Extrapolative Expectations and Investment Decisions: Evidence from Scrip Dividends

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Abstract

We use data on scrip dividends, which give shareholders the option to receive additional shares instead of cash dividends, to investigate how investors form expectations of future returns. Shareholders are more likely to elect to receive dividends in shares when recent past returns are higher, especially when returns are positive and volatile. Actions based on extrapolative beliefs are stronger in small firms, growth firms, and firms with low institutional ownership. Finally, take-up rates of scrip dividends negatively predict both short- and long-run future returns.

Keywords: dividends, extrapolative expectations

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1 Introduction

Many studies have investigated how investors form their expectations about future asset returns. One of the useful ideas is return extrapolation, the belief that an asset's future return is a positive function of its recent past returns. Expectation models based on return extrapolation can explain important facts about asset prices, such as return prediction at the aggregate level, excess volatility, and asset bubble (Barberis et al., 2015; Jin and Sui, 2021). In particular, recent studies using survey data provide convincing evidence that extrapolative beliefs affect investors' expectations of future stock returns (Vissing-Jorgensen, 2004; Greenwood and Shleifer, 2014; Cassella and Gulen, 2018; Da, Huang, and Jin, 2021).

However, existing studies have limitations in terms of providing evidence that extrapolative beliefs affect expectation formation. Existing literature mainly focuses on analyzing the aggregate stock market return using survey data, except for Da, Huang, and Jin (2021), who study individual stock returns. There is a question on whether extrapolative beliefs affect expectations for individual stock prices, not the aggregate stock return. This difference is potentially significant because firm-specific information can be involved in forecasting individual stock returns. A problem is also inherent in the survey data used to analyze the expectation formation process. In investment situations, investors' expectations are deeply associated with future economic consequences. On the other hand, when predicting stock prices in surveys, making a prediction has no economic consequence. Since the economic consequence is not tied to answering a survey, the expectation in a survey and in an actual investment situation can be different. Therefore, it is difficult to tell from survey data whether return extrapolation affects expectation formation if expectations are associated with future wealth.

To overcome this issue, we analyze a hand-collected data set on scrip dividends. A scrip dividend is a process of providing shareholders the option of receiving either a cash dividend or common stock. Shareholders who hold shares as of record date can decide to elect for the scrip dividend program and receive dividends in stocks. This choice reflects a shareholder's expectation of future returns on their holdings. The expectation reflected in taking the scrip dividend is directly linked to the shareholder's future wealth. In particular, shareholders will choose the scrip dividend option if they believe stock prices will increase in the future.[1] Otherwise, shareholders can opt out to receive cash and use it elsewhere.

[1] One other possible economic incentive is that shareholders can increase the holdings without additional transaction costs. However, the motivation from transaction costs does not affect the fact that shareholders will choose scrip dividends only when their expectation of future stock price is higher than the current price.

Taking advantage of our data on scrip dividends, we investigate whether extrapolative beliefs affect shareholders' expectations of future stock returns. We use a fraction of shareholders taking scrip dividends, namely, scrip take-up, as a proxy for shareholders' expectations. We hypothesize that a larger fraction of shareholders will choose the scrip dividend option when recent past returns of their holdings are higher. To investigate this, we first estimate a linear regression of scrip take-up on recent past stock returns. We find that more shareholders choose to receive dividends in stock when the recent monthly returns are higher. The regression coefficient is positive and significant for the most recent returns but insignificant for more distant past returns. The result is stronger when past returns are positive and more volatile. Importantly, the relationship between scrip take-up and past returns holds for the idiosyncratic component but not for the systematic component of past returns. Our results are robust to the inclusion of market returns and various firm characteristics.

To quantify the tendency of investors to overweigh recent returns, we estimate Greenwood and Shleifer (2014)'s specification of extrapolation with exponential decay function as the weighting scheme for past returns. In this framework, the degree of extrapolative weighting is measured by two parameters. The first parameter, β, measures the extent to which shareholders' expectations are associated with past returns overall. The second parameter, λ, measures the relative weight of distant past returns to recent past returns when shareholders extrapolate past returns to predict future prices. We find that β is positive and significant, meaning that shareholders relate past returns to expectations in their decisions to take scrip dividends. Moreover, λ is significantly lower than 1, suggesting that shareholders significantly overweigh recent past returns compared to distant past returns in expectation formation. Our result is consistent with other research that use a survey response as a proxy for investors' expectations.

We explore how firm characteristics affect the fraction of shareholders to take scrip dividends and whether shareholders form expectations differently according to the size and growth opportunity of a firm. We first show that β is positive and significant for small firms but insignificant for large firms. This result indicates that shareholders of small firms are more strongly affected by past returns in their expectations than shareholders of large firms. However, a larger δ for small firms implies that both distant and recent past returns affect shareholders' expectations. Next, we show that β is positive and significant for firms with a low book-to-market ratio (growth firms) but insignificant for firms with a high book-to-market ratio (value firms). This result provides evidence that shareholders of growth firms are more reliant on past returns when forming expectations than shareholders of value firms. The size of λ is comparable between growth and value firms.

Next, we investigate how institutional ownership is associated with extrapolative beliefs affecting the fraction of shareholders to take scrip dividends. Through this analysis, we study whether extrapolative beliefs are more prevalent among retail investors than institutional investors. We find that β is positive and significant only for firms with low institutional ownership. This finding implies that institutional investors are less affected by extrapolative beliefs when deciding to take scrip dividends. Similar to what we observed in the results for small firms, δ is larger for firms with low institutional ownership. This result indicates that both distant and recent past returns affect retail shareholders' expectations.

We explore how firm characteristics affect the extrapolative beliefs of shareholders in taking scrip dividends and whether shareholders form expectations differently according to the size and growth opportunity of a firm. We first show that β is positive and significant for small firms but insignificant for large firms. This result indicates that shareholders of small firms are more strongly affected by past returns in their expectations than shareholders of large firms. However, a larger δ for small firms implies that both distant and recent past returns affect shareholders' expectations. Next, we show that β is positive and significant for firms with a low book-to-market ratio (growth firms) but insignificant for firms with a high book-to-market ratio (value firms). This result provides evidence that shareholders of growth firms are more reliant on past returns when forming expectations than shareholders of value firms. The size of δ is comparable between growth and value firms.

Finally, we investigate whether expectations reflected in the take-up rate of scrip dividend is accurate or systematically biased. If shareholders' expectation on scrip take-up rate is accurate, then there should be a positive relationship between scrip take-up rate and future stock returns. On the other hand, if shareholders' expectation on scrip take-up rate is biased, then there should be a negative relationship between scrip take-up rate and future stock returns. Our results show that both general investors and shareholders can have biased beliefs on their holdings. Using the Fama–Macbeth regression, we find that a higher scrip take-up rate predicts a lower return in the future. This return predictability persists over the next 24 months. Our results are robust to the inclusion of various firm characteristics, including firm size, book-to-market ratio, dividend-to-price, and earnings-to-price ratio as controls.

