Can the information content of share repurchases improve the accuracy of equity premium predictions?

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Forthcoming in the Journal of Empirical Finance

Abstract

We adjust the dividend-price ratio for share repurchases and investigate whether predictive power can be improved when constructing forecasts of UK and French equity premia. Regulations in the two largest European stock markets allow us to employ actual repurchase data in our predictive regressions. Hence, we are able to overcome problems associated with markets characterised by less stringent disclosure requirements, where investors might have to rely on proxies for measuring repurchase activity. We find that predictability does not improve either in a statistical or in an economically significant sense once actual share repurchases are considered. Furthermore, we employ a proxy measure of repurchases which can be easily constructed in international markets and demonstrate that its predictive content is not in line with that of the actual repurchase data.

JEL Classification: C22, C53, G12, G17

Keywords: Stock return predictability; Dividend-price ratio; Share repurchases; Out-of-sample tests; Economic value

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1. Introduction

A number of studies in the return predictability literature have documented the poor out-of-sample performance of the dividend-price ratio and other variables when used to predict stock returns in the US context (see Bossaerts and Hillion, 1999; Goyal and Welch, 2003, 2008). A very recent and small body of work posits the view that the weak out-of-sample performance of the dividend-price ratio in the US may be due to the fact that dividends alone are not representative of the true cash flow to shareholders (see Robertson and Wright, 2006; Boudoukh et al., 2007). This work links the loss of the dividend-price ratio's predictive power to the fact that firms substitute share repurchases for dividend payments. For instance, Boudoukh et al. (2007, p. 880) argue that "repurchases should be taken into account when relating yields to expected returns". Hence, they construct the total payout ratio, a measure that adjusts the dividend-price ratio for share repurchase activity and demonstrate that it outperforms the dividend-price ratio in terms of predictive ability.

Furthermore, recent work suggests that share repurchases have also become an increasingly popular and important way of providing cash payouts to shareholders in countries other than the US (von Eije and Megginson, 2008; Haw et al., 2011). However, regulations governing share repurchases are not uniform across countries (Kim et al., 2004). For example, the actual number of repurchased shares and the price paid are not always disclosed (Gonzalez and Gonzalez, 2004; Haw et al., 2011). Therefore, lack of disclosure requirements in some markets could result in researchers and investors having to rely on monthly or quarterly proxies to measure share repurchase activity (Stephens and Weisbach, 1998; Chung et al., 2007). Nevertheless, these proxies tend to produce inaccurate estimates of actual repurchase data (Banyi et al., 2008).

The linkage between share repurchases and return predictability suggested in the recent US literature combined with the growing importance of share repurchases as a payout method outside the US market raises two important questions: Can share repurchases add useful information in predictive regressions with the equity premium outside a US setting? Furthermore, to what extend can the imprecise calculation of share repurchases lead to a spurious relationship between the total payout ratio and the equity premium due to lack of disclosure requirements in some countries? Our study seeks to answer these questions and offers important new evidence within an international stock return predictability setting.

The contribution of this paper is threefold. First, we examine whether actual share repurchases via the total payout ratio variable can enhance the ability of the dividend-price ratio to predict the equity premium in the UK and French stock markets. These two markets are the largest in terms of capitalisation and the ones with the highest repurchase activity in Europe (von Eije and Megginson, 2008). For both countries, our sample covers all listed companies (active and delisted) reported in DataStream and spans the period 1990:01-2010:06. To our knowledge, this is the first study to investigate the predictive content of share repurchases within a cross-country framework. Such framework allows us to extend the existing evidence which is limited and focused only on the US market.

Second, we investigate whether the imprecise calculation of share repurchases can affect inferences in terms of predictability. Firms in the UK and France are required to disclose the number of repurchased shares and the price paid not long after the transaction is completed. Our dataset is particularly advantageous within this context as it allows us to employ actual repurchase data and to overcome any measurement problems associated with share repurchases. Therefore, we are able to evaluate the predictive content of share repurchases with more

accuracy. We additionally construct a proxy measure of the total payout ratio which involves readily available data from DataStream and can be easily constructed in international markets where there is lack of disclosure requirements. This enables us to assess whether the predictive content of proxy repurchase data is in line with that of the actual repurchase data.

Third, we move beyond a purely statistical context and evaluate the economic significance of return predictability. This is particularly important as out-of-sample statistical significance does not necessarily translate into economic gains for investors (Leitch and Tanner, 1991). In a mean-variance framework, we compare the out-of-sample performance of a dynamic portfolio strategy that uses the historical moving average of the equity premium (benchmark strategy) relative to a dynamic portfolio strategy that uses either the dividend-price ratio, the total payout ratio or the proxy of the total payout ratio.

Our key findings can be summarized as follows. First, by employing a battery of in-sample and out-of-sample tests of predictive accuracy, including the Goyal and Welch (2003) graphical method, we show that the total payout ratio is a useful predictor of UK and French equity premia. However, it fails to outperform the dividend-price ratio in both markets. This new finding in the return predictability literature implies that the predictive performance of the total payout ratio may be driven by the information conveyed by the dividends rather than the actual share repurchase activity.

Second, we demonstrate that the predictive content of the proxy repurchase data is not in line with that of the actual repurchase data. In particular, the proxy measure of the total payout ratio is found to be the weakest predictive variable in the UK market, but the strongest in the French market. This lack of association in the predictive performance between the total payout ratio and its proxy counterpart suggests that inferences in predictability may be misleading if

they are based on proxy measures of repurchase activity, which are inherently associated with measurement errors. Therefore, our paper posits the view that actual data should be used when available as they carry a more relevant economic content.

Finally, the results based on economic value are in line with the corresponding results derived from the statistical analysis. This gives further support to the view that first, repurchase activity does not enhance the predictive content of the dividend-price ratio in the two largest European stock markets and second, measuring repurchase activity with an error is likely to result in a predictive performance which is not in line with that of the underlying actual data.

Although return predictability is predominantly assessed in the US market, an emerging body of work suggests that UK stock returns contain an element of predictability at an index level. Therefore, our findings are in line with the general consensus that UK stock returns are predictable to some degree by dividend-price ratios. More specifically, Pesaran and Timmermann (2000) apply an extended version of the recursive modelling strategy developed in Pesaran and Timmermann (1995) and show that dividend-price ratios are useful predictors of the UK FTSE All-Share index returns between 1965 and 1993. Using quarterly data during the 1975-2001 period and adopting a non-linear approach, McMillan (2003) also reports a significant relationship between the dividend-price ratio and FTSE All-Share returns. More recently, Kellard et al. (2010) demonstrate that dividend-price ratios and dividend yields possess more in and out-of-sample predictive power in the UK market compared to the US market during the 1975-2009 period. In line with previous findings, Giot and Petitjean (2011) also uncover a good predictive performance of the dividend-price ratio in the UK market between 1950 and 2005.

On the other hand, significantly fewer studies explore stock return predictability in the French market. Bossaerts and Hillion (1999) employ data for 14 industrialized countries and their findings suggest the poor predictive performance of the dividend-price ratio between 1971 and 1995 in France. Using monthly data between 1975 and 2001, Ang and Bekaert (2007) find that the dividend yield predicts returns at short horizons when employed together with the short rate. Moreover, Hjalmarsson (2010) concludes that there is no consistent evidence that the dividend yield predicts returns for OECD countries including France. Finally, McMillan (2009) shows that a trading rule based on the dividend-price ratio could lead to higher returns for investors compared to the random walk model during the 1973-2007 period. Despite the relatively mixed results in the extant literature with respect to the French market, using our data we uncover some predictable patterns especially towards the latter sample period which includes the recent financial crisis.

The paper is organised as follows. Section 2 describes the screening process of the data and the variables used, while it also provides a preliminary data analysis. Section 3 presents the methodological approach and Section 4 discusses the empirical findings. Finally, Section 5 concludes.

