namely, 0.96. Naturally, we find this stationarity result comforting both from the perspective of the economic explanations of predictability as well as the statistical properties of these long-horizon regressions.

We conclude that if researchers ignore repurchases and estimate the dividend yield process, they would find the process has, not surprisingly in light of our findings, changed dramatically. This change coupled with weaker results at long horizons would lead to erroneous conclusions about long-term predictability.

Third, the cross-sectional evidence of payout yield being a factor for asset pricing is stronger than that for dividend yields. We perform non-parametric analysis as well as characteristic and factor regressions. In most cases the evidence supports the idea that measurement of payout yields is important for understanding cross-sectional variation in returns. For example, average monthly returns on three total payout portfolios grouped from low to high and based on *total repurchases (net repurchases)* range from 1.06% (1.06%), 1.25% (1.19%) to 1.34% (1.29%), respectively. In contrast, similarly organized dividend yield portfolios exhibit average monthly returns of 1.01%, 1.17% and 1.12%, respectively. Thus the cross-sectional relation between total payout yield and returns is much more distinct than the relation between dividend yield and returns. Moreover, while there is a consistent relation between average returns and payout yield in the context of Fama-French 3-factor model regressions, this is not the case for dividend yields. Most important, asset pricing restrictions of the Fama-French 3-factor model can be rejected for a cross-section of portfolios related to these factors and payout yield. Finally, when a payout yield factor is added to the mix we cannot reject the restrictions of the model (in contrast to a dividend yield factor).

This paper is organized as follows. Section II describes the data, including definitions, sources and statistical properties. In this section, the implications of measurement error are explored in a simple framework that illustrates the potential problem. In Section III, we investigate the time-series and cross-sectional implications of the measurement problem form an empirical viewpoint. Section IV concludes.

II. Payout Yields: Data and Implications

A. Data Description

For the cross sectional analysis, we follow closely the sample selection and variable construction methods of Fama and French (1992, 1993). Nonfinancial firms in the intersection of the CRSP monthly return file and COMPUSTAT annual files form the core of our sample. For consistency with previous work, we also require that each firm have COMPUSTAT data on book assets, book equity and earnings for its fiscal year ending in calendar year *t-1*. All fiscal year-end accounting variables in year *t-1* are merged with the monthly returns for July of year *t* to June of year *t+1*, thus ensuring that the accounting information is known prior to the returns that they are used to explain.

The book-to-market ratio is computed as the sum of fiscal year-end book equity (Compustat item #60) and balance sheet deferred taxes (Compustat item #74), divided by the CRSP market capitalization in December of the corresponding year. Firm size is the CRSP market capitalization as of June in year *t*. Thus, the book-to-market for year *t-1* and the firm size in June of year *t* are merged with the returns from July of year *t* to June of year *t+1*.

We compute "pre-ranking" beta estimates for each stock in July of year *t* by first regressing monthly returns on the contemporaneous and lagged market return, measured by the CRSP value-weighted index, using 24-60 months of historical data (as available). The pre-ranking beta estimate is the sum of the regression coefficients on the two market returns and is meant to adjust for nonsynchronous trading (Dimson (1979)). These estimates are updated annually each July by re-estimating the regressions after incorporating the most recent data. We note that the estimation of pre-ranking betas imposes the additional requirement of at least 24 months of historical returns data for inclusion in our tests of monthly returns.

To compute post-ranking betas, we begin by creating pre-ranking beta deciles using only NYSE-listed stocks that satisfy the data requirements outlined above. We merge in size breakpoints from Ken French's website to create 100 size/beta portfolios for which we create equal-weighted monthly returns. We then regress each portfolio's return series on the contemporaneous and lagged CRSP value-weighted return, and sum the resulting parameter estimates to obtain the post-ranking beta estimates.

For the construction of our repurchase and dividend variables, we construct two measures. The first measure, denote *total repurchases*, is based on Grullon and Michaely (2002). In that paper, repurchases are defined as the total expenditure on the purchase of common and preferred stocks (Compustat item #115) minus any reduction in the value of the net number of preferred stocks outstanding (Compustat item #56).[3] This data is available from the statement of cash flows for the period 1971-2002. We define dividends as the total dollar amount of dividends declared on the common stock of the firm during the year (Compustat item #21). Total payout yields are defined as the sum of dividends and *total repurchases* during the year, divided by the year-end market capitalization. Dividend yields are formed each year by dividing the total dividends paid during the year

[3] This measure of repurchase activity is similar to the one used by Jagannathan, Stephens and Weisbach (2000). While we measure the repurchase activity only for common stocks, their measure uses the entire repurchase activity, which also includes preferred stocks. The difference, however, is minimal (see Grullon and Michaely (2002)).

by the year-end market capitalization.[4] As with the book-to-market variable, both year-end *t-1* yield variables are merged with monthly returns from July of year *t* to June of year *t+1*.

There are several theoretical reasons why dividends and repurchases may be substitutes. First, from a tax perspective, firms may prefer to switch from dividend payments to repurchases, which are more tax effective. Second, in most agency (e.g. Jensen 1986) and signaling models (e.g., Miller and Rock, 1985) dividends and repurchases play a similar role. Indeed empirically, Grullon and Michaely (2002) provide two important pieces of evidence that support the idea of a substitution effect between repurchases and dividends. First, they show that, conditional on a particular dividend model, the difference between actual and expected dividend payments is negatively correlated with a firm's repurchase activity. Second, the market reaction upon an announcement of a dividend decrease is much less negative for firms that are repurchasing shares. Though these results support the substitution hypothesis, they provide a noisy measure of the exact portion of repurchases that are substitutes.

There are a number of reasons why repurchases may in fact be independent of a firm's dividend policy and therefore may not be appropriate as a substitute for dividends. For example, a firm might do one-off repurchases as a way of reducing agency conflicts within the firm (Jensen (1986)) or as a signal of the firm's being undervalued (Vermaelen (1984)). If dividend policy is not affected by such activities, then it is not clear that these repurchases will be helpful for our understanding of the risk-return relation that is the focus of this paper. Of course, a firm may change its dividend policy for the exact same reasons and be similarly uninformative about risk and returns (e.g., Miller and Rock (1985) and John and Williams (1985)).

Putting these considerations aside, however, Fama and French (2001) argue that a portion of repurchases is done in response to exercise of stock options. Hence repurchases substitute for forgone wages rather than for dividends, which is equivalent to directly paying employees the cash used for the repurchase. Fama and French (2001) provide

[4] In the asset pricing literature this variable has been traditionally defined as the dividend price ratio, while the dividend yield has been defined as the sum of dividends over the beginning of the period price. We have also used this alternative specification and found qualitatively similar results throughout.

evidence that accounting for employees' stock option exercise when calculating net repurchases result in a lower estimate of repurchases than when simply calculating the amount spent on repurchases. They also find that many firms that use cash to repurchase stocks use most (or all) of those stocks in lieu of employees' stock option exercise.

To account for the possibility that a significant portion of repurchases substitute for wages and has no impact on dividend policy, we employ a second measure for repurchases, denote *net repurchases*, described in Fama and French (2001). They define repurchases as the change in the firm's Treasury Stock (Compustat item #226), which is available from 1983 to 2002.[5] In theory, all repurchases used for employee compensation plans will result in a zero change in the firm's treasury stock as the increase due to the repurchase will be offset by the corresponding decrease due to the share distribution to employees. As Fama and French (2001) point out, this measure suffers from difficulties, most notably the lack of synchronicity between the repurchase program and employee stock distribution.[6] In addition, the question of measuring repurchases against *ex post* option exercise versus *ex ante* option issuance also clouds the picture. Arguably, measurement error of the *net repurchases* method may be significantly greater than *total repurchases*.

Time series analysis combines the standard data from CRSP with repurchase data from COMPUSTAT. In particular, the dependent variable, excess return on the market, is the total return on the CRSP value-weighted index minus a proxy for the riskless interest rate.[7] The dividend yield, total dividends over the past year divided by current price, is imputed directly from CRSP's return series by taking the difference in cum- and ex-dividend returns**.** The repurchase yield is calculated separately by taking total dollar repurchases during each year and dividing by the year-end market capitalization. Our total payout yield is the sum of dividend and repurchase yields.

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[5] Since the level of the treasury stock is available beginning in 1983, our repurchase measure based on the change in this variable is available beginning in 1984.

[6] Our variable construction mimics that presented in Appendix A.4. of Fama and French (2001). We also adjust for potential non-synchronicity by backing out any negative changes in the treasury stock that occur in the year subsequent a repurchase (i.e., positive change in the treasury stock).

[7] Due to data availability for our sample period we follow Goyal and Welch (2003) in using the three month rate instead of the one year rate. This should have no material effect on the results.

It is important to point out that, for the results to follow, the tendency of the measurement error in either *total repurchases* or *net repurchases* will be to dilute their impact. As a preview, we find strong support for repurchases being included as a payout measure for understanding the risk-return relation, and these results are robust to either of the repurchase measures.

B. Preliminary Data Analysis and Observations

As described earlier, Figure 1 illustrates total dividends and payouts, in addition to the ratio of dividends to total payouts, over the period 1971 to 2002. Several observations are of interest. First, there is a gradual increase in repurchases over the latter half of the sample. Since equity values increased dramatically over this period, neglecting repurchases leads to a substantial reduction in yields. This is an important point because whatever theory underlies dividend yield's usefulness in predicting stock returns probably does not distinguish how cash is distributed back to equity holders.[8] Second, though this increase is gradual, there is significant variation in the level of repurchases. This variation introduces noise in the comparison of dividend to payout yields, which may affect the relation, or lack thereof, between returns and yields. Third, assuming dividend yield is a relevant factor for asset pricing models, the question of whether Figure 1 suggests anything about these models depends on two conditions. The first condition is that the effect apparent from Figure 1 should be associated with meaningful variation cross-sectionally and/or with shifts in the time-series process for the yield measures during the period in which repurchases substitute for dividends. The second condition is that, assuming the first condition holds, it has a significant economic affect on empirical asset pricing. We deal with the former condition in this section and the latter condition in the next section.

