

Cross-sectional evidence on the equity term structure

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Abstract

We introduce TIM, a measure of a stock's cash-flow timing. Unlike equity duration measures, TIM does not conflate discount rate with cash-flow timing information and allows for inference about equity term premia. We find unconditionally no relation between cash-flow timing and mean returns, consistent with recent findings on index dividend derivatives but contrasting with the equity duration literature. Late-minus-early timing returns exhibit a strong factor structure. This helps reconcile seemingly conflicting evidence on cyclicity based on the market dividend price ratio and recession indicators: Positive market beta implies countercyclical term premia, whereas negative investment beta suggests procyclical term premia.

Keywords: Equity duration, cash flow timing, term structure of equity, cross-section of expected returns

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1 Introduction

Whether long- or short-maturity equity has higher mean returns remains a debated question (Golez and Jackwerth, 2024; Bansal et al., 2021; van Binsbergen et al., 2012). Much of this disagreement arises from the relatively short samples used to estimate returns on dividend claims across maturities. To overcome this limitation, we draw on comprehensive stock-level data covering almost 60 years to examine how the timing of future cash flows relates to stock returns.

We make three main contributions. First, we introduce TIM, a stock-level measure of *cash-flow timing*, rather than *duration*.¹ This distinction matters because, as we discuss in the next paragraph, duration captures not only the timing of cash flows to shareholders but also the stock’s discount rate, linking it mechanically to mean returns. Second, using this distinction, we reconcile conflicting findings in the literature on the equity term structure and the literature on equity duration. Specifically, we document a flat unconditional relation between cash-flow timing and average returns, indicating that the negative relation between established equity duration measures and returns does not reflect the shape of the equity term structure. The flat unconditional term structure can be explained by offsetting factor exposures. Most importantly, late timing stocks have positive market betas but strongly negative conservative-minus-aggressive investment (CMA) factor betas. On average, positively and negatively priced exposures cancel out, leading to a flat term structure. Third, the factor structure also helps reconcile diverging findings on cyclicalities: consistent with Gormsen (2021), the market dividend price (DP) ratio positively predicts returns on the late-minus-early portfolio; however, we find a downward slope in recessions. This discrepancy reflects the cyclicalities of pricing factors other than the return on the market portfolio (whose returns are predicted by the market DP ratio). In particular, the negative CMA beta suggests negative mean returns in recessions.

Holding future cash flows fixed, duration is determined by expected returns and is therefore inapt for inference about the equity term structure. Note that equity duration is defined as a stock’s weighted average payment date, $DUR = \sum_t w_t \cdot t$, where w_t is each payment’s contribution to the full sum of discounted cash-flows to shareholders. Weights w_t depend on the full sequence of future cash flows as well as the stock’s discount rate, $w_t = f(\{C_\tau\}_{\tau=1}^\infty, R) = \frac{C_t R^{-t}}{\sum C_\tau R^{-\tau}}$. Weights w increase (decrease) in the discount rate R for early (late) payments. This can be seen in a two-period setting where an asset pays

¹Stock-time level data on TIM are available at the authors’ websites.

$C_1 = C_2 = 1$. When computing duration at $t = 0$ as $DUR = \sum_{h=1}^T h \cdot \frac{C_{t+h}}{R^h} \left(\sum_{h=1}^T \frac{C_{t+h}}{R^h} \right)^{-1}$, the $t = 1$ and $t = 2$ payments receive weights $w_1 = \frac{1}{1+R^{-1}}$ and $w_2 = \frac{1}{1+R}$, respectively. w_1 is larger than w_2 but w_1 (w_2) rises (falls) in R . Holding the timing of cash-flows fixed, duration falls mechanically as the discount rate R rises. Therefore, two assets with the exact same sequence of expected cash flows differ in duration depending on their price. Consequently, sorts on duration generate mechanically negative sorts on expected returns, irrespective of the shape of the term structure of equity premia. This holds regardless of whether the inputs to the duration formula are known. We show that when the inputs have to be estimated, cash-flow forecasts based on market prices lead to additional biases that make duration unsuitable for inference about equity term premia. As we discuss in great detail in Section 4 below, market-based duration measures (e.g., Dechow et al., 2004; Weber, 2018; Gonçalves, 2021) rely on prices and, therefore, inevitably sort expensive (low expected-return) stocks as high duration and cheap (high expected-return) stocks as low duration. Duration is a valid predictor of future cash-flow growth, but market prices used in established duration measures add little to the forecasting power while inducing a mechanical relation between duration and expected returns. We want to emphasize that this is not a critique of equity duration measures per se. In particular, duration is fine as a measure of discount rate sensitivity rather than cash-flow timing because the level of the discount rate determines the discount rate sensitivity. Our concern is most relevant when attempting to infer the relation between cash-flow timing and expected returns, as is commonly done in the literature.

Our measure TIM resolves this issue by building on existing duration measures (Dechow et al., 2004; Weber, 2018; Gonçalves, 2021) but stripping out their mechanical dependence on discount rates. TIM at time t for stock j is defined like akin to standard Macaulay duration $TIM_{j,t} = \sum_{h=1}^H \frac{C_{j,t+h} \cdot e^{-r \cdot h}}{\sum_{i=1}^H C_{j,t+i} \cdot e^{-r \cdot i}} \cdot h$ with forecast cash flows to shareholders C (i.e., dividends, repurchases, stock issuances) discounted at a uniform discount rate r across all stocks. The difference to established duration measures is that neither does r reflect the stock-specific discount rate implied by market prices, nor do we use market prices to forecast cash flows. Both features would lead to a mechanical relation between the measure and mean returns. TIM predicts cash-flow growth just as well as (or better than) conventional duration measures, yet avoids using market prices that confound inference about expected returns.

Using portfolio sorts based on TIM, we find no unconditional link between cash-flow timing and

mean returns: stocks paying cash-flows further in the future do not systematically earn higher or lower average returns than those paying sooner. This implies that the negative return spreads reported for high- versus low-duration stocks (e.g., Dechow et al., 2004; Weber, 2018; Gonçalves, 2021) are driven entirely by discount-rate effects, not cash-flow timing. This result aligns with structural evidence from Giglio et al. (2024) who estimate a stochastic discount factor (SDF) from cross-sectional data and compares to insignificantly downward-sloping equity term premia in van Binsbergen et al. (2012), insignificantly upward-sloping term premia in Bansal et al. (2021), flat premia in Boguth et al. (2022) and mostly flat premia in Golez and Jackwerth (2024). Thus, using our measure TIM, we can reconcile evidence from the cross-section of stocks with findings from index dividend derivatives. The absence of a term premium is, moreover, in line with the Fama and French (2015) five-factor (FF5) model: Among other features that one would expect from growing firms (such as low payout ratios and currently low cash flows), late timing firms have high investment rates. On its own, their strong negative exposure to the investment factor CMA would imply negative return premia. At the same time, since the market portfolio has a tilt towards late-timing stocks, these firms have high market betas, implying higher expected returns. On average, these opposing forces offset each other, resulting in a virtually zero equity term premium.

Next, we turn to the conditional equity term structure. Specifically, we study the cyclicalities of expected late-minus-early timing returns by running predictive regressions of late-minus-early returns on countercyclical predictors. We find that the market dividend-price (DP) ratio predicts the late-minus-early return positively (as in Gormsen, 2021). Given that late-timing stocks have higher market beta, it is not surprising that the market DP ratio positively predicts late-minus-early returns. After all, the market DP ratio reflects the market discount rate and must predict returns on the market (factor) (see Cochrane, 2008, 2011). However, much like the CAPM does not fully capture the cross-section of timing-sorted stock returns, the market DP does not fully capture their time variation. In particular, late timing stocks have high investment rates and negative CMA betas. Therefore, we expect a predictor of investment factor returns to predict the late-minus-early portfolio return with a *negative* sign. We construct such a countercyclical predictor based on valuation ratios of low and high investment firms, which we call the investment valuation spread (IVS). Indeed, we find that IVS predicts late-minus-early returns with a negative coefficient. Faced with these opposing forces on the

cyclicality of the term structure, we step away from projecting returns onto indicators for high or low expected returns of specific asset pricing factors. Instead, we turn to a non-linear discount-rate free cycle indicator, NBER recessions. Conditional 12-, 18-, and 24-month returns on portfolios formed in NBER recessions indicate a downward sloping term structure in recessions. We find that the dividend strip return differentials provided by van Binsbergen et al. (2012) and Golez and Jackwerth (2024) exhibit the same pattern, i.e., a negative relation to the lagged countercyclical IVS, a positive relation to the lagged countercyclical market DP ratio, and (more) negative return differentials in NBER recessions. Thus, it seems likely that our findings are not specific to the cross-section of timing-sorted equities but by and large also pertain to index dividend claims. Our findings can help reconcile the somewhat divergent results by Bansal et al. (2021), who find a downward slope in hold-to-maturity returns in recessions and those by Gormsen (2021). While the slope of hold-to-maturity returns and one-period returns can potentially differ because returns on long-and short-horizon claims are measured over different time periods², we find that even when comparing the exact same time periods, evidence based on recession indicators and the market DP leads to diverging conclusions.

We rationalize a pro-cyclical term premium in a Lettau and Wachter (2007) type model of the cross section where the exposure of late timing stocks to long-term dividend growth provides a hedge against time-varying, pro-cyclical local dividend risk, leading to downward-sloping risk premia when short-run cash flows are risky, i.e., in recessions. In normal times, the downward slope is offset by the upward-sloping risk premia for long-term dividend growth.

Related literature. Our paper contributes to the literature on equity duration and cash-flow timing, starting with Dechow et al. (2004) who adapt the concept of duration (Macaulay, 1938) to equities. The Dechow et al. (2004) equity duration (DUR^{DSS}) forecasts cash flows to shareholders using a restricted VAR and assumes that, after a finite forecast horizon, the remaining market value of the stock is paid out as a level perpetuity (see Section 4 for details). Thus, market prices enter the calculation and conflate a measure of cash-flow timing with one of discount rates. Weber (2018) thoroughly studies the relation between Dechow et al. (2004)-type duration and expected stock returns in the

² As pointed out by Gormsen (2021), hold-to-maturity returns compare long-and-short horizon claims over different time periods and, hence, states of the world. If, e.g., the long-horizon claim has higher expected returns during the recession but lower expected returns after the recession than the short horizon claim had during the recession, then an upward slope in one-period returns could correspond to a downward slope in hold-to-maturity returns.

cross-section. He finds a negative relation between equity duration and mean returns and suggests a behavioral explanation based on investors’ extrapolation of past cash-flow growth.