2. Data

2.1. Data description

Monthly data for all companies listed on the UK and French stock exchanges covering the period from 1990:01 to 2010:06 are obtained from the Thomson Financial DataStream. To account for survivorship bias, our sample includes companies that subsequently failed, merged or were de-listed. Collecting data at the firm level enables us to construct the total payout ratio (as defined in

equation (2) below) which is not readily available at an aggregate level. Our international dataset initially consists of 4,880 UK and 1,647 French stocks. Following Griffin et al. (2010) and Lee (2010) we apply a screening process that excludes non-common stocks, such as preferred stocks, warrants, unit or investment trusts, American Depository Receipts (ADRs), Global Depository Receipts (GDRs) or cross listings. This screening process results in the deletion of 1,000 UK and 107 French stocks. In addition, as in Griffin et al. (2010) and Ince and Porter (2006), we exclude all stocks not listed on the exchanges of the reference country (124 in the UK and 2 in France). Moreover, to filter out potential recording errors embedded in DataStream we follow Ince and Porter (2006) and apply a similar screening procedure to stock returns.[1] Our final dataset contains stocks from 3,756 UK and 1,538 French firms with the respective numbers of firm-month observations being 393,084 and 188,278.

The dependent variable in our predictive regressions is the equity premium which is commonly defined as the difference between the log of the value-weighted total market return, $r_{m,t} = \log(1+R_{m,t})$, and the log return on a risk-free three-month Treasury bill, $r_{f,t} = \log(1+R_{f,t})$.

Our paper employs two variables with the purpose to predict the equity premium, namely the dividend-price ratio and the total payout ratio. The dividend-price ratio is defined as:

$$DP_t = \log\left[\frac{D_t}{MCAP_t}\right], \tag{1}$$

where dividends, D_t, are defined as twelve-month moving sums of dividends paid on common stocks listed on the stock exchange while $MCAP_t$ denotes the total market capitalisation. These data are obtained from the Thomson Financial DataStream.

The total payout ratio on the other hand, can be expressed as:

[1] Returns for months t and t–1 are set to missing if $(1+R_t)(1+R_{t-1}) - 1 < 50\%$ where R_t is the return for month t, and at least one of the two returns is greater than 300% (see also Lee, 2010).

(2) $$TPO_t = \log\left[\frac{D_t + REP_t}{MCAP_t}\right],$$

where REP_t is defined as the twelve-month moving sum of the total amount of actual share repurchases. The data on the actual value of share repurchases are drawn from Zephyr, a database maintained by Bureau Van Dijk.

In addition, we construct a second measure of the total payout ratio denoted by *proxy-TPO* , which is based on estimated values of share repurchases instead. Specifically, we estimate share repurchases using the monthly decrease in shares outstanding reported by DataStream adjusted for distribution events such as stock splits and stock dividends (see, *inter alia*, Stephens and Weisbach, 1998; Banyi et al., 2008). A few other approaches for estimating share repurchases do exist (e.g., Stephens and Weisbach, 1998) but data for their construction in the UK and France are available only at an annual or a semi-annual frequency. Therefore, adopting these approaches, which have their own inherent problems (Banyi et al., 2008), would substantially limit our dataset. Additionally, the proxy we use can be easily applied to other markets with data limitations (either regarding actual repurchase data or components required for constructing proxies for measuring repurchase activity). Our proxy measure of the total payout ratio is expressed as:

(3) $$proxy\text{-}TPO_t = \log\left[\frac{D_t + REP_t^*}{MCAP_t}\right],$$

where REP_t^* is defined as the twelve-month moving sum of the total amount of estimated share repurchases. We are particularly interested in this measure since our aim is to also examine whether predictability results are affected when having to rely on estimated rather than on actual share repurchase data.

Figure 1 shows the graphs of all variables under consideration. The UK dividend-price ratio shows a declining trend between 1990 and 2000 (with the exception of 1994-1996) where it resumes a positive trend until mid-2003. Thereafter, a decline occurs until 2007 where it bounces back until 2009. In France, no pronounced changes occur with respect to the predictive variables during 1990-1999. On the other hand, they all experience a sharp decline post-1999 and jump back up in mid-2000 (this is further investigated in Section 2.2).

Moreover, Figure 1 shows that the proxy measure of share repurchase activity overestimates actual repurchases in the UK while an underestimation occurs in France. In general, and in line with our French data, one would expect that the monthly decrease in shares outstanding which constitutes our proxy-TPO variable, would underestimate the actual repurchases. This is due to the fact that if activities such as seasoned equity offerings (SEOs), the exercise of stock options, conversion of convertible securities, and exercise of warrants take place in the same month as share repurchases, the monthly decrease in shares outstanding would underestimate the actual repurchases (see Stephens and Weisbach, 1998; Banyi et al., 2008).

However, as Figure 1 suggests with respect to the UK market, such underestimation is not always the case. This indicates that there might be other factors which are country specific and can collectively lead to an overestimation of the actual share repurchases by the proxy-TPO. In the UK for instance, shares of a firm purchased by employee share ownership plans (ESOP) trusts are classified as a deduction from the firm's shareholder equity.[2] Another factor that could result in a reduction in the number of shares outstanding and thus in an overestimation of the actual share repurchases by the proxy is the number of mergers which are not financed only by

[2] In France, however, such trusts are recorded as an asset item and do not affect the number of shares outstanding. Furthermore, in France (as well as in other continental European countries) prior to the adoption of the International Financial Reporting Standards (IFRS) in 2005, share repurchases were also recorded as an asset item. This accounting practice had no effect on the number of shares outstanding resulting in an underestimation of the actual repurchases by the proxy-TPO.

stocks (see Pontiff and Woodgate (2008) for evidence in the US). To explore this aspect in our study, we obtain data from the Thomson One database on mergers consummated in the UK as well as in France during the full sample period. In line with Pontiff and Woodgate (2008), we find that there is a significant relationship between mergers of not stock-only consideration and the reduction in the number of shares outstanding in the UK. In fact, there are 2,750 deals of this type in the UK over the entire sample period, out of a total of 11,592 mergers. On the other hand, no significant relationship is found in the French market between mergers of any consideration and reductions in the number of shares outstanding.[3] The above findings are consistent with the fact that the proxy-TPO overestimates actual share repurchases in the UK while it underestimates those in France over the studied period.

[Insert Figure 1 around here]

As a final remark, to the extent that relevant information is available, one should be able to get a sense of the bias associated with the proxy-TPO by looking at the aforementioned factors in the market under consideration.

2.2. Preliminary data analysis

Table 1 provides standard summary statistics with respect to all variables employed in this study. The average UK equity premium is found to be 2% with a standard deviation of 8.44% while the average French equity premium is 2.06% with a standard deviation of 10.04%. Table 1 also presents the results of the Elliot et al. (1996) (ERS) point optimal unit root test with respect to all employed variables. Simulations have shown that the ERS test has good small sample properties

[3] In France, there are 1,438 deals of not stock-only consideration (out of a total of 2,391 mergers) over the entire sample period.

and exhibits a substantially improved power over earlier tests such as the Dickey-Fuller (1979) test (Elliot et al., 1996).

[Insert Table 1 around here]

The ERS test statistics suggest that the null hypothesis of a unit root is rejected for all series in the UK market. In France on the other hand, the equity premium is found to be stationary while all predictive variables contain a unit root. Looking at Figures 1(v) – 1(vi) however, we observe an apparent one-time structural break in the French dividend-price ratio as well as in the TPO and the proxy-TPO series which occurs around the year 1999. Therefore, the evidence of a unit root may simply be the outcome of a structural break which could jeopardise the stationarity of the considered variables over the full sample (Perron, 1989). To account for a structural break when testing for unit roots and address the issue, we employ the Zivot and Andrews (1992) test statistic. With this statistic the null of a unit root is tested against the alternative of stationarity with a structural break in the level at some unknown point. Given that the statistic does not follow a standard distribution, we rely on Zivot and Andrews (1992) for valid critical values (-4.58, -4.80 and -5.34 at the 10%, 5% and 1% levels of significance respectively). The computed Zivot and Andrews test statistics are -5.73 for the dividend-price ratio, -5.40 for the TPO and -5.73 for the proxy-TPO. Hence, for all predictive variables in France, we can reject the null hypothesis of a unit root.