Our paper contributes to the literature on scrip dividend. Studies in this literature focus on the motivation of firms to pay scrip dividends. Both Lasfer (1997b) and Lasfer (1997a) suggest that scrip dividends may not be motivated by the financial considerations of firms. Recently, however, Feito-Ruiz, Renneboog, and Vansteenkiste (2020) provide contradicting evidence that scrip dividends are offered by firms when financial constraints are binding.

Different from prior studies, our paper investigates the motivation of shareholders to take scrip dividend.

More broadly, our paper adds to the literature studying investors' biased beliefs using survey data (Malmendier and Nagel, 2011; Hirshleifer, Li, and Yu, 2015; Amromin and Sharpe, 2016; Bordalo et al., 2019; **?**, 2020; Choi and Robertson, 2020; Giglio et al., 2021).[2] Our paper is specifically related to a part of the literature that analyzes the consequence of return extrapolation on asset prices (Greenwood and Shleifer, 2014; Barberis et al., 2015; Nagel and Xu, 2019; Jin and Sui, 2021). In particular, our results contribute to the literature by providing direct evidence of the variation of return extrapolation in a time series or cross-section (Cassella and Gulen, 2018; Da, Huang, and Jin, 2021).

The remainder of the paper proceeds as follows. Section 2 discusses the institutional background of scrip dividend in detail. Section 3 explains our data and empirical methodology. Section 4 explores the main results of the experiment. Section **??** concludes.

2 Institutional Background

Scrip dividends are a form of dividend distribution in the United Kingdom and some other countries that gives shareholders the choice to receive additional shares in lieu of cash. Every time a firm declares a scrip dividend, an election notice is mailed to all shareholders of record. Shareholders who wish to receive additional shares instead of cash must sign and return the scrip dividend election notice by the election date. All other shareholders—those who proactively selected cash and those who did not return an election notice—receive cash dividends by default.

When investors elect the scrip dividend option, the number of shares they receive is determined by dividing the value of the cash dividend by the scrip dividend reference price. The reference price is usually the average closing price over the five trading days starting on the ex-dividend date. Both cash and scrip dividends are distributed on the payment date.

Figure 1 presents the timeline of events using the average values for scrip dividends in our data. Shareholders generally have about three weeks from the record date until the scrip election date. The payment date is usually 14 business days after the election date.

[2] See Barberis (2018) for a comprehensive review of this topic.

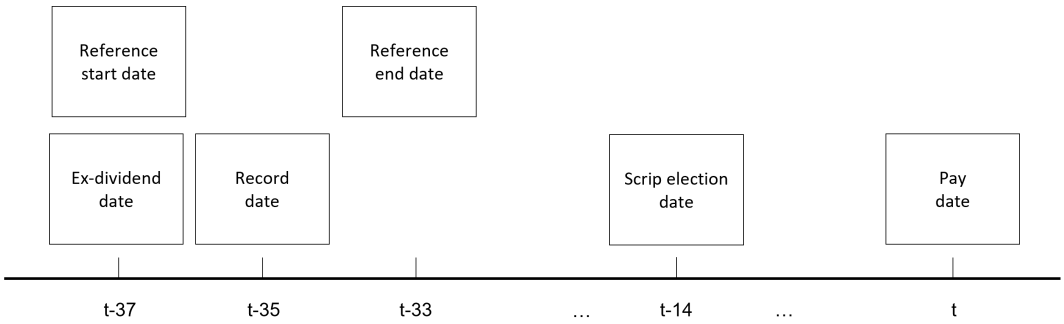


Figure 1. Dividend timeline The numbers on the timeline indicate the average number of trading days between key events for scrip dividends in our sample.

Our analysis studies the determinants of the scrip dividend take-up rate, the fraction of outstanding shares that elect the scrip dividend option. The take-up rate is usually not directly reported but can be calculated using other pieces of information:

$$Scrip\ Take\text{-}Up(\%) = \frac{\#\ shares\ issued \times \frac{Reference\ price}{Dividend}}{\#\ shares\ outstanding} \times 100 \tag{1}$$

where the second term in the numerator is the number of existing shares needed to receive one additional share.[3]

There a couple of additional aspects of scrip dividends that are worth noting. First, scrip dividends are different from Dividend Reinvestment Plans (DRIPs) in two ways that make scrip dividends a much better laboratory for studying extrapolative beliefs. Unlike DRIPs that pre-commit investors to reinvesting their cash dividends, scrip dividends ask investors to make a choice each time a firm declares a dividend. Second, we can measure the take-up rate of scrip dividends much more accurately than one could measure the take-up rate of DRIPs.

Finally, it is worth noting that scrip dividends are taxed at the personal income tax rate, just like the cash dividend. Thus the decision to elect scrip dividend option is unlikely to be driven by investors' tax considerations.

[3] Because scrip dividends do not distribute fractional shares, investors who hold fewer shares will receive cash dividend.

3 Data and Methodology

3.1 Data

We start by identifying firms that paid scrip dividends at some point in their life. We search Factiva for mentions of "scrip dividends" in articles sourced from the Regulatory News Service (RNS). RNS transmits both regulatory and non-regulatory information published by companies listed on the London Stock Exchange.[4] The search results retrieved mention 219 unique firms.

We match these firms to Capital IQ and exclude firms classified by Capital IQ as investment funds or government institutions.[5] We then use Bloomberg to extract the dividend history for firms in our sample. Bloomberg reports the net amount per share, relevant dates (i.e., declaration, ex-dividend, record, and payment), dividend frequency, and whether the dividend is interim or final. Bloomberg does not provide data on scrip dividends.[6]

For each dividend in the sample, we search Factiva, London Stock Exchange, and Morningstar for information on whether a scrip dividend option was offered and, if it was, what were the applicable terms and the take-up rate. Specifically, we record the 1) election date, 2) the reference price or number of existing shares needed to receive one new share, and 3) the take-up rate.

Monthly returns are calculated using Datastream's total return index adjusted for stock splits and dividends. Financial variables, including book-to-market equity (B/M) and market value of equity (size) are from Worldscope. Data on institutional and blockholder ownership are from Capital IQ and Factset.

We exclude firms that had offered scrip dividends fewer than three times in their history as their decision to offer scrip dividends may be driven by unusual idiosyncratic circumstances. We also exclude enhanced scrip dividends that encourage shareholders to elect the scrip dividend option by setting the reference price at a discount to the market price. Our final sample consists of 1,005 dividend events for 80 firms.

[4] https://www.lseg.com/areas-expertise/market-information/regulatory-news-service

[5] Specifically, we exclude the following company types: public funds, public investment firms, private investment firms, and government institutions.