The Gonçalves (2021) duration measure (DUR^G) builds on DUR^{DSS} but extends the forecast horizon to 1000 years using a full VAR and, moreover, assigns to each stock its market price-implied discount rate. Gonçalves finds a negative relation between duration and mean returns and suggests that this can be explained by a (rational) reinvestment risk premium. This duration measure gives an arguably more accurate measure of duration. However, using market prices to estimate stock-specific discount rates and including market-based cash-flow predictors in the VAR induces a negative cross-sectional relation between the measure and mean returns, irrespective of the true shape of the term structure. We show that unconditionally, there is no significant relation between versions of Gonçalves (2021) equity duration that do not use market prices (such as TIM) and mean returns. Similar to Gonçalves (2021), we find that profitability is strongly related to cash-flow timing. However, bar any unconditional term premium, it is unlikely that term premia explain the profitability anomaly.

Gormsen and Lazarus’s (2023) study of duration relates analysts’ earnings forecasts to a selection of stock-level return predictors (profitability, investment, market beta, book-to-market, and the payout ratio). They find a negative relation between CAPM alphas and the (partially) fitted values from regressions of three- to five-year analyst earnings growth forecasts on the predictors and introduce a priced duration factor based on a portfolio sort on the weighted average of the predictors. Our results on factor exposure and characteristics are in line with those of Gormsen and Lazarus (2023) in that we find that early timing stocks have low investment and high profitability. However, arguably because we use objective cash flow forecasts that do not suffer from the well-documented biases of survey expectations towards expensive stocks (see, e.g., La Porta, 1996; Bordalo et al., 2019; Jylha and Ungeheuer, 2021), we find no tilt towards high market-to-book stocks. These biases are innocuous when studying duration (i.e., including discount-rate effects, as is the explicit goal in Gormsen and Lazarus, 2023, see p. 1401). In contrast, using a forecast that is systematically biased upwards for expensive stocks is problematic when studying the term structure. Moreover, we test for exposure to all FF5 factors and find that positively and negatively priced exposure roughly offset each other, leading to an unconditional zero term premium. Other duration measures in the literature are either conceptually similar to Dechow et al.’s (see, e.g. Chen, 2011; Chen and Li, 2018), do not consider cash

flows to shareholders (Schröder and Esterer, 2016), or are not forward-looking (see, e.g., Da, 2009).

Our paper reconciles single-stock measures of cash flow timing with the recent literature on the equity term structure. In particular, our unconditional results are in line with Giglio et al. (2024), who estimate an SDF using cross-sectional data and find a mostly flat term structure of equity risk premia. In contrast, our approach is model-free in the sense that we do not make assumptions regarding the existence or form of the SDF. In a related paper, Jankauskas et al. (2021) estimate future cash-flows of stocks using analyst forecasts and fit the parameters of a term structure model by matching forecast-implied prices with market prices.

Our findings also help explain and reconcile the earlier findings from the literature on the unconditional equity premium term structure, starting with van Binsbergen et al. (2012, 2013) and van Binsbergen and Koijen (2017). Using dividend derivative data, this literature finds an on average weakly downward-sloping term structure as well as CAPM betas that increase and alphas that decrease with maturity. While we do not find an unconditionally negative relation of timing to mean returns in our long time series, we do find that CAPM betas increase and CAPM alphas decrease with timing. We show that this is due to a rich cross-sectional factor structure related to cash-flow timing that the CAPM alone cannot capture, in particular, the relation of cash-flow timing to investment rates. In contrast, the Fama and French (2015) model, which captures this factor structure in full, explains the cross-sectional return spreads. Bansal et al. (2021) argue that the dividend strip data is not representative of the long-run balance of economic growth. They find that the term structure of hold-to-maturity equity returns is downward-sloping only in recessions and upward-sloping in expansions, in line with recent findings by Ulrich et al. (2022) who use analyst forecasts to estimate dividend growth. Our results on one-period returns are qualitatively consistent with these predictions. Golez and Jackwerth (2024) study dividend strips over a sample spanning the years from 1996 to 2022 and find an unconditionally flat term structure.

Using a 2003 to 2019 sample of one-year returns on dividend futures for four major equity indices, Gormsen (2021) finds that the long-short-maturity one-period return differentials are positively predicted by the market dividend price ratio.³ We find results in line with Gormsen (2021) when we predict late-minus-early timing portfolios with the dividend price ratio as a cyclical predictor. However,

³Note that this does not necessarily contradict the findings of Bansal et al. (2021), see Footnote 2 above.

this only captures the positive exposure to the market factor. Using a predictor based on the valuation ratios of investment-sorted stocks, we find evidence for a pro-cyclical slope. Moreover, late-minus-early returns are significantly lower during NBER recessions. We show that these results also hold for the time series of dividend strip returns provided by van Binsbergen et al. (2012) and Golez and Jackwerth (2024). Our explanation for the disparate results about the cyclicalities of the term structure follows Gormsen’s (2021) theoretical insight that multiple factors are needed to simultaneously explain differing unconditional and conditional slopes of the term structure. Consistent with our explanation, Cejnek and Randl (2016) suggest that the premia on short-maturity equity stem from exposure to downside risk.

While our findings regarding the cyclicalities of the term structure are consistent with the literature that uses index dividend strips, it should be noted that there are some conceptual differences between evidence from index dividend derivatives and our evidence based on cross-sectional sorts. In particular, our late timing stocks have later timing than the S&P500, which is typically considered as the late equity claim (see, e.g. van Binsbergen et al., 2012; Golez and Jackwerth, 2024). Consequently, the market factor, rather than the short (“aggressive”) leg of the CMA factor, emerges as the main driver of the late equity claim in those studies. In that regard, the cross-section of timing-sorted stocks can perhaps give a more complete picture of the term structure. This comes with the downside that sorts on timing only give a relative sort without the clearly defined maturities of dividend derivatives. There are some other differences, such as TIM measuring all cash flows rather than just dividends, or the fact that late-timing stocks can be small and medium caps. We find that these differences do not materially affect our results: Sorts on our measure generate monotonic spreads in dividend growth and all stylized facts on conditional and unconditional moments are in line with the recent evidence from the index dividend strip literature; when considering subsamples of large stocks only, our results do not change qualitatively.

2 A measure of cash-flow timing

In this section, we introduce our measure of cash-flow timing and briefly discuss why duration is not an apt measure of cash-flow timing, both with full information (when all inputs to the formula are known) and when inputs have to be estimated. We amend this brief discussion with an in-depth treatment of

the established duration measures and their (mechanical) relation to discount rates in Section 4, with details on the construction left to the Internet Appendix.

2.1 Duration and timing

Duration uses weights that depend on the asset's discount rate. Therefore, duration depends not just on cash-flow timing but is a decreasing function of discount rates, as illustrated in Figure A.1 in the Appendix.⁴ Therefore, duration is best-understood as a measure of discount-rate sensitivity rather than cash-flow timing. Note that while late timing implies high discount rate sensitivity, high discount rate sensitivity does not imply late timing. Despite this, duration and cash-flow timing are often used synonymously—perhaps so because the concept was first used in fixed income analysis. Macaulay (1938) introduces duration as the weighted average payment date of a bond, with each weight given by the present value of the respective payment divided by the sum of all such present values, i.e., the bond price. Just like equity duration, bond duration is a function of the bond's discount rate. However, with finite maturity, moderate cross-sectional yield spreads, and coupons that reflect the bond's discount rate, cross-sectional differences in bond duration are much less influenced by cross-sectional differences in discount rates. Equity, in contrast, has in principle infinite maturity and a cross-section of typically growing cash flows that do not necessarily reflect cross-sectional differences in discount-rate levels.

The crucial consequence of the mechanical relation between duration and discount rates, both theoretically and in the empirical analysis below, is that the cross-sectional relationship between

⁴ To summarize, it holds that, for DUR defined as $\sum_{h=1}^T w_h \cdot h$ with $w_h = \frac{C_h}{R^h} (\sum_{h=1}^T \frac{C_h}{R^h})^{-1}$:

$$\frac{\partial DUR}{\partial R} = \frac{1}{R} \left(\sum_{h=1}^T \frac{C_h}{R^h} \right)^{-2} \left[\left(\sum_{h=1}^T h \frac{C_h}{R^h} \right)^2 - \left(\sum_{h=1}^T h^2 \frac{C_h}{R^h} \right) \sum_{h=1}^T \frac{C_h}{R^h} \right]. \quad (1)$$

The expression in (1) is negative if the term in square brackets is negative. This term can be expressed as

$$\sum_{h=1}^T \left(h \frac{C_h}{R^h} \right)^2 + 2 \sum_{i < j, j \leq T} i \frac{C_i}{R^i} j \frac{C_j}{R^j} - \sum_{h=1}^T \left(h \frac{C_h}{R^h} \right)^2 - \sum_{i < j, j \leq T} (i^2 + j^2) \frac{C_i}{R^i} \frac{C_j}{R^j} \quad (2)$$

$$= \sum_{i < j, j \leq T} \frac{C_i}{R^i} \frac{C_j}{R^j} (2ij - i^2 - j^2) = - \sum_{i < j, j \leq T} \frac{C_i}{R^i} \frac{C_j}{R^j} (i - j)^2, \quad (3)$$

which is negative for all $T > 1$ and when there are positive payments in different periods i and j . Note that the derivative could theoretically become positive with mixed-sign cash flows, but this is unlikely for equity: firms with substantial early issuances (negative flows) are typically low- R firms, so their future positive distributions remain significant in present value terms and dominate the calculation.

duration and mean returns will necessarily be negative, irrespective of the shape of the equity term structure. Hence, (equity) duration is not a clean measure of cash-flow timing and is not apt for inference regarding the term structure of equity premia.

2.2 Our measure of cash-flow timing

To overcome this shortcoming of duration, we introduce our measure of cash-flow timing, TIM, which builds on the established duration measures by Dechow et al. (2004); Weber (2018); Gonçalves (2021) but avoids the mechanical relation of those measures with discount rates and, consequently, mean returns. We follow the literature and decompose a firm’s net distributions to shareholders C (“cash flows”) into earnings (E) and changes to book equity (BE)⁵:

$$C_t = E_t - (BE_t - BE_{t-1}), \quad (4)$$

i.e., firms distribute the part of their earnings that is not kept in the firm on the balance sheet. Equation (4) can be expressed in terms of return on equity, ROE , and equity growth, EG , by factoring out BE_{t-1} :

$$C_t = BE_{t-1} \cdot \left[\frac{E_t}{BE_{t-1}} - \frac{(BE_t - BE_{t-1})}{BE_{t-1}} \right] = BE_{t-1} \cdot [ROE_t - EG_t]. \quad (5)$$

To forecast future cash flows C , we follow Gonçalves (2021) and forecast ROE and EG using a VAR. In addition to ROE and EG , the predictor variables in the VAR are asset growth, sales growth, clean surplus profitability, gross profits-to-assets, book leverage, and cash holdings (see Internet Appendix IA.1 for details.)

We then use the forecast cash flows to equity and compute the weights w of future cash flows. Specifically, we discount the cash-flow forecasts with a uniform discount rate r of 12% and divide these cash-flow forecasts at time t by the sum of discounted cash flows from time $t + 1$ to a horizon $H = 1,000$ years.⁶ TIM is then given for each stock j in year t by:

⁵In our empirical analysis, in line with the procedure in Gonçalves (2021), we use clean surplus earnings defined as $E = PO + \Delta BE$ with net payouts PO defined following Boudoukh et al. (2007) as the sum of cash dividends and stock repurchases minus equity issuances. For details, see Internet Appendix IA.1.