The Zivot and Andrews (1992) test can also provide a specific date for the structural break of the individual French series. In all cases, a break is detected in April 1999. Unlike Boudoukh et al. (2007) who detect a structural break in their dividend-price ratio series but not in their TPO measure, we do find evidence of a structural break in the French TPO series. This

finding rules out the possibility of a structural break in the dividend-price ratio as a result of French firms substituting share repurchases for dividends.

To explore the issue further, we seek to examine what caused the noticeable structural break in the French predictive variables. While it is not straightforward to provide a clear-cut answer, we can point out to the introduction of the euro in France in 1999 which is likely to have caused this structural change. This is because the introduction of the common currency can be seen as a part of the liberalization process in the participating countries (Coeurdacier and Martin, 2009; Jappelli and Pistaferri, 2011). Within this context, Bekaert and Harvey (2000) argue that capital market liberalizations can be viewed as structural breaks that render the dividend-price ratio non-stationary. Moreover, they argue that the main channel through which the capital market liberalization affects the dividend-price ratio is the cost of capital. There is evidence that the introduction of the euro resulted in lower levels of cost of capital for the Eurozone countries (Hardouvelis et al., 2007; Bris et al., 2009). A lower cost of capital however would result in a decrease in the dividend-price ratio and this may be able to explain the drop we observe in Figures 1(v) – 1(vi). Moreover, the reduction in a firm's cost of capital expands its set of profitable investment opportunities (Bris et al., 2009). In such environment, firms may choose to distribute fewer dividends and invest more (Bekaert and Harvey, 2000). Indeed, there is evidence that firms in the Eurozone countries have responded to these investment opportunities by further reducing the amount of dividends paid to investors (von Eije and Megginson, 2008) and by increasing the level of investment compared to that of non-member countries (Dvorak, 2006; Aabo and Pantzalis, 2011). Finally, another channel through which the dividend-price ratio may be reduced is the increase in firms' expected cash flows. There is indeed evidence that an

increase in firms' expected cash flows occurred in Eurozone countries following the introduction of the euro (see Bris et al., 2009).

Finally, we also test for a structural break in the UK series. More specifically, based on the Andrews (1993) and the Andrews and Ploberger (1994) tests we cannot reject the null of no structural break in any of the UK series.[4]

3. Methodology

3.1. In-sample predictive ability

Typically, empirical studies on stock return predictability employ the following in-sample predictive regression specification:

(4) $$y_t = a + \beta x_{t-1} + \varepsilon_t, \ t = 1,...,T,$$

where $y_t = r_{m,t} - r_{f,t}$ denotes the log excess return (i.e. the equity premium), as defined in Section 2.1, x_{t-1} is the lagged predictive variable of interest, known at the beginning of the return period, and ε_t is the regression's disturbance term. In our case, x can be either the dividend-price ratio, the total payout ratio or the proxy measure of the total payout ratio.

If expected returns are constant, it is easy to show that β must be zero in equation (4). This is the null hypothesis of no predictability (or the "random walk" hypothesis). Hence, the alternative hypothesis of predictability predicates that $\beta \neq 0$. In practice, the one-sided alternative hypothesis is the more interesting one as it incorporates more economic content (Inoue and Kilian, 2004). The predictive ability of x_{t-1} is assessed by examining the statistical

[4] The results of these tests are available upon request.

significance of $\hat{\beta}$, the OLS estimate of β in equation (4), as well as the goodness of fit measure, R^2.

3.1.1. Bootstrap procedure

To account for potential small sample biases and data mining concerns, we follow much of the recent literature and base our in-sample inferences on a non-parametric bootstrap procedure which imposes the null of no predictability for obtaining appropriate *p*-values (see Nelson and Kim, 1993; Mark, 1995; Kilian, 1999; Rapach and Wohar, 2006).

The data are generated according to the following system:

(5) $$y_t = a_0 + u_{1t},$$

(6) $$x_t = b_0 + b_1 x_{t-1} + ... + b_p x_{t-p} + u_{2t},$$

where the disturbance vector $u_t = (u_{1t}, u_{2t})'$ is independently and identically distributed with covariance matrix Σ. Once the above system is estimated via OLS, with the lag order (*p*) in equation (6) chosen by the Akaike information criterion (AIC),[5] the residuals $\hat{u}_t = \{(\hat{u}_{1t}, \hat{u}_{2t})'\}_{t=1}^{T-p}$ are stored for sampling. We then generate 10,000 bootstrapped time-series by sampling with replacement from the residuals, $\{\hat{u}_t\}_{t=1}^{T-p}$.[6] Using these bootstrap time-series we obtain an empirical distribution for the *t*-statistic corresponding to $\hat{\beta}$ in the in-sample predictive regression. The *p*-value of the *t*-statistic is the proportion of the bootstrap statistics that are higher than the statistic obtained using the original sample. With this bootstrap procedure we are able to preserve both the autocorrelation structure of the predictor variables, hence being consistent with

[5] We consider a maximum number of four lags.
[6] For a more detailed description, see Rapach and Wohar (2006). Unlike Rapach and Wohar (2006), we do not bias-adjust the OLS estimates of equation (6) when generating the 10,000 bootstrap time series.

the Stambaugh (1999) specification, and the contemporaneous correlation between the disturbances in the original sample.

3.2. Out-of-sample performance

3.2.1. Conventional approach

The focal point of our study is the out-of-sample forecasting power of the employed variables since (i) if both in-sample and out-of-sample tests offer evidence of predictability the case for a predictable component in stock returns is strengthened (Rapach and Wohar, 2006), and (ii) this is of particular interest to a real-time investor. Following a recent strand of return predictability papers (e.g., Goyal and Welch, 2008; Rapach et al., 2010; Kellard et al., 2010) we use an expanding estimation window and generate one-month-ahead out-of-sample forecasts of the equity premium recursively.

In more detail, let *L* denote the number of in-sample observations and let *P* denote the number of out-of-sample forecasts. The first out-of-sample forecast for the x variable predictive regression model is generated in the following manner. Initially, we estimate equation (4) via OLS using data available through period *L*. Then, the first forecast for the equity premium is constructed as $\hat{y}_{1,L+1} = \hat{\alpha}_{1,L} + \hat{\beta}_{1,L} x_L$ where $\hat{\alpha}_{1,L}$ and $\hat{\beta}_{1,L}$ are the OLS parameter estimates of α and β in equation (4) using data available through period *L*. Consequently, the first out-of-sample forecast error is given by $\hat{\varepsilon}_{1,L+1} = y_{1,L+1} - \hat{y}_{1,L+1}$. In order to generate a second set of forecasts, we update the above procedure by using data available through period *L*+1 and obtaining the corresponding OLS parameter estimates. This process is repeated until all available observations are used. On the other hand, each month in the out-of-sample period, our benchmark model

computes the up-to-date equity premium average which gives the respective forecasts for the next month's equity premium.

We report the statistics on the out-of-sample prediction errors obtained in different sample periods. In particular, we document the mean, standard deviation and root mean square error (RMSE) of equity premium prediction errors resulting from each competing model. The next step is to compare the out-of-sample forecasts derived from the conditional models against the corresponding forecasts derived from the historical moving average model, which serves as our benchmark model. If the financial variable under consideration manages to outperform the prevailing moving average then this implies that it adds useful information and improves predictive ability.

As explained in the introduction, the aim of this paper is to examine whether share repurchases can enhance the dividend-price ratio's predictive performance, as well as to explore potential differences in the predictive performance between the total payout ratio and its proxy measure. Therefore, once we assess individual predictive performance, we additionally compare forecasts between the variables themselves.

