Appendix to

"The Predictive Power of the Dividend Risk Premium"

Not Intended for Publication!

Will be Provided as Online Appendix

A Proofs

This appendix presents the detailed proof of the propositions presented in the main text. In order to facilitate the exposition of the derivations, it is useful to re-state our main assumptions:

$$r_{t+1} = \mu_t + \epsilon^r_{t+1} \tag{A.1}$$

$$\mu_{t+1} = \alpha_0 + \alpha_1 \mu_t + \epsilon^\mu_{t+1} \tag{A.2}$$

$$\text{IG}_{t+1} = \delta_0 + \delta_1 \text{IG}_t + \epsilon^{\text{IG}}_{t+1} \tag{A.3}$$

$$\text{DRP}_{t+1} = \phi_0 + \phi_1 \text{IG}_t + \phi_2 \text{DRP}_t + \epsilon^{\text{DRP}}_{t+1} \tag{A.4}$$

where all error terms are *i.i.d* with zero mean.

A.1 Proposition 1

To derive the first proposition of our model, we start from the accounting identity linking together the expected dividend growth rate, the expected DRP and the implied growth rate:

$$\mathbb{E}_t(\Delta d_{t+1}) - \mathbb{E}_t(\text{DRP}_{t+1}) = \text{IG}_t$$

This implies that:

$$\begin{aligned}
\mathbb{E}_t(\Delta d_{t+1}) &= \mathbb{E}_t(\text{DRP}_{t+1}) + \text{IG}_t \\
&= \mathbb{E}_t(\phi_0 + \phi_1 \text{IG}_t + \phi_2 \text{DRP}_t + \epsilon^{\text{DRP}}_{t+1}) + \text{IG}_t
\end{aligned}$$

$$\mathbb{E}_t(\Delta d_{t+1}) = \phi_0 + (1+\phi_1)\mathrm{IG}_t + \phi_2 \mathrm{DRP}_t \tag{A.5}$$

Recall that the realized dividend growth can be decomposed into an expected component and a shock:

$$\Delta d_{t+1} = \mathbb{E}_t(\Delta d_{t+1}) + \epsilon_{t+1}^{\Delta d} \tag{A.6}$$

$$\Delta d_{t+1} = \phi_0 + (1+\phi_1)\mathrm{IG}_t + \phi_2 \mathrm{DRP}_t + \epsilon_{t+1}^{\Delta d} \tag{A.7}$$

This completes the proof of Proposition 1. ■

A.2 Proposition 2:

For ease of exposition, let us restate equation (10) from the manuscript:

$$\sum_{j=0}^{+\infty} \overline{\rho}^j \left(\mathbb{E}_t(r_{t+1+j}) - \mathbb{E}_t(\Delta d_{t+1+j})\right) = \frac{k}{1-\overline{\rho}} + \mathrm{DP}_t \tag{A.8}$$

Using equations (A.1) and (A.2), we can compute the first summation term on the left-hand side of equation (A.8):

$$\sum_{j=0}^{+\infty} \overline{\rho}^j \mathbb{E}_t(r_{t+1+j}) \equiv k_r + \sum_{j=0}^{+\infty} \overline{\rho}^j \alpha_1^j \mu_t$$

$$\sum_{j=0}^{+\infty} \overline{\rho}^j \mathbb{E}_t(r_{t+1+j}) \equiv k_r + \frac{\mu_t}{1-\overline{\rho}\alpha_1} \tag{A.9}$$

where k_r is a constant that depends on α_0 and α_1.

Similarly, we combine the result of Proposition 1 (equation (A.7)) together with equations (A.3) and (A.4) to compute the infinite sum of expected dividend growth rates:

$$\sum_{j=0}^{+\infty} \overline{\rho}^j \mathbb{E}_t(\Delta d_{t+1+j}) = k_{\Delta d} + \sum_{j=0}^{+\infty} \overline{\rho}^j \left[\delta_1^j(1+\phi_1) + \phi_1\phi_2 \frac{\delta_1^j - \phi_2^j}{\delta_1 - \phi_2} \right] \mathrm{IG}_t + \sum_{j=0}^{+\infty} \overline{\rho}^j \phi_2^{j+1} \mathrm{DRP}_t$$

(A.10)

$$\sum_{j=0}^{+\infty} \overline{\rho}^j \mathbb{E}_t(\Delta d_{t+1+j}) \equiv k_{\Delta d} + \left[\frac{1+\phi_1}{1-\overline{\rho}\delta_1} + \frac{\bar{\rho}\phi_1\phi_2}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)} \right] \mathrm{IG}_t + \frac{\phi_2 \mathrm{DRP}_t}{1-\overline{\rho}\phi_2}$$

where $k_{\Delta d}$ is a constant that depends on δ_0, δ_1, ϕ_0, ϕ_1, and ϕ_2.

Substituting equations (A.9) and (A.10) into equation (A.8) yields:

$$\begin{aligned} \mathrm{DP}_t &= -\frac{k}{1-\overline{\rho}} + \sum_{j=0}^{+\infty} \overline{\rho}^j \left(\mathbb{E}_t(r_{t+1+j}) - \mathbb{E}_t(\Delta d_{t+1+j}) \right) \\ &= \underbrace{-\frac{k}{1-\overline{\rho}} + k_r - k_{\Delta d}}_{k_1} + \frac{\mu_t}{1-\overline{\rho}\alpha_1} - \left[\frac{1+\phi_1}{1-\overline{\rho}\delta_1} + \frac{\bar{\rho}\phi_1\phi_2}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)} \right] \mathrm{IG}_t - \frac{\phi_2 \mathrm{DRP}_t}{1-\overline{\rho}\phi_2} \end{aligned}$$