[6] Bloomberg terminal does indicate whether a given dividend included the scrip dividend option, but it does not provide information on the terms and is not consistent in its reporting of whether there was a scrip dividend option.

Table 1 reports summary statistics for our sample.

Table 1
Summary Statistics

This table reports summary statistics for the scrip dividend events in our sample. R_{t-1} is the 1-month return during the month before the ex-dividend date. $Mktcap$ is the market capitalization in millions of pounds. B/M is the book to market ratio in month $t-1$. D/P is the amount of dividend paid divided by price per share. Scrip take-up rate is the percentage of outstanding shares that elect the scrip dividend option, i.e., to receive new shares instead of cash. E/P is the annual net income divided by price per share. *Div.amount* is the amount of dividend paid per share.

				Percentile			
	Mean	SD	Min	25th	50th	75th	Max
R_{t-1}	1.75	9.13	-67.48	-3.25	1.42	6.83	63.72
$Mktcap$	23,411.35	46,366.52	8.52	556.98	2572.01	18,041.02	217,803.59
B/M	0.83	0.64	-1.59	0.40	0.70	1.10	5.26
$Div.Yield$	0.04	0.04	0.00	0.03	0.04	0.05	1.29
E/P	0.08	0.10	0.00	0.05	0.07	0.09	2.00
Scrip take-up (%)	23.44	20.41	0.45	7.02	17.23	33.98	100.00
Div. amount(Pence)	7.51	9.81	0.03	1.50	4.30	9.02	86.53

3.2 Methodology

We take a revealed preference approach to provide evidence of extrapolative expectations affecting investor decisions and estimate regressions of scrip take-up rate on lagged stock returns:

$$\textit{Scrip take-up (\%)}_{f,t} = \alpha + \sum_{k=1}^{n} \beta_k \cdot R_{f,t-k} + \gamma' X_{f,t-1} + \varepsilon_{f,t}, \tag{2}$$

where f indexes firms and t indexes months relative to the ex-dividend date. If investors act based on extrapolative expectations, then high past stock returns will increase their expectations of future stock returns and make them more willing to opt for the scrip dividend option.

We measure returns through months $t-1$ relative to the ex-dividend date, because after the reference price is set, subsequent price changes directly affect shareholders' incentive to elect the scrip dividend option. For example, if the reference price is set at £20 and the stock price goes up to £25 by the election date, then the scrip dividend will be a bargain. By selecting the scrip dividend option, shareholders are able to purchase new shares at the £20 reference price instead of the current stock price of £25. Thus, any relationship between the scrip take-up rate and stock returns after the reference price is set is likely due to the direct economic incentive and not the extrapolative beliefs. To estimate the effect of extrapolative beliefs, we measure returns through months $t-1$ relative to the ex-dividend date.

To study whether shareholders put more weight on more recent returns than on distant ones, we estimate the nonlinear least squares model from Greenwood and Shleifer (2014):

$$\textit{Scrip take-up(\%)}_{f,t} = \alpha + \beta \cdot \sum_{k=1}^{n} w_k \cdot R_{f,t-k} + \gamma' X_{f,t} + \varepsilon_{f,t}, \quad \text{where } w_k = \frac{\lambda^{k-1}}{\sum_{s=0}^{n-1} \lambda^s}. \tag{3}$$

This specification captures extrapolative expectations with two parameters. λ measures the relative weight of past returns in forming expectations. When λ is small, recent returns receive greater weight than distant past returns. One can think of $1 - \lambda$ as the degree of extrapolation. Parameter β, on the other hand, measures the sensitivity of the scrip take-up rate to investors' expectations of future returns, as captured by the weighted past returns.

4 Results

We start by investigating the relationship between the scrip take-up rate and the first lag of monthly stock returns. In column 1 of Table 2, we regress the scrip take-up rate on the lagged stock return and the excess return on the market. The coefficient on the lagged stock return indicates that a 10% increase in the lagged stock return is associated with a 1.29% increase in the scrip take-up rate. This increase in the take-up rate is about 5.6% of the average take-up rate of 23.4%. The coefficient on the excess market return is negative and not statistically significant. While we have less variation with which to estimate the effect of excess market returns, the magnitude is roughly similar to the effect of the stock return, suggesting that investors may be basing their decision on market-adjusted returns. The coefficient on the *Scrip default* dummy is large and highly statistically significant. When scrip dividend is the default option, the take-up rate is 63.3% higher.

In column 2, we add controls for stock characteristics, including log market capitalization, book-to-market, dividend-to-price, and earnings-to-price, which may be correlated with investor expectations of future returns and may affect the take-up rate. We find a positive and weakly statistically significant coefficient on the log market cap. The other coefficients are not significant. Most importantly, controlling for firm characteristics has little effect on the coefficient on lagged stock returns.

Columns 3 and 4 add firm fixed effects that control for any unobserved differences between firms in their risk, expected returns, and propensity of shareholders to elect scrip dividends. These results indicate that shareholders of a given firm are more likely to elect scrip dividends following high returns than following low returns. The magnitude of the coefficients is

Table 2
Past Returns and Scrip Dividend Take-Up Rate

This table reports the results of regressions of the scrip dividend take-up rate on past stock returns:

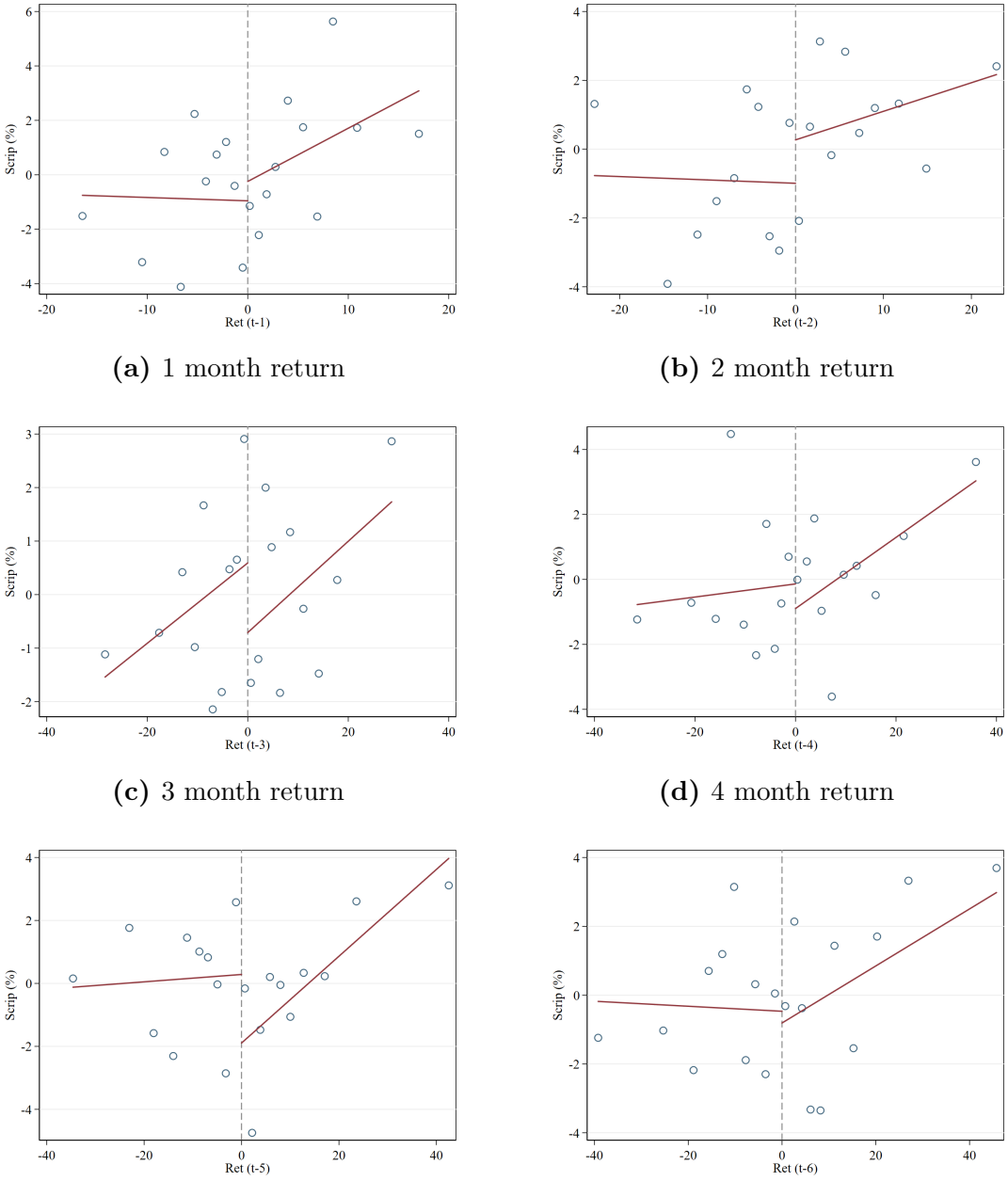
$$Take\text{-}up_{f,t} = \alpha + \beta \cdot R_{f,t-1} + \gamma \cdot X_{f,t-1} + \varepsilon_{f,t}$$

where f indexes firms and t indexes time in months. Scrip take-up rate is the percentage of outstanding shares that elect the scrip dividend option, i.e., to receive new shares instead of cash. R_{t-1} is the 1-month return during the month before the ex-dividend date. $Rmrf$ is the monthly UK market premium in month $t-1$. $Mktcap$ is the market capitalization in millions of pounds. B/M is the book to market ratio in month $t-1$. *Default* is a dummy variable that equals to one if the default option of the scheme is to take scrip dividend. Standard errors are adjusted for clustering by year and firm. $*$, $**$, and $***$ indicate statistical significance at 10%, 5%, and 1%.

	(1)	(2)	(3)	(4)	(5)	(6)
$R_{f,t-1}$	0.158***	0.148**	0.153***	0.163***	0.145***	0.136***
	(0.052)	(0.057)	(0.039)	(0.047)	(0.043)	(0.046)
Enhanced	26.827***	27.475***	22.487***	24.672***	19.542**	20.445**
	(6.401)	(6.593)	(7.229)	(7.548)	(8.279)	(8.547)
Default	63.874***	61.564***				
	(2.094)	(4.082)				
Rmrf	-0.095	-0.150	-0.112	-0.167	-0.117	-0.150
	(0.187)	(0.201)	(0.173)	(0.183)	(0.156)	(0.166)
Mktcap		1.265*		3.666**		-0.778
		(0.698)		(1.431)		(1.433)
B/M		1.643		-1.305		-0.908
		(2.269)		(1.527)		(1.563)
D/P		-83.637		-86.567*		-68.387*
		(70.973)		(45.302)		(37.958)
E/P		16.185		53.655*		27.935
		(30.668)		(27.199)		(17.356)
N	1009	901	1009	901	1009	901
R^2	0.283	0.321	0.560	0.580	0.621	0.630
Year FEs					✓	✓
Firm FEs			✓	✓	✓	✓

somewhat larger than in columns 1 and 2. A 10% increase in past monthly returns is associated with about 1.6% increase in the scrip take-up rate.

Columns 5 and 6 show that the results are robust to controlling for year fixed effects.



(a) 1 month return

(b) 2 month return

(c) 3 month return

(d) 4 month return

(e) 5 month return

(f) 6 month return

Figure 2. Scrip Take-up and Stock Return

This figure reports the binned scatter plot to represent the relationship between scrip take-up and past stock returns. Both scrip take-up and returns are residualized at the firm-level. The lines represent the linear fit lines from regressing scrip take-up on returns with a discontinuity at 0. The sample period is from 1993 to 2018.

Figure 2 is the binned scatter plot that presents the within-firm relationship between scrip take-up and past returns with the various horizon. Both scrip take-up and returns are residualized at the firm level. The results show that a higher proportion of existing shares participate in the scrip dividend program when past returns are high. The regression lines slope upward in general for various return horizons. For example, Figure suggests that when past returns are positive, the scrip take-up rate increases about 2 percentage points when the past one-month return increases about 10 percentage points. Shareholders are interested in increasing their stake in a firm when past returns are positive.

Interestingly, there are clear discontinuities in the relationship between past returns of the various horizon and scrip take-up at $R_{t-k} = 0$. The slope of the regression line is positive if $R_{t-k} > 0$. When $R_{t-k} < 0$, the slope is flat at 0, indicating that the scrip take-up rate moves around the historical average level regardless of the level of past returns. This finding suggests that extrapolative beliefs affect the decision to take scrip dividends when past returns are positive.

Table 3
Part Returns and Scrip Dividend Take-Up Rate

This table reports the results of regressions of the scrip dividend take-up rate on past stock returns:

$$Take\text{-}up_{f,t} = \alpha + \beta \cdot R_{f,t-1} + \phi \cdot Dum_{f,t} + \xi \cdot R_{f,t-1} \cdot Dum_{f,t} + \gamma \cdot X_{f,t-1} + \varepsilon_{f,t}$$

where f indexes firms and t indexes time in months. Scrip take-up rate is the percentage of outstanding shares that elect the scrip dividend option, i.e., to receive new shares instead of cash. R_{t-1} is the 1-month return during the month before the ex-dividend date. *Pos* is a dummy that equals 1 if $R_{t-1} > 0$. $HighVol(2)$ is a dummy that equals 1 if the weekly stock return volatility over the past 24 months leading up to the ex-dividend date is above the median past volatility of firms that paid scrip dividend for the same period. Standard errors are adjusted for clustering by year and firm.