3.2.2. Testing for equal predictive accuracy

An important facet of the above approach is that the model with the smallest forecast error is not necessarily superior to the other competing models. Hence, we need to formally examine whether the identified RMSE differences are significantly different from one another in a statistical sense. To address the issue, we employ the Diebold and Mariano (1995) (DM) statistic which tests for equal predictive accuracy.

When comparing forecasts between non-nested models (such as between models of two different variables), the DM statistic has a standard normal asymptotic distribution (see West, 1996). However, when comparing forecasts from nested models, McCracken (2007) shows that the DM statistic follows a non-standard limiting distribution and provides asymptotically valid critical values for various combinations of in-sample and out-of-sample proportions (π) and exclusion restrictions (k_2). In our study, this case applies when we compare the benchmark historical moving average model against the conditional models which are based on the considered financial ratios. Hence, for valid inference we use asymptotic critical values tabulated in McCracken (2007).

3.2.3. Further examination of the out-of-sample performance: A graphical approach

This section offers a brief overview of the graphical approach which is introduced by Goyal and Welch (2003) as a complementary measure for equity premium and stock return prediction. This technique could enhance our evidence regarding the out-of-sample performance and more importantly, it might reveal hidden aspects of predictive ability which cannot be captured by more conventional methods. The graphical procedure makes it easy to detect if and when predictability has occurred throughout the out-of-sample period. Specifically, it plots the cumulative sum-squared error differences between two competing models allowing us to observe the relative performance at any point in time. If we denote it by $SSED_T$ for a sample of T observations, its algebraic expression is as follows:

$$SSED_T = \sum_{t}^{T} [SE_{\text{t}}^{\text{unconditional model}} - SE_{t}^{\text{conditional model}}], \quad (7)$$

where SE_t stands for the squared out-of-sample prediction error in observation t. With respect to the unconditional benchmark model, the prevailing up-to-date moving average serves as the forecast of the next month's excess return. In order to obtain the conditional prediction errors, we carry out recursive regressions with the lagged variable x being the single predictor of the following month's excess return (see Section 3.2.1). A positive point in the graph indicates that the predictive variable has performed better so far. Furthermore, a positive slope suggests a consistently superior performance during a given period.

4. Empirical Results

4.1. In-sample results

Panel A of Table 2 presents the results of the univariate predictive regressions described in Section 3.1. In order to give a more complete view of the in-sample performance of our predictive variables, we also present results for an arbitrarily chosen sub-period which includes observations up to 2005. Our inferences are based on the bootstrap procedure described in Section 3.1.1, which is the most commonly used method for robust inference in the return predictability literature as it is less susceptible to small sample biases (see Goetzmann and Jorion, 1993; Nelson and Kim, 1993; Mark, 1995; Kilian, 1999; Rapach and Wohar, 2006; Goyal and Welch, 2008).[7] However, some new testing procedures such as that of Lewellen (2004) and Amihud and Hurvich (2004) have been proposed in the literature which base inference on bias-corrected estimators of the predictive regression. In a Monte Carlo set up, Amihud et al. (2004) show that the Amihud and Hurvich (2004) procedure exhibits better size and power properties

[7] With respect to the French data, the bootstrap procedure accounts for the structural break discussed in Section 2.2 by augmenting equation (6) with a dummy variable which takes the value of 1 for the post-break period and 0 otherwise.

compared to the bootstrap or the Lewellen (2004) alternatives. In light of these findings and as a further robustness check, we also report results obtained from the Amihud and Hurvich (2004) testing procedure.

[Insert Table 2 around here]

Regarding the full sample period, both the bootstrap and the Amihud and Hurvich (2004) testing procedures suggest that the dividend-price ratio is a significant in-sample predictor of the UK equity premium. The TPO is also found to be significant but produces a lower R^2.[8] The proxy-TPO shows a weaker in-sample predictive performance in terms of the produced R^2s (e.g., an R^2 of 2.73% as opposed to 12.33% for the dividend-price ratio and 6.30% for the TPO) but it is also found to be significant at all conventional levels. Using data up to 2005:01, we find that the overall picture is similar although the corresponding *t*-statistics and R^2s are relatively smaller. However, the proxy-TPO is statistically insignificant during this period. These findings indicate that during the last five years of the sample, changes in the considered variables are likely to be associated with changes in UK excess returns. Indeed, unreported regressions show that for all predictive variables the in-sample predictability strengthens during the 2005:01-2010:06 period which encompasses the recent financial crisis and the associated recession. This finding is in line with Henkel et al. (2011) and Rapach et al. (2013) who report considerably stronger aggregate market return predictability during recession periods.

On the other hand, our univariate regressions reveal a different pattern when we use data from France. The proxy-TPO produces the highest *t*-statistics and R^2s followed by the dividend-price ratio. Interestingly, the TPO is the weakest in-sample predictor in this case. Nevertheless, with the exception of the TPO when we consider the Amihud and Hurvich (2004) testing

[8] In Table 2 and in the tables that follow, the TPO measure includes all share repurchases consummated by the firms in our sample. However, our results are also robust to a subset which includes only the open market repurchases.

procedure, all variables retain good statistical significance. Moreover, to further investigate the predictive regression in light of the identified structural break in French predictive variables, we also split the sample at the break date estimated by the Zivot and Andrews (1992) test (see Section 2.2).[9] We find that the dividend-price ratio and the proxy-TPO are significant in-sample predictors in both the pre-break and post-break periods while the TPO is significant only in the latter period. In all cases, predictability is strengthened in terms of the produced R^2s in the post-break period.[10]

Comparing the results between the two markets, we observe that a higher degree of in-sample predictability exists in the UK when the dividend-price ratio and the TPO are employed as predictors. Moreover, the dividend-price ratio exhibits a stronger performance compared to the TPO across markets. This implies that the information conveyed by share repurchases, via the TPO, may not be useful for explaining the variation in next month's excess returns in either the UK or in France. To examine whether this is indeed the case, we also estimate a bivariate regression which includes the dividend-price ratio as well as the TPO. This allows us to assess whether the TPO can add predictive power in the presence of the dividend-price ratio. In order to account for potential multicollinearity problems, we follow Cooper and Priestley (2009) and we look at the relative performance of the dividend-price ratio and the TPO when the latter is orthogonalised relative to the former. Panel B of Table 2 provides the results. We observe that the dividend-price ratio retains its statistical significance while the orthogonalised TPO is found to be insignificant in both markets. Moreover, we find that the R^2s are very similar to the ones obtained from univariate regressions which included the dividend-price ratio as the sole predictive variable. This result suggests that the TPO does not add forecasting power in the

[9] The results are available upon request.
[10] We also split the sample based on break dates estimated by the Bai (1997) method and our results remain unaffected.

presence of the dividend-price ratio and thus share repurchases do not offer additional useful information in explaining variation of either the UK or the French equity premium.[11]

Finally, the proxy-TPO shows a predictive performance which is not in line with that of the underlying actual data. In particular, it is found to be a stronger candidate than the TPO in France, but weaker in the UK. We shall return to this in more detail in Section 4.3.

4.2. Out-of-sample results

In-sample statistical significance may be a first indication of predictive performance but this does not mean that the variables under consideration will also be successful predictors of stock returns out-of-sample. Therefore, the real test of a model is whether it can produce good forecasts of future stock returns and outperform the historical moving average model using only currently available data. Table 3 tabulates the forecast error statistics obtained from recursive regressions that employ the lagged variables considered in this study to produce one-month-ahead forecasts of the equity premium. In order to evaluate the out-of-sample performance in a more comprehensive manner, we also divide the full out-of-sample period (i.e. 2000:01-2010:06) into two sub-periods, each spanning approximately five years.