(A.11)

$$\mathrm{DP}_t \equiv k_1 + \frac{\mu_t}{1-\overline{\rho}\alpha_1} - \left[\frac{1+\phi_1}{1-\overline{\rho}\delta_1} + \frac{\bar{\rho}\phi_1\phi_2}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)} \right] \mathrm{IG}_t - \frac{\phi_2}{1-\overline{\rho}\phi_2} \mathrm{DRP}_t$$

Similarly, we can express the next-period dividend price ratio as:

$$\mathrm{DP}_{t+1} \quad = \quad k_1 + \frac{\mu_{t+1}}{1-\overline{\rho}\alpha_1} - \left[\frac{1+\phi_1}{1-\overline{\rho}\delta_1} + \frac{\bar{\rho}\phi_1\phi_2}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)} \right] \mathrm{IG}_{t+1} - \frac{\phi_2}{1-\overline{\rho}\phi_2} \mathrm{DRP}_{t+1}$$

Using equations (A.3) and (A.4), we can show that:

$$\mathrm{DP}_{t+1} = k_1 + \frac{\mu_{t+1}}{1-\overline{\rho}\alpha_1} - \left[\frac{1+\phi_1}{1-\overline{\rho}\delta_1} + \frac{\bar{\rho}\phi_1\phi_2}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)} \right] \mathrm{IG}_{t+1} - \frac{\phi_2}{1-\overline{\rho}\phi_2} \mathrm{DRP}_{t+1}$$

$$
\begin{aligned}
&= k_1 + \frac{\alpha_0 + \alpha_1\mu_t + \epsilon^{\mu}_{t+1}}{1-\bar{\rho}\alpha_1} - \left[\frac{1+\phi_1}{1-\bar{\rho}\delta_1} + \frac{\bar{\rho}\phi_1\phi_2}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)}\right](\delta_0 + \delta_1 \mathrm{IG}_t + \epsilon^{\mathrm{IG}}_{t+1}) \\
&- \frac{\phi_2}{1-\bar{\rho}\phi_2}(\phi_0 + \phi_1 \mathrm{IG}_t + \phi_2 \mathrm{DRP}_t + \epsilon^{\mathrm{DRP}}_{t+1}) \\
&= k_1 + \underbrace{\frac{\alpha_0}{1-\bar{\rho}\alpha_1} - \left[\frac{1+\phi_1}{1-\bar{\rho}\delta_1} + \frac{\bar{\rho}\phi_1\phi_2}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)}\right]\delta_0 - \frac{\phi_0\phi_2}{1-\bar{\rho}\phi_2}}_{k_2} + \frac{\alpha_1\mu_t + \epsilon^{\mu}_{t+1}}{1-\bar{\rho}\alpha_1} \\
&- \left[\frac{1+\phi_1}{1-\bar{\rho}\delta_1} + \frac{\bar{\rho}\phi_1\phi_2}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)}\right](\delta_1 \mathrm{IG}_t + \epsilon^{\mathrm{IG}}_{t+1}) - \frac{\phi_1\phi_2 \mathrm{IG}_t}{1-\bar{\rho}\phi_2} - \frac{\phi_2^2 \mathrm{DRP}_t + \phi_2\epsilon^{\mathrm{DRP}}_{t+1}}{1-\bar{\rho}\phi_2} \\
&\equiv k_1 + k_2 + \frac{\alpha_1\mu_t}{1-\bar{\rho}\alpha_1} - \left[\frac{1+\phi_1}{1-\bar{\rho}\delta_1} + \frac{\bar{\rho}\phi_1\phi_2}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)}\right]\delta_1 \mathrm{IG}_t - \frac{\phi_1\phi_2 \mathrm{IG}_t}{1-\bar{\rho}\phi_2} \\
&- \frac{\phi_2^2 \mathrm{DRP}_t}{1-\bar{\rho}\phi_2} + \underbrace{\frac{\epsilon^{\mu}_{t+1}}{1-\bar{\rho}\alpha_1} - \left[\frac{1+\phi_1}{1-\bar{\rho}\delta_1} + \frac{\bar{\rho}\phi_1\phi_2}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)}\right]\epsilon^{\mathrm{IG}}_t - \frac{\phi_2\epsilon^{\mathrm{DRP}}_{t+1}}{1-\bar{\rho}\phi_2}}_{\epsilon^{\mathrm{DP}}_{t+1}} \\
&\equiv \alpha_1 k_1 + \frac{\alpha_1\mu_t}{1-\bar{\rho}\alpha_1} - \left[\frac{1+\phi_1}{1-\bar{\rho}\delta_1} + \frac{\bar{\rho}\phi_1\phi_2}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)}\right](\alpha_1 + \delta_1 - \alpha_1)\mathrm{IG}_t \\
&- \frac{\phi_1\phi_2 \mathrm{IG}_t}{1-\bar{\rho}\phi_2} - \frac{\alpha_1 + \phi_2 - \alpha_1}{1-\bar{\rho}\phi_2}\phi_2 \mathrm{DRP}_t + k_2 + (1-\alpha_1)k_1 + \epsilon^{\mathrm{DP}}_{t+1}
\end{aligned}
$$

(A.12)

$$
\begin{aligned}
\mathrm{DP}_{t+1} &= k_2 + (1-\alpha_1)k_1 + \alpha_1 \mathrm{DP}_t - \left[\frac{1+\phi_1}{1-\bar{\rho}\delta_1} + \frac{\bar{\rho}\phi_1\phi_2}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)}\right](\delta_1 - \alpha_1)\mathrm{IG}_t \\
&- \frac{\phi_1\phi_2 \mathrm{IG}_t}{1-\bar{\rho}\phi_2} - \frac{\phi_2 - \alpha_1}{1-\bar{\rho}\phi_2}\phi_2 \mathrm{DRP}_t + \epsilon^{\mathrm{DP}}_{t+1}
\end{aligned}
$$

Following the steps of Campbell and Shiller (1988), it is straightforward to show that:

(A.13) $$r_{t+1} \approx k + \Delta d_{t+1} + \mathrm{DP}_t - \bar{\rho}\mathrm{DP}_{t+1}$$

The final step of the proof consists in substituting equations (A.7), (A.11), and

(A.12) into equation (A.13):

$$
\begin{aligned}
r_{t+1} &= \mathbb{E}_t\left(k + \Delta d_{t+1} + \mathrm{DP}_t - \overline{\rho}\mathrm{DP}_{t+1}\right) + \epsilon^r_{t+1} \\
&= k + \phi_0 + (1+\phi_1)\mathrm{IG}_t + \phi_2\mathrm{DRP}_t + \mathrm{DP}_t - \overline{\rho}\left(k_2 + (1-\alpha_1)k_1\right) + \epsilon^r_{t+1} \\
&- \overline{\rho}\left(\alpha_1 DP_t - \left[\frac{1+\phi_1}{1-\overline{\rho}\delta_1} + \frac{\bar{\rho}\phi_1\phi_2}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)}\right](\delta_1-\alpha_1)\mathrm{IG}_t - \frac{\phi_1\phi_2\mathrm{IG}_t}{1-\overline{\rho}\phi_2} - \frac{\phi_2-\alpha_1}{1-\overline{\rho}\phi_2}\phi_2\mathrm{DRP}_t\right) \\
&= \underbrace{k + \phi_0 - \overline{\rho}\left(k_2 + (1-\alpha_1)k_1\right)}_{\Psi} + (1-\overline{\rho}\alpha_1)\left(\mathrm{DP}_t + \left[\frac{1+\phi_1}{1-\overline{\rho}\delta_1} + \frac{\bar{\rho}\phi_1\phi_2}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)}\right]\mathrm{IG}_t\right) \\
&+ (1-\overline{\rho}\alpha_1)\left(\frac{\phi_2\mathrm{DRP}_t}{1-\overline{\rho}\phi_2}\right) + \epsilon^r_{t+1}
\end{aligned}
$$

We thus obtain:

$$
r_{t+1} \equiv \Psi + (1-\overline{\rho}\alpha_1)\underbrace{\left(\mathrm{DP}_t + \frac{1+\phi_1}{1-\overline{\rho}\delta_1}\mathrm{IG}_t + \frac{\bar{\rho}\phi_1\phi_2\mathrm{IG}_t}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)} + \frac{\phi_2}{1-\overline{\rho}\phi_2}\mathrm{DRP}_t\right)}_{\mathrm{DP}^{\mathrm{CORR}}} + \epsilon^r_{t+1} \tag{A.14}
$$

This completes the proof of Proposition 2. ■

B Additional Control Variables

- DP^{LAC}: We compute the DP^{LAC} ratio as in Golez (2014):

(B.1)
$$\text{DP}^{\text{LAC}} = \text{DP}_t + \frac{\Delta\bar{d}_t}{1-\bar{\rho}}$$

  where $\Delta\bar{d}_t$ is the average dividend growth rate over the past year.

- ΔFF: We construct ΔFF as the 1-month change in the federal fund rate as in Maio (2014).

- RREL: The RREL measure is the difference between the 3-month Treasury bill rate and its last four-quarter average as in Maio (2013). We obtain all interest rate data from the FRED database of the Federal Reserve Bank of St. Louis.

- SKEW: We download the time-series of the implied skewness from the website of the CBOE.

- SOP: We implement the sum-of-part method with no multiple growth. The forecast is given as $\hat{r}_{t+1} = \text{DP}_t + \bar{g}e_t$ where $\bar{g}e_t$ is the average earnings growth rate at time t computed using a trailing window of 20 years as in Ferreira and Santa-Clara (2011).

- SVAR: Following Bollerslev, Tauchen, and Zhou (2009) and Drechsler and Yaron (2011), we construct SVAR as the sum of the squared (1) 5-minute intraday returns and (2) the close-to-open (overnight) returns observed that month. We annualize the monthly SVAR by multiplying it with 12. All calculations are based on the intraday dataset from the CBOE.

- TERM: Following Maio (2013), we construct TERM as the difference between the yields on the 10-year and the 1-year US Treasury bonds. The data come from the FRED database.

- VRP: The VRP is defined as the difference between the (1) physical and (2) risk-neutral expectations of next-month's variance. We proxy the risk-neutral expectation of variance with the squared value of the VIX, which we obtain from Bloomberg. In order to compute the physical expectation of the (annualized) realized variance of the index returns, we closely follow the empirical framework of Drechsler and Yaron (2011). Briefly, we regress the monthly time series of SVAR on a constant, the lagged SVAR, and the lagged squared value of the VIX. We use the fitted value from this model as the physical expectation of realized variance.

Table A.1: Summary Statistics: At-the-Money Options

This table reports the summary statistics of several time series. Δd denotes the time series of (annualized) monthly dividend growth. r denotes the time series of (annualized) monthly S&P 500 returns. This corresponds to the return of the trading strategy that buys the index, collects the dividends paid over the next month and sells the index at the end of the following month. IG relates to the implied growth rate. In constructing the dividend strip, we only consider options that are at-the-money, i.e. with a Black and Scholes (1973) delta that is in absolute value between 0.375 and 0.625. DRP refers to the dividend risk premium. DP is the standard dividend price ratio. IG^{CORR} is the dividend risk premium corrected implied growth rate. DP^{IG} relates to the growth adjusted dividend price ratio. DP^{CORR} denotes the corrected dividend price ratio. The column entitled "Mean" reports the average of the time series [name in row]. Similarly, "Std", "Skew", and "Kurt" relate to the standard deviation, skewness, and kurtosis of the series [name in row]. AR(1) reports the first order autocorrelation. Finally, "Nobs" shows the number of observations.