⁶We follow Dechow et al. (2004) in using a 12% discount rate. Our results do not differ materially if we choose other values for r (see Appendix A.2), but it is important for the sums of discounted cash flows to converge that r is sufficiently large.

$$TIM_{j,t} = \sum_{h=1}^H w_{j,t+h} \cdot h \quad \text{where} \quad w_{j,t+h} = \frac{C_{j,t+h} \cdot e^{-r \cdot h}}{\sum_{i=1}^H C_{j,t+i} \cdot e^{-r \cdot i}}. \quad (6)$$

It is important to note where our approach departs from the duration measures suggested in the previous literature. Rather than using a uniform discount rate across stocks, Gonçalves (2021) uses the discount rate that equates the stock's market capitalization with the sum of discounted forecast cash flows. Hence, two stocks with the same forecast cash flow dynamics will be assigned different values for duration if their market prices differ. This is, of course, a valid approach, but this measure of duration does not allow for clean inference regarding the term structure of equity premia. The Dechow et al. (2004) duration (also used by Weber, 2018) explicitly avoids this by applying a uniform discount rate across stocks. However, after a forecast horizon of 10 (and in Weber's case 15) years, it is assumed that the remainder of the current market value that has not been paid out by year 10 is paid out as a level perpetuity. Hence, high prices are assigned entirely to high future cash flows rather than low discount rates. Consequently, for two stocks with the exact same cash flow timing, the one with the higher price (lower expected returns) will be assigned the higher duration. Similarly, the VAR in Gonçalves (2021) contains market price variables for the cash-flow forecasts. To avoid this relation to discount rates, we use a uniform discount rate as opposed to stock-specific discount rates in Gonçalves (2021). Moreover, we restrict the VAR to state variables without market prices, which leaves 8 out of 12 variables used by Gonçalves (2021). Lastly, we use a forecast implied price in Equation (6) as the denominator for the weights based on the discounted sum of model implied cash-flows. To sum up, using the established duration measures, cheaper stocks (with higher expected returns) will be assigned the lower duration irrespective of their cash flow timing. Since we are interested in cross-sectional return spreads related to the timing of cash flows, we avoid a mechanical relation with our variable of interest (expected returns) by not using variables that contain market prices (and hence market-implied expected returns).⁷

We compare the empirical properties of our timing measure TIM with the established duration measures in Section 4 below and show how the properties of DUR^{DSS} and DUR^G change when taking out the discount-rate information one-by-one. Before we proceed to the empirical analysis of TIM,

⁷A similar issue occurs when using analyst forecasts of earnings growth that are biased upwards for expensive stocks (see, e.g., Bordalo et al., 2019, for a discussion of this bias)

we would like to emphasize once more that we do not critique the concept of equity duration per se. Rather, we argue that, for the specific purpose of understanding term premia in the cross-section, it is advisable to use TIM rather than any of the established duration measures.

3 Empirical analysis

Having introduced our measure of cash-flow timing, TIM, we now study its associated stock characteristics, its ability to capture cross-sectional differences in cash-flow timing, and how cash-flow timing relates to mean stock returns, both unconditionally and conditional on whether the economy is in a recession. We start by discussing the data.

3.1 Data

We obtain data on stock prices, shares outstanding, and returns, which we adjust for delisting following Shumway (1997), from the Center for Research in Security Prices. Our sample consists of all common U.S. stocks with share codes 10 and 11 that are listed on the NYSE, AMEX, or NASDAQ. Stocks in the financial and utility sectors (SIC codes 4900-4999 and 6000-6999) are excluded because they typically have different balance sheet patterns compared to stocks in industrial sectors. We obtain annual accounting data from Compustat and match them for fiscal years ending in $t - 1$ to return data from July in year t to June in year $t + 1$ (see Fama and French, 1992). Moreover, we only include Compustat observations that have at least two previous observations in this database to avoid a backfilling bias (Fama and French, 1992). Data on the NBER recession indicator is from the Federal Reserve Bank of St. Louis. We use data for the Fama and French (2015) factor model and valuation spreads from Kenneth French’s website. Moreover, dividend strip returns are provided by van Binsbergen et al. (2012) and Golez and Jackwerth (2024) on the websites of the American Economic Review and the Review of Financial Studies, respectively.

We precisely follow Weber (2018) and Gonçalves (2021) in constructing the original measures DUR^{DSS} and DUR^{G} , and we explain all construction details in Internet Appendix IA.1. To see how these equity duration measures relate to expected returns, we sort stocks at the end of each June in each year into deciles based on NYSE breakpoints of the corresponding measure. We rebalance these portfolios monthly to control for delistings. All portfolio returns are value-weighted. The sample for

DUR^{DSS} and TIM^{DSS} (a version of DUR^{DSS} that avoids market prices introduced in Section 4 below) starts in July 1963, whereas the sample for DUR^{G} and TIM begins in July 1973 to ensure sufficient observations for the estimation of the VAR coefficients in the early years in our sample.⁸ The sample ends in December 2020 for all measures.

3.2 Stylized facts about late and early timing stocks

The main object of interest in the subsequent sections will be the returns on portfolios sorted on TIM . To get an understanding of what kind of stocks have late or early cash-flow timing, we first discuss average stock characteristics measured at portfolio formation in Table 1. In Panel *A*, we present payout characteristics, before moving on to standard stock characteristics in Panel *B*.

Overall, late and early TIM stocks exhibit features one would expect from late and early cash-flow timing stocks. As shown in Table 1, Panel *A*, late-timing stocks tend to pay out rather little of their earnings as dividends relative to early-timing stocks (see also Golez and Koudijs, 2025). On average, early-timing firms distribute 41 percent of their earnings as dividends, whereas late-timing stocks only distribute 22 percent. Similarly, the repurchase ratio (repurchases divided by earnings) declines from 47 percent (early) to 17 percent (late). Conversely, share issuances rise from 2 percent of book equity for early stocks to 9 percent for late-timing stocks. This leads to a negative total payout ratio (net payouts in percent of book equity) for late stocks. Intuitively, firms with a late cash-flow timing raise equity today to invest, which, in expectation, leads to higher payouts in the future.

The general stock characteristics are presented in Panel *B*. The patterns we find for investment characteristics mirror the payout characteristics. Total asset growth rises monotonically from 3 percent (early timing) to 52 percent (late timing) with similar patterns for book equity growth and sales growth. Because high TIM corresponds to high investment, correlates of high investment are also associated with high TIM . In particular, late-timing stocks tend to be somewhat smaller than early-timing stocks.

In order to be assigned a late cash flow timing, firms need to have low current cash flows that are predicted to rise over time. Hence, we find that late-timing firms tend to have low profitability, i.e., these firms currently do not have large earnings but are expected to turn more profitable with larger payouts in the more distant future. Operating profitability decreases monotonically from 42 percent

⁸We follow Gonçalves (2021) and use data from 1963 onward to estimate the VAR for each year with an expanding window.

Table 1: Characteristics of TIM-sorted portfolios.

This table shows the time-series averages of various characteristics for portfolios sorted from early to late cash-flow timing based on the cash-flow timing measure TIM. Newey and West (1987) t -statistics with 6 lags are printed in brackets, and we winsorize each characteristic in each year at the 1% and 99% quantiles. The definitions of all characteristics are documented in the Internet Appendix IA.2. The sample period is from July 1973 to December 2020.

	Early	2	3	4	5	6	7	8	9	Late	Late-Early
Cash-flow timing	24.9	26.9	28.1	29.1	30.1	31.3	32.6	34.4	37.2	57.8	32.9 (17.3)
Panel A: Payout characteristics											
Dividend ratio	0.41	0.40	0.41	0.38	0.38	0.33	0.34	0.37	0.27	0.22	-0.19 (-11.3)
Repurchase ratio	0.47	0.38	0.34	0.32	0.30	0.30	0.30	0.31	0.18	0.17	-0.30 (-10.5)
Issuance ratio	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.04	0.09	0.07 (10.8)
Total payout ratio	0.21	0.14	0.13	0.10	0.09	0.07	0.06	0.04	0.02	-0.04	-0.25 (-14.5)
Panel B: General characteristics											
Asset growth	0.03	0.07	0.10	0.11	0.12	0.15	0.15	0.18	0.23	0.52	0.48 (14.4)
Book equity growth	0.03	0.08	0.11	0.11	0.13	0.15	0.16	0.18	0.22	0.50	0.47 (12.8)
Sales growth	0.03	0.08	0.10	0.10	0.12	0.14	0.17	0.18	0.21	0.39	0.36 (16.3)
Size	23.1	23.4	23.4	23.2	23.0	23.0	23.0	22.5	22.3	22.1	-0.90 (-10.2)
Operating profitability	0.42	0.39	0.38	0.36	0.34	0.34	0.33	0.31	0.30	0.25	-0.17 (-4.79)
Clean surplus prof.	0.23	0.21	0.21	0.20	0.19	0.20	0.18	0.18	0.16	0.19	-0.04 (-2.13)
Return on equity	0.22	0.20	0.19	0.18	0.17	0.17	0.15	0.13	0.12	0.05	-0.17 (-6.89)
Profits-to-assets	0.41	0.43	0.44	0.45	0.44	0.44	0.44	0.41	0.40	0.30	-0.11 (-2.77)
Book-to-market	0.61	0.55	0.51	0.49	0.51	0.50	0.54	0.57	0.58	0.59	-0.02 (-0.36)
Book leverage	0.14	0.17	0.18	0.19	0.21	0.22	0.23	0.27	0.32	0.40	0.25 (22.9)
Market beta	0.90	0.91	0.98	1.00	1.04	1.08	1.08	1.14	1.22	1.32	0.42 (18.0)
Cash	0.10	0.11	0.12	0.12	0.12	0.14	0.13	0.13	0.14	0.12	0.02 (2.02)

(early timing) to 25 percent (late timing).

High investment rates are associated with high market-to-book ratios, whereas low profitability

is associated with low market-to-book ratios (see, e.g., Fama and French, 2015). At the same time, high investment growth and low profitability are associated with late timing, so consequently, there is only a small and insignificant tilt of late stocks towards high market-to-book growth firms. This is perhaps surprising given the received wisdom that high market-to-book ratios reflect high future cash flows. Our results do not contradict this received wisdom but add nuance to it: Cross-sectionally, high market-to-book ratios are associated with higher *levels* of cash flows than low market-to-book stocks, but they do not *grow* more than those of low market-to-book stocks. We also find that late timing stocks have higher book leverage, which perhaps adds to the strong, positive spread in market betas that rise monotonically from 0.9 (early timing) to 1.32 (late timing). There is no pronounced cross-sectional pattern in cash holdings.