[Insert Table 3 around here]

The dividend-price ratio is found to be the most prominent candidate for predicting the UK equity premium. It produces the lowest RMSE's across all periods suggesting that the information content of share repurchases is not yet able to enhance the dividend-price ratio and

[11] As there is no other evidence outside the US market, it is worth mentioning that the produced beta coefficients and R^2s from the TPO models in Table 2, are relatively smaller than the ones reported in Boudoukh et al. (2007). Specifically, with respect to their three TPO measures, they report beta coefficients between 0.172 and 0.759 and R^2s between 8% and 26.2%. Also, Robertson and Wright (2006) report a beta coefficient of 0.144 for their cash-flow yield. Hence, our results are consistent with the notion that share repurchases might be more informative for predicting the equity premium in the US market rather than in the UK or in France.

strengthen its predictive power in the UK context. Out-of-sample predictability seems to be more pronounced during the last five years of the sample where the RMSE of all predictive variables are much smaller relative to the RMSE of the naive model as opposed to the first five years where this difference is not as broad. Turning to the French market, Table 3 shows that all variables maintain a good out-of-sample performance and outperform the historical moving average across all periods. For instance, during the full out-of-sample period the benchmark model produces a RMSE of 11.12%, the dividend-price ratio model produces a RMSE of 11.02%, the total payout ratio model produces a RMSE of 11.04% while the total payout ratio proxy model yields the smallest RMSE of 10.87%.

A consistent finding across markets is that the actual repurchase data do not convey additional useful information so as to enhance the forecasting power of the dividend-price ratio. A plausible explanation for this finding could be that dividend policies are independent of share repurchase policies in the UK and in France. Therefore, share repurchases may not be substitutes for cash dividends and their information content may not be relevant for predicting the equity premium (Boudoukh et al., 2007).[12] On the other hand, the proxy measure of the total payout ratio produces the best forecasts across all periods in France, which is in sharp contrast to the UK findings. This result is a first indication that researchers should be cautious when using proxy payout measures in out-of-sample tests.

Overall, the above findings are congruent with our in-sample results in the sense that first, the total payout ratio does not seem able to outperform the dividend-price ratio and second, the predictive content of proxy share repurchases is not in line with that of the actual repurchase data.

[12] Of course there are other reasons for firms to repurchase their own shares (see Lakonishok et al., 1995).

4.3. Diebold and Mariano (1995) test results

The identified differences in Section 4.2 above do not necessarily suggest that the competing models produce forecasts which are also different in a statistical sense. Therefore, before we reach our final conclusion we conduct a formal test of equal predictive accuracy. As such, Table 4 tabulates the computed DM statistics when we compare each conditional variable model to the naive benchmark model across different periods. As we are equally interested in the out-of-sample performance of the total payout ratio relative to its proxy measure and to the dividend-price ratio, we report results of the produced DM statistics when making comparisons between the conditional models in Table 5.[13]

[Insert Table 4 around here]

[Insert Table 5 around here]

Table 4 suggests that during the full out-of-sample period (i.e. 2000:01-2010:06) and also during the two sub-sample periods, the dividend-price ratio and the total payout ratio significantly outperform the historical moving average at all conventional levels. The proxy measure of total payout ratio also outperforms the benchmark model during the full out-of-sample period and during the last five years of the sample. However, it does not produce statistically different forecasts from the benchmark model during the first sub-period which spans 2000:01-2005:01.

Regarding the French market, all conditional models manage to outperform the historical moving average model during the full out-of-sample period. In particular, the total payout ratio proxy is found to be a better predictor at all conventional levels while the other two candidates

[13] Calculating a modified version of the Diebold and Mariano (1995) test, suggested by Harvey et al. (1997), and a more recent test proposed by McCracken (2007) do not materially affect our results. The former is used to correct for small size distortions compared to the original DM test and the latter has been proven to be a more powerful statistic in extensive simulation experiments.

outperform the naive model at the 5% level. During the first five years of the out-of-sample period predictability is somewhat weaker and all predictive variables produce statistically different forecasts compared to the historical moving average at the 10% significance level. Finally, in the last five years of the sample, only the dividend-price ratio and the proxy measure of the total payout ratio significantly outperform the historical moving average (at 5% and 1% levels respectively).

Clearly, the above results suggest that in both markets the dividend-price ratio model captures predictability at any period, even where the total payout ratio model fails to do so. Therefore, the question of interest is whether the identified differences between the conditional models are also statistically significant. Perhaps more importantly, we need to address the issue of whether a proxy measure is an adequate substitute of the more accurate total payout ratio when used in predictive regressions.

Table 5 reveals that, apart from one sub-period in France, forecasts derived from the dividend-price ratio model are always statistically superior to the ones derived from the total payout ratio model. This result suggests that dividends convey more useful information for predicting the equity premium than actual share repurchases. As mentioned earlier, this may be an indication that share repurchases do not substitute for dividends in the UK and France and thus their information content might not be useful for predicting stock returns.

The total payout ratio model produces significantly different forecasts compared to its proxy counterpart in both markets (between 1% and 5% levels). This is a particularly important finding given that the proxy measure produced the highest RMSE's using UK data but the lowest RMSE's using French data. Clearly, our findings do not exclude the possibility of a proxy outperforming another variable in terms of predictability. One possible explanation is that, in

some instances, the proxy may capture useful information about returns which is not contained in actual share repurchases. This information will depend on the regulatory settings of each country, such as the ones discussed in Section 2.1. However, proxies are inherently associated with measurement errors and any predictability might be spurious or a matter of chance. An investor is in no position of knowing ex-ante whether the proxy-TPO would lead to better predictions than the TPO. Therefore, we posit the view that investors should rely on actual data when available as they carry a more relevant economic content.

With the aim to further explore the out-of-sample performance of our predictive variables, we turn to the graphical diagnostic suggested by Goyal and Welch (2003) which will allow us to observe predictability in a more dynamic framework.

4.4. Additional out-of-sample evidence: the graphical procedure

Figure 2 shows the relevant graph when the diagnostic method of Goyal and Welch (2003) is applied to our UK and French data. The cumulative sum-squared error differences are plotted for all models under consideration.

[Insert Figure 2 around here]

With respect to the UK market, Figure 2 (i) suggests that the dividend-price ratio and the total payout ratio have an almost identical predictive performance between 2000 and the first quarter of 2006. The graph line of the diagnostic test shows an upward tendency during that period suggesting a better performance of the two variables relative to the historical moving average. The graph line for the total payout ratio then experiences a decline until 2009. Interestingly, in both cases the slope becomes very steep between the first quarter of 2009 and the end of the sample, in 2010:06, indicating that predictability is more pronounced in this

period. During the same period, the dividend-price ratio conveys more information as the corresponding line is at a much higher level compared to the one derived from the total payout ratio. On the other hand, the proxy measure of the total payout ratio exhibits the worst performance as suggested by the graph line which is almost identical to the zero line for the most part of the sample. It is not until 2009 where it starts to consistently outperform the benchmark model. Overall, the graphical procedure gives support to the previous reported findings in terms of relative predictive performance throughout the out-of-sample period and also reveals that predictability is stronger from 2009 onwards.

Turning to the French market in Figure 2 (ii), we observe that for all three variables, the graph line is always above zero and exhibits a similar pattern until the third quarter of 2008. Performance seems balanced during the first five years with almost equal fractions of positive and negative slope tendencies. As of 2006, we observe a steady upward trend which leads to an even more distinct and sharp positive slope (starting at the end of 2008 and ending mid-2009) in the case of the proxy measure of the total payout ratio, and to a steady decline in the case of the other two conditional models at the beginning of 2009. Finally, the depicted graph line corresponding to the proxy measure concludes with a decline during 2010, albeit at a much higher level compared to the dividend-price ratio and the total payout ratio. Overall, throughout the out-of-sample period the line corresponding to the total payout ratio proxy measure is consistently above the lines obtained from the other two variables and this is more evident during the last two years of the sample. This confirms that the proxy measure performs differently across markets and also yields different results compared to the total payout ratio which employs actual share repurchases. As noted earlier, these findings raise some concerns regarding the reliability of the proxy-TPO as a predictive variable.

As a final remark, the relatively stronger return predictability we detect in the later years of our sample is broadly in line with recent work that suggests a weaker performance of the historical moving average and a better predictive ability of the conditioning variables during recessions (see Henkel et al., 2011).