	(1)	(2)	(3)	(4)	(5)	(6)
R_{t-1}	0.131	0.054	0.120	0.172	0.018	0.014
	(0.127)	(0.174)	(0.120)	(0.103)	(0.074)	(0.077)
Pos	-4.237**	-3.633**	-3.059*			
	(1.872)	(1.670)	(1.582)			
R_{t-1}*Pos*	0.303	0.440*	0.237			
	(0.209)	(0.253)	(0.182)			
HighVol(2)				2.585*	2.173*	0.103
				(1.427)	(1.501)	(1.077)
R_{t-1}*HighVol(2)*				-0.071	0.262***	0.204**
				(0.122)	(0.085)	(0.089)
N	986	973	973	912	902	902
R^2	0.368	0.599	0.645	0.387	0.598	0.649
Controls	✓	✓	✓	✓	✓	✓
Year FE	✓		✓	✓		✓
Firm FE		✓	✓		✓	✓

In Table 3, we further investigate how past return characteristics affect extrapolative beliefs in taking scrip dividends. In the first three columns, we investigate whether shareholders extrapolate returns asymmetrically for the positive and negative returns. To test this conjecture, we create a dummy variable Pos that equals 1 if the past one-month return is positive. Columns (1)–(3) reports the results from the regression, including Pos and the interaction between Pos and R_{t-1}. We start with a specification with a firm-fixed effect. The coefficient for the interaction term is positive and statistically significant in column (2) while the coefficient for R_{t-1} is close to 0, not statistically positive. This result suggests that shareholders register more for the scrip dividends with higher past returns within a firm's history but only if the return is positive. Our result is not robust to the inclusion of year-fixed effects.

In the last three columns, we test whether shareholders extrapolate returns asymmetrically for stocks with high past volatility. For the specification with year-fixed effects, $HighVol(2)$ is a dummy that equals 1 if volatility from the past 24 monthly returns is above the past median volatility of firms that paid scrip dividends in the same year. For the specification with firm-fixed effects, $HighVol(2)$ is a dummy that equals 1 if volatility from the past 24 weekly returns is above the past median volatility of its scrip dividend history. The results in column (4) suggest that past volatility affects the extrapolative beliefs in the cross-section; specifically, more dispersed past returns are associated with a higher regression coefficient in the cross-section. The coefficient for the interaction term is also positive and significant for column (5). The within-firm analysis suggests that shareholders with extrapolative beliefs only affect the take-up rate of scrip dividends only when the past returns are dispersed. Our result is not robust to the inclusion of both firm- and year-fixed effects. These results highlight that investors are affected by the characteristics of historical returns when forming expectation of future returns.

4.1 Expectation Formation in Scrip Dividends

We now explore how shareholders form expectations of future returns from a series of past returns. To test whether shareholders rely heavily on recent returns in making their decision to receive scrip dividends, we first rely on a linear regression model in Equation (4) with six lagged returns. Specifically, we focus on the firm-level variation of the scrip take-up rate and returns by including firm-fixed effects.

Table 4 presents the results. Column (1) shows the results by using raw returns as independent variables. We find that the coefficients diminish as the returns become more

distant. The coefficient of R_{t-1} is positive and statistically significant while the coefficients of distant returns are close to 0. In addition, only the coefficients for R_{t-2} and R_{t-3} are positive. These results strongly suggest that shareholders tend to extrapolate only recent returns while disregarding returns from the distant past.

From column (2) to column (4), we present results from the idiosyncratic components of the past monthly returns. In column (2), the dependent variable is the idiosyncratic returns from CAPM estimated from the UK stock market. Column (3) utilizes the Fama–French three-factor model that uses market premium, size, and book-to-market as dependent variables. Column (4) uses the Carhart four-factor model that adds momentum factor to the Fama–French three-factor model. These results present evidence that shareholders are especially reliant on the recent idiosyncratic returns. The coefficient for R_{t-1} is positive and significant for all three specifications. Similar to the result in column (1), the coefficients tend to decay while k increases, the pattern we expect if investors have extrapolative beliefs. We interpret these results as strong evidence that shareholders extrapolate idiosyncratic component of returns when they decide to receive stock or cash dividends.

Lastly, from columns (5) and (6), we reconfirm our baseline result from column (1). Column (5) includes both year- and firm-fixed effects in the specification. Column (6) includes controls such as market premium, size, and book-to-market. Our results are robust to the inclusion of year-fixed effect and controls. All results are consistent with column (1), that is, the coefficient of R_{t-1} is greater than other coefficients and statistically significant.

To further investigate how shareholders form expectations depending more on recent returns than on distant returns, we use the nonlinear least square model in Equation (5) from Greenwood and Shleifer (2014) with lagged returns for the past 12 months. We particularly focus on within-firm variations of scrip take-up rate and past returns. For this purpose, we demeaned both the monthly returns and scrip take-up rate to estimate the nonlinear model.

Table 5 provides evidence that shareholders extrapolate past returns while weighing heavily on recent returns. Column (1) is the result when standardized returns are used as independent variables. The estimated value for λ is 0.498 and statistically significant. This value indicates that shareholders extrapolate past returns by weighting R_{t-1} twice as much as R_{t-2}. In addition, the estimated value for β is 0.137, suggesting that shareholders take more (less) scrip dividends when the weighted past returns are high (low). The combined coefficient for R_{t-1} from the estimated λ and β is 0.069. In column (5), we report that column (1) is robust to control variables, including one-month market premium, market capitalization, and book-to-market. Specifically, our estimation indicates that the value of

Table 4
Extrapolative Beliefs: Linear Regression Model

This table reports the results of regressions of the scrip dividend take-up rate on lagged monthly returns:

$$\textit{Take-up}_{f,t} = \alpha + \sum_{k=1}^{6} \beta_k \cdot R_{f,t-k} + \gamma \cdot X_{f,t-1} + \varepsilon_{f,t}$$

where f indexes firms and t indexes time in months. Scrip take-up rate is the percentage of outstanding shares that elect the scrip dividend option, i.e., to receive new shares instead of cash. R_{mm} is the idiosyncratic component of the monthly stock returns from the market model. R_{3f} is the idiosyncratic component of the monthly stock returns from the Fama—French 3 factor model. R_{4f} is the idiosyncratic component of the monthly stock returns from the Carhart 4 factor model. Standard errors are adjusted for clustering by year and firm.