	Mean	Std	Skew	Kurt	AR(1)	Nobs
Δd	0.06	0.05	-0.60	5.56	0.19	231
r	0.07	0.16	-0.78	4.32	0.08	231
IG	0.01	0.15	-2.05	10.40	0.78	231
DRP	0.04	0.13	1.92	10.40	0.70	231
DP	-4.04	0.22	0.22	3.81	0.98	231
$\mathbf{IG^{CORR}}$	0.06	0.07	-1.92	9.65	0.81	231
$\mathbf{DP^{IG}}$	-3.94	1.37	-2.18	11.22	0.79	231
$\mathbf{DP^{CORR}}$	-4.00	0.41	-2.20	10.14	0.87	231

Table A.2: The In-Sample Predictability of Dividend Growth: At-the-Money Options

This table summarizes the results of the predictability of 1-month dividend growth. We regress the time series of dividend growth on a constant and a lagged predictive variable. We consider two distinct predictive variables. The first one, IG, is the implied dividend growth rate. The second predictor, IG^{CORR}, is the expected dividend risk premium corrected implied growth rate: $\text{IG}_t^{\text{CORR}} = \phi_0 + (1 + \phi_1)\text{IG}_t + \phi_2\text{DRP}_t$. In constructing the dividend strip, we only consider options that are at-the-money, i.e. with a Black and Scholes (1973) delta that is in absolute value between 0.375 and 0.625. In the data, we find that $\phi_0 = 0.04$, $\phi_1 = -0.58$, and $\phi_2 = 0.24$. Armed with these parameters, we can construct IG^{CORR}. Although all regressions are estimated with an intercept, we report the slope estimates only. The entries in parentheses indicate the Newey–West (1987) adjusted t-statistics computed with 2 lags. The figures in square brackets relate to the bootstrapped p-values computed as in Rapach et al. (2013). R^2 is the r-squared of the regression model.

	0.40	
IG	(5.27)	
	[0.00]	
		0.97
$\mathbf{IG^{CORR}}$		(4.54)
		[0.00]
R^2	15.56%	17.23%

Table A.3: The Out-of-Sample Predictability of Dividend Growth: At-the-Money Options

This table presents the out-of-sample R^2 (R^2_{oos}) linked to the predictability of 1-month dividend growth by the variable [name in column]. The benchmark model is the recursive mean. We consider two alternative models. Our first model derives the forecast ($\hat{y}_t$) as follows: $\hat{y}_t = \text{IG}_t$. Our second model derives the forecast as: $\hat{y}_t = \phi_0 + (1+\phi_1)\text{IG}_t + \phi_2\text{DRP}_t$. This forecast corresponds exactly to $\text{IG}_t^{\text{CORR}}$. In constructing the dividend strip, we only consider options that are at-the-money, i.e. with a Black and Scholes (1973) delta that is in absolute value between 0.375 and 0.625. We use an expanding training window to estimate the parameters ϕ_0, ϕ_1, and ϕ_2. $MSE-F$ and $MSE-Adj$ denote the McCracken (2007) and Clark and West (2007) test statistics, respectively. The critical values of the $MSE-F$ statistic are 3.18, 1.55, and 0.80 at the 1 %, 5 %, and 10 % significance levels, respectively. The critical values for the $MSE-Adj$ test statistic are 2.33, 1.65, and 1.28 at the 1 %, 5 %, and 10 % significance levels, respectively. ***, **, and * indicate statistical significance at the 1 %, 5 %, and 10 % significance levels, respectively.

	IG	**IG$^{\textbf{CORR}}$**
R^2_{oos}	-12.30%	21.53%
$MSE-F$	-9.42	23.59***
$MSE-Adj$	1.51*	2.12**

Table A.4: The In-Sample Predictability of Returns: At-the-Money Options

This table summarizes the results of the predictability of monthly returns. We regress the time series of returns on a constant and the lagged predictive variable. We consider three main predictive variables. The first one, DP, is the standard dividend price ratio. The second predictor, $\mathrm{DP}^{\mathrm{IG}}$, is the implied growth augmented dividend price ratio: $\mathrm{DP}^{\mathrm{IG}} = \mathrm{DP}_t + \frac{\mathrm{IG}_t}{1-\bar{\rho}\delta_1}$. In constructing the dividend strip, we only consider options that are at-the-money, i.e. with a Black and Scholes (1973) delta that is in absolute value between 0.375 and 0.625. The third predictor, $\mathrm{DP}^{\mathrm{CORR}}$, is the corrected dividend price ratio: $\mathrm{DP}^{\mathrm{CORR}} = \mathrm{DP}_t + \frac{(1+\phi_1)\mathrm{IG}_t}{1-\bar{\rho}\delta_1} + \frac{\bar{\rho}\phi_1\phi_2\mathrm{IG}_t}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)} + \frac{\phi_2\mathrm{DRP}_t}{1-\bar{\rho}\phi_2}$. Using the following information, $\phi_1 = -0.58$, $\bar{\rho} = 0.98$, $\delta_1 = 0.90$, and $\phi_2 = 0.24$, we compute the relevant forecasting variables. We also consider several control variables discussed in the text: $\mathrm{DP}^{\mathrm{LAC}}$, BM, DEF, ΔFF, EP, INFL, NTIS, PAY, RREL, SKEW, SOP, SVAR, TBILL, TERM, and VRP. Although all regressions are estimated with an intercept, we report the slope estimates only. The entries in parentheses indicate the Newey–West (1987) adjusted t-statistics computed with 2 lags. The figures in square brackets relate to the bootstrapped p-values computed as in Rapach et al. (2013). R^2 is the r-squared of the regression model.