4.5. Further analysis of predictability: economic significance

Finding statistical significance in terms of predictive ability does not necessarily mean that there is also economic significance, which would be of more interest to investors. In this section, we analyse the performance of different investment strategies conditioned on our predictive variables and we study their economic significance within each market. In particular, we compare each strategy from the perspective of an investor who faces an investment opportunity set spanned by the market portfolio and a riskless asset. Our goal is to assess how the predictability results presented in the previous sections are affected when economic value is accounted for. In other words, we seek to answer (i) which conditional model can also lead to economically sensible predictions and (ii) what is the impact of using proxy repurchase data on investment decisions.

4.5.1. The framework for measuring economic significance

Consider an investor whose goal is to maximise a mean-variance utility function. The investor dynamically rebalances her portfolio which comprises of one risky asset (i.e. the market portfolio) and the risk-free asset. For a given level of initial wealth, the investor's optimization problem can be expressed as follows:

(8) $$\max_{w_{t+1}} u\left\{ E_t(r_{p,t+1}), Var_t(r_{p,t+1}) \right\},$$

where w_{t+1} denotes the time-varying proportion of the portfolio allocated to the risky asset, and $r_{p,t+1}$ is the return of the portfolio which equals:

(9) $$r_{p,t+1} = r_{f,t+1} + w_{t+1}(r_{m,t+1} - r_{f,t+1}),$$

where $r_{m,t+1}$ is the return on the risky asset in period $t+1$ and $r_{f,t+1}$ is the return on the risk-free asset. The utility function we assume is (see also Marquering and Verbeek, 2004):

(10) $$u(\cdot) = E_t(r_{p,t+1}) - \frac{1}{2}\gamma Var_t(r_{p,t+1}),$$

where the coefficient γ measures the investor's degree of risk aversion. The solution to the above maximization problem leads to the following optimal portfolio weight on the risky asset:

(11) $$w^*_{t+1} = \frac{1}{\gamma}\frac{E_t(r_{m,t+1}) - r_{f,t+1}}{Var_t(r_{m,t+1})}.$$

Equation (11) shows that the optimal weights for the different investment strategies will vary to the extent that the conditional moments obtained from our predictive models will vary.

The realized Sharpe ratio is a commonly employed performance measure to assess economic significance. However, Goetzmann et al. (2007) show that this measure can be open to manipulation and suggest an alternative manipulation-proof measure that overcomes this problem. Therefore, we adopt their approach and calculate the risk-adjusted return of each conditional strategy relative to the benchmark strategy as shown in equation (12):

(12) $$\Theta = \frac{1}{(1-\gamma)}\left\{ \ln\left[\frac{1}{T}\sum_{t=0}^{T-1}\left(\frac{r^{C}_{p,t+1}}{r_f} \right)^{1-\gamma} \right] - \ln\left[\frac{1}{T}\sum_{t=0}^{T-1}\left(\frac{r^{\mathrm{B}}_{p,t+1}}{r_f} \right)^{1-\gamma} \right] \right\},$$

where $r^{C}_{p,t+1}$ denotes the gross portfolio return of the conditional strategy based on any of our three predictive variables, and $r^{B}_{p,t+1}$ is the gross portfolio return resulting from the benchmark strategy. In line with our statistical analysis, the benchmark strategy uses the historical moving average of the equity premium to construct one-step-ahead forecasts. The estimates of Θ are reported in annualized basis points (bps).

4.5.2. Empirical evidence on the economic significance

This section addresses the important question of whether a dynamic strategy based on each of the conditioning variables can lead to economic gains relative to the benchmark strategy.

Table 6 shows the computed performance measure Θ with respect to all considered variables for a mean-variance investor who invests in a domestic market, be it the UK or France. In line with the out-of-sample analysis from the previous sections, the results are presented for the full period and for the two sub-periods, each spanning approximately five years. As in Goetzmann et al. (2007) and Della Corte et al. (2010), the risk aversion coefficient γ is assumed to be 3.[14]

[Insert Table 6 around here]

The results suggest that large economic gains can be made in the UK by adopting a dynamic trading strategy which utilises the information content of the dividend-price ratio (DP). This can be demonstrated by the large value of Θ which shows that the DP model generates 172 annual bps relative to the benchmark model during the full out-of-sample period. The total payout ratio (TPO) results in an annual economic gain of 124 bps during this period. However,

[14] We have also considered investors with $\gamma \in \{2,4,6\}$ and our conclusions are robust to different levels of risk aversion.

the proxy measure of the total payout ratio (proxy-TPO) leads to an annual loss of 26 bps. The ranking of the above strategies remains the same if we consider each of the two out-of-sample sub-periods. In particular, DP and TPO always produce the highest economic gains and more so during the last five years of the sample (with annual gains of 241 bps and 146 bps respectively). The proxy-TPO manages to outperform the naive strategy only in the last five years with annual gains of 59 bps.

In France, all conditional strategies outperform the benchmark strategy and yield positive economic gains. In this case however, it is the proxy-TPO that generates the highest premium relative to the benchmark model across all periods. For example, it generates economic gains of 73 bps during the full out-of-sample period as opposed to 28 bps for the DP and 22 bps for the TPO. During the first five-year period the TPO model leads to higher gains compared to the DP model while the opposite is true during the second sub-period.

Overall, the results presented in this section are consistent with the statistical results reported in the previous sections and suggest that the economic performance of each predictive variable is in line with its statistical performance. This gives further support to our findings and strengthens our main conclusions.

5. Conclusion

A small body of literature suggests that the total payout ratio, a measure which adjusts the dividend-price ratio for share repurchases, can lead to better predictions of the equity premium within the US market (e.g., Robertson and Wright, 2006; Boudoukh et al., 2007). The current paper contributes to this literature in three ways. First, we construct this new variable and assess its predictive performance against the dividend-price ratio within an international setting. To our

knowledge, this is the first study to investigate the predictive content of share repurchases outside the US context. In particular, we apply a prediction testing framework to monthly data derived from the two largest European stock markets (both in terms of size and repurchase activity), the UK and France, and cover all listed firms between the 1990:01-2010:06 period. Second, we offer some important new evidence by including both actual and estimated repurchase data in our analysis. Specifically, we assess the predictive performance of the total payout ratio when compared against a proxy total payout measure which can be easily constructed in markets where there are repurchase data limitations. Third, in departure from a purely statistical context, our paper further investigates predictability in terms of economic significance and evaluates the performance of a mean-variance portfolio optimization strategy based on each of the conditional predictive models relative to the historical moving average model.

In-sample and out-of-sample statistical tests suggest that an element of predictability exists in both markets. Out-of-sample performance is assessed by means of conventional tests and also by employing the Goyal and Welch (2003) graphical diagnostic. Our results suggest that the total payout ratio, although a successful predictor of the equity premium, does not manage to outperform the dividend-price ratio in any of the considered markets. This important new finding implies that share repurchase policies may be independent of dividend policies in the two largest European stock markets and hence, share repurchases do not substitute for dividend payments. Consequently, the information content of repurchases may not be relevant for predicting the equity premium in these markets.

Moreover, although the literature suggests that the proxy we use is expected to underestimate actual share repurchases (see Stephens and Weisbach, 1998; Banyi et al., 2008),

our UK data reveal that this is not always the case and that country specific factors may lead to an overestimation instead. Therefore, to the extent relevant data is available, interested parties should consider these factors when employing proxies (see Section 2.1). Additionally, we find no association between the predictive performance of the total payout ratio and its proxy counterpart. This lack of association indicates that the predictive content of proxy repurchase data is not in line with that of the actual repurchase data. Therefore, caution should be taken when repurchase activity is represented by proxies in order to predict excess returns. This is because proxies are inherently associated with measurement errors and even if it is possible to outperform other variables in practice, there is no way of knowing ex-ante when this might be the case. Therefore, our paper suggests that actual data should be preferred when available as they carry a more relevant economic content. Finally, we find that there is consistency between the statistical evidence of predictability and the evidence based on economic value, substantiating the robustness of our conclusions under different frameworks of analysis.