In terms of the impact of the mismeasurement of payout yields, it is natural to ask whether the cross-section of firms varies across dividend, repurchase and payout yields. This matters because it is standard practice to evaluate factors and returns via the sorting

[8] A notable exception is the tax-based theories such as Brennan (1971) and Litzenberger and Ramaswamy (1979), in which dividends play a different role than repurchases.

of stocks into portfolios. Panel A of Figure 2 graphs the rank correlation between dividend and total payout yield year by year. Throughout the 1970's, this correlation was close to one. This is not surprising, as the primary cash payout method was dividends. However, by the mid 1980's the correlation had dropped to between 0.8 and 0.9 depending on the repurchase measure. It generally stayed in that range throughout the rest of the sample period (though hitting a low of 0.65 in 1998). In contrast, Panel B shows that the correlation between repurchase yields, i.e., the other component of payout yields, and total yields increased from 0.5 in the early 70's to around 0.8 in the 90's. Thus, remarkably, by the end of the sample period, ranking firms by repurchases was a more accurate assessment of payout yield ranks than using dividend yields. Interestingly, the rank correlation between the two repurchase yield measures hover around 0.9 throughout the sample, giving evidence of the robustness of the two measures.

The implication of this result is that asset pricing tests that need to measure cash distributions to shareholders are less likely to be able to accurately pick up economic effects if these studies ignore repurchases. One caveat, however, should follow. For those tests that are derived from theory (such as the consumption-based asset pricing models described earlier), it is fairly clear that one needs to include the portion of repurchases that substitute for dividends. However, it is not clear that the information content of share repurchase announcements is identical to that of dividend change announcements (e.g. Grullon and Michaely (2004)). Indeed, there is some evidence that repurchases have more explanatory power for expected returns than dividends (e.g., Lakonishok, Ikenberry and Vermaelen (1995) and Benartzi, Michaely and Thaler (1997)). Thus, if one takes the view that the variable of interest is the one that best explains variation in future returns (e.g., Fama and French (1992, 1993)), it may be the portion of repurchases not substituting for dividends that has the explanatory power.

Arguably more important than the cross-sectional characteristics of dividend versus payout yields are the time-series features. By far the strongest evidence and greatest use in asset pricing models is the treatment of dividend yield as the primary source of fundamental movements in asset prices, either directly through cash flow distributions or via its impact on time-varying expected returns. This literature covers the excess volatility studies (e.g., Shiller (1981), Grossman and Shiller (1981), Marsh and Merton (1986), Kleidon (1986), Campbell and Shiller (1988a), Campbell (1991) and Cochrane (1991), among others), the predictability of stock returns (e.g., Hansen and Singleton (1983), Fama and French (1988, 1989), Ferson and Harvey (1991) and Hodrick (1992)), and the process for dividend yields and its implications for returns (e.g., Campbell and Shiller (1988b), Cochrane (1998), Ang and Bekaert (2001), Lettau and Ludvigson (2001), Fama and French (2002) and Lewellen (2003)).

Table 1 provides a summary of the properties of the dividend and payout yield time-series processes over the sample periods commonly looked at in empirical studies. As documented by others, the time-series process for dividend yields is dramatically different in comparing the 1926-1985 to the 1926-2002 sample periods. In particular, the process is much more persistent (see, e.g., Goyal and Welch (2003)). For example, the AR(1) parameter increases from 0.804 to 0.963. This is a dramatic shift towards interpreting the dividend yield process as being nonstationary. This, in turn, casts doubt on the underlying economic intuition of stock return predictability. Table 1 presents Dickey-Fuller tests for nonstationarity using the autocorrelation coefficient (set up as an AR(1) regression with an intercept), i.e., the test statistic $(\hat{\rho}-1)/\hat{\sigma}_{\hat{\rho}}$. Using the Student-t distribution is inappropriate under the null of a unit root, so we use the critical values provided by Fuller (1996). For example, the 10% critical value is -2.57. The shift in autocorrelation from 0.804 for the subsample to 0.963 in the full sample translates into a shift from a test statistic of -2.450 to -0.649, a shift from borderline-rejection of the unit root null to being well within the confines of a unit root. Since the persistence of the dividend yield process, together with the short horizon stock return predictability coefficient, are the fundamental components of the stock returns/dividend yield relation for long-horizon regressions and excess volatility tests, there is little question that these results have a profound impact on our standard asset pricing models.

Table 1 provides alternative evidence that questions the above interpretation. If one treats the payout yield as the appropriate process to study, the shift in the process from the 1926-1985 sample to the 1926-2002 sample is much more marginal. In this case, the

AR(1) coefficient increases from 0.807 to just 0.868 using *total repurchases.* Since treasury stock data is only available beginning in 1984, the dividend yield and payout yield using *net repurchases* are identical from 1926-1984. Thus, we compare the total payout yield computed using *net repurchases* for the full sample (1926-2002) with the dividend yield for the partial sample (1926-1985). When we do, we see the AR(1) coefficient rise from 0.804 to 0.907.[9] The unit root test statistics are of much higher magnitude in the full sample, namely -2.275 and -1.431 using the two measures.

An alternative way to look at the time-series process for dividend yields and payout yields in the predictive regressions is to perform tests for a structural break. While in reality the shift (if any) is most likely gradual, we nevertheless choose 1985, the first period of an economically significant level of repurchases, as the "event date". The Chow test for structural break calls for the estimation of the model over the entire sample and the two subsamples. We obtain a sum of squared residuals for the full sample (RSS), for the early, pre-1985 subsample (RSS_E), and for the late, post 1985, subsample (RSS_L). Intuitively, a large difference between RSS and the sum $RSS_E + RSS_L$ signifies a structural break. Specifically, the test statistic is

$$F = \frac{[RSS-(RSS_E + RSS_L)]/k}{(RSS_E + RSS_L)/(n-2k)} \sim F(k,n-2k),$$

where n is the number of observations and k is the number of regressors.

We perform the test for the driving processes underlying the dividend and total payout processes, as well as the predictive regressions. Table 2, Panel C shows the dividend process does, indeed, experience a structural break. The F-statistic is 3.616, with a corresponding p-value of 0.032. The dividend yield predictive regression's F-statistic is 3.115, with a p-value of 0.051. Interestingly, irrespective of the repurchase measure used, similar calculations for the total payout process and related predictive regression do not show any evidence of a structural break. These results provide an interpretation for our earlier analysis of Dickey-Fuller tests statistics for a unit root. In particular, to the extent there is a break in the dividend price ratio time series, its stationarity is, not surprisingly,

[9] Note that, due to very few aggregate repurchases relative to aggregate dividends prior to 1985, the processes are quite similar.

jeopardized in the full sample, a result of the structural break. We may now interpret the test as a result of a structural break rather than the additional data providing true evidence against stationarity of the underlying series.

While the actual impact of this result for asset returns will be studied empirically in the next section, this finding tends to support the existing literature that relies on stationarity of dividend yields. Consider models that include dividend price ratios in VAR frameworks and exploit their implications for long-horizon expected returns (e.g., Campbell and Shiller (1988) and Cochrane (1998)). If one uses total payout as aggregate distributions to shareholders, one will reach similar conclusions to this earlier literature with respect to volatility of returns and decomposition into time-varying risk premiums versus cash flow risk.

Aside from making stationarity assumptions about dividend yields in theoretical finance models, some economists argue that stationary systems are a natural outcome of the equilibrium process. In this context, the above results lend support to the idea that payout yields are a more appropriate measure of cash flow distributions (and the underlying economic fundamentals) than dividend yields, confirming previously mentioned evidence in Grullon and Michaely (2002) and Dittmar and Dittmar (2002), albeit from a different perspective. Although we do not investigate the implications of the changed process for dividend growth versus payout growth rates in this paper, the results in Table 1 should prove useful for current research that focuses on the properties of dividend growth rates (e.g., Ang and Bekaert (2001), Lettau and Ludvigson (2001) and Menzly, Santos and Veronesi (2003)) or for reevaluations of excess volatility studies (Shiller (1981) and Kleidon (1986)).

C. Measurement Error / Omitted Variables Model and Implications

In this section we specify a model that combines the effects of two standard problems that arise in empirical asset pricing, namely, omitted variables and measurement error. The model enhances our understanding of the possible biases that arise from measuring the payout ratio of equities with an error. We focus on the effect of the omission of repurchase yield from regressions of stock returns on total payout yields. In the true model, stock returns are assumed to be related to the current payout ratio, the sum of dividend yield, D, and share repurchase yield, B. Consistent with our empirical model we can assume that payout is measured as past year's cumulative dividends and share repurchases divided by today's price. The true model can, therefore, be written as a standard linear regression

$$R = \alpha + \beta(B + D) + \varepsilon \tag{1}$$

where R is the return on a stock or an index and $B+D$ is the total payout ratio, repurchase yield plus dividend yield, and ε is a random error term.

The typical procedure, however, is to regress returns on dividend yields:

$$R = \hat{\alpha} + \hat{\beta} D + \nu \tag{2}$$

Note that total payout is measured with error, the omission of repurchase yield. Without loss of generality we can model the dividend yield as a fraction of the total payout yield,

$$D = \theta(D + B) + \xi \tag{3}$$

Modeling the fraction dividends are of total payout as time-varying is consistent with our data. To the extent we may assume that the error is mean zero, dividends are on average a fraction θ of total payout.[10]

Our alternative procedure is to incorporate repurchases (either *total* or *net*) into regression (1) albeit with the type of measurement error described in Section II.A. Thus, if we define $\overline{B}$ as our measure of repurchases, then we run the regression

$$R = \tilde{\alpha} + \tilde{\beta}(\overline{B} + D) + \eta \tag{4}$$

$$\text{where } \overline{B} = \gamma B + \varsigma \,. \tag{5}$$

In terms of the earlier discussion regarding our repurchase measures, it is reasonable to assume that γ is larger for *total repurchases* than for *net repurchases* and greater than 1 (due to stock option compensation plans). It is also reasonable to assume that ς has a greater volatility for *net repurchases,* due to the difficulty in contemporaneously linking treasury stock changes to repurchases for stock grant purposes.