DP	0.20 (0.80) [0.24]																	
$\mathrm{DP}^{\mathrm{IG}}$		0.05 (2.02) [0.03]																
$\mathrm{DP}^{\mathrm{CORR}}$			0.16 (2.24) [0.02]	0.16 (2.11) [0.03]	0.20 (2.12) [0.03]	0.16 (2.19) [0.02]	0.15 (2.04) [0.03]	0.16 (1.85) [0.04]	0.16 (2.20) [0.02]	0.21 (2.89) [0.00]	0.16 (2.27) [0.02]	0.14 (1.89) [0.04]	0.16 (2.23) [0.02]	0.16 (2.17) [0.02]	0.16 (2.14) [0.03]	0.19 (2.49) [0.01]	0.19 (2.57) [0.01]	0.16 (2.16) [0.02]
$\mathrm{DP}^{\mathrm{LAC}}$				0.00 (0.39) [0.36]														
BM					-0.30 (-0.52) [0.32]													
DEF						5.63 (0.72) [0.26]												
ΔFF							13.26 (1.26) [0.13]											
EP								0.02 (0.17) [0.45]										
INFL									5.70 (0.60) [0.30]									
NTIS										4.60 (1.54) [0.08]								
PAY											-0.01 (-0.07) [0.48]							
RREL												9.47 (1.52) [0.08]						
SKEW													0.01 (0.84) [0.22]					
SOP														0.34 (0.18) [0.44]				
SVAR															-1.40 (-2.04) [0.03]			
TBILL																1.23 (0.76) [0.25]		
TERM																	-3.29 (-1.12) [0.16]	
VRP																		0.18 (0.07) [0.47]
R^2	0.64%	1.45%	1.56%	1.71%	1.67%	2.06%	2.50%	1.58%	1.71%	3.91%	1.56%	2.86%	1.73%	1.59%	3.34%	1.74%	1.98%	1.57%

Table A.5: The Out-of-Sample Predictability of Returns: At-the-Money Options

This table summarizes the evidence of the predictability of returns out-of-sample. The benchmark model is the recursive mean. We consider the DP, the $\mathrm{DP}^{\mathrm{IG}}$, and the $\mathrm{DP}^{\mathrm{CORR}}$ ratios, in turn. The last two forecasting variables are computed using the following formulas: $\mathrm{DP}^{\mathrm{IG}} = \mathrm{DP}_t + \frac{\mathrm{IG}_t}{1-\bar{\rho}\delta_1}$ and $\mathrm{DP}^{\mathrm{CORR}} = \mathrm{DP}_t + \frac{(1+\phi_1)\mathrm{IG}_t}{1-\bar{\rho}\delta_1} + \frac{\bar{\rho}\phi_1\phi_2\mathrm{IG}_t}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)} + \frac{\phi_2\mathrm{DRP}_t}{1-\bar{\rho}\phi_2}$. In constructing the dividend strip, we only consider options that are at-the-money, i.e. with a Black and Scholes (1973) delta that is in absolute value between 0.375 and 0.625. We use an expanding training window to recursively estimate the parameters ϕ_1, $\bar{\rho}$, δ_1, and ϕ_2. We use these parameters to compute the relevant forecasting variables. We also consider several documented predictors of stock market returns discussed in the text: $\mathrm{DP}^{\mathrm{LAC}}$, BM, DEF, ΔFF, EP, INFL, NTIS, PAY, RREL, SKEW, SOP, SVAR, TBILL, TERM, and VRP. For each of the aforementioned predictive variables, we estimate a return forecasting regression using all information from the training sample. We then use the estimated parameters together with the most recent observation of the forecasting variable to generate the forecast for the next-period, which we subsequently compare to the realized return. We report the out-of-sample R^2 (R^2_{oos}) achieved by each forecasting variable [name in column]. $MSE-F$ and $MSE-Adj$ denote the McCracken (2007) and Clark and West (2007) test statistics, respectively. The critical values of the $MSE-F$ statistic are 3.18, 1.55, and 0.80 at the 1 %, 5 %, and 10 % significance levels, respectively. The critical values for the $MSE-Adj$ test statistic are 2.33, 1.65, and 1.28 at the 1 %, 5 %, and 10 % significance levels, respectively. ***, **, and * indicate statistical significance at the 1 %, 5 %, and 10 % significance levels, respectively.

	DP	$\mathrm{DP}^{\mathrm{IG}}$	$\mathrm{DP}^{\mathrm{CORR}}$	$\mathrm{DP}^{\mathrm{LAC}}$	BM	DEF	ΔFF	EP	INFL	NTIS	PAY	RREL	SKEW	SOP	SVAR	TBILL	TERM	VRP
R^2_{oos}	1.25%	0.70%	2.38%	-2.44%	-0.22%	-3.15%	-0.11%	-0.65%	-0.12%	-3.04%	-1.06%	-0.13%	-1.04%	0.02%	-0.27%	-2.29%	-1.91%	-0.69%
$MSE-F$	1.09*	0.60	2.10**	-2.05	-0.19	-2.62	-0.09	-0.55	-0.11	-2.54	-0.90	-0.12	-0.89	0.02	-0.23	-1.93	-1.61	-0.59
$MSE-Adj$	1.78**	0.87	2.12**	-1.12	-0.09	-2.49	-0.17	-0.66	0.14	-1.13	-1.65	0.00	-0.80	0.18	0.13	-2.07	-1.71	-1.37

Table A.6: The Economic Value of Return Predictability: At-the-Money Options

This table sheds light on the economic gains of an investor who attempts to exploit the predictability of returns by devising market timing strategies. In constructing the dividend strip, we only consider options that are at-the-money, i.e. with a Black and Scholes (1973) delta that is in absolute value between 0.375 and 0.625. We assume that the investor has a quadratic utility function with a coefficient of relative risk aversion equal to γ. The first column shows the different values of γ, i.e. $\gamma = 2, 4, 6, 8$ or 10. At the end of each month, we compute the optimal allocation of the investor to the risky stock and the riskless asset. These weights depend, among others, on the forecasting model for expected returns and the risk aversion estimate. The investor considers several forecasting variables: DP, DP^{IG}, DP^{CORR}, DP^{LAC}, BM, DEF, ΔFF, EP, INFL, NTIS, PAY, RREL, SKEW, SOP, SVAR, TBILL, TERM, and VRP. Given these weights, we compute the realized return on the portfolio. We do this for each calendar month and return forecasting variable. The first 5 rows report the difference between the annualized certainty equivalent (ΔCE) of the strategy based on the predictive variable [name in column] and that of the strategy based on the recursive mean. The penultimate row sheds light on the difference between the annualized Sharpe ratio (SR) of the strategy based on the predictive variable [name in column] and that of the strategy based on the recursive mean. The last row presents the annualized Sharpe ratio (SR) of the strategy based on the variable [name in column].