Acknowledgements

We thank an anonymous referee, an associate editor, and Theo J. Vermaelen (the editor) for their invaluable comments which substantially improved the paper. We also thank Christos Agiakloglou, Sanjay Banerji, Leonidas Barbopoulos, Chris Brooks, Taufiq Choudhry, George Dotsis, Neil M. Kellard, Gerhard Kling, John C. Nankervis, Andrew Vivian, John O.S. Wilson, Simon Wolfe, and conference participants at the 2012 British, Accounting and Finance Association (BAFA) meeting in Brighton, UK, the 2012 International Finance and Banking Society (IFABS) meeting in Valencia, Spain, the 2012 Multinational Finance Society in Krakow, Poland, and the 2012 Financial Management Association (FMA) meeting in Atlanta, USA, for helpful comments and discussions.

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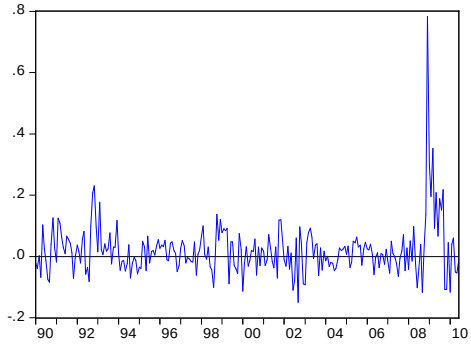
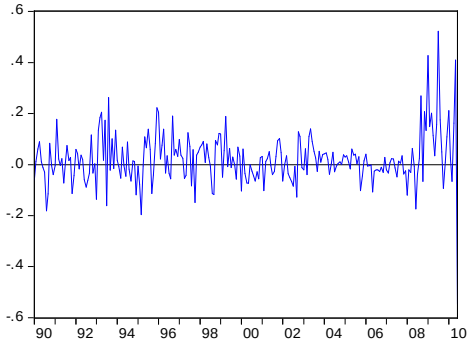
Figures

Figure 1 Time series graphs

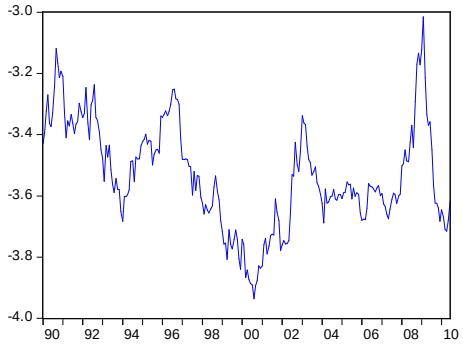
(i) The log equity premium (UK)



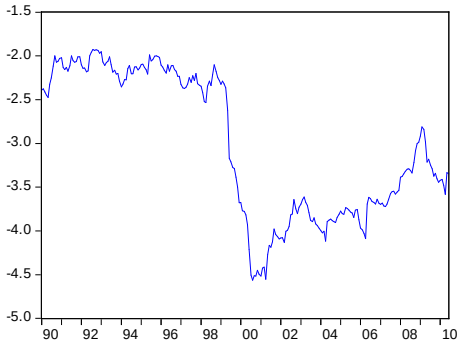
(iv) The log equity premium (France)



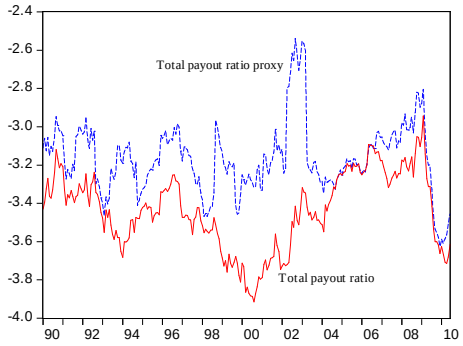
(ii) The log dividend-price ratio (UK)



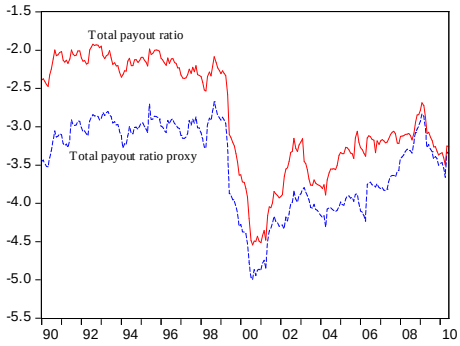
(v) The log dividend-price ratio (France)



(iii) Total payout ratios (UK)



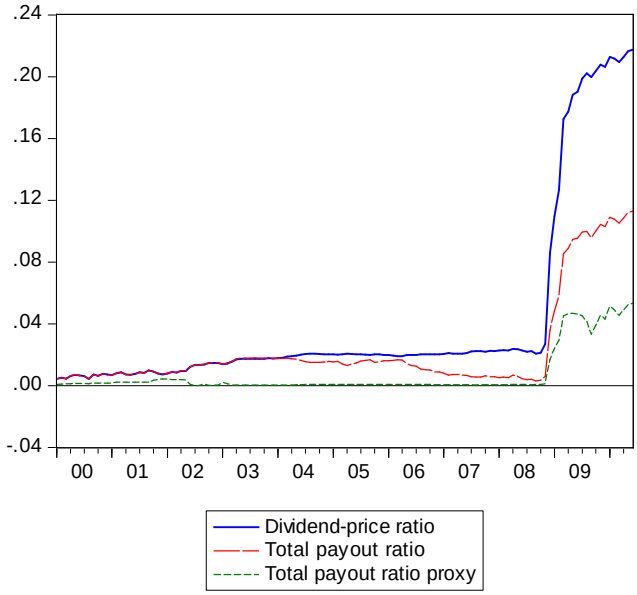
(vi) Total payout ratios (France)



The above graphs depict the time series of the log equity premium, the log dividend-price ratio and the two measures of the total payout ratio in the UK and France. All variables are explained in Section 2.

Figure 2 Graphical representation of cumulative relative out-of-sample performance

(i) UK market



(ii) French market

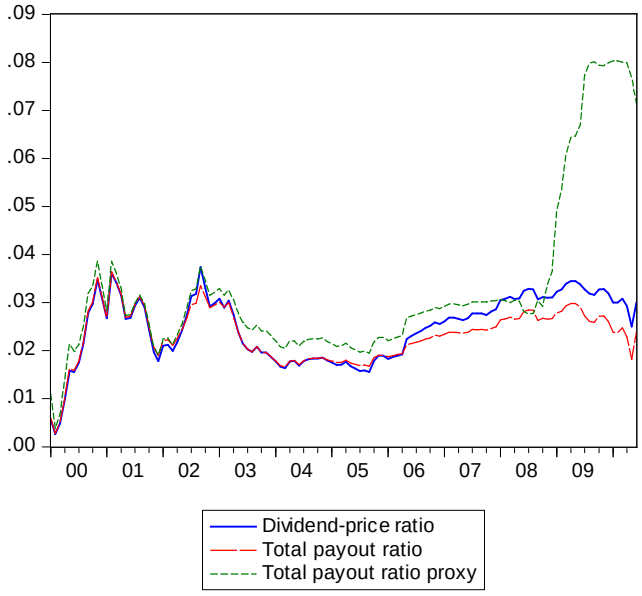


Figure 2 presents the out-of-sample graphical procedure of Goyal and Welch (2003) when applied to the UK and France (see Section 3.2.3 for a detailed description). The method is presented for all models under consideration when compared to the historical moving average model. The out-of-sample period spans 2000:01-2010:06.

Tables

Table 1 Descriptive statistics.