To sum up, relative to early cash-flow timing stocks, late cash-flow timing stocks have high market beta, low profitability, and pay out a small share of their earnings to shareholders, but rather raise equity in the market in order to invest. These are features one would expect for late cash-flow timing stocks. In Section 3.5 below, we show that the returns on TIM-sorted stocks exhibit a factor structure that aligns with these findings. We proceed to test if TIM indeed forecasts cash flow growth.

3.3 Cash flows

We “backtest” whether TIM indeed generates cross-sectional spreads in realized payouts and cash-flow growth in the years after portfolio formation in Table 2. Intuitively, while portfolios with late cash-flow timing should have relatively low payouts in the near future, they should also have relatively high growth rates of future cash-flows in the more distant future compared to portfolios with relatively early cash-flow timing. The results of the empirical analysis are shown in Table 2. Consistent with this intuition, we find that cash-flow growth increases with TIM for all measures of cash flows, i.e., dividend and repurchase growth (DRG), growth in EBITDA (EBITDAG), and cash flow to equity growth (CG). Not surprisingly, the resulting pattern is clearest for dividends and repurchases, relatively smooth quantities that are at firms’ discretion.

Table 2: Cash-flow growth rates of TIM-sorted portfolios after portfolio formation.

This table shows the time-series averages of realized cash-flow growth rates after portfolio formation for portfolios sorted from early to late cash-flow timing based on the cash-flow timing measure TIM. Realized cash-flow growth rates correspond to the average dividend and repurchase growth (DRG), the average EBITDA growth (EBITDAG), and the average net cash-flow to equity growth (CG) in the five years $(t, t + 5)$, and in the ten years $(t, t + 10)$ after portfolio formation. All growth rates are annualized and in percent per year. We document the details to construct each growth rate in the Internet Appendix IA.2. Newey and West (1987) corrected t -statistics with 6 lags are in brackets, and the sample period is from July 1973 to December 2020.

	Early	2	3	4	5	6	7	8	9	Late	Late-Early
DRG _{t,t+5}	5.05 (6.39)	9.14 (11.4)	10.5 (13.1)	11.7 (14.7)	13.1 (13.6)	14.3 (16.1)	14.6 (14.7)	16.1 (16.2)	17.7 (16.4)	17.9 (17.0)	12.8 (20.9)
DRG _{t,t+10}	5.79 (15.8)	7.48 (21.8)	8.74 (22.7)	9.83 (24.1)	10.4 (26.9)	12.1 (30.8)	12.0 (26.2)	12.6 (24.4)	13.8 (27.9)	14.5 (21.3)	8.71 (16.1)
EBITDAG _{t,t+5}	7.96 (15.8)	7.28 (18.7)	7.77 (20.9)	8.16 (23.3)	8.05 (20.4)	8.22 (22.6)	9.08 (21.9)	9.32 (23.5)	9.94 (26.0)	13.5 (26.8)	5.49 (9.69)
EBITDAG _{t,t+10}	7.21 (26.7)	6.49 (32.6)	6.75 (34.3)	7.19 (42.2)	7.11 (40.5)	7.47 (36.1)	7.96 (35.5)	8.04 (33.4)	8.60 (31.7)	10.3 (30.7)	3.07 (8.78)
CG _{t,t+5}	4.67 (6.41)	8.89 (11.3)	9.93 (13.5)	11.4 (14.2)	12.7 (13.9)	13.7 (16.7)	14.0 (15.1)	14.9 (16.2)	15.6 (16.5)	16.7 (15.7)	12.1 (18.2)
CG _{t,t+10}	5.46 (15.6)	7.26 (20.3)	8.31 (23.1)	9.40 (24.9)	10.2 (26.8)	11.8 (29.6)	11.5 (26.4)	12.3 (22.4)	13.0 (26.7)	13.1 (19.9)	7.68 (13.9)

3.4 Unconditional mean returns

Next, we study the unconditional relation of the cash-flow timing measure TIM to mean returns. In Table 3, we present monthly mean returns, return standard deviations, and Sharpe ratios for each of the TIM-sorted portfolios.

Overall, TIM suggests a flat relation between cash-flow timing and mean returns. Comparing mean returns across TIM-sorted portfolios in Table 3 indicates no clear pattern with late-timing returns, which are 21 basis points below early-timing returns with a t -statistic of -1.15 . Return standard deviations increase in TIM from 4.46 to 6.79 percent. Consequently, Sharpe ratios exhibit an (insignificant) ‘downward slope’. These results remain qualitatively when we vary the uniform discount rate in Equation (6) for our timing measure TIM, as shown in Table A.1. Empirical evidence on the term structure of dividend strips is a natural point of comparison. Our findings concerning a flat relationship between timing and expected returns are similar to what Golez and Jackwerth (2024)

find for a post-1990 sample of S&P500 dividend strips.⁹ To account for differences between the sample of index dividend strips and cash-flow timing estimates in the cross-section, we consider samples that are closer to the underlying of index dividend strips. Specifically, we also provide results for TIM when omitting share repurchases and stock issuances for the computation of book-equity growth in order to base cash flow growth on dividends only (see Appendix Table A.2). Moreover, we provide results for samples comprising only large-cap stocks (Appendix Table A.3). All results are qualitatively unchanged.

Table 3: Unconditional returns of TIM-sorted portfolios.

This table shows the time-series averages of monthly returns (r) for portfolios sorted from early to late cash-flow timing based on the cash-flow timing measure TIM. Portfolio returns are calculated from July 1973 until December 2020 and reported in percent per month. We weight individual stock returns by their market capitalization when aggregating them into portfolio returns. Numbers in brackets are Newey and West (1987) t -statistics with 6 lags. Moreover, we report the standard deviations of monthly portfolio returns in percent (σ), and annualized Sharpe ratios (SR_{ann}) alongside t -statistics based on bootstrapped standard errors (10,000 samples with replacement).

	Early	2	3	4	5	6	7	8	9	Late	Late-Early
r	1.09 (5.82)	1.05 (6.19)	1.07 (4.98)	1.08 (5.59)	1.21 (5.89)	1.14 (5.43)	0.97 (4.79)	1.01 (4.44)	1.26 (5.02)	0.88 (2.98)	-0.21 (-1.15)
σ	4.46	4.35	4.93	4.67	5.19	5.18	5.21	5.36	5.83	6.79	4.50
SR_{ann}	0.85 (5.54)	0.84 (5.33)	0.75 (4.73)	0.80 (5.19)	0.81 (5.21)	0.76 (4.86)	0.64 (4.43)	0.65 (4.19)	0.75 (4.91)	0.45 (3.00)	-0.16 (-1.09)

While our results are largely in line with those of the dividend strip literature (in particular the more recent results using longer samples such as Golez and Jackwerth, 2024) our results seem to be in contrast to the duration literature (Dechow et al., 2004; Weber, 2018; Gonçalves, 2021) which finds an unconditionally downward-sloping relation between duration and mean returns. The fact that taking market prices out of the duration computation yields a flat relationship indicates that the duration premium is due to the mechanical relation between duration and discount rate levels reflected in market prices. We study this more closely in Section 4 below.

Table 4: Alphas and factor exposures of TIM-sorted portfolios.

This table shows the mean pricing errors (alphas) and factor exposures for portfolios sorted from early to late cash-flow timing based on the cash-flow timing measure TIM. We show the coefficients based on regressing the value-weighted TIM-sorted portfolio returns on the market factor in Panel A, on the Fama and French (1993) three-factors in Panel B, and on the Fama and French (2015) five-factors in Panel C. In brackets are Newey and West (1987) t -statistics with 6 lags, and the alpha is in percent per month. The sample period is from July 1973 to December 2020.

Panel A: CAPM alphas and market exposures

	Early	2	3	4	5	6	7	8	9	Late	Late-Early
MKT	0.83 (20.8)	0.86 (29.3)	0.97 (35.3)	0.94 (52.8)	1.05 (50.6)	1.04 (51.2)	1.04 (38.8)	1.08 (57.5)	1.17 (36.4)	1.37 (39.6)	0.54 (9.31)
α^{CAPM}	0.57 (5.45)	0.51 (5.88)	0.45 (4.53)	0.48 (6.47)	0.54 (6.73)	0.48 (5.75)	0.30 (3.67)	0.32 (3.35)	0.51 (4.32)	0.01 (0.13)	-0.56 (-3.78)

Panel B: Fama and French (1993) alphas and factor exposures

	Early	2	3	4	5	6	7	8	9	Late	Late-Early
MKT	0.87 (29.4)	0.87 (29.4)	0.99 (37.7)	0.94 (52.7)	1.02 (50.6)	1.02 (47.4)	1.02 (37.3)	1.05 (49.8)	1.11 (33.5)	1.30 (34.5)	0.43 (7.49)
SMB	-0.10 (-1.84)	-0.05 (-1.84)	-0.18 (-5.83)	-0.08 (-2.90)	0.05 (1.17)	0.02 (0.67)	0.04 (1.03)	0.15 (3.21)	0.22 (5.43)	0.35 (8.79)	0.45 (6.84)
HML	0.22 (2.87)	0.03 (0.77)	-0.08 (-1.66)	-0.07 (-2.31)	-0.13 (-2.76)	-0.14 (-3.51)	-0.13 (-2.71)	-0.07 (-1.82)	-0.12 (-2.17)	-0.06 (-0.98)	-0.28 (-2.49)
α^{FF3}	0.51 (5.56)	0.50 (5.74)	0.50 (5.80)	0.52 (6.99)	0.57 (7.14)	0.52 (5.89)	0.34 (3.72)	0.32 (3.33)	0.52 (4.48)	-0.02 (-0.14)	-0.53 (-3.72)

Panel C: Fama and French (2015) alphas and factor exposures

	Early	2	3	4	5	6	7	8	9	Late	Late-Early
MKT	0.95 (34.9)	0.93 (36.3)	1.00 (36.9)	0.95 (52.6)	1.03 (49.0)	1.01 (42.5)	1.02 (45.8)	1.04 (47.0)	1.13 (33.7)	1.28 (33.4)	0.33 (6.11)
SMB	-0.01 (-0.21)	0.00 (0.11)	-0.17 (-5.29)	-0.06 (-2.09)	0.04 (1.11)	0.03 (0.76)	0.08 (2.08)	0.19 (4.55)	0.22 (5.27)	0.33 (8.70)	0.34 (6.63)
HML	-0.01 (-0.26)	-0.18 (-3.74)	-0.12 (-2.48)	-0.12 (-3.11)	-0.16 (-3.99)	-0.11 (-2.41)	-0.11 (-1.73)	-0.05 (-1.31)	-0.16 (-2.74)	0.02 (0.24)	0.03 (0.34)
RMW	0.38 (4.45)	0.24 (4.32)	0.02 (0.26)	0.08 (2.06)	-0.02 (-0.25)	0.02 (0.30)	0.15 (2.63)	0.13 (2.89)	0.02 (0.39)	-0.08 (-1.15)	-0.46 (-3.64)
CMA	0.49 (5.34)	0.48 (5.94)	0.10 (1.08)	0.11 (1.62)	0.09 (1.09)	-0.06 (-0.75)	-0.09 (-0.86)	-0.08 (-1.19)	0.10 (1.50)	-0.16 (-1.77)	-0.65 (-4.52)
α^{FF5}	0.26 (2.79)	0.30 (3.74)	0.47 (5.20)	0.46 (5.63)	0.56 (6.38)	0.53 (5.55)	0.31 (3.52)	0.30 (3.05)	0.49 (4.38)	0.05 (0.49)	-0.20 (-1.44)

3.5 The factor structure in timing-sorted stock returns

We have seen above that cash-flow timing-sorted portfolios exhibit marked patterns in terms of average stock characteristics. Therefore, while Table 3 shows no indication of a cross-sectional mean return spread for late relative to early timing stocks, it could be that the zero spread masks a non-zero mean pricing error (alpha) with respect to standard pricing models. Table 4 shows factor exposures and alphas with respect to the CAPM (Panel *A*) as well as the Fama and French (1993) (FF3, see Panel *B*) and Fama and French (2015) (FF5, see Panel *C*) factor models.