[10] This measurement model imposes a restriction on the distribution of the error, namely:

$$-\theta(D + B) < \xi < (1 - \theta)(D + B) \,.$$

While it is an empirical question whether model (2), with repurchases completely omitted, or (4), with repurchases measured with error, best approximates the true relation described in equation (1), it is possible to theoretically derive the impact of measurement error on the coefficient β and the regression's R^2. This is interesting because reasonable assumptions can be made about the extent of the measurement errors, namely the magnitude of θ and γ, and the volatilities of ξ and ς.

In particular, the probability limits of the estimated regression coefficients $\hat{\beta}$ and $\tilde{\beta}$ as a function of the true model regression coefficient, β, are

$$\text{plim}\left[\hat{\beta}\right] = \frac{Cov(R,D)}{Var(D)} = \frac{\theta\sigma^2_{D+B}}{\theta^2\sigma^2_{D+B} + \sigma^2_{\xi}}\beta,$$

$$\text{plim}\left[\tilde{\beta}\right] = \frac{Cov(R, D+\overline{B})}{Var(D+\overline{B})} = \frac{\left[1-(1-\gamma)(1-\theta)\right]\sigma^2_{D+B}}{\left[1-(1-\gamma)(1-\theta)\right]^2\sigma^2_{D+B} + (1-\gamma)^2\sigma^2_{\xi} + \sigma^2_{\varsigma}}\beta \quad .$$

In order to better understand the implications of these models first consider the case in which $\sigma^2{}_{\xi}$=0 (i.e., there are no measurement errors *per se*) and $\sigma^2{}_{\varsigma}$=0 (i.e., the problem is purely one of understating or overstating repurchases). The estimated betas are biased upward in the case of regression (2), $plim[\hat{\beta}] = \beta/\theta$ and downward in the case of regression (4), $plim[\tilde{\beta}] = \beta/[1-(1-\gamma)(1-\theta)]$, since $\gamma>1$. Intuitively, regressing on an understated (overstated) total payout ratio results in a compensating upward (downward) bias in the β coefficient. In order to understand the magnitudes, over the 1985-2002 period, we ran regressions (3) and (5) (assuming *Net Repurchases* equal *B*). Given estimates of $\theta=0.75$ and γ=1.8, the bias in $\hat{\beta}$ and $\tilde{\beta}$ are on the order of +33% and -17%, respectively.

These biases are, in fact, more general, and will hold true for the case when the measurement error effect is of negligible magnitude relative to payout volatility. Fixing the informativeness of payout yield, the more volatile this yield is the less critical is the measurement error. The more reasonable case, however, is to consider the impact of measurement error, i.e., when the measurement error variance is high relative to the volatility of the payout ratio, $\sigma^2{}_{\xi}$ and $\sigma^2{}_{\varsigma} \gg \sigma^2{}_{D+B}$. This is the classical case of the downward bias that is introduced by measurement error. While it is not possible to identify the measurement error from payout volatility, it is possible to generate intuition concerning the comparison of regression models (2) and (4).

Consider first regression model (2). If payout yield is relatively stable, but the breakdown of payout between dividends and repurchases is volatile, then the dividend yield becomes a very noisy measure of the truly informative variable, total payout ratio. The effect of the measurement error problem on the observed regression's R-squared can be examined by the ratio of the measured regression (2) R-squared, denoted $R^2_{(2)}$, to the true model's R-squared, denote R^2:

$$R^2_{(2)} \big/ R^2 = \frac{\theta^2 \sigma^2_{D+B}}{\theta^2 \sigma^2_{D+B} + \sigma^2_{\xi}}.$$

In terms of the explanatory power the only thing that matters is the signal to noise ratio, and the upward bias due to the omitted variables problem has effect only to the extent the breakdown is noisy.

It is also possible to derive the ratio of the measured regression (4) R-squared, denoted $R^2_{(4)}$, to the true model's R-squared, R^2, for the regression model using repurchases:

$$R^2_{(4)} \big/ R^2 = \frac{\left[1-(1-\gamma)(1-\theta)\right]^2 \sigma^2_{D+B}}{\left[1-(1-\gamma)(1-\theta)\right]^2 \sigma^2_{D+B} + (1-\gamma)^2 \sigma^2_{\xi} + \sigma^2_{\varsigma}}$$

Similar to the regression model (2), the R^2 is also biased downward, but is impacted by both the potential overstatement in repurchases γ, as well as measurement error in payouts and repurchases in regressions (3) and (5), respectively.

In order to compare the effect of complete omission, as in (2), to inclusion of a variable measured with error, as in (4), we may use the estimates of $\theta = 0.75$ and γ=1.8, and compute the relative R^2s across the two possibilities, which yields:

$$R^2_{(2)} \big/ R^2_{(4)} = \frac{\sigma^2_{D+B} + .47\sigma^2_{\xi} + .70\sigma^2_{\varsigma}}{\sigma^2_{D+B} + 1.78\sigma^2_{\xi}}.$$

Since the *total repurchases* measure is expected to have a small σ^2_ς, the analysis here suggests that the R^2 is significantly higher when we include noisy repurchases relative to complete omission of any repurchase measure. This is supportive of the idea that repurchases have an important role to play in measuring regressions like those given in equation (1). The same type of analysis can be derived for the *net repurchase* measure, in which we believe γ is close to one (and $\theta=0.75$ still), but σ^2_ς is considerably higher. In this case,

$$R^2_{(2)} \big/ R^2_{(4)} = \frac{\sigma^2_{D+B} + \sigma^2_\varsigma}{\sigma^2_{D+B} + 1.78\sigma^2_\xi}.$$

For *net repurchases* the assumption that σ^2_ς is small, hence, much smaller than $1.78\sigma^2_\xi$, is clearly much less valid. Whether using *net repurchases* is likely to provide an improvement relative to complete omission remains an empirical question. The degree to which *total repurchases* provides a higher R^2 than *net repurchases* depends on the relative magnitudes of the measurement error volatilities σ^2_ξ and σ^2_ς. It is, again, an empirical question which measure dominates though clearly there is a tradeoff between γ and σ^2_ς across the two measures.[11]

There are a few important caveats to this analysis. First, the omitted variables / measurement error model above refers to both the time series analysis as well as the cross sectional analysis. According to the above model, firm level dividends are a fraction of total payout, where there is some uncertainty about this fraction as measured by the noise term ξ. There is an implicit assumption in extending the problem to the aggregate level and making implications for the time series. In particular, the assumption is that the measurement error does not diversify away on the aggregate, and that there is a pervasive factor in this measurement error. This property is borne out by the data, as is apparent from the comparison of aggregate dividend and payout yields, and from the differing time series properties of these two yield series, as is demonstrated below. That said, we don't

[11] The measurement error problem also affects the test statistics of the regression coefficient with conclusions similar to those derived for the R-square (the measurement error problem lowers the t-statistic of the observed regression in a similar way).

view this paper as the last word on this particular point and believe there is room for further studying the firm-specific and pervasive components of the breakdown of the total payout yield.

Second, the analysis assumes the measurement error and omitted variables problem are the same from period to period. As documented in figures 1 and 2, the problem was minor prior to the 1980's and gradually worsened throughout the remaining period. A more careful examination would have to adjust the parameters θ, γ, $\sigma^2{}_\xi$ and $\sigma^2{}_\varsigma$ for the period in question. The directions of the effects, however, are robust and the implication of the analysis remains valid.

III. Empirical Results

The thesis of this paper is that if the cash flow distributions to equity holders has fundamental information about asset pricing, then researchers should be careful in using dividend yields alone if repurchases are used as a substitute. While previous literature has shown that repurchases and dividends are substitutes, and Section 2 showed the estimated process was more "consistent" if we include repurchases, the issue remains whether the mismeasurement is a problem empirically. In this section, we follow the strategy of Section 2. Specifically, we investigate the properties of the stock return/dividend yield relation in periods where repurchases were and were not prevalent, and then extend the analysis to include total payout yields. The analysis is performed both in the time-series and the cross-section.

A. Time-Series Analysis

By far the most important result in the literature on estimating time-varying expected returns is the predictive power of dividend yields. For example, Campbell, Lo and MacKinlay (1997) as well as Cochrane (2001), in their book chapters discussing predictability, give center stage to empirical results involving the dividend price ratio. This evidence has been looked at across asset classes, across industries, and across countries. While there is significant debate about dividend yields as predictors, especially at long horizons, part of its extra scrutiny is due to it being the most single-pointed variable. (For skeptical views, see Goetzmann and Jorion (1993), Nelson and Kim (1993), Stambaugh (1999), Bossaerts and Hillion (1999), Valkanov (2001) and Goyal and Welch (2003).) Goyal and Welch, for example, provide a detailed and thorough analysis of various measures of dividend yields and argue that the predictive power has been overstated both in- and out-of-sample. In particular, they document predictability prior to 1990 but show that this disappears when including the last decade. After considering various explanations, they argue that the most likely one is that the relation was spurious.