γ	DP	DP^{IG}	DP^{CORR}	DP^{LAC}	BM	DEF	ΔFF	EP	INFL	NTIS	PAY	RREL	SKEW	SOP	SVAR	TBILL	TERM	VRP
2	4.21%	2.50%	6.59%	-4.72%	0.44%	-6.79%	-0.01%	-0.39%	-0.24%	-5.17%	-2.58%	0.85%	-1.84%	0.68%	0.03%	-5.03%	-4.95%	-1.52%
4	2.10%	1.25%	3.30%	-2.37%	0.21%	-3.41%	-0.01%	-0.21%	-0.12%	-2.60%	-1.30%	0.41%	-0.90%	0.33%	0.00%	-2.53%	-2.48%	-0.77%
6	1.39%	0.83%	2.20%	-1.59%	0.14%	-2.28%	0.00%	-0.14%	-0.07%	-1.74%	-0.87%	0.27%	-0.59%	0.22%	-0.01%	-1.69%	-1.66%	-0.51%
8	1.04%	0.62%	1.66%	-1.20%	0.10%	-1.72%	0.00%	-0.11%	-0.05%	-1.31%	-0.66%	0.20%	-0.44%	0.16%	-0.01%	-1.27%	-1.25%	-0.39%
10	0.83%	0.50%	1.33%	-0.96%	0.08%	-1.38%	0.00%	-0.10%	-0.04%	-1.06%	-0.53%	0.16%	-0.34%	0.12%	-0.01%	-1.02%	-1.00%	-0.31%
ΔSR	26.63%	17.96%	37.10%	-20.98%	4.77%	-66.86%	1.06%	-1.49%	-2.45%	-23.90%	-21.07%	7.82%	-12.68%	5.75%	2.52%	-40.96%	-46.92%	-11.69%
SR	44.34%	35.67%	54.81%	-3.28%	22.48%	-49.15%	18.76%	16.22%	15.25%	-6.19%	-3.36%	25.52%	5.03%	23.46%	20.23%	-23.25%	-29.22%	6.02%

Table A.7: Summary Statistics: Alternative Interpolation

This table reports the summary statistics of several time series. Δd denotes the time series of (annualized) monthly dividend growth. r denotes the time series of (annualized) monthly S&P 500 returns. This corresponds to the return of the trading strategy that buys the index, collects the dividends paid over the next month and sells the index at the end of the following month. IG relates to the implied growth rate. In constructing the annual dividend strip, we directly interpolate the 12-month maturity. DRP refers to the dividend risk premium. DP is the standard dividend price ratio. IG^{CORR} is the dividend risk premium corrected implied growth rate. DP^{IG} relates to the growth adjusted dividend price ratio. DP^{CORR} denotes the corrected dividend price ratio. The column entitled "Mean" reports the average of the time series [name in row]. Similarly, "Std", "Skew", and "Kurt" relate to the standard deviation, skewness, and kurtosis of the series [name in row]. AR(1) reports the first order autocorrelation. Finally, "Nobs" shows the number of observations.

	Mean	Std	Skew	Kurt	AR(1)	Nobs
Δd	0.06	0.05	-0.60	5.56	0.19	231
r	0.07	0.16	-0.78	4.32	0.08	231
IG	0.00	0.15	-2.29	11.36	0.84	231
DRP	0.05	0.11	2.59	14.70	0.75	231
DP	-4.04	0.22	0.22	3.81	0.98	231
$\mathbf{IG^{CORR}}$	0.06	0.08	-2.19	10.59	0.86	231
$\mathbf{DP^{IG}}$	-4.00	1.17	-2.46	12.65	0.86	231
$\mathbf{DP^{CORR}}$	-4.01	0.47	-2.56	12.49	0.90	231

Table A.8: The In-Sample Predictability of Dividend Growth: Alternative Interpolation

This table summarizes the results of the predictability of 1-month dividend growth. We regress the time series of dividend growth on a constant and a lagged predictive variable. We consider two distinct predictive variables. The first one, IG, is the implied dividend growth rate. The second predictor, IG^{CORR}, is the expected dividend risk premium corrected implied growth rate: $\text{IG}_t^{\text{CORR}} = \phi_0 + (1+\phi_1)\text{IG}_t + \phi_2\text{DRP}_t$. In constructing the annual dividend strip, we directly interpolate the 12-month maturity. In the data, we find that $\phi_0 = 0.04$, $\phi_1 = -0.49$, and $\phi_2 = 0.25$. Armed with these parameters, we can construct IG^{CORR}. Although all regressions are estimated with an intercept, we report the slope estimates only. The entries in parentheses indicate the Newey–West (1987) adjusted t-statistics computed with 2 lags. The figures in square brackets relate to the bootstrapped p-values computed as in Rapach et al. (2013). R^2 is the r-squared of the regression model.