Similar to dividend strips (see van Binsbergen et al., 2012; Gormsen, 2021), early timing stocks have low market betas and positive CAPM alphas, while late timing stocks have high market betas and insignificant CAPM alphas close to zero. This spread in market betas is robust to including a size (SMB) and value (HML) factor in the FF3 model. In line with the somewhat smaller average size of late stocks, we find a positive spread in SMB beta and, in line with received wisdom, a moderately negative spread in HML betas. FF3 alphas yield a downward slope.

However, it turns out that the late-minus-early return differentials can be explained very well by the FF5 model. While the positive spread in market betas persists, the SMB beta spread declines, the HML spread disappears entirely, but strong, negative spreads in the profitability factor (robust-minus-weak', RMW) and in particular the investment factor (conservative-minus-aggressive', CMA) emerge, leaving no room for a FF5 alpha. This is intuitive given that late timing stocks tend to be stocks that currently have low cash flows and profitability, but due to strong investment, are expected to have larger cash flows in the future. While the positive exposure to the market and SMB factors imply a positive expected return, the negative betas with respect to the RMW and CMA factors imply a negative return spread. Taken together, the positive return premia and the negative return premia roughly add up to zero, yielding zero FF5 alphas. Moreover, a large negative exposure to the CMA factor implies high volatility that (all else equal) is associated with lower mean returns, which helps explain the (insignificant) downward slope of Sharpe ratios.

⁹Golez and Jackwerth's findings bear out those by van Binsbergen et al. (2012), except that the latter authors had found lower volatility for late dividend claims.

3.6 Conditional mean returns

Various asset pricing models differ in their predictions about how equity term premia evolve over the business cycle. For example, standard long-run risk models (Bansal and Yaron, 2004) suggest a countercyclical term structure (upward slope in recessions), as do habit formation models (such as Campbell and Cochrane, 1999). While empirical evidence suggests that the term structure of hold-to-maturity returns of dividend claims is downward-sloping in recessions (see, e.g., Bansal et al., 2021), the recent empirical evidence on one-period returns with different maturities is consistent with a countercyclical term premium, i.e., an upward slope when market valuations are low (see, e.g., Gormsen, 2021; Golez and Jackwerth, 2024). Moreover, given the rich factor structure in timing-sorted stock returns, it is likely that any time variation in factor premia yields time variation in late-minus-early cash-flow timing return premia.

We start our analysis of cyclicity by adopting the approach in Gormsen (2021), which regresses the returns of late and early dividend strips on the aggregate market dividend price (DP) ratio. Gormsen (2021) finds a positive spread in slope coefficients, indicating a countercyclical slope of the equity term structure, i.e., in bad times, late timing equity has higher expected returns than early timing equity. In Panel A.1 of Table 5, we find results in line with those of Gormsen (2021): A higher market DP ratio is associated with a higher late-minus-early timing portfolio return over horizons of 12 months (and with waning statistical significance for 18 and 24 months).

Our analysis of the factor structure in Section 3.5 suggests that predictive regressions using the aggregate DP ratio may not capture the full cyclical dynamics of late-minus-early returns. In very much the same way that exposure to the CAPM market factor does not capture the cross-section of timing-sorted stock returns, predictability by the market DP ratio does not capture the full time variation in timing-sorted stock returns. By definition, the market DP ratio must predict returns on the market (factor). It only predicts the returns on other assets to the extent that their expected returns are related to those of the market, as indicated by, e.g., a large market beta. As we discuss in Section 3.5 above, timing-sorted stocks exhibit a rich factor structure that is not captured by the CAPM. In particular, the positive market beta (0.33) of the late-minus-early return is accompanied by a strong negative exposure to the investment factor of -0.65. Both the market factor and the investment factor exhibit strong counter-cyclicity (see, e.g., Cooper and Maio, 2019b). There is also cyclicity

Table 5: Predicting late-minus-early portfolio returns

This table shows the regression coefficients from predictive regressions of h -month holding period returns on two predictor variables. Returns are from July in year y to h months later (i.e., to the end of June in year $y + 1$ for $h = 12$) and are regressed onto the predictor variable computed at the end of June in year y . In Panel A, the predictor variable is the investment valuation spread (IVS) from June in year y . In Panel B, it is the market dividend price ratio (DP). We study returns of late TIM stocks minus the returns of early TIM stocks (r^{l-e}) in Panels A.1 and B.1. Moreover, we analyze return differentials between the S&P 500 and the earliest timing dividends strips from van Binsbergen et al. (2012) and Golez and Jackwerth (2024) (r^{mkt-e}) in Panels A.2 and B.2. To avoid overlapping portfolio returns as much as possible, we only include yearly observations from July of each year. Holding period returns are continuously compounded and are in percent per month. The dividend-price ratio is computed using the value-weighted market return provided by CRSP following Cochrane (2008). IVS is the difference in log book-to-market ratios between low and high investment portfolios with low book-to-market ratios (portfolios 1 and 5) based on the 25 portfolios sorted on investments and book-to-market on Kenneth French's website. t -statistics are based on bootstrapped standard errors that control for the contemporaneous correlation of holding period returns and the predictor and are robust to Stambaugh (1999) bias. Moreover, standard errors control for a potential autocorrelation if the holding period exceeds 1 year. For details, see Internet Appendix IA.3. The sample period ranges from July 1973 to December 2020 for TIM. We use the original samples for van Binsbergen et al. (2012) and Golez and Jackwerth (2024).

Panel A: Predictive regressions on the market dividend-price ratio (DP)

	A.1: Late-minus-early stock portfolio			A.2: Market-minus-early dividend strips					
	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	van Binsbergen et al. (2012)			Golez and Jackwerth (2024)		
	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}
DP	5.31 (1.86)	5.17 (1.38)	4.71 (0.87)	68.19 (2.48)	104.70 (1.88)	126.13 (1.61)	56.24 (2.28)	88.90 (2.52)	86.83 (1.98)

Panel B: Predictive regressions on the investment valuation spread (IVS)

	B.1: Late-minus-early stock portfolio			B.2: Market-minus-early dividend strips					
	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	van Binsbergen et al. (2012)			Golez and Jackwerth (2024)		
	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}
IVS	-35.44 (-2.85)	-43.52 (-3.01)	-43.14 (-2.40)	-37.16 (-1.73)	-41.93 (-1.88)	-33.20 (-1.54)	-19.41 (-0.89)	-28.75 (-2.31)	-45.54 (-3.04)

in the other factors, but the exposure of the late-minus-early portfolio to CMA is roughly double the size of the market beta and by far the largest, which motivates our focus on the investment factor. Given the strongly negative exposure to the investment factor CMA, it is conceivable that there is a negative net effect, and the term structure slopes downward in recessions.

To test the cyclicity of the term structure slope entailed by the investment exposure, we introduce a variable that is countercyclical (i.e., its correlation with the NBER recession indicator is positive, just as it is the case for the DP ratio) but which reflects the expected returns on the investment

factor rather than the aggregate market. Specifically, we introduce the “investment valuation spread” (IVS) constructed as the difference in log book-to-market ratios of low and high investment portfolios. We use the book-to-market ratio rather than the dividend-price ratio because it is less noisy for portfolios of non-dividend paying stocks that make up a large part of high investment firms (see Table 1).¹⁰ By construction, IVS reflects the difference in expected returns between low and high investment stocks, and because the late-minus-early portfolio has a strongly negative CMA beta, we expect IVS to predict returns with a negative sign. In Panel B.1 of Table 5, we show the results of predictive regressions of late-minus-early returns on IVS. The persistently and significantly negative coefficients suggest that late-timing stocks have lower returns in downturns than early-timing stocks, indicating a pro-cyclical term structure. This result is not specific to our timing portfolios but also holds qualitatively for the market-minus-early timing returns by van Binsbergen et al. (2012) and Golez and Jackwerth (2024), as we show in Panels A.2 and B.2 of Table 5. Given that the long leg for those two time series *is* the market return, we find strong predictability by the market DP ratio for those assets, whereas the predictive power of IVS is somewhat weaker. Arguably, this is because the market portfolio does not capture late-timing equity as well as the portfolio of stocks with distinctly late cash-flow timing.

Depending on which predictor one uses to predict returns, the implications for cyclicity differ substantially. Any projection of returns on indicators for high or low returns on one or more components of the late-minus-early return cannot fully capture the state-dependent expected return. Omitting a component can bias the conclusion altogether. For example, it is well-known that CMA and the market factor are negatively correlated (the correlation coefficient is about -0.38 in our sample). Hence, in a full-sample linear regression, a positive market beta and a negative exposure to CMA contribute to positive linear predictability of late-minus-early returns by a predictor of the market return. However, conditional on being in a recession, a negative CMA beta suggests low expected returns, and a positive market beta suggests high expected returns. Any full-sample linear regression of a variable that mostly spans the expected return on the market (or any other asset for that matter) will not be able to fully

¹⁰The book-to-market ratios of investment-sorted portfolios are available at Kenneth French’s data library. In order to have discount-rate sensitive return predictors, we use the log book-to-market ratios of portfolios 1 and 5 in Kenneth French’s 25 book-to-market and investment sorted portfolios (low book-to-market, low investment, and low book-to-market high investment). As we have shown in Section 2 above, low discount rates (such as those of low book-to-market portfolios) imply high discount-rate sensitivity and hence superior predictive power.

capture the “recession” state of the economy. This also holds for univariate linear regressions on other variables that predict the expected return on the market factor across the cycle.¹¹

Faced with the opposing forces of different asset pricing factors on the cyclicity of the term structure slope, we turn to NBER recessions as a non-linear indicator for the business cycle that, unlike the market DP ratio and IVS, does not reflect expected rates of return on specific asset pricing factors but precisely captures whether the U.S. economy is in a recession. Because market participants may not be fully aware that they are in a downturn, we vary both the portfolio formation states and the holding periods.