As shown above, in the last 15 years we have experienced a dramatic shift in the breakdown between payout yields and dividend yields (see also Cochrane (2001, P.391) and Allen and Michaely (2003)). Table 2 presents the results of aggregate time series regressions of the market excess return on the dividend and total payout yield. From 1926-1985 (Panel B), the coefficient on dividend yield is 0.294 with t-statistic and R^2 of 3.50 and 12.9%, respectively. However, when the recent history is included (Panel A), the coefficient drops to 0.133 with a corresponding t-statistic of 1.52 and R^2 of 4.1%. As the literature concluded, predictability based on dividend yields disappears. In the context of the omitted variables/measurement error analysis of Section 2.3, this should not be surprising. Recall that we would expect both R^2s and *t*-statistics to fall in the presence of measurement error.

Taking the R^2 calculations in Section II.C literally, it can be shown that the drop in R^2 means approximately 60% of the variation in dividend yields is due to variation from payout yields. While the coefficient estimate of returns on yields also drops substantially, it falls relatively less compared to the R^2 and *t*-statistic. This too is expected as the omitted variables problem leads to a partially offsetting effect. The estimates suggest a θ of around 70% in equation (1). While this is lower than the aforementioned estimate, note that throughout much of the earlier sample (i.e., pre 1970's) θ is close to one.

In contrast to the results for dividend yields, when we use the total payout yield as a predictor for the entire sample period the regression coefficients, *t*-statistics and R^2s change only mildly, and statistical significance is not lost. Interestingly, this is true irrespective of whether we use *total* or *net repurchases.* This should not be surprising as the γ and σ^2_ς effect the statistics in similar ways, and there is a tradeoff in this respect across the two measures. The results suggest that their effect is of similar magnitude, and improvement in the precision of either measure might substantially increase the model's predictability.

For the *total (net*) measure, the regression coefficient drops from 0.281 (0.294) to 0.200 (0.197), the *t*-statistic remains highly significant at any reasonable level, dropping from 3.47 (3.502) to 2.70 (2.241), and the R^2 drops from 11.5% (12.9%) to 7.2% (7.1%).[12] Again, we assume that the net payout yield is identical to the dividend yield during the 1926-1985 period since treasury stock data is unavailable pre-1984. This completely reverses the spirit of the result in Goyal and Welch (2003) and others documenting the disappearance of predictability using updated data but ignoring repurchases.

Panel C of Table 2 provides structural break tests for the one period predictive regressions. Consistent with the AR(1) structural break tests discussed above, but to our purpose more interesting, is the fact that a structural break can be detected when using dividends alone, and the break disappears when regressing returns on total payout (again, regardless of the measurement method). In particular, the P-value of the structural break test for dividends alone is 0.051. This indicates that statistically there is a discernable difference between the betas in the pre-85 and post-85 periods. This P-value rises to 0.165 (0.116) for total (net) payout yield. That is, there is no statistical evidence of instability in the predictive regression when using either measure of repurchases along with dividends.

Panel D of Table 2 provides a "horse race" between dividend yield and total payout yield. Consistent with our main thesis, total payout comes in highly significant, while dividend yield is insignificant, and the R^2 shows that, indeed, in the presence of repurchase yield there is only a small marginal contribution to dividend yield. Note that there is a slightly larger jump using the *net repurchase* measure, which is consistent with

[12] Robertson and Wright (2003) reach similar conclusions with respect to the measurement of dividend yields versus payout yields. Their results are reassuring since they use a different econometric specification (cointegrating VAR framework rather than predictive regressions), different data sources (e.g., Federal Reserve/Bureau of Economic Analysis) and alternative definition for total payout calculations (e.g., including new equity issues). They find that the total payout process is, indeed, less persistent, and that the cointegration restrictions implied by predictive regressions are not rejected with total payouts but is rejected with dividend yields.

contemporaneous correlation between dividends and *net repurchases*, and greater measurement error in *net repurchases*.

Table 2 also provides results on long-horizon regressions of stock returns on yield measures. The results refer to overlapping returns of one to five years. It is well known that the two key determinants of the long-horizon predictability are (i) the extent of predictability at short horizons, and (ii) the persistence of the regressor. The R^2 at long horizons *relative* to the single period R^2 is a function of (ii). Everything else the same (in particular, the single period predictability) higher persistence results in a higher fraction of long horizon returns that is explainable. As a function of the horizon the R^2 first rises with the horizon but eventually decay. The initial rise is due to the persistence; long horizon forecasts correlate with short horizon forecasts and the explained variance is hence nearly linear in the horizon, while the total variance is rising less rapidly with the horizon due to negative serial correlation. The effect diminishes eventually due to the exponential decline in the informativeness of the predictive variable, and in spite of the high persistence.

The results above for predictability and the persistence results presented in Table 1 suggest that there could be considerable differences when using dividend versus payout yields. Consistent with the existing literature on stock return forecastability (and dividend yield persistence), there is a general increase in the relation between stock returns and dividend yields as the horizon gets longer, i.e., in the coefficient estimate, *t*-statistics, and R^2s. This is true for the 1926-1985 period for both dividend and payout yields when the level of repurchases is insignificant. For example, in the dividend yield regression, the R^2s rise from 12.9% to 31.6% and the *t*-statistics from 3.50 to 4.83 for regressions from 1 to 5 years. Putting aside the statistical issues associated with long-horizon estimation and the joint nature of the horizon estimators, these results are the standard ones now quoted in various finance surveys, e.g., Fama (1998), Campbell, Lo and MacKinlay (1997), Cochrane (2001) and Campbell (2000).

When one extends the dataset to 2002, however, the evidence substantially diminishes in terms of significance. The coefficients are approximately one-half the size, the *t*-statistics are insignificant at standard significance levels and the R^2s vary (albeit increasing across horizons) from 4.1% to 13.2%. What is interesting about these results, however, is that one might expect the increased level of dividend yield persistence would have increased the long-horizon predictability. As pointed out above, though, the problem is that the initial amount of predictability at shorter horizons is minimal. While the evidence for payout yields is not quite as strong in the earlier sample period, it still provides substantive evidence of predictability. Though the coefficients drop in magnitude by 20% percent or so with the added data, the *t*-statistics are still all individually significant, and the R^2s vary from 7.2% to 19.2% for *total repurchases*, and from 7.1% to 18.9% for *net repurchases*. Again, the use of payout yields provides a consistent measure of the relation between returns and yields over both sample periods whereas dividend yields do not. The source for this difference is the substitution of dividends to repurchases in the latter part of the sample period.

The ratio of R^2s for long over short horizons, namely $R^2(5)/R^2(1)$, for the overall sample, is 0.132/0.041=3.22 for the dividend regression and 0.192/0.072=2.67 for the total payout regression (with *total repurchases*). This is, as we pointed out above, to be expected, given the higher persistence of the dividend process relative to that of the total payout process in the overall sample period. It does not diminish the fact that the long horizon predictability is overall smaller for the dividend regression in spite of its persistence, as the initial level of predictability is low. Interestingly, the subsample results line up perfectly with the payout regression. In particular, the ratio of R^2s for the dividend regression is 2.45 and it is 2.64 for the payout regression. It is not surprising that the two numbers are similar since dividends and payout line up almost perfectly in the early subsample, what is intriguing is that these numbers line up perfectly with the R^2 ratio for the full sample period payout regression. We view this as corroborating evidence on the stability of the economic effect when payouts are measured correctly.

B. Cross-Sectional Analysis

The idea that dividends can be a useful measure for expected stock returns has very early roots in finance (e.g., Dow (1920)). Nevertheless, the recent literature has focused more on dividend yield's time-series properties (primarily due to applications of consumption-based asset pricing models), and concentrated on other variables such as book-to-market, size, earnings yields and liquidity for explaining the cross-section.[13] In this section, we explore (i) whether yields are useful measures for describing cross-sectional variation in expected returns, and (ii) whether the different yield measures (i.e., payout versus dividend) lead to alternative conclusions.

As an illustration of the interest behind the cross-sectional relation between dividend yields and stock returns, consider the popular trading strategy, *Dogs of the Dow*. This strategy became popular in the early 90's and was motivated by empirical evidence. In its simplest form, this strategy amounts to buying the high yield portion (say a third) of the Dow Jones Index. In Burton Malkiel's (2003) well-known book, *A Random Walk Down Wall Street*, he describes how this strategy historically outperformed the Dow Jones by 2-3% per annum. Malkiel goes on to say, however, that once this strategy became popular, the returns disappeared – *"the dogs no longer hunt"* (pp. 246). On the surface, Malkiel is correct in that, over the 1985-2002 period, the difference has shrunk to 1.19%. Small sample considerations aside, however, this finding is puzzling in light of the Fama French-type analysis which suggests a tradeoff between risk and return. Note that Malkiel makes no correction for the amount of repurchases substituting for dividends during this period. When one does this, the difference emerges again, 3.70% using *total* and 2.73% using *net repurchases*. This example just serves notice that one must be cautious in interpreting cash flow payouts and their effect on returns.

For a more detailed comparison with previous studies, we begin by examining the characteristics of stocks as a function of our different yield measures. Each year at the end of June, we form ten portfolios based on the ranked values of dividend yield and total payout yield (using the two repurchase measures). Breakpoints are determined using only NYSE stocks with a positive yield. We choose positive yield stocks because the underlying risk-return theories relate to the magnitude of the yield and have nothing to say about zero yield stocks. Since there are periods when many firms do not pay dividends (see, for example, Fama and French (2001)), the sample size varies considerably throughout the analysis. That said, whenever relevant, we compare the results to the entire universe of stocks.

[13] An exception are the tests of the tax-based CAPM, e.g., Black and Scholes (1974), Litzenberger and

Table 3 presents the average return, post-ranking beta, log firm size, log book-to-market, yield and number of firms for each of the ten yield portfolios, as well as for a portfolio of zero-yield stocks. Panel A of Table 3 presents the results for dividend yield portfolios during the period July 1985 to December 2002 when repurchase activity is more common. For the most part, there seems to be little cross-sectional variation based on these portfolios, e.g., the lowest three deciles' mean is 1.01% monthly, the middle four is 1.17 % and the highest three is 1.12%. This contrasts to the July 1963 to June 1985 period (not reported in the tables), in which these same portfolios monotonically increase in dividend yield from 1.19% to 1.45% to 1.55%. In both periods, the average beta decreases with the dividend yield while the book-to-market variable exhibits a positive association with dividend yields.