Sample 1990:01-2010:06	Mean	St.dev.	Median	ERS
		UK		
EQP_t	2.00	8.44	1.69	0.34***
DP_t	-3.53	17.25	-3.56	2.79**
TPO_t	-3.44	20.00	-3.43	2.96*
$proxy-TPO_t$	-3.16	18.96	-3.18	1.43***
		France		
EQP_t	2.06	10.04	1.17	1.13***
DP_t	-3.02	82.79	-3.21	18.13
TPO_t	-2.87	71.85	-3.07	12.00
$proxy-TPO_t$	-3.51	57.51	-3.32	4.98

Table 1 presents summary statistics on the time series of the excess returns (EQP), dividend price ratio (DP), total payout ratio (TPO), and the proxy of the total payout ratio (proxy-TPO). ERS denotes the Elliot et al. (1996) unit root test. Asterisks *, **, and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 2 Predictive regressions.

Panel A: Univariate predictive regressions						
	UK			France		
	DP_{t-1}	TPO_{t-1}	$proxy\text{-}TPO_{t-1}$	DP_{t-1}	TPO_{t-1}	$proxy\text{-}TPO_{t-1}$
Full sample 1990:01-2010:06						
Coefficient	0.172	0.106	0.074	0.024	0.012	0.031
t-statistic	(5.845)	(4.040)	(2.610)	(2.458)	(1.349)	(2.847)
Boot. *p*-value	[0.000]	[0.000]	[0.007]	[0.008]	[0.094]	[0.002]
R^2 %	12.33	6.30	2.73	2.43	0.74	3.23
Adj. Coefficient	0.160	0.094	0.068	0.021	0.009	0.028
t-statistic	(5.440)	(3.570)	(2.420)	(2.160)	(1.012)	(2.611)
p-value	[0.000]	[0.000]	[0.007]	[0.016]	[0.154]	[0.004]
Sample period 1990:01-2005:01						
Coefficient	0.064	0.058	0.007	0.018	0.013	0.022
t-statistic	(2.613)	(2.263)	(0.291)	(2.180)	(1.728)	(2.419)
Boot. *p*-value	[0.009]	[0.021]	[0.449]	[0.017]	[0.046]	[0.034]
R^2 %	3.70	2.80	0.05	2.60	1.65	3.18
Adj. Coefficient	0.049	0.044	0.002	0.012	0.007	0.017
t-statistic	(1.998)	(1.679)	(0.087)	(1.481)	(0.990)	(1.851)
p-value	[0.023]	[0.047]	[0.465]	[0.070]	[0.160]	[0.032]

Panel B: Multivariate predictive regressions						
	UK			France		
	DP_{t-1}	TPO_{t-1}	R^2 %	DP_{t-1}	TPO_{t-1}	R^2 %
Coefficient	0.171	0.001	12.33	0.024	-0.075	2.94
t-statistic	(5.833)	(0.033)		(2.460)	(-1.139)	
p-value	[0.000]	[0.973]		[0.014]	[0.255]	

In this table, Panel A presents results from the following univariate regression:

$$r_{m,t} - r_{f,t} = \alpha + \beta x_{t-1} + \varepsilon_t$$

where the predictive variable, *x*, can be either the dividend-price ratio (DP), the total payout ratio (TPO) or the total payout ratio proxy (proxy-TPO). Panel B presents results from bivariate regressions of the log excess market returns on the dividend-price ratio (DP) and the total payout ratio (TPO). The adjusted coefficient (adj. coefficient) is computed using the method of Amihud and Hurvich (2004). Bootstrap *p*-values (Boot. *p*-value) are computed using the bootstrap procedure described in Section 3.1.1 based on 10,000 repetitions. In the case of France the bootstrap procedure also accounts for the structural break reported in Section 2.2 by incorporating a dummy variable in equation (6) which takes the value of 1 for the post-break period and 0 otherwise. 0.000 indicates < 0.001. Results are also reported with respect to a sub-period which uses data up to 2005.

Table 3 Out-of-sample performance.

Forecast error statistic	Historical moving average %	Dividend-price ratio %	Total payout ratio %	Total payout ratio proxy %
Full sample 2000:01-2010:06		UK		
Mean	0.50	0.77	0.32	0.68
Standard Deviation	10.29	9.39	9.85	10.07
Root Mean Square Error	10.26	**9.38**	9.81	10.05
Sub-sample 2000:01-2005:01				
Mean	-1.51	-0.80	-1.09	-1.49
Standard Deviation	5.61	5.46	5.48	5.61
Root Mean Square Error	5.77	**5.47**	5.54	5.76
Sub-sample 2005:02-2010:06				
Mean	2.38	2.24	1.64	2.72
Standard Deviation	13.03	11.82	12.55	12.64
Root Mean Square Error	13.15	**11.94**	12.56	12.84
Full sample 2000:01-2010:06		France		
Mean	0.34	1.92	1.73	1.81
Standard Deviation	11.16	10.89	10.95	10.76
Root Mean Square Error	11.12	11.02	11.04	**10.87**
Sub-sample 2000:01-2005:01				
Mean	-1.14	1.45	1.29	1.83
Standard Deviation	5.93	5.61	5.65	5.44
Root Mean Square Error	6.00	5.75	5.75	**5.69**
Sub-sample 2005:02-2010:06				
Mean	1.72	2.37	2.15	1.79
Standard Deviation	14.37	14.20	14.27	14.08
Root Mean Square Error	14.36	14.29	14.33	**14.09**

This table presents the properties of the equity premium prediction errors obtained from four competing models: The historical moving average model, a model which employs the lagged dividend-price ratio, and two other models which employ the lagged total payout ratio using either actual or estimated data on share repurchases. The full out-of-sample period spans 2000:01-2010:06. For a more in-depth evaluation, results are also reported for arbitrary splits of the sample, each spanning approximately five years. All models use available data starting from 1990:01. Boldface indicates superior performance (i.e. more accurate forecasts).

Table 4 Diebold and Mariano (1995) statistics.

Sample Period	Dividend-price ratio model	Total payout ratio model	Total payout ratio proxy model
	UK		
2000:01-2010:06 (full sample)	2.68***	2.46***	1.83***
2000:01-2005:01	2.56***	1.90***	0.16
2005:02-2010:06	2.48***	2.18***	1.84***
	France		
2000:01-2010:06 (full sample)	1.17**	0.98**	2.06***
2000:01-2005:01	0.73*	0.79*	0.77*
2005:02-2010:06	1.29**	0.63	2.39***

Table 4 shows the computed Diebold and Mariano (1995) test statistics across different periods. These statistics are employed to test whether the reported RMSE performances between the predictive variables and the historical moving average in Table 3, are statistically different from one another. A positive value indicates that the conditional model performs better than the historical moving average model. Asterisks *, **, and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 5 Diebold and Mariano (1995) statistics between predictive variables.

Sample Period	Dividend-price ratio vs Total payout ratio	Total payout ratio vs Total payout ratio proxy
	UK	
2000:01-2010:06 (full sample)	-2.77***	-2.40***
2000:01-2005:01	-1.96**	-1.48*
2005:02-2010:06	-2.70***	-1.98**
	France	
2000:01-2010:06 (full sample)	-1.34*	1.88**
2000:01-2005:01	0.08	0.46
2005:02-2010:06	-2.77***	1.84**

Table 5 shows the computed Diebold and Mariano (1995) test statistics across different periods to assess whether the reported RMSE performances between the predictive variables in Table 3, are statistically different from one another. A negative (positive) value indicates that the first model performs better (worse) compared to the second model. Asterisks *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 6 Out-of-sample economic significance.

Sample Period	Dividend-price Ratio	Total payout ratio	Total payout ratio proxy
		UK	
2000:01-2010:06 (full sample)	172	124	-26
2000:01-2005:01	104	101	-110
2005:02-2010:06	241	146	59
		France	
2000:01-2010:06 (full sample)	28	22	73
2000:01-2005:01	23	31	85
2005:02-2010:06	32	15	62

This table reports the estimated Θs (see Section 4.5.1) which measure the economic significance of a dynamic strategy based on each considered predictive variable, namely the dividend-price ratio (DP), the total payout ratio (TPO) and the total payout ratio proxy (proxy-TPO) relative to a benchmark strategy which uses the historical moving average of the equity premium to construct one-step-ahead forecasts.