Table 6 shows that when buying a portfolio long in late-timing stocks and short in early-timing stocks during a recession, irrespective of how long the portfolio is held, it yields a negative return, indicating a downward slope of the equity premium term structure. In Panel A, the strategy is to buy the portfolio in every NBER recession month and hold the portfolio for 1 to 24 months. Statistical significance varies (for 12-month holding periods, the negative return differential is not statistically significant), but the return differentials are always more negative than in non-recession times (shown in row “ Δ ”). All Δ -coefficients are statistically significantly negative for all holding periods.

We are interested in the mean returns of positions initiated during NBER recessions to the extent that they reflect expected returns conditional on being in a recession. However, since NBER recessions are only declared in hindsight, it is unclear whether market participants have fully priced in the recession when it begins. Consequently, the more negative returns for late stocks may either reflect upward-sloping term premia with a more positive discount rate shock for late stocks realized at the onset of the recession or a manifestation of a downward slope in term premia over the course of the recession. In Panel B of Table 6, we examine returns during later quarters of a recession, which should provide a more robust indication of expected returns in a recession state. Crucially, we find that, regardless of the holding periods, and whether we consider the full recessions or merely the months following the first quarter, the cross-sectional return differences indicate a negative relationship between timing and mean returns in NBER recessions, which is statistically different from the return differential in non-recession months, shown in rows “ Δ ”.

¹¹See, e.g., the regressions in Table AIII in the appendix of Gormsen (2021). While cay and the NFCI contain a plethora of market discount rates, consumption growth and the output gap are positively related to aggregate stock market valuations through the business cycle and cannot capture diverging correlations of the market and investment factor returns during recessions and non-recessions.

Table 6: Late-minus-early portfolio returns conditional on NBER recessions.

This table shows returns on late/market-minus-early portfolios in recessions. Specifically, we show the returns on portfolios formed in all NBER recession months (Panel A) and in all NBER recession months excluding the first recession quarter (Panel B), which we denote with NBER-". Rows marked with Δ show the difference between the late minus early return in NBER" or "NBER-" months and all other months. We study returns on three portfolios: returns of late TIM stocks minus the returns of early TIM stocks (r^{l-e}) in Panels A.1 and B.1. Moreover, we analyze return differentials between the S&P 500 and the earliest timing dividends strips from van Binsbergen et al. (2012) and Golez and Jackwerth (2024) (r^{mkt-e}) in Panels A.2 and B.2. We consider various holding periods indicated by the subscripts next to the returns: 1 month ($h1$), 12 months ($h12$), 18 months ($h18$), and 24 months ($h24$). Holding-period returns are continuously compounded and are in percent per month. Newey and West (1987) corrected t -statistics are in brackets (the number of lags corresponds to the number of months in the holding period). The sample period ranges from July 1973 to December 2020 for TIM. We use the original samples for van Binsbergen et al. (2012) and Golez and Jackwerth (2024). Lastly, we show the number of observations (Nobs.).

Panel A: NBER recession periods

	A.1: Late-minus-early stock portfolio				A.2: Market-minus-early dividend strips							
					van Binsbergen et al. (2012)				Golez and Jackwerth (2024)			
	r_{h1}^{l-e}	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	r_{h1}^{mkt-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}	r_{h1}^{mkt-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}
NBER	-1.19 (-1.89)	-6.66 (-1.42)	-11.04 (-2.20)	-13.54 (-2.08)	-3.16 (-3.88)	-29.31 (-5.97)	-39.41 (-5.44)	-52.45 (-31.02)	-2.66 (-2.26)	-15.72 (-2.20)	-16.33 (-1.65)	-12.34 (-0.92)
Δ	-1.12 (-2.01)	-4.92 (-2.59)	-9.06 (-3.99)	-11.77 (-4.41)	-2.86 (-1.70)	-23.46 (-4.14)	-30.19 (-3.68)	-37.99 (-3.20)	-2.69 (-1.40)	-10.48 (-2.82)	-9.03 (-1.94)	-0.17 (-0.03)
Nobs.	570	559	553	547	165	154	148	142	324	313	307	301

Panel B: NBER recession periods excluding the first recession quarter

	B.1: Late-minus-early stock portfolio				B.2: Market-minus-early dividend strips							
					van Binsbergen et al. (2012)				Golez and Jackwerth (2024)			
	r_{h1}^{l-e}	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	r_{h1}^{mkt-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}	r_{h1}^{mkt-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}
NBER-	-1.31 (-1.49)	-6.31 (-1.52)	-11.92 (-2.70)	-14.63 (-2.04)	-2.11 (-3.52)	-25.86 (-5.87)	-36.03 (-5.09)	-47.70 (-60.10)	-2.69 (-2.36)	-11.85 (-1.50)	-11.40 (-1.15)	-5.63 (-0.43)
Δ	-1.21 (-1.89)	-4.36 (-2.02)	-9.72 (-3.76)	-12.55 (-4.14)	-1.55 (-0.82)	-18.69 (-2.71)	-25.36 (-2.25)	-32.24 (-2.13)	-2.65 (-1.18)	-6.07 (-1.38)	-3.51 (-0.64)	7.03 (1.20)
Nobs.	570	559	553	547	165	154	148	142	324	313	307	301

Again, this is not a peculiarity of returns on timing-sorted stock portfolios. We find similar results using the S&P 500 dividend strip returns provided by van Binsbergen et al. (2012) and Golez and Jackwerth (2024), see Panels A.2 and B.2. The mean return differentials between the market

and short-run dividend claims provided by van Binsbergen et al. (2012) and Golez and Jackwerth (2024) are more negative in recessions than in non-recessions. This suggests that our main results on cyclicity are not due to differences between dividend strips and stocks, but rather that returns on early timing equity claims generally are higher in recessions. Similarly, the downward slope in recessions only becomes more pronounced when considering portfolios of large stocks, see Table A.6. The evidence on predictability by the DP ratio and IVS is also robust to only using large caps (see Appendix Table A.4). As suggested by Boguth et al. (2022), we also consider log returns, which are more robust to noise. Our results in Appendix Tables A.5 and A.7 show that, if anything, the evidence for a downward slope becomes stronger when we consider log returns.

In summary, predictive regressions using valuation ratios on high-low-investment stock portfolios indicate a procyclical term spread. Given the pronounced factor structure associated with cash-flow timing, where late stocks exhibit high investment, which is associated with pro-cyclical expected returns not captured by the market DP ratio, we argue that discount-rate-free, non-linear cyclical indicators, such as recession indicators, provide a more complete picture of average term structure slopes in recessions.

3.7 Theoretical implications

Our explanation for why different valuation-based predictors have opposite implications regarding the cyclicity of the equity term structure resonates with the theoretical argument in Gormsen (2021) that at least two factors are needed to simultaneously match the conditional and unconditional term structures.

The factor structure associated with the timing of cash flows suggests that these factors can be captured by the factors of the FF5 model. Indeed, when taking the factor exposures from Table 4 and multiplying them with the average returns on the FF5 factors during NBER recessions, one gets negative expected returns on the late-minus-early portfolio in recessions. While the FF5 model may be understood as a mostly descriptive model, several economic mechanisms could explain why stocks with early cash-flow timing have higher returns only in recessions.

In Section IA.5 in the Internet Appendix, we present a reduced-form model of the cross-section of stocks in the style of Lettau and Wachter (2007). In our model, firms with higher exposure to

persistent dividend growth have later cash-flow timing. On the one hand, such stocks earn higher risk premia for this cash-flow exposure. On the other hand, because innovations to long-run and short-run dividend growth are negatively correlated (as in Gormsen’s (2021) model), late timing stocks are a hedge against local (i.e., instantaneous) dividend risk. A positive exposure of late timing stocks to volatility and (persistent) cash-flow growth is largely consistent with the stylized facts that late timing stocks have negative RMW and CMA exposure, which, according to Cooper and Maio (2019a), proxies for positive exposure to volatility and low exposure to short-run growth state variables, respectively. So, in a rough way, the model maps into FF5 factor exposure. Because the local risk is higher in recessions, the “cross-sectional term structure” is downward-sloping only in recessions. When volatility is at its long-run mean, the two effects roughly cancel out, leading to flat unconditional return differentials. The mechanism for countercyclical slopes in Gormsen (2021) is different, suggesting time-varying discount rates (rather than time-varying risk) as an indicator of bad times. In that model, late-timing stocks depreciate when the discount rate rises, making them more exposed to bad times, such that in bad times, the term structure slopes upwards.

Both the mechanism in Gormsen (2021) (discount rate shocks in recessions) and the mechanism in our model (cash-flow uncertainty in the near future) are plausible. We argue that both mechanisms likely also have empirical merit. Considering the recessions in our sample provides tentative evidence: While the empirical evidence suggests that, on average, the term structure tends to slope downwards in recessions, there are some recessions in which the FF5-implied late-minus-early return is positive (see Internet Appendix Table A.8 for one-month and Table A.9 for 12-month returns). In particular, the recessions of 1980 and the early 1990s, in which the FF5 model suggested positive returns on the late-minus-early portfolio, are commonly associated with tight monetary policy, which, in a Gormsen (2021) style model, could be represented by a positive shock to discount rates that yields high expected returns for late timing stocks. Most other recessions, in particular those commonly associated with real economic uncertainty rather than monetary policy shocks, such as the oil crises or the Great Recession, feature pronounced downward slopes that drive the overall result of a downward-sloping term structure in recessions.

4 Empirical duration measures

The pricing implications of empirical duration measures differ significantly from those of cash-flow timing measures. This is because duration measures incorporate market prices. In the following, we examine how the original duration measures proposed by Dechow et al. (2004) and Weber (2018) (DUR^{DSS}), and DUR^{G} proposed by Gonçalves (2021) relate to mean returns and cash flow forecasts. We also briefly discuss how incorporating market prices influences the returns of duration-sorted portfolios.

We replicate the documented duration premium from the literature. Both DUR^{DSS} and DUR^{G} produce strongly negative return spreads between high- and low-duration portfolios. As shown in Appendix Tables A.11 and A.13, high-duration stocks earn 0.43% (DUR^{DSS}) to 0.71% (DUR^{G}) lower monthly returns than low-duration stocks. When we examine the associated spreads in future cash flow growth, we find that incorporating market prices into duration measures does not meaningfully improve cash flow forecasts compared to discount-rate-free timing measures such as our measure TIM. As we show in Appendix Tables A.12 and A.10, respectively, DUR^{G} produces spreads in realized cash flows that are comparable to our measure TIM, whereas DUR^{DSS} yields considerably smaller spreads for the growth in dividends and repurchases as well as for the growth in cash-flows to shareholders. Overall, this suggests that using market price information does not materially improve cash-flow forecasts.

Importantly, we find that when market price information is excluded from the duration measures, the return spreads largely disappear. For example, TIM, which corresponds to DUR^{G} without market price information, yields an unconditional return spread close to zero. Similarly, TIM^{DSS} , which replaces market prices in DUR^{DSS} with internally consistent, forecast-implied prices, also produces a near-zero unconditional spread (Appendix Table A.11).