As far as the average return is concerned, the portfolios formed on payout yield measures (Panels B and C) tell a different story. Most important, there is measurable cross-sectional variation in expected returns, the result being an almost monotonic relation between returns and payout yield. In terms of the examples given above, for *total repurchases* (*net repurchases*) the lowest three deciles' mean is 1.06% (1.06%), the middle four is 1.25% (1.19%) and the highest three is 1.34% (1.29%). Note that finding higher payout yield portfolios having higher realized returns is consistent with the time-series results documented in Section III.A. In that section, we documented higher returns during periods of high payout yields for the aggregate market. Like the dividend yield portfolios, the total payout yield portfolios seem to be negatively correlated with beta and positively correlated with book-to-market.

As is now standard in the literature, Table 4 performs Fama-MacBeth monthly return regressions on market betas, book-to-market, size and either dividend or total payout yield, over the period January 1985 to December 2002. Again, we focus on this later period, during which repurchases are no longer a negligible component of corporate payout policy. More specifically, we run cross-sectional regressions every month in order to generate a time series of parameter estimates. As in Fama and French (1992), each month we trim the smallest and largest 0.5% of the observations for book-to-market.

Ramaswamy (1979), and Miller and Scholes (1982).

Similarly, we trim the largest 5% of the observations for dividend yield and total payout yield. This trimming avoids giving extreme observations excessive weight in the regressions, although we also address this issue further by using robust regression below. Table 4 presents the average value of each parameter's time series, along with a corresponding standard error and t-statistic.

Interestingly, the standard result no longer applies. That is, neither book-to-market nor size appear to be important variables for explaining the cross-section. Is this due to the time period, the positive yield sample, or the inclusion of payout yield? To help answer this question, we re ran the analysis including zero yielding stocks, and book-to-market now comes in as highly significant. Though outside the topic at hand, this result suggests that the book-to-market effect is only relevant to the extent it tells us something about zero yielding stocks, some of which are more commonly aligned with the so-called growth category, some of which are former dividend payers.

More to the point of this paper, however, is that the payout yield coefficient is statistically significant, whereas the dividend yield coefficient is not. For example, the coefficient on payout yield using the *total repurchase* measure is 0.07 with a t-statistic of 2.17 versus basically -0.00 and a t-statistic of -0.01 for dividend yield. However, the results are somewhat noisy. Note that the *net repurchase* measure leads to a similar coefficient on payout yields, 0.05, but is no longer significant with a t-statistic of 1.45. Interestingly, estimating the coefficient of dividend yield in the July 1963 to June 1985 period (not shown in the tables) provides similar a coefficient, i.e., 0.05, but is also not significant. While some of the results are weak, they are all supportive of the overall finding of the paper that there has been a general shift between dividend yields and total payout yields during this period, which directly impacts empirical asset pricing.

One of the commonly cited problems in measuring the cross-section of returns is robustness. To complete the analysis, therefore, we extend our results to incorporate outliers. In particular, Knez and Ready (1997) argue that robust estimation should be applied due to outliers and find that the size effect reverses (becomes positive) when such a technique is applied. As such, it seems worthwhile applying a similar methodology here. We replicate the above analysis using a least absolute deviation (LAD) regression. Similar to Knez and Ready (1997), the standard size effect reverses sign and now is strongly significant. (The book-to-market effect remains insignificant.) The coefficient on payout yield is robust, however, and comes in stronger for both repurchase measures while the dividend yield remains unimportant. This is consistent with the declining rank correlation between payout yields and dividend yields during the 1985-2002 period described above and in Figure 2.

Given the evidence of cross-sectional covariation between stock returns and payout yield, we develop measures of both dividend and payout yields as potential factors. We begin by sorting firms into three dividend yield groups and three total payout yield groups each year, ignoring again the zero yielding stocks. We then construct nine portfolios from the intersection of the dividend and payout yield groups and compute equal-weighted average returns for each portfolio. Our dividend yield factor is computed as the average return across the three high dividend yield groups minus the average return across the three low dividend groups. The total yield factor is constructed analogously. Note that this approach mirrors Fama and French's (1993) method for forming the size and book-to-market factors and, as such, aids in purging the correlation between our two yield factors. The result of this procedure is three monthly time-series including: DYHML (corresponding to the dividend yield factor), TYHML (CF) (corresponding to the payout yield factor computed using *total repurchases* from the statement of cash flows), and TYHML (TS) (corresponding to the payout yield factor computed using *net repurchases* from the change in the treasury stock).

The analysis that we perform is standard and based on the original portfolio regressions performed by Fama and French (1993). We begin by merging data for the excess market return, SMB factor return, and HML factor return (all of which are obtained from Ken French's website) with our yield factors discussed above. These three time series, in addition to one of our yield factors, form the design matrix in our factor regressions. The dependent variables consist of monthly stock returns for three sets of 25 portfolios: beta/total payout yield, size/total payout yield, and book-to-market/total payout yield. To coincide with the existing evidence, these portfolios include zero yielding stocks. For the beta/total payout yield portfolios, we sort NYSE stocks in June of each year *t* into beta and (independently) total payout yield quintiles.[14] The 25 portfolios are then constructed from the intersection of the quintiles and an equal-weighted monthly return is computed. We then regress monthly excess portfolio returns on an intercept, the excess market return, SMB, HML and either DYHML, TYHML (CF) or TYHML (TS). Table 5 presents the estimated intercepts and yield coefficients, as well as the corresponding t-statistics.

Before commenting on the results with the dividend and payout yield factors, it is worthwhile documenting the findings for a conventional 3-factor model estimated on the three sets of portfolios described above: beta/total yield, size/total yield, and market-to-book/total yield.[15] Panel B of Table 6 summarizes the test results. In terms of the number of significant alphas, we find 7, 2 and 9 out of 25, respectively. Of course, these alphas may be correlated, which calls for a joint test. We look at the standard Wald test that the alphas are all equal to zero. The Wald tests produce test-statistics of 49.49, 57.46, and 86.41 respectively, all of which are asymptotically distributed $\chi^2(25)$ and highly statistically significant. That these tests reject the joint hypothesis that all of the intercepts are zero is potentially important. While it is not the first rejection of the Fama-French model (see Davis, Fama and French (2000) and Cremers (2003), among others), it does suggest that portfolios returns sorted in some way on payout yield cannot be solely explained cross-sectionally by the Fama-French factors.

To this point there is some evidence that payout yield may be a factor in describing expected returns. Across all three cross-section of portfolios sorted on payout yield and the other factors (i.e. beta, size, book-to-market), the alphas tend to be statistically indistinguishable from zero (see Panel A for the book-to-market/total payout portfolios in Table 5 as a representative). For example, relative to the three-factor model, for portfolios sorted on beta, size and book-to-market, the number of significant alphas for the dividend yield factor are 0, 1 and 2 compared to the payout yield factor having 0, 2 and 3 respectively out of 25 (see Panel B of Table 5) for the *total repurchase* measure and 0, 1

[14] Size and book-to-market quintiles are formed using the breakpoints downloaded from Ken French's website and the corresponding sets of portfolios are formed in the same manner as the beta/total payout yield portfolios.

[15] For expositional purposes related to Table length, Table 5 does not report these results or the results related to beta and size portfolios.

and 1 for *net repurchases*. While the alphas are probably correlated, suggesting a joint hypothesis, the evidence presented here is very suggestive of the importance of a yield factor albeit distinguishing less between dividend yield and payout yield.

To complete the analysis, we perform a Wald test analogous to the one described above, the results of which are presented in panel B of Table 5. We find respectively for the three sets of portfolios much lower Wald test-statistics of 18.88, 38.91, and 37.92 once the dividend yield factor is included. With the exception of the beta portfolios, however, the joint tests still reject the null hypotheses of zero intercepts. In contrast, other than for the size portfolios, the Wald test statistics are no longer significant when we use total payout instead of dividend yield. For the *total repurchase (net repurchase)* measures the Wald test-statistics are 23.52 (19.80), 40.87 (38.75), and 37.11 (33.61), respectively. From this perspective, therefore, there is greater evidence that the payout yield is a priced factor, i.e., it both explains the cross-section and reduces excess returns to zero.

In terms of the coefficients on the payout yield, approximately half of them are significant in the regressions, which suggests that they have useful information for describing cross-sectional variation above and beyond the usual factors. Moreover, the coefficients do appear to follow patterns, such as a positive correlation between the payout factor coefficient and payout sorted portfolios. For example, consider the 25 book-to-market/payout yield portfolios and the payout yield factor using *total repurchases*. The coefficients tend to be negative for the low payout yield portfolios irrespective of its book-to-market (i.e., -0.30, -0.07, -0.44, -0.53 -0.29) and increase almost monotonically as payout yields increase. For the highest payout yield portfolios, again independent of their book-to-market, the coefficients are the most positive, e.g., 0.56, 0.08, 0.24, 0.20 and 0.18 respectively. This finding is consistent with the results of Table 3 on the relation between average returns and payout yields, and shows that it carries through even in the presence of the well-documented 3-factor model of Fama and French. In contrast, the evidence for these patterns shows up less for the dividend yield factor coefficient.

Overall, the evidence suggests that (i) payout yields (including repurchases) have additional explanatory power for expected returns, and (ii) these yields generally outperform dividend yields, which supports the measurement issue.

IV. Concluding Remarks and Future Research

There is strong evidence in the literature that dividends and repurchases have been substitutes for each other over the past fifteen years. Evidence presented in this paper supports this literature. Therefore, asset pricing models that try to fundamentally relate dividends to asset prices need to take this result into account.