	0.45	
IG	(4.86)	
	[0.00]	
		0.86
$\mathbf{IG^{CORR}}$		(4.51)
		[0.00]
R^2	18.13%	18.66%

Table A.9: The Out-of-Sample Predictability of Dividend Growth: Alternative Interpolation

This table presents the out-of-sample R^2 (R^2_{oos}) linked to the predictability of 1-month dividend growth by the variable [name in column]. The benchmark model is the recursive mean. We consider two alternative models. Our first model derives the forecast ($\hat{y}_t$) as follows: $\hat{y}_t = \text{IG}_t$. Our second model derives the forecast as: $\hat{y}_t = \phi_0 + (1+\phi_1)\text{IG}_t + \phi_2\text{DRP}_t$. This forecast corresponds exactly to $\text{IG}_t^{\text{CORR}}$. In constructing the annual dividend strip, we directly interpolate the 12-month maturity. We use an expanding training window to estimate the parameters ϕ_0, ϕ_1, and ϕ_2. $MSE - F$ and $MSE - Adj$ denote the McCracken (2007) and Clark and West (2007) test statistics, respectively. The critical values of the $MSE - F$ statistic are 3.18, 1.55, and 0.80 at the 1 %, 5 %, and 10 % significance levels, respectively. The critical values for the $MSE - Adj$ test statistic are 2.33, 1.65, and 1.28 at the 1 %, 5 %, and 10 % significance levels, respectively. ***, **, and * indicate statistical significance at the 1 %, 5 %, and 10 % significance levels, respectively.

	IG	$\textbf{IG}^{\textbf{CORR}}$
R^2_{oos}	0.56%	22.52%
$MSE - F$	0.49	25.00***
$MSE - Adj$	1.54*	2.02**

Table A.10: The In-Sample Predictability of Returns: Alternative Interpolation

This table summarizes the results of the predictability of monthly returns. We regress the time series of returns on a constant and the lagged predictive variable. We consider three main predictive variables. The first one, DP, is the standard dividend price ratio. The second predictor, DP^{IG}, is the implied growth augmented dividend price ratio: $\text{DP}^{\text{IG}} = \text{DP}_t + \frac{\text{IG}_t}{1-\bar{\rho}\delta_1}$. In constructing the annual dividend strip, we directly interpolate the 12-month maturity. The third predictor, DP^{CORR}, is the corrected dividend price ratio: $\text{DP}^{\text{CORR}} = \text{DP}_t + \frac{(1+\phi_1)\text{IG}_t}{1-\bar{\rho}\delta_1} + \frac{\bar{\rho}\phi_1\phi_2\text{IG}_t}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)} + \frac{\phi_2\text{DRP}_t}{1-\bar{\rho}\phi_2}$. Using the following information, $\phi_1 = -0.49$, $\bar{\rho} = 0.98$, $\delta_1 = 0.89$, and $\phi_2 = 0.25$, we compute the relevant forecasting variables. We also consider several control variables discussed in the text: DP^{LAC}, BM, DEF, ΔFF, EP, INFL, NTIS, PAY, RREL, SKEW, SOP, SVAR, TBILL, TERM, and VRP. Although all regressions are estimated with an intercept, we report the slope estimates only. The entries in parentheses indicate the Newey–West (1987) adjusted t-statistics computed with 2 lags. The figures in square brackets relate to the bootstrapped p-values computed as in Rapach et al. (2013). R^2 is the r-squared of the regression model.

DP	0.20 (0.80) [0.23]																	
DP^{IG}		0.05 (1.77) [0.05]																
DP^{CORR}			0.14 (2.15) [0.02]	0.13 (2.02) [0.03]	0.16 (1.81) [0.06]	0.13 (1.95) [0.04]	0.13 (1.93) [0.04]	0.14 (1.84) [0.05]	0.14 (2.11) [0.03]	0.16 (2.43) [0.01]	0.14 (2.18) [0.02]	0.11 (1.71) [0.06]	0.14 (2.12) [0.02]	0.14 (2.10) [0.02]	0.12 (1.81) [0.05]	0.16 (2.18) [0.02]	0.16 (2.38) [0.02]	0.14 (2.10) [0.03]
DP^{LAC}				0.00 (0.27) [0.41]														
BM					-0.20 (-0.33) [0.39]													
DEF						4.50 (0.56) [0.31]												
ΔFF							13.17 (1.25) [0.12]											
EP								0.01 (0.08) [0.47]										
INFL									5.21 (0.57) [0.31]									
NTIS										4.02 (1.36) [0.11]								
PAY											0.01 (0.07) [0.47]							
RREL												9.16 (1.50) [0.08]						
SKEW													0.01 (0.80) [0.23]					
SOP														0.09 (0.05) [0.47]				
SVAR															-1.30 (-1.82) [0.05]			
TBILL																1.00 (0.59) [0.30]		
TERM																	-3.12 (-1.03) [0.18]	
VRP																		0.07 (0.03) [0.49]
R^2	0.64%	1.32%	1.44%	1.51%	1.49%	1.76%	2.37%	1.45%	1.57%	3.30%	1.45%	2.63%	2.63%	1.45%	2.94%	1.57%	1.82%	1.44%

Table A.11: The Out-of-Sample Predictability of Returns: Alternative Interpolation