Our findings indicate that the observed return spreads between high and low duration stocks are driven by the inclusion of market prices in the construction of duration measures. Consequently, the duration premium documented by Dechow et al. (2004) and Gonçalves (2021) appears to stem from a mechanical relationship between prices and mean returns, rather than differences in cash flow timing. In the following, we discuss how these duration measures combine timing and discount rate information. Additional results, including analyses of related duration measures such as those in Chen

(2011) and Chen and Li (2018), are provided in Appendix IA.4.

Dechow et al. (2004) equity duration. To see how DUR^{DSS} combines discount-rate and cash-flow timing information, consider its definition for each stock j in each year t :

$$DUR_{j,t}^{DSS} = \frac{1}{P_{j,t}} \cdot \left[\sum_{h=1}^H \frac{h \cdot C_{j,t+h}}{R^h} + \left(H + \frac{R}{R-1} \right) \cdot \left[P_{j,t} - \sum_{h=1}^H \frac{C_{j,t+h}}{R^h} \right] \right], \quad (7)$$

where cash flows C are forecast using two separate AR(1) processes for return on book equity $\frac{E_t}{BE_{t-1}}$ and book equity growth $\frac{BE_t - BE_{t-1}}{BE_{t-1}}$. The two processes are the same for all stocks and jointly determine the stocks' future cash flows by the accounting identity $C_t = BE_{t-1} \left[\frac{E_t}{BE_{t-1}} - \frac{BE_t - BE_{t-1}}{BE_{t-1}} \right]$. Dechow et al. (2004) assign a uniform discount rate R across all stocks in order to make sure that their measure “is driven solely by differences in the timing of the expected future cash flows” (Dechow et al., 2004, p.203). However, because they use market capitalization $P_{j,t}$ to forecast future cash flows after the forecasting horizon H , for two stocks with the exact same cash-flow timing, the one with the higher price (and c.p. lower mean returns) will be assigned a higher duration.¹² So while on average, stocks with higher prices may potentially have higher future cash flows beyond the forecast horizon H than their otherwise identical peers, it is unclear if the observed duration premium is driven by cash flow timing and a non-flat term structure or simply because DUR^{DSS} is higher for stocks with higher prices (and c.p. lower discount rates). Our results indicate that the latter is the case. We introduce a discount-rate free timing measure TIM^{DSS} defined as

$$TIM_{j,t}^{DSS} = \frac{1}{P_{j,t}^{FI}} \cdot \left[\sum_{h=1}^H \frac{h \cdot C_{j,t+h}}{(1+r)^h} + \left(H + \frac{1+r}{r-g} \right) \cdot \left[P_{j,t}^{FI} - \sum_{h=1}^H \frac{C_{j,t+h}}{(1+r)^h} \right] \right], \quad (9)$$

with $P_{j,t}^{FI} = \sum_{h=1}^H \frac{C_{j,t+h}}{(1+r)^h} + \frac{C_{j,t+H} \cdot (1+g)}{(1+r)^H \cdot (r-g)}$ denoting the forecast-implied price. That is, we replace the market capitalization in Equation (7) with the price implied by the cash-flow forecasts and a long-run

¹²Formally,

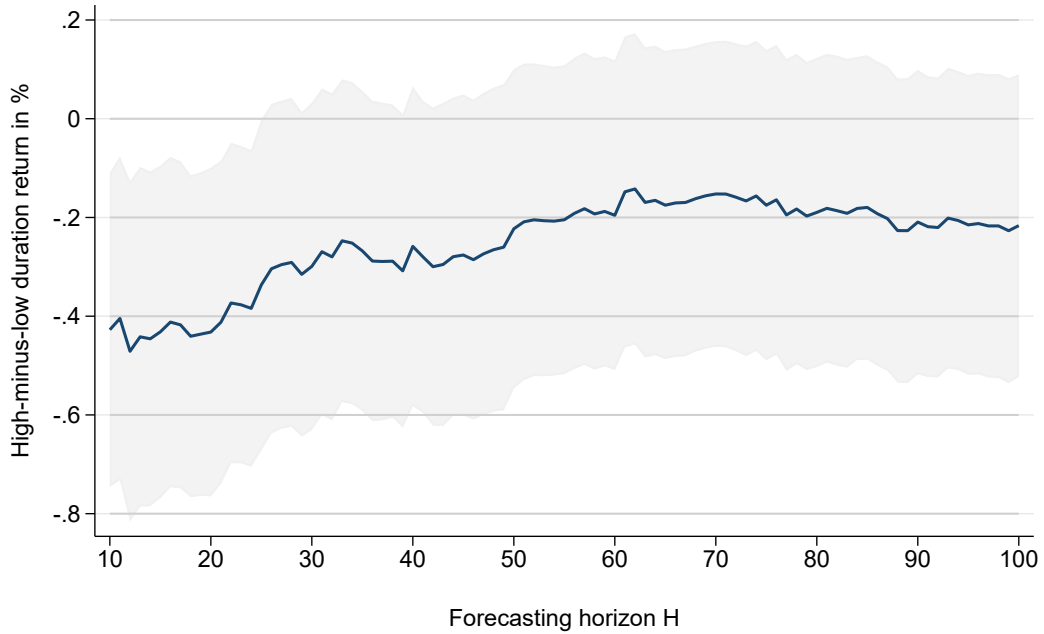
$$\frac{\partial DUR_j^{DSS}}{\partial P_j} = \frac{\left(H + \frac{R}{R-1} \right) \sum_{h=1}^H \frac{C_{j,t+h}}{R^h} - \sum_{h=1}^H \frac{h \cdot C_{j,t+h}}{R^h}}{P_j^2} > 0, \quad (8)$$

because, by definition, $h \leq H \forall h$.

growth rate g .¹³ TIM^{DSS} does similarly well in predicting cash flows as does DUR^{DSS} , but it does not yield any return spread between late and early timing stock portfolios whatsoever (see Table A.11). This is illustrated in Figure 1 where we increase the forecasting horizon h in Equation (7) from 10 to 100 years, such that the market price in Equation (7) plays a lesser and lesser role. By about 25 years, the duration premium becomes insignificant.

Figure 1: Mean return spread of DUR^{DSS} for different forecasting horizons H .

This figure depicts the return (in % per month) of the high minus low equity duration portfolio sorted on the equity duration measure DUR^{DSS} following Dechow et al. (2004) and Weber (2018) for different lengths of the forecasting horizon H in Equation (7). The grey area corresponds to 90 % confidence intervals computed with Newey and West (1987) standard errors with 6 lags.



To summarize, DUR^{DSS} conflates timing and discount-rate information by assigning high market capitalization entirely to high future cash flows rather than to low discount rates. Hence, for two stocks with the same forecast cash flows, DUR^{DSS} will be higher for the one with the higher price (and the lower expected returns). Removing this mechanical relationship by replacing the market price with an internally consistent forecast-implied price in our measure TIM^{DSS} shows that the negative relation between DUR^{DSS} and mean returns is driven by the mechanical relation between prices and mean

¹³We assume a growth rate of 6% implied by the difference in the long-run growth rate for ROE of 12% and the long-run growth rate for book-equity growth of 6%.

returns.

Gonçalves (2021) equity duration. The contamination of DUR^G with market-price implied discount rates comes from two sources. First, unlike DUR^{DSS} and TIM, which apply a uniform discount rate across stocks, DUR^G incorporates a stock-specific discount rate by equating each stock’s observed market price with the sum of its forecast cash flows discounted at that rate. As discussed in Section 2.1, duration is mechanically linked to the level of the stock-specific discount rate. Hence, for two stocks with identical forecast cash flows, DUR^G will assign a higher duration to the stock with the higher market price (and, *ceteris paribus*, the lower expected return). While DUR^G is an appropriate measure of duration, this dependence on stock-specific discount rates makes it unsuitable for studying term premia.

Second, similar to DUR^{DSS} but in contrast to the discount-rate-free measure TIM, DUR^G incorporates market-price-based variables, such as the market-to-book equity ratio, as predictors in the VAR used to forecast cash flows. This can be problematic, particularly when the VAR is estimated in pooled regressions, as it conflates cross-sectional persistence with time-series persistence in cash flows. The result is an overestimation of cash-flow growth for high market-to-book firms, which are persistently more profitable than value firms but whose profitability tends to decline over time. By picking up the cross-sectional persistence of high-market-to-book firms’ profitability (high market-to-book firms continue to be more profitable than low market-to-book firms), the pooled estimation exaggerates the relationship between currently high market-to-book ratios and future cash flows. This creates a spurious link between prices and high duration unrelated to actual cash-flow timing. This issue parallels the arguments by Chen et al. (2013) regarding cash-flow news as drivers of valuations and De la O et al.’s (2023) findings that the dispersion in earnings-to-price ratios mostly reflects differences in profitability levels rather than future cash flow growth.¹⁴

To gauge how much of the mean return differential between low- and high- DUR^G stocks stems from these two mechanisms, we compute two adjusted measures. DUR^{G-U} follows the Gonçalves (2021) methodology but replaces stock-specific discount rates with a uniform discount rate. DUR^{G-U*} further

¹⁴See also Fama and French (1995), who document the cash flow dynamics of value and growth portfolios. We reproduce a version of their Figure 1 as Figure IA.1. Relative to their levels at the sorting date, growth stocks’ profitability declines while value stocks’ profitability rises. Since cash-flow timing pertains to dynamics rather than levels, we avoid forecasts driven by the cross-sectional relation between book-to-market ratios and profitability.

demeans the VAR predictor variables along the time-series dimension, mitigating cross-sectional persistence. As shown in Table A.13, replacing stock-specific discount rates reduces the duration premium from -71 basis points (DUR^G , top Panel of Table A.13) to -46 basis points (DUR^{G-U} , middle Panel of Table A.13). When we also demean the VAR variables, the spread shrinks further to -22 basis points and becomes insignificant (DUR^{G-U*} , bottom panel of Table A.13).¹⁵

Timing measures, duration measures, and the book-to-market-ratio Since our measure TIM builds on Gonçalves’s duration measures DUR^G , it is a natural question how the two are linked. Table A.14 in the appendix shows the pairwise rank correlations between the different duration measures and TIM, as well as the book-to-market ratio in Panel *A* and the return correlation in the decile 10-minus-decile 1 portfolios sorted with respect to different measures in Panel *B*.

As one would expect, TIM has positive rank correlations with all duration and timing measures, in particular with DUR^G , upon which TIM is based. Interestingly, TIM is virtually uncorrelated with the book-to-market ratio both in terms of stocks’ rank correlation and in terms of its returns (-2% and 1%, respectively). This goes against the received wisdom that low book-to-market (growth) stocks grow in terms of cash flows. Technically, this is because firms with high expected cash-flow growth tend to have low current profitability (which by itself would result in a positive correlation of TIM with the book-to-market ratio) and high investment rates (which by itself would result in a negative correlation of TIM with the book-to-market ratio).¹⁶ Aggregating these relations, there is no strong relation between TIM and the book-to-market ratio. This result seems less surprising when we consider the empirical evidence that value stocks’ cash flows do not grow less than growth stocks (see Hansen et al. (2008) and, more recently, Chen (2017)) and that in the time series most of the variation in valuation ratios can be explained by discount-rate rather than cash-flow variation (see, among others, Cochrane, 2008, 2011). Overall, our findings provide further evidence that the value premium is not due to cash-flow timing (see also Golubov and Konstantinidi, 2019). In contrast, because they effectively sort on prices, DUR^{DSS} and DUR^G are strongly negatively correlated with the book-to-market ratio.