We present a number of important results in this context. First we show that both the cross-sectional and time-series properties of dividends have changed due to the shift towards repurchases. In fact, these properties, as measured from early samples where repurchases were economically immaterial, closely resemble those of total payouts. Second, with respect to implications of this finding for empirical asset pricing, we find that the time series predictability of stock returns (at both short and long horizons) is robust to payout yields over the sample period but not to dividend yields. Last, we provide evidence that payout yield has information and is priced in the cross-section of expected returns to a greater extent than dividend yields. These results strongly support the intuition that dividends and repurchases are substitutes, and give hope for existing asset pricing frameworks that have become disillusioned due to the use of dividends as a fundamental variable.

More important, new research begins to exploit complex properties of the process of dividend growth rates both at the aggregate and individual firm level. This paper suggests caution in how we interpret these new results. A better approach would be to look at the growth rate for total payouts and proceed along those lines.

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Figure 1

Aggregate Dividends and Repurchases Over Time

The sample consists of firms from the annual COMPUSTAT data files (1971-2002) with data for book equity, earnings, book assets, common dividends paid, repurchase of common stock (from the statement of cash flows), share price and shares outstanding. For the years, 1983 to 2002 we also require treasury stock data to calculate an alternative measure of share repurchases based on positive changes in the treasury stock each year. The height of the black bars correponds to the total dollar amount of dividends paid to common share holders. The height of the white bars from 1971 to 1983 correponds to the total dollar amount of gross repurchases measured from the statement of cash flows. The height of the dark grey bars correponds to the total dollar amount of share repurchases computed using changes in the treasury stock and, as such, are only present from 1984 to 2002. The height of the light grey bars is the difference between the two share repurchase measures (cash flow - change in treasury stock). All dollar figures are inflation adjusted to 2000 dollars using the all-urban CPI. The solid line presents the ratio of total common share repurchases (R) to the sum of common share repurchases and common dividends (D), where the repurchases are computed using the statement of cash flows. The dashed line presents the ratio of total share repurchases to the sum of share repurchases and common dividends, where the repurchases are computed using the change in treasury stock.

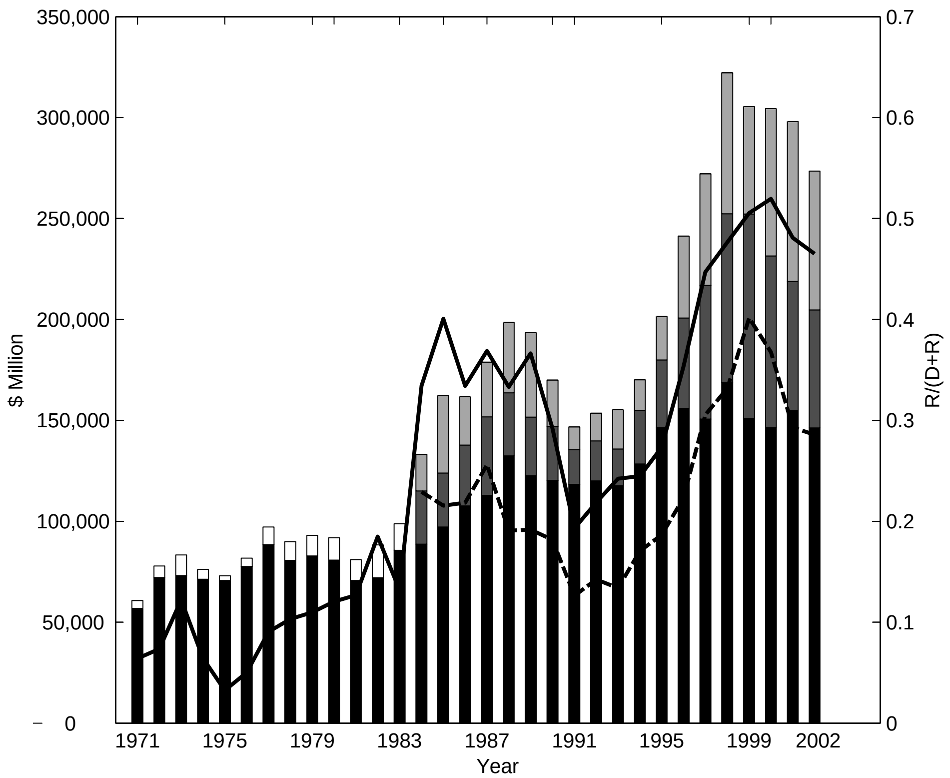
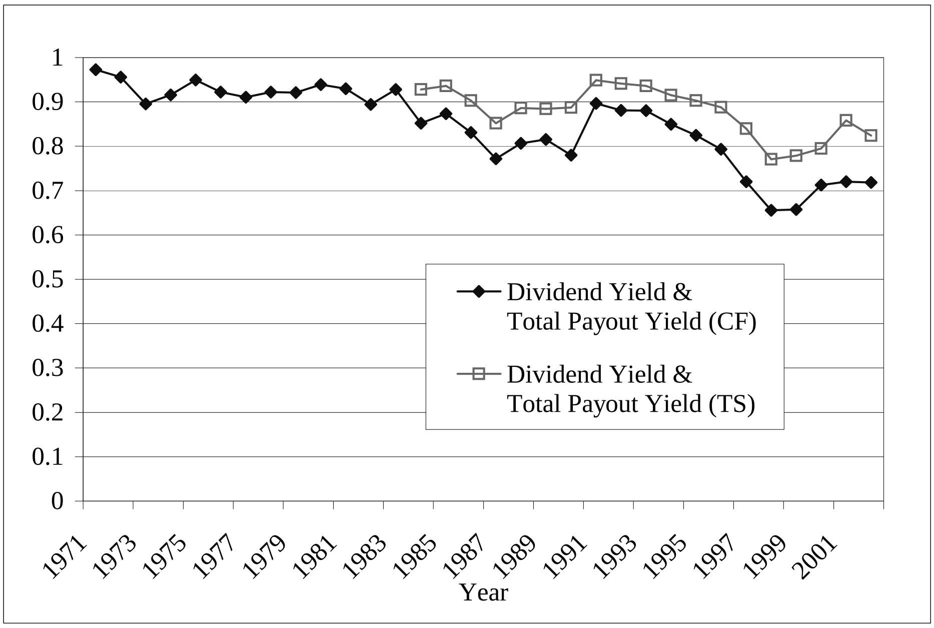


Figure 2

Rank Correlations of Dividend and Repurchase Yield with Payout Yield

The sample consists of firms from the annual Compustat data files (1971-2002) with data for book equity, earnings, book assets, common dividends paid, repurchase of common stock (from the statement of cash flows and indicated by (CF)), share price and shares outstanding. For the years, 1983 to 2002 we also require treasury stock data to calculate an alternative measure of share repurchases based on positive changes in the treasury stock (indicated by (TS)) each year. The sample is restricted to firms with positive dividend payments. Yields are computed by normalizing the relevant variable by contemporaneous fiscal year-end market capitalization. Panel A presents two series of annual rank correlations. The first is between dividend yield and total payout (CF) yield, where the total payout is defined as the sum of common dividends and common share repurchases (CF). The second is between dividend yield and total payout (TS) yield, where the total payout is defined as the sum of common dividends and share repurchases (TS). Panel B presents three series of annual rank correlations. The first is between repurchase (CF) yield and total payout (CF) yield. The second is between repurchase (TS) yield and total payout (TS) yield. The third is between total payout (CF) yield and total payout (TS) yield.

Panel A: Dividend Yield and Total Payout Yields



Panel B: Repurchase Yields and Total Payout Yields

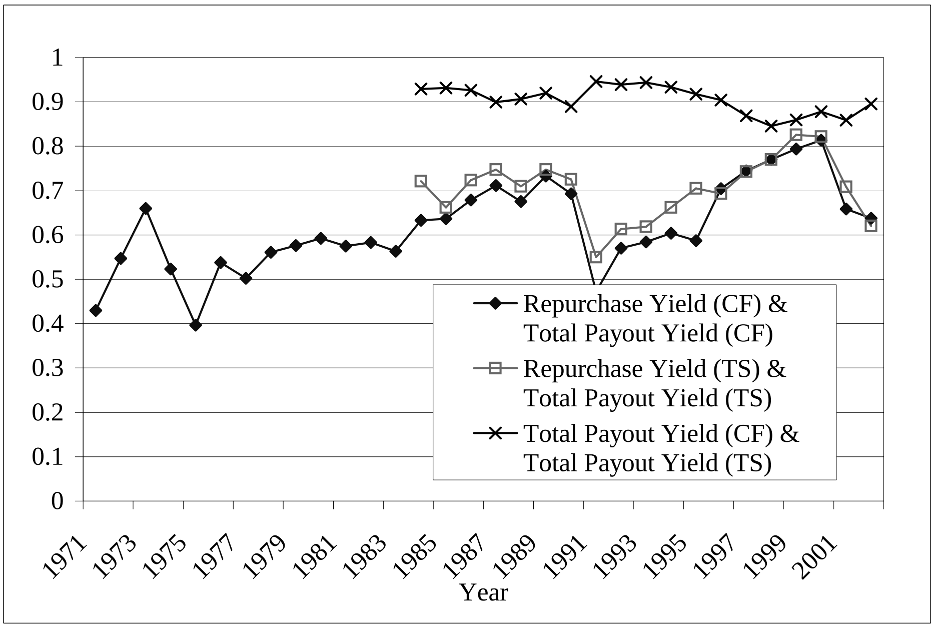


Table 1
Aggregate Time Series Summary Statistics

The data presents summary statistics for aggregate annual time series over the period 1926-2002. Excess market return is the difference in the CRSP value-weighted total return (including dividends) and the return on a three-month Treasury bill. Dividend yield is the ratio of common dividends paid during the year to the year-end market capitalization. Total payout (CF) yield is the sum of dividends and repurchases of common equity (from the statement of cash flows and indicated by (CF)) during the year divided by the year-end market capitalization. Total payout (TS) yield is the sum of dividends and repurchases of common equity (computed from positive changes in the treasury stock and indicated by (TS)) during the year divided by the year-end market capitalization. Repurchase data is available from 1971-2002. Treasury stock data is available only from 1984-2002. Pre-1971, the total payout yield is assumed equal to the dividend yield because of negligible repurchase activity. SD is the standard deviation. SE is the standard error. ρ is the first-order autocorrelation coefficient. Test-Stat presents test statistic values for hypothesis tests of the autocorrelation coefficients. For the excess market return, the null hypothesis is that $\rho = 0$ and the test statistic, $(N-2)^{1/2}[\hat{\rho}/(1-\hat{\rho}^2)^{1/2}]$, is asymptotically standard normal under the null. For the yields, the null hypothesis is that $\rho = 1$ and the test-statistic, $(\hat{\rho}-1)/\hat{\sigma_\rho}$, has a distribution under the null that is tabulated in Fuller (1996).