	(1)	(2)	(3)	(4)	(5)	(6)
Indep. Var:	*R*	*R(MM)*	*R(3F)*	*R(4F)*	*R*	*R*
R_{t-1}	0.130***	0.115***	0.178***	0.169***	0.125***	0.145***
	(0.043)	(0.037)	(0.049)	(0.045)	(0.043)	(0.051)
R_{t-2}	0.022	0.044	0.037	0.020	0.020	0.061
	(0.064)	(0.060)	(0.060)	(0.062)	(0.061)	(0.077)
R_{t-3}	-0.053	-0.013	0.021	0.004	-0.056	-0.080
	(0.072)	(0.083)	(0.097)	(0.098)	(0.063)	(0.081)
R_{t-4}	0.027	0.014	0.009	-0.007	0.029	0.022
	(0.075)	(0.052)	(0.037)	(0.044)	(0.073)	(0.083)
R_{t-5}	-0.039	-0.053	-0.028	-0.018	-0.062*	-0.021
	(0.041)	(0.055)	(0.054)	(0.052)	(0.036)	(0.065)
R_{t-6}	-0.044	-0.035	-0.040	-0.007	-0.067	-0.044
	(0.059)	(0.051)	(0.070)	(0.071)	(0.055)	(0.072)
N	1009	1009	926	926	1009	901
R^2	0.560	0.559	0.564	0.564	0.622	0.632
Controls						✓
Year FE					✓	✓
Firm FE	✓	✓	✓	✓	✓	✓

λ remains similar while the value of β increases by including controls.

Our results also hold for the idiosyncratic returns. In all specifications from column (2) to (4), λ ranges from 0.498 to 0.619, suggesting that the weights of recent returns are much higher than those of distant returns. Column (2) uses the idiosyncratic returns from CAPM as a main variable interest and reports a λ of 0.581, suggesting that shareholders put more weight on the recent idiosyncratic returns than on distant returns. Similarly, λ is 0.619 in column (3), which uses idiosyncratic returns from the Fama–French three-factor model and 0.554 in column (4), which uses the Carhart four-factor model. β is economically larger for idiosyncratic returns from the three-factor and four-factor models. We report β of 0.306 in column (3) and 0.260 in column (4). These results suggest that the relationship between past returns and scrip take-up rate is stronger for idiosyncratic returns, consistent with the

Table 5
Extrapolative Beliefs: Non-linear Regression Model

This table reports the results of regressions of the scrip dividend take-up rate on past stock returns:

$$\textit{Take-up}_{f,t} = \alpha + \beta \cdot \sum_{k=1}^{12} w_k R_{f,t-k} + \gamma \cdot X_{f,t-1} + \varepsilon_{f,t} i, t, \quad \text{where } w_k = \frac{\lambda^{k-1}}{\Sigma_{s=0}^{12} \lambda^s},$$

f indexes firms and t indexes time in months. Scrip take-up rate is the percentage of outstanding shares that elect the scrip dividend option, i.e., to receive new shares instead of cash. R_{mm} is the idiosyncratic component of the monthly stock returns from the market model. R_{3f} is the idiosyncratic component of the monthly stock returns from the Fama—French 3 factor model. R_{4f} is the idiosyncratic component of the monthly stock returns from the Carhart 4 factor model. Standard errors are adjusted for clustering by year and firm.

	(1)	(2)	(3)	(4)	(5)
Indep. Var:	*R*	*R(mm)*	*R(3f)*	*R(4f)*	*R*
α	0.025	0.031	0.032	0.036	-0.408
	(0.413)	(0.413)	(0.440)	(0.440)	(1.352)
β	0.133*	0.141	0.247**	0.189*	0.133
	(0.078)	(0.108)	(0.125)	(0.106)	(0.102)
λ	0.518***	0.565***	0.582***	0.544***	0.551***
	(0.102)	(0.124)	(0.079)	(0.095)	(0.158)
N	1005	1005	922	922	899
R^2	0.006	0.003	0.007	0.006	0.018
Controls					✓

results in Table 4.

We now study the heterogeneity of β and λ for different firm characteristics. Specifically, we study whether the degree of extrapolative beliefs among shareholders are different across small and large firms and growth and value firms. In each year, we first rank firms that paid scrip dividends into two groups according to the firm characteristics and then separately estimate the model in Equation (5) for each group.

Table 6 presents the result. In panel A, we separately estimate the nonlinear model for firms with a market capitalization below and above the median of firms that paid scrip dividends in a year. The results estimated from the small firm group (low *mktcap*) are significantly different from the results from the large firm group (high *mktcap*). For the small firm group, λ from column (1) to (4) are about 0.7 and significant. The estimated values of λ from both total returns and idiosyncratic returns are slightly higher than the estimated values from all samples in Table 5. On the other hand, values of β range from 0.314 to 0.456 and are significant for all specifications. Especially, the values of β from the small firm group are larger than the values of β from all samples. The results provide evidence that shareholders extrapolate past returns strongly when taking scrip dividends for small firms.

Table 6
Extrapolative Beliefs: Firm Characteristics

This table presents the results from the regression of scrip take-up rate on the monthly stock return for each sub-group. The specification of the regression equation is as follows:

$$\textit{Take-up}_{f,t} = \alpha + \beta \cdot \sum_{k=1}^{12} w_k R_{f,t-k} + \gamma \cdot X_{f,t-1} + \varepsilon_{f,t} i, t, \quad \text{where } w_k = \frac{\lambda^{k-1}}{\Sigma_{s=0}^{12} \lambda^s},$$

f indexes firms and t indexes time in months. Scrip take-up rate is the percentage of outstanding shares that elect the scrip dividend option, i.e., to receive new shares instead of cash. R_{mm} is the idiosyncratic component of the monthly stock returns from the market model. R_{3f} is the idiosyncratic component of the monthly stock returns from the Fama—French 3 factor model. R_{4f} is the idiosyncratic component of the monthly stock returns from the Carhart 4 factor model. Standard errors are adjusted for clustering by year and firm.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Low vs High Mktcap								
Dep. Var:	*Low Mktcap*				*High Mktcap*			
Indep. Var:	*R*	*R(mm)*	*R(3f)*	*R(4f)*	*R*	*R(mm)*	*R(3f)*	*R(4f)*
α	-0.032	-0.034	-0.076*	-0.077*	0.022	0.022	0.048	0.047
	(0.036)	(0.036)	(0.045)	(0.045)	(0.038)	(0.038)	(0.043)	(0.043)
β	0.334**	0.364**	0.520***	0.524***	0.066	0.027	0.029	0.011
	(0.165)	(0.156)	(0.184)	(0.182)	(0.069)	(0.063)	(0.070)	(0.067)
λ	0.721***	0.730***	0.716***	0.715***	0.536***	0.500	0.504	0.490
	(0.024)	(0.024)	(0.019)	(0.019)	(0.173)	(0.379)	(0.400)	(1.034)
N	627	627	410	410	625	625	500	500
R^2	0.008	0.009	0.022	0.022	0.003	0.001	0.001	0.000
Panel B: Low vs High B/M								
Dep. Var:	*Low B/M*				*High B/M*			
Indep. Var:	*R*	*R(mm)*	*R(3f)*	*R(4f)*	*R*	*R(mm)*	*R(3f)*	*R(4f)*
α	-0.016	-0.020	-0.030	-0.028	0.005	0.003	0.013	0.014
	(0.037)	(0.036)	(0.040)	(0.040)	(0.038)	(0.038)	(0.048)	(0.048)
β	0.429***	0.430***	0.503***	0.465***	0.278	0.013	0.076	0.109
	(0.155)	(0.153)	(0.165)	(0.166)	(0.175)	(0.046)	(0.150)	(0.210)
λ	0.746***	0.749***	0.746***	0.751***	0.730***	0.427	0.632***	0.696***
	(0.022)	(0.024)	(0.021)	(0.024)	(0.029)	(0.496)	(0.226)	(0.118)
N	637	637	532	532	615	615	378	378
R^2	0.014	0.013	0.019	0.018	0.004	0.000	0.002	0.001