This table summarizes the evidence of the predictability of returns out-of-sample. The benchmark model is the recursive mean. We consider the DP, the DP^{IG}, and the DP^{CORR} ratios, in turn. The last two forecasting variables are computed using the following formulas: $\text{DP}^{\text{IG}} = \text{DP}_t + \frac{\text{IG}_t}{1-\bar{\rho}\delta_1}$ and $\text{DP}^{\text{CORR}} = \text{DP}_t + \frac{(1+\phi_1)\text{IG}_t}{1-\bar{\rho}\delta_1} + \frac{\bar{\rho}\phi_1\phi_2\text{IG}_t}{(1-\bar{\rho}\delta_1)(1-\bar{\rho}\phi_2)} + \frac{\phi_2\text{DRP}_t}{1-\bar{\rho}\phi_2}$. In constructing the annual dividend strip, we directly interpolate the 12-month maturity. We use an expanding training window to recursively estimate the parameters ϕ_1, $\bar{\rho}$, δ_1, and ϕ_2. We use these parameters to compute the relevant forecasting variables. We also consider several documented predictors of stock market returns discussed in the text: DP^{LAC}, BM, DEF, ΔFF, EP, INFL, NTIS, PAY, RREL, SKEW, SOP, SVAR, TBILL, TERM, and VRP. For each of the aforementioned predictive variables, we estimate a return forecasting regression using all information from the training sample. We then use the estimated parameters together with the most recent observation of the forecasting variable to generate the forecast for the next-period, which we subsequently compare to the realized return. We report the out-of-sample R^2 (R^2_{oos}) achieved by each forecasting variable [name in column]. $MSE-F$ and $MSE-Adj$ denote the McCracken (2007) and Clark and West (2007) test statistics, respectively. The critical values of the $MSE-F$ statistic are 3.18, 1.55, and 0.80 at the 1 %, 5 %, and 10 % significance levels, respectively. The critical values for the $MSE-Adj$ test statistic are 2.33, 1.65, and 1.28 at the 1 %, 5 %, and 10 % significance levels, respectively. ***, **, and * indicate statistical significance at the 1 %, 5 %, and 10 % significance levels, respectively.

	DP	DP^{IG}	DP^{CORR}	DP^{LAC}	BM	DEF	ΔFF	EP	INFL	NTIS	PAY	RREL	SKEW	SOP	SVAR	TBILL	TERM	VRP
R^2_{oos}	1.25%	0.06%	1.58%	-2.44%	-0.22%	-3.15%	-0.11%	-0.65%	-0.12%	-3.04%	-1.06%	-0.13%	-1.04%	0.02%	-0.27%	-2.29%	-1.91%	-0.69%
$MSE-F$	1.09*	0.06	1.38*	-2.05	-0.19	-2.62	-0.09	-0.55	-0.11	-2.54	-0.90	-0.12	-0.89	0.02	-0.23	-1.93	-1.61	-0.59
$MSE-Adj$	1.78**	0.43	1.48*	-1.12	-0.09	-2.49	-0.17	-0.66	0.14	-1.13	-1.65	0.00	-0.80	0.18	0.13	-2.07	-1.71	-1.37

Table A.12: The Economic Value of Return Predictability: Alternative Interpolation

This table sheds light on the economic gains of an investor who attempts to exploit the predictability of returns by devising market timing strategies. In constructing the annual dividend strip, we directly interpolate the 12-month maturity. We assume that the investor has a quadratic utility function with a coefficient of relative risk aversion equal to γ. The first column shows the different values of γ, i.e. $\gamma = 2, 4, 6, 8$ or 10. At the end of each month, we compute the optimal allocation of the investor to the risky stock and the riskless asset. These weights depend, among others, on the forecasting model for expected returns and the risk aversion estimate. The investor considers several forecasting variables: DP, DP^{IG}, DP^{CORR}, DP^{LAC}, BM, DEF, ΔFF, EP, INFL, NTIS, PAY, RREL, SKEW, SOP, SVAR, TBILL, TERM, and VRP. Given these weights, we compute the realized return on the portfolio. We do this for each calendar month and return forecasting variable. The first 5 rows report the difference between the annualized certainty equivalent (ΔCE) of the strategy based on the predictive variable [name in column] and that of the strategy based on the recursive mean. The penultimate row sheds light on the difference between the annualized Sharpe ratio (SR) of the strategy based on the predictive variable [name in column] and that of the strategy based on the recursive mean. The last row presents the annualized Sharpe ratio (SR) of the strategy based on the variable [name in column].

γ	DP	DP^{IG}	DP^{CORR}	DP^{LAC}	BM	DEF	ΔFF	EP	$INFL$	NTIS	PAY	RREL	SKEW	SOP	SVAR	TBILL	TERM	VRP
2	4.21%	1.22%	4.86%	-4.72%	0.44%	-6.79%	-0.01%	-0.39%	-0.24%	-5.17%	-2.58%	0.85%	-1.84%	0.68%	0.03%	-5.03%	-4.95%	-1.52%
4	2.10%	0.60%	2.43%	-2.37%	0.21%	-3.41%	-0.01%	-0.21%	-0.12%	-2.60%	-1.30%	0.41%	-0.90%	0.33%	0.00%	-2.53%	-2.48%	-0.77%
6	1.39%	0.40%	1.62%	-1.59%	0.14%	-2.28%	0.00%	-0.14%	-0.07%	-1.74%	-0.87%	0.27%	-0.59%	0.22%	-0.01%	-1.69%	-1.66%	-0.51%
8	1.04%	0.30%	1.22%	-1.20%	0.10%	-1.72%	0.00%	-0.11%	-0.05%	-1.31%	-0.66%	0.20%	-0.44%	0.16%	-0.01%	-1.27%	-1.25%	-0.39%
10	0.83%	0.24%	0.98%	-0.96%	0.08%	-1.38%	0.00%	-0.10%	-0.04%	-1.06%	-0.53%	0.16%	-0.34%	0.12%	-0.01%	-1.02%	-1.00%	-0.31%
ΔSR	26.63%	11.49%	29.37%	-20.98%	4.77%	-66.86%	1.06%	-1.49%	-2.45%	-23.90%	-21.07%	7.82%	-12.68%	5.75%	2.52%	-40.96%	-46.92%	-11.69%
SR	44.34%	29.19%	47.08%	-3.28%	22.48%	-49.15%	18.76%	16.22%	15.25%	-6.19%	-3.36%	25.52%	5.03%	23.46%	20.23%	-23.25%	-29.22%	6.02%