	Log(Excess Market Return)	Log(Dividend Yield)	Log(Total Payout (CF) Yield)	Log(Total Payout (TS) Yield)
Mean	0.056	-3.262	-3.139	-3.195
SD	0.200	0.405	0.290	0.319
Full Sample (1926-2002) Autocorrelations				
ρ	0.115	0.963	0.868	0.907
SE	0.157	0.057	0.058	0.065
Test-Stat	1.003	-0.649	-2.275	-1.431
Partial Sample (1926-1985) Autocorrelations				
ρ	0.104	0.804	0.807	0.799
SE	0.169	0.080	0.076	0.082
Test-Stat	0.796	-2.450	-2.539	-2.451

Table 2

Return Predictability

The table presents results from regressions of excess market returns, defined as the difference in the CRSP value-weighted total return (including dividends) and the return on a three-month Treasury-bill, over different horizons (one to five years) on dividend yields and total payout yields. Dividend yield is the ratio of common dividends paid during the year to the year-end market capitalization. Total payout (CF) yield is the sum of dividends and repurchases of common equity (from the statement of cash flows and indicated by (CF)) during the year divided by the year-end market capitalization. Total payout (TS) yield is the sum of dividends and repurchases of common equity (computed from positive changes in the treasury stock and indicated by (TS)) during the year divided by the year-end market capitalization. Repurchase data is available from 1971-2002. Treasury stock data is available only from 1984-2002. Pre-1971, the total payout yield is assumed equal to the dividend yield because of negligible repurchase activity. Panels A and B present results of the following regression:

$$log(Rm_{t,t+J}) - log(Rf_t) = \alpha + \beta Yield_t + \varepsilon_{t,t+J}$$

where $Rm_{t,t+J}$ is the market return over the period t to $t+J$, $J = 1, ..., 5$ is the horizon, Rf_t is the return on a 3-month Treasury bill, $Yield_t$ is one of the three yield measures, and $\varepsilon_{t,t+J}$ is a random error. t-stats for long horizon regressions are computed using Newey and West (1987) standard errors adjusted for the moving average structure of the regression errors. Panel C presents results of Chow tests for a structural break in the dividend (total payout) yield process and predictive regression. The test-statistic is:

$$F = \frac{[RSS - (RSS_E + RSS_L)]/k}{(RSS_E + RSS_L)/(n - 2k)}$$

where RSS is the residual sum of squares for the full sample, RSS_E is the residual sum of squares for the pre-1985 sample, RSS_L is the residual sum of squares for the post-1984 period, n is the number of observations, and k is the number of regressors. F is distributed $F(k, 2n-k)$. Panel D presents results of a regression of excess returns on both the dividend and total payout yields.

Panel A: Full Sample (1926-2002)

Horizon (Years)	1	2	3	4	5
$Yield_t$ =Dividend Yield					
β	0.133	0.222	0.308	0.384	0.491
t-stat	1.522	1.306	1.319	1.408	1.780
R^2	0.041	0.054	0.076	0.094	0.132
$Yield_t$ =Total Payout (CF) Yield					
β	0.200	0.357	0.481	0.579	0.683
t-stat	2.699	2.487	2.338	2.306	2.772
R^2	0.072	0.105	0.140	0.161	0.192
$Yield_t$ =Total Payout (TS) Yield					
β	0.197	0.337	0.451	0.547	0.665
t-stat	2.241	2.088	2.032	2.076	2.611
R^2	0.071	0.097	0.127	0.149	0.189

Panel B: Partial Sample (1926-1985)

Horizon (Years)	1	2	3	4	5
$Yield_t$ =Dividend Yield					
β	0.294	0.566	0.736	0.846	0.942
t-stat	3.502	4.666	4.489	3.841	4.828
R^2	0.129	0.216	0.270	0.288	0.316
$Yield_t$ =Total Payout (CF) Yield					
β	0.281	0.553	0.727	0.834	0.931
t-stat	3.473	4.056	3.805	3.367	4.158
R^2	0.115	0.202	0.258	0.275	0.304

Panel C: Structural Break Test

	RSS	RSS_E	RSS_L	F	P-value
Dividend Yield AR(1)	2.707	2.202	0.245	3.616	0.032
Dividend Yield Predictive Regression	1.656	1.261	0.255	3.115	0.051
Total Payout (CF) Yield AR(1)	1.636	1.250	0.368	0.364	0.696
Total Payout (CF) Yield Predictive Regression	2.622	2.226	0.261	1.851	0.165
Total Payout (TS) Yield AR(1)	1.634	1.261	0.325	1.022	0.365
Total Payout (TS) Yield Predictive Regression	2.623	2.202	0.260	2.220	0.116

Panel D: Regression of Log Return on Dividend and Total Payout (CF) or (TS) Yield

	Dividend Yield	Total Payout (CF) Yield
β	-0.087	0.288
t-stat	-0.596	2.106
R^2	0.076	
	Dividend Yield	Total Payout (TS) Yield
β	-0.411	0.641
t-stat	-1.742	2.489
R^2	0.105	

Table 3

Yield Portfolio Returns and Characteristics

At the end of June of each year t, ten portfolios are formed on the basis of ranked values of dividend yield, total payout (CF) yield and total payout (TS) yield. The dividend yield is the ratio of common dividends paid in year t to year-end market capitalization. The total payout (CF) yield is the ratio of the sum of common dividends paid and common share repurchases made in year t to year-end market capitalization, where common share repurchases are obtained from the statement of cash flows. The total payout (TS) yield is the ratio of the sum of common dividends paid and share repurchases made in year t to year-end market capitalization, where share repurchases are computed as positive changes in the treasury stock. The breakpoints for the portfolios are based on ranked values of the relevant yield variable for all NYSE stocks, with strictly positive yields. The upper 5-percentile of all positive yields are trimmed each year. All stocks containing nonmissing data for book equity, earnings, book assets, common share dividends and common share repurchases (after 1970) are then allocated to the yield portfolios using NYSE breakpoints based on positive yields. Each portfolio's monthly equal-weighted return for July of year t to June of year $t+1$ is calculated, and then the portfolios are reformed in July of year $t+1$. ME is the market capitalization, in millions of dollars, as of June in year t. BE/ME is the ratio of book equity in December of year $t-1$ to market capitalization in December of year $t-1$. β is the time series average of the monthly portfolio post-ranking betas. The post-ranking β for portfolio i is the sum of betas from the time series regression of average returns for portfolio i against the contemporaneous and lagged excess market return. Firms is the average number of stocks in the portfolio in each month. A portfolio with zero-yield stocks is presented as well.

Panel A: Portfolios Formed on Dividend Yield During 7/85-12/02

		Dividend Yield Deciles										
	Zero Yield	1	2	3	4	5	6	7	8	9	10	All
Average Return	1.24	0.89	1.13	1.00	1.16	1.15	1.20	1.22	1.24	1.21	0.90	1.11
β	1.59	1.59	1.23	1.17	1.14	1.09	1.08	1.04	0.95	0.83	0.93	1.10
ln(ME)	3.71	6.19	5.95	6.08	6.11	6.17	6.13	6.05	5.83	5.79	4.79	5.91
ln(BE/ME)	-0.60	-0.93	-0.70	-0.62	-0.53	-0.48	-0.39	-0.30	-0.18	-0.04	1.67	-0.25
Dividend Yield	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.04	0.05	0.06	0.15	0.04
Firms	2,367	149	143	130	123	118	117	119	128	122	138	129

Panel B: Portfolios Formed on Total Payout (CF) Yield During 7/85-12/02

		Total Payout (CF) Yield Deciles										
	Zero Yield	1	2	3	4	5	6	7	8	9	10	All
Average Return	1.18	0.95	1.14	1.10	1.20	1.17	1.27	1.35	1.32	1.29	1.42	1.22
β	1.60	1.60	1.30	1.23	1.17	1.15	1.08	1.05	0.96	0.97	1.09	1.16
ln(ME)	3.57	4.81	5.25	5.39	5.57	5.74	5.76	5.64	5.67	5.57	4.50	5.39
ln(BE/ME)	-0.62	-0.74	-0.60	-0.49	-0.43	-0.41	-0.37	-0.31	-0.25	-0.17	1.05	-0.27
Total Payout Yield	0.00	0.00	0.01	0.02	0.02	0.03	0.04	0.05	0.07	0.09	0.16	0.05
Firms	1,635	286	208	179	160	154	150	152	149	154	186	178