However, the results do not support the notion that shareholders of the large firm group are affected by extrapolative beliefs. While λ for total returns and idiosyncratic returns are lower and statistically significant for three columns, the values of β are close to 0 and statistically insignificant. The estimated coefficient of R_{t-1} in column (5) is 0.0115, which is about one-sixth of the coefficient of R_{t-1} from the whole sample. These results suggest that shareholders of larger firms tend to rely less on the past returns when deciding to receive scrip dividends.

In panel B, we estimate the nonlinear model for firms with book-to-market ratios below and above the median of firms that paid scrip dividends in a year. In the case of λ, the estimated values are statistically significant in both growth firms (low B/M) and value firms (high B/M). However, in the case of β, the estimated coefficients from the two groups differ considerably. The estimated β coefficients from growth firms are 0.432 for total returns and ranges from 0.417 to 0.451 for idiosyncratic returns. β is statistically significant in all specifications from column (1) to (4). On the other hand, β coefficients from value firms are not statistically significant for idiosyncratic returns and has a value of about 0.1. In addition, for total returns, the β estimated from the value firms is about 32% smaller than the β estimated from growth firms. We take these results as evidence that extrapolative beliefs play a more important role in decisions to receive scrip dividends among shareholders of growth firms than among value firms.

Table 7
Extrapolative Beliefs: Institutional Ownership

This table presents the results from the regression of scrip take-up rate on the monthly stock return for each sub-group. The specification of the regression equation is as follows:

$$\textit{Take-up}_{f,t} = \alpha + \beta \cdot \sum_{k=1}^{12} w_k R_{f,t-k} + \gamma \cdot X_{f,t-1} + \varepsilon_{f,t} i, t, \quad \text{where } w_k = \frac{\lambda^{k-1}}{\Sigma_{s=0}^{12} \lambda^s},$$

f indexes firms and t indexes time in months. Scrip take-up rate is the percentage of outstanding shares that elect the scrip dividend option, i.e., to receive new shares instead of cash. R_{mm} is the idiosyncratic component of the monthly stock returns from the market model. R_{3f} is the idiosyncratic component of the monthly stock returns from the Fama—French 3 factor model. R_{4f} is the idiosyncratic component of the monthly stock returns from the Carhart 4 factor model. Standard errors are adjusted for clustering by year and firm.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var:	*Low Ownership*				*High Ownership*			
Indep. Var:	*R*	*R(mm)*	*R(3f)*	*R(4f)*	*R*	*R(mm)*	*R(3f)*	*R(4f)*
α	1.377**	1.298*	0.634	0.622	1.931***	1.894**	2.855***	2.867***
	(0.692)	(0.697)	(0.716)	(0.717)	(0.723)	(0.732)	(0.854)	(0.853)
β	0.844***	0.658*	0.588*	0.403	0.089	0.193	0.086	0.104
	(0.322)	(0.338)	(0.330)	(0.267)	(0.061)	(0.254)	(0.074)	(0.075)
λ	0.720***	0.729***	0.672***	0.642***	0.339***	0.625***	0.312***	0.319***
	(0.020)	(0.033)	(0.043)	(0.072)	(0.058)	(0.164)	(0.041)	(0.041)
N	352	352	308	308	346	346	271	271
R^2	0.025	0.010	0.017	0.013	0.012	0.003	0.018	0.021

Finally, we study whether the degree of extrapolative beliefs are different among shareholders of firms with low institutional ownership and high institutional ownership. In each year, we rank firms that paid scrip dividends into two groups according to the institutional ownership and then separately estimate the model in Equation (5) for each group.

Table 7 presents the results. We find that the λ for firms with low institutional ownership ranges from 0.642 to 0.729 while the λ for firms with high institutional ownership ranges from 0.312 to 0.625. Larger coefficients of λ indicate that the weight decays more slowly into the past for firms with low institutional ownership. On the other hand, the contrast of β coefficients between the two groups of firms is dramatic. For raw returns, β is 0.844 for firms with low institutional ownership. This result suggests that a 1 percentage point increase in weighted average of past returns is associated with a 0.844 percentage point increase in scrip take-up rate. However, β is 0.089 and statistically insignificant for firms with high ownership. Using idiosyncratic returns, β ranges from 0.403 to 0.658 for firms with low institutional ownership, but β ranges from 0.086 to 0.193.

4.2 Return Predictability of Scrip Dividend

We investigate whether the scrip take-up rate predicts future returns. The predictability helps us identify what drives the relationship between past returns and scrip take-up rates. If return extrapolation drives a high scrip take-up rate when past returns are high, then this overreaction should be negatively related to future returns. Alternatively, suppose it is information advantage or learning from experience that causes shareholders to take more scrip dividends when past returns are high. In that case, the high scrip take-up should be positively related to the future returns.

We examine the return predictability of scrip take-up rate by using Fama–Macbeth forecasting regressions with a rolling window of 12 months updated quarterly. Specifically, at the end of each quarter, scrip dividends in the past 12 months are grouped. The dependent variable is R_{t+k}, the cumulative return from the beginning of month $t+1$ to the end of month $t+k$ for $k = 1, 3, 6, 9, 12, 24$. To avoid using the period before the scrip election date, we set t as the month of the pay date instead of the ex-dividend date.

Table 8 reports the result. The table clearly shows that the scrip take-up rate predicts the forward stock returns with negative signs. The coefficients of scrip take-up rates are all negative and statistically significant at least at the 10% level, except for column (1). While the return predictability does not rise for the 3-month return, predictability exists for all other horizons, from 1 month up to 24 months. Specifically, a 1 percentage point increase in scrip take-up rate is associated with a 0.051 decrease in 1-month forward returns. The predictability becomes stronger as the horizon increases. For example, a 1 percentage point increase in scrip take-up rate is associated with a 0.122 decrease in 6-month forward returns, a 0.183 decrease in 9-month forward returns, a 0.153 decrease in 12-month forward returns,

Table 8
Scrip Dividend and Return Predictability

This table presents the results of Fama-Macbeth forecasting regressions with rolling window of 12 months updated quarterly. For each scrip dividend event of firm f with pay date in month t, the dependent variable is the cumulative monthly return beginning from month $t+1$ to $t+k$, for $k = 1, 3, 6, 9, 12, 24$. Scrip take-up rate is the percentage of outstanding shares that elect the scrip dividend option, i.e., to receive new shares instead of cash. R_{t-1} is the 1-month return during the month before the ex-dividend date. $Rmrf$ is the monthly UK market premium in month $t-1$. $Mktcap$ is the market capitalization in millions of pounds. B/M is the book to market ratio in month $t-1$. The robust standard errors are in parenthesis.