Panel C: Portfolios Formed on Total Payout (TS) Yield During 7/85-12/02

		Total Payout (TS) Yield Deciles										
	Zero Yield	1	2	3	4	5	6	7	8	9	10	All
Average Return	1.22	0.92	1.13	1.13	1.22	1.09	1.24	1.21	1.36	1.22	1.28	1.18
β	1.46	1.46	1.15	1.06	1.01	1.03	0.94	0.88	0.73	0.74	0.98	1.00
ln(ME)	3.67	5.03	5.48	5.58	5.69	5.89	5.92	5.73	5.77	5.66	4.58	5.53
ln(BE/ME)	-0.64	-0.77	-0.64	-0.55	-0.43	-0.42	-0.37	-0.30	-0.22	-0.12	1.25	-0.26
Total Payout Yield	0.00	0.00	0.01	0.02	0.02	0.03	0.04	0.04	0.06	0.08	0.15	0.04
Firms	1,978	245	183	166	150	142	137	149	139	142	169	162

Table 4
Fama-MacBeth Monthly Return Regressions

The sample consists of firms from the annual COMPUSTAT data files that have no missing values for book equity, earnings, book assets, common dividends and repurchases of common stock (after 1970). Return data comes from the monthly CRSP file. Cross-sectional OLS regressions are estimated for each month in the relevant subperiod. Mean is the time series mean of the estimated coefficients, Std is its time series standard deviation, and t(Mn) is Mean divided by its time series standard error. Market capitalization is denoted by ME, book equity is denoted by BE, common dividends is denoted by D, common share repurchases from the statement of cash flows is denoted by RCF and share repurchases computed from positive changes in the treasury stock is denoted by RTS. β is the pre-ranking beta computed using 2 to 5 years of monthly returns (as available). The book-to-market ratio (BE/ME) is trimmed at the upper and lower 0.5-percentile. D/ME, (D+RCF)/ME and (D+RTS)/ME are trimmed at the upper 5-percentile. The table provides estimates based on ordinary least squares (OLS) and least absolute deviation (LAD) regressions.

	OLS Estimates			LAD Estimates		
	7/85-12/02 (210 Mos.)			7/85-12/02 (210 Mos.)		
Coefficient	Mean	Std	t(Mn)	Mean	Std	t(Mn)
$R_{it} = a + b_{1t}\beta_{it} + b_{2t}\ln(ME_{it}) + b_{3t}\ln(BE_{it}/ME_{it}) + b_{4t}\ln(D_{it}/ME_{it}) + e_{it}$						
a	1.24	4.70	3.83	-0.21	3.61	-0.84
b_1	-0.13	2.40	-0.77	-0.21	2.41	-1.29
b_2	0.00	0.67	0.04	0.15	0.59	3.77
b_3	0.07	0.96	1.13	0.00	0.91	0.07
b_4	-0.00	0.63	-0.01	0.05	0.62	1.12
$R_{it} = a + b_{1t}\beta_{it} + b_{2t}\ln(ME_{it}) + b_{3t}\ln(BE_{it}/ME_{it}) + b_{4t}\ln((D+RCF)_{it}/ME_{it}) + e_{it}$						
a	1.55	5.81	3.88	-0.65	3.97	-2.38
b_1	-0.01	2.15	-0.06	-0.22	2.15	-1.47
b_2	-0.06	0.89	-1.01	0.21	0.67	4.61
b_3	0.14	1.16	1.76	0.11	0.91	1.82
b_4	0.07	0.47	2.17	0.10	0.44	3.44
$R_{it} = a + b_{1t}\beta_{it} + b_{2t}\ln(ME_{it}) + b_{3t}\ln(BE_{it}/ME_{it}) + b_{4t}\ln((D+RTS)_{it}/ME_{it}) + e_{it}$						
a	1.61	5.86	3.99	-0.60	3.85	-2.26
b_1	-0.06	2.12	-0.40	-0.22	2.12	-1.52
b_2	-0.07	0.90	-1.05	0.21	0.66	4.50
b_3	0.11	1.11	1.40	0.09	0.89	1.43
b_4	0.05	0.49	1.45	0.09	0.43	3.06

Table 5
Factor Regressions

The sample consists of firms from the annual COMPUSTAT data files that have data for book equity, earnings, book assets, common dividends, repurchases of common stock from the statement of cash flows (indicated by (CF)), and stock repurchases computed positive changes in the treasury stock (indicated by (TS)). Return data comes from the monthly CRSP file. The regression equation is:

$$R_t - Rf_t = \alpha + \beta_1[RM_t - Rf_t] + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 YIELDHML_t + \varepsilon_t.$$

The regressand is monthly excess portfolio returns, $R_t - Rf_t$, from 7/1985 to 12/2002, and the regressors are the market excess return ($RM_t - Rf_t$), the small minus big factor return (SMB_t),the high minus low factor return (HML_t), and the high minus low yield factor return for the dividend yield and total payout yield. The first three regressors are obtained from Ken French's website. YIELDHML corresponds to one of three yield factors: dividend, total payout (CF) or total payout (TS). The table presents intercept and yield factor slope coefficient estimates (and corresponding t-statistics) for 25 portfolios formed on book-to-market and total payout yield (panel A). Panel B presents a summary of statistical tests of intercept significance for four different model specifications and the three aforementioned sets of portfolios. χ^2 is the test-statistics corresponding to a Wald test of the joint hypothesis that all of the intercepts are equal to 0. One asterisk (two asterisk) correspond to statistical significance at the 5% (1%) level.

Panel A: Book-to-Market Equity/Total Payout Yield Portfolios

	Total Payout Yield Quintiles									
BE/ME Quintile	Low	2	3	4	High	Low	2	3	4	High
	YIELDHML = Dividend Yield									
	α					t(α)				
Small	0.05	0.14	0.28	0.72	0.51	0.32	0.88	1.86	3.45	2.00
2	-0.16	-0.10	0.27	0.15	0.39	-0.86	-0.57	1.47	0.79	1.76
3	-0.34	-0.16	0.00	0.10	0.32	-1.61	-0.81	0.02	0.46	1.45
4	-0.23	0.04	-0.03	-0.17	-0.08	-1.21	0.18	-0.13	-0.97	-0.40
Big	-0.34	-0.38	-0.54	0.04	0.02	-1.46	-1.37	-1.94	0.15	0.13
	β_4					t(β_4)				
Small	-0.48	-0.34	-0.36	-0.21	-0.44	-5.12	-3.53	-3.90	-1.60	-2.80
2	-0.16	-0.60	-0.25	-0.21	-0.46	-1.37	-5.75	-2.18	-1.70	-3.41
3	-0.48	-0.53	-0.11	0.08	0.04	-3.65	-4.41	-0.85	0.60	0.26
4	-0.50	-0.51	-0.48	0.03	-0.10	-4.22	-4.07	-3.66	0.29	-0.81
Big	-0.16	-0.70	-0.37	0.00	0.23	-1.06	-4.12	-2.18	0.02	2.17
	YIELDHML = Total Payout Yield (CF)									
	α					t(α)				
Small	0.14	0.12	0.34	0.73	0.24	0.83	0.72	2.12	3.30	0.90
2	-0.14	-0.09	0.42	0.26	0.32	-0.73	-0.50	2.19	1.29	1.35
3	-0.19	-0.05	0.10	0.18	0.22	-0.85	-0.26	0.46	0.84	0.97
4	-0.05	0.19	0.02	-0.15	-0.17	-0.23	0.90	0.09	-0.82	-0.81
Big	-0.23	-0.22	-0.43	0.00	-0.04	-0.94	-0.76	-1.47	0.01	-0.22
	β_4					t(β_4)				
Small	-0.30	-0.02	-0.22	-0.05	0.56	-2.56	-0.17	-1.88	-0.31	2.99
2	-0.07	-0.11	-0.40	-0.29	0.08	-0.50	-0.82	-2.95	-2.02	0.47
3	-0.44	-0.34	-0.26	-0.19	0.24	-2.79	-2.30	-1.63	-1.23	1.46
4	-0.53	-0.47	-0.19	-0.04	0.20	-3.70	-3.06	-1.22	-0.33	1.30
Big	-0.29	-0.48	-0.32	0.08	0.18	-1.69	-2.32	-1.58	0.47	1.46
	YIELDHML = Total Payout Yield (TS)									
	α					t(α)				
Small	0.22	0.22	0.13	0.62	0.43	1.40	1.39	0.71	2.83	1.64
2	-0.08	0.01	0.19	0.26	0.18	-0.42	0.06	1.09	1.20	0.69
3	-0.12	0.15	0.05	0.02	0.17	-0.57	0.66	0.24	0.07	0.70
4	-0.13	-0.23	-0.07	-0.06	-0.26	-0.63	-1.03	-0.32	-0.28	-1.13
Big	-0.16	-0.15	-0.39	0.13	0.03	-0.80	-0.55	-1.30	0.52	0.20
	β_4					t(β_4)				
Small	-0.21	-0.24	-0.12	0.04	0.31	-2.35	-2.73	-1.18	0.34	2.07
2	-0.18	-0.11	-0.16	-0.18	0.07	-1.61	-1.03	-1.57	-1.43	0.44
3	-0.34	-0.21	-0.12	-0.08	0.13	-2.78	-1.66	-0.97	-0.64	0.95
4	-0.21	-0.24	0.01	-0.11	0.04	-1.87	-1.90	0.10	-0.97	0.29
Big	-0.13	-0.18	0.01	-0.17	0.12	-1.10	-1.12	0.04	-1.17	1.22

Panel B: Tests of Intercept Significance

	FF 3-Factor		FF 3-Factor + DYHML		FF 3-Factor) TYHML (CF)		FF 3-Factor + TYHML (TS)	
Portfolio Set	Significant α	χ^2	Significant α	χ^2	Significant α	χ^2	Significant α	χ^2
Beta / Total Payout Yield	7	49.49**	0	18.88	0	23.52	0	19.80
Size / Total Payout Yield	2	57.46**	1	38.91*	2	40.87*	1	38.75*
Book-to-Market / Total Payout Yield	9	86.41**	2	37.92*	3	37.11	1	33.61