	(1)	(2)	(3)	(4)	(5)	(6)
Indep. Var:	R_{t+1}	R_{t+3}	R_{t+6}	R_{t+9}	R_{t+12}	R_{t+24}
Take-up	-0.051*	-0.047	-0.122***	-0.183***	-0.153***	-0.310***
	(0.031)	(0.039)	(0.029)	(0.044)	(0.049)	(0.097)
Rmrf	0.115	0.508*	0.487**	0.300	0.424	0.447
	(0.070)	(0.262)	(0.241)	(0.298)	(0.291)	(0.476)
Mktcap	0.003	-0.005	-0.001	-0.010	-0.004	-0.011
	(0.002)	(0.005)	(0.009)	(0.009)	(0.012)	(0.019)
B/M	0.000	-0.062	-0.082	-0.083	-0.145*	-0.275***
	(0.006)	(0.043)	(0.063)	(0.056)	(0.075)	(0.101)
D/P	0.130	0.012	1.342	1.571**	2.234**	5.160***
	(0.327)	(0.421)	(0.862)	(0.629)	(0.924)	(1.858)
E/P	0.080	0.724***	0.941*	1.363**	1.509**	3.241**
	(0.162)	(0.249)	(0.476)	(0.652)	(0.717)	(1.457)
Constant	-0.010	-0.022	-0.071	-0.106	-0.101	-0.240**
	(0.014)	(0.035)	(0.063)	(0.068)	(0.074)	(0.111)
N	2124	2124	2124	2124	2076	1972
R^2	0.315	0.402	0.374	0.402	0.418	0.434

and a 0.310 decrease in 24-month forward returns. The statistical significance of all results are at the 1% level. Overall, the results in Table 8 indicate that a systematic bias exists in shareholders' decision to receive additional shares in lieu of cash dividends.

4.3 Robustness

In our previous results, we investigated the relationship between returns before ex-dividend date when the reference price is set and the scrip take-up rate to study extrapolative beliefs among investors. The reason is because returns after the reference price is set determine whether obtaining shares through scrip dividends is a discount or not. For example, if a reference price is set to be \$100 and returns between ex-dividend date and election date is 10%, then the price of a stock on election date is \$110. Thus, shareholders have a clear incentive to receive scrip dividends.

Table 9
Past Returns and Scrip Dividend Take-Up Rate

This table reports the results of regressions of the scrip dividend take-up rate on past stock returns:

$$\textit{Take-up}_{f,t} = \alpha + \beta \cdot R_{f,t-1} + \gamma \cdot X_{f,t-1} + \varepsilon_{f,t}$$

where f indexes firms and t indexes time in months. Scrip take-up rate is the percentage of outstanding shares that elect the scrip dividend option, i.e., to receive new shares instead of cash. R_{t-1} is the 1-month return during the month before the ex-dividend date. $Rmrf$ is the monthly UK market premium in month $t-1$. $Mktcap$ is the market capitalization in millions of pounds. B/M is the book to market ratio in month $t-1$. *Default* is a dummy variable that equals to one if the default option of the scheme is to take scrip dividend. Standard errors are adjusted for clustering by year and firm.

	(1)	(2)	(3)	(4)	(5)	(6)
$R_{f,t-1}$	0.187***	0.175***	0.175***	0.210***	0.168***	0.166***
	(0.048)	(0.057)	(0.041)	(0.055)	(0.049)	(0.057)
$R_{f,elect}$	0.378***	0.392***	0.386***	0.429***	0.415***	0.433***
	(0.054)	(0.060)	(0.045)	(0.049)	(0.043)	(0.046)
N	923	822	923	822	923	822
R^2	0.214	0.254	0.541	0.569	0.623	0.630
Controls		✓		✓		✓
Year FEs					✓	✓
Firm FEs			✓	✓	✓	✓

We study whether our previous finding still holds after controlling the returns between ex-dividend date to election date. Table 9 presents the results. In all specifications, coefficients for $R_{f,t-1}$ are positive and significant, suggesting that the positive relationship between past returns and scrip take-up rate is robust to the inclusion of returns between ex-dividend date and election date. While shareholders react to returns before the ex-dividend date, they also react to the obvious economic incentive to take scrip dividends. The positive and significant coefficients for $R_{f,elect}$ indicate that more shareholders receive scrip dividends when the stock price is higher than the reference price on election date.

5 Conclusion

Existing studies provide convincing evidence that investors have extrapolative beliefs. However, the problem of survey data is that it is difficult to study investor expectations on individual stocks. Expectations collected via survey are also loosely linked, if at all, to the economic incentive of respondents. To resolve this issue, we use novel data on scrip dividends to study how shareholders form expectations of future stock returns on their holdings. Scrip dividends provide shareholders options to receive additional shares instead of cash dividends. When there is no other economic incentives, shareholders choose to take scrip dividends if

they expect stock prices to increase in the future. Therefore, shareholders' expectations of future returns are reflected in the scrip dividends, and their decisions to take scrip dividends are tightly linked to their future wealth.

Taking advantage of this institutional setting, we use the proportion of shareholders choosing to take scrip dividends as a proxy for shareholders' expectations. By doing so, we provide direct evidence that shareholders' expectations of the future returns of their holdings reflect extrapolative beliefs. In particular, we find that only recent past returns are positively associated with the proportion of shareholders to take scrip dividends. The relationship between past returns and scrip take-up rate is stronger when past returns are positive and more volatile. Next, using a nonlinear specification from Greenwood and Shleifer (2014), we find that shareholders of small and growth firms tend to be more reliant on past returns when deciding to take scrip dividends. At the same time, these shareholders also extrapolate both recent and distant past returns. On the other hand, shareholders of firms with low institutional ownership tend to extrapolate past returns more when deciding to take scrip dividends.

Finally, we investigate whether expectations reflected in shareholders' decisions to take scrip dividends are biased. In particular, we investigate the return predictability of the scrip take-up rate. If shareholders' expectations are biased, then we expect higher scrip take-up rates to be related to lower future returns. We find that a higher scrip take-up rate is associated with negative future returns even after controlling for various firm characteristics and market returns. Moreover, this return predictability persists from the subsequent 1-month returns to 24-month returns. Overall, our results indicate that extrapolative beliefs are prevalent even among shareholders, who are more likely to have an information advantage over general investors.

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