¹⁵Table A.12 shows that neither change negatively affects the cash-flow forecasting ability of the two altered duration measures.

¹⁶See, for instance, Novy-Marx (2013) and Fama and French (2015).

5 Conclusion

We introduce a novel measure of cash-flow timing, TIM, which – in contrast to established duration measures – does not confound information on discount-rate levels with information on cash-flow timing. Our measure predicts cross-sectional spreads in cash-flow growth just as well or better than the established duration measures. However, it does not generate a cross-sectional spread in mean returns between late and early timing stocks. Our findings imply that established empirical measures of equity duration derive their predictive power for returns entirely from their mechanical relation with discount rates. Without this relation, there is no unconditionally monotonic relation between duration measures and subsequent returns. The lack of any unconditional timing premium can be explained by the exposure to standard cross-sectional asset pricing factors. In particular, while late-timing stocks have positive market beta, they also tend to have high investment rates and correspondingly, strongly negative CMA (conservative-minus-aggressive investment) beta. Unconditionally, these effects cancel out, implying no timing premium. However, due to the strong negative exposure to the countercyclical investment factor, late-timing stocks have lower returns than early-timing stocks in recessions.

Our findings reconcile various findings from the literature on the term structure of broad equity indices and the duration literature: First, in line with recent evidence from dividend derivatives, we find no cross-sectional return differences between late and early cash-flow timing stocks once we isolate cash-flow timing from discount rate information in established equity duration measures. Second, the rich cross-sectional factor structure behind late-minus-early timing returns can explain why different cyclical indicators may either indicate a pro-cyclical or a counter-cyclical slope of the equity term structure. Specifically, we show that counter-cyclical predictors of market factor returns suggest a counter-cyclical equity term structure, whereas counter-cyclical predictors of investment factor returns suggest pro-cyclical slopes. These findings indicate that, besides differences in return measurement, the approaches of Gormsen (2021) and Bansal et al. (2021) capture different conditional expected return components.

Finally, because TIM does not contain market price information and therefore poses no endogeneity problem, it lends itself to be used as a demand shifter in demand system estimation (Kojien and Yogo, 2019).

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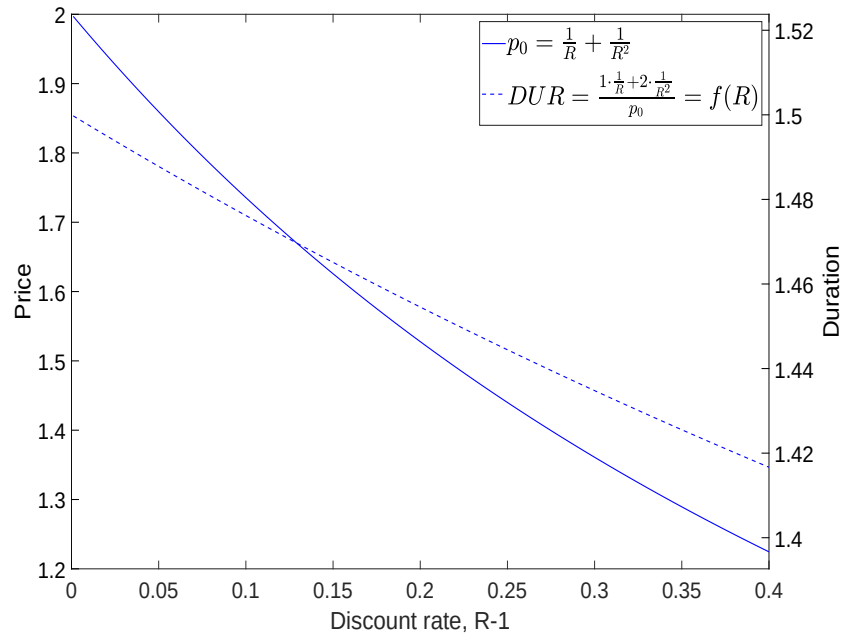
Appendix

A.1 Duration and discount rates

In this section, we illustrate how duration depends on discount rate levels.

Figure A.1: Prices, discount rates and duration.

This figure shows the prices of assets with payoffs $C_1 = C_2 = 1$, but different discount rate levels (points on the solid blue line), and the corresponding duration level (dashed line). The price is given by $P = 1/R + 1/R^2$, and duration by $DUR = \frac{1}{1+R^{-1}} + \frac{2}{1+R}$.



A.2 Unconditional returns of timing-sorted portfolios

In this section, we provide robustness tests for the unconditional relation between TIM and mean returns.

Table A.1: Unconditional returns of timing-sorted portfolios for different discount rates.

This table shows the time-series averages of monthly returns (r) for portfolios sorted from early to late cash-flow timing based on the cash-flow timing measure TIM. We vary the uniform discount rate for TIM from 10% to 18% in Equation (6) and show the respective results in Panel A to Panel D. Portfolio returns are calculated from July 1973 until December 2020 and reported in percent per month. We weight individual stock returns with their market capitalization when aggregating them into portfolio returns. Numbers in brackets are Newey and West (1987) t -statistics with 6 lags. Moreover, we report the corresponding standard deviations (σ) of monthly portfolio returns in percent, and annualized Sharpe ratios (SR_{ann}) alongside t -statistics based on bootstrapped standard errors (10,000 samples with replacement).

Panel A: Uniform discount rate of 10%

	Early	2	3	4	5	6	7	8	9	Late	Late-Early
r	1.10 (5.75)	1.02 (5.55)	1.16 (5.60)	1.09 (5.59)	1.21 (6.01)	1.05 (5.24)	0.92 (4.46)	1.10 (4.84)	1.08 (4.30)	0.88 (2.93)	-0.22 (-1.20)
σ	4.51	4.55	4.78	4.80	5.28	5.07	4.97	5.30	5.84	6.87	4.48
SR_{ann}	0.84 (5.36)	0.77 (4.90)	0.84 (5.39)	0.78 (5.21)	0.79 (5.15)	0.72 (4.65)	0.64 (4.20)	0.72 (4.69)	0.64 (4.15)	0.44 (2.91)	-0.17 (-1.18)

Panel B: Uniform discount rate of 14%

	Early	2	3	4	5	6	7	8	9	Late	Late-Early
r	1.11 (6.03)	1.09 (6.01)	1.01 (5.28)	1.05 (4.88)	1.16 (5.63)	1.16 (5.59)	1.03 (4.94)	1.15 (4.95)	1.20 (5.02)	0.99 (3.31)	-0.12 (-0.63)
σ	4.37	4.55	4.55	5.02	5.00	5.26	5.41	5.60	5.72	6.85	4.63
SR_{ann}	0.88 (5.61)	0.83 (5.37)	0.77 (4.96)	0.73 (4.72)	0.80 (5.10)	0.76 (4.92)	0.66 (4.36)	0.71 (4.51)	0.73 (4.68)	0.50 (3.39)	-0.09 (-0.63)

Panel C: Uniform discount rate of 16%

	Early	2	3	4	5	6	7	8	9	Late	Late-Early
r	1.21 (6.47)	1.03 (5.83)	0.95 (4.90)	1.08 (5.40)	1.02 (4.61)	1.15 (5.48)	1.17 (5.26)	1.12 (5.11)	1.12 (4.44)	1.06 (3.66)	-0.15 (-0.81)
σ	4.44	4.41	4.65	4.81	5.16	5.21	5.40	5.74	5.69	6.72	4.37
SR_{ann}	0.94 (5.94)	0.81 (5.27)	0.71 (4.49)	0.78 (5.18)	0.68 (4.32)	0.77 (4.95)	0.75 (4.97)	0.68 (4.41)	0.68 (4.43)	0.55 (3.62)	-0.12 (-0.79)

Panel D: Uniform discount rate of 18%

	Early	2	3	4	5	6	7	8	9	Late	Late-Early
r	1.22 (6.39)	1.00 (5.45)	0.96 (4.97)	1.10 (5.81)	1.05 (4.77)	1.01 (4.88)	1.31 (5.76)	1.16 (5.17)	1.09 (4.29)	1.10 (3.88)	-0.12 (-0.70)
σ	4.49	4.50	4.66	4.68	5.27	5.09	5.41	5.86	5.73	6.61	4.26
SR_{ann}	0.94 (5.91)	0.77 (4.96)	0.71 (4.49)	0.81 (5.24)	0.69 (4.54)	0.69 (4.52)	0.84 (5.41)	0.69 (4.54)	0.66 (4.33)	0.58 (3.91)	-0.10 (-0.69)

Table A.2: Unconditional returns of timing-sorted portfolios without issuances and repurchases.

This table shows the time-series averages of monthly returns (r) for portfolios sorted from early to late cash-flow timing based on the cash-flow timing measure TIM. We take out share repurchases and stock issuances when computing the growth in book equity for TIM. Portfolio returns are calculated from July 1973 until December 2020 and reported in percent per month. We weight individual stock returns with their market capitalization when aggregating them into portfolio returns. Numbers in brackets are Newey and West (1987) t -statistics with 6 lags. Moreover, we report the standard deviations of monthly portfolio returns in percent (σ), and annualized Sharpe ratios (SR_{ann}) alongside t -statistics based on bootstrapped standard errors (10,000 samples with replacement).

	Early	2	3	4	5	6	7	8	9	Late	Late-Early
r	0.95 (5.12)	0.94 (5.03)	0.95 (4.64)	1.24 (6.27)	1.13 (5.15)	0.94 (4.26)	1.30 (5.61)	1.20 (5.52)	1.34 (5.01)	1.05 (3.39)	0.09 (0.43)
σ	4.47	4.48	5.00	4.93	5.32	5.33	5.53	5.36	6.12	7.04	4.81
SR_{ann}	0.74 (4.81)	0.72 (4.63)	0.66 (4.24)	0.87 (5.59)	0.73 (4.71)	0.61 (4.01)	0.81 (5.31)	0.78 (4.88)	0.76 (4.93)	0.51 (3.38)	0.07 (0.47)

Table A.3: Unconditional returns of timing-sorted portfolios based on large cap stocks.

This table shows the time-series averages of monthly returns (r) for portfolios sorted from early to late cash-flow timing based on the cash-flow timing measure TIM. We only consider stocks that have market values above the 20% quantile of market equity based on all NYSE-listed stocks in our sample when we form portfolios. Portfolio returns are calculated from July 1973 until December 2020 and reported in percent per month. We weight individual stock returns with their market capitalization when aggregating them into portfolio returns. Numbers in brackets are Newey and West (1987) t -statistics with 6 lags. Moreover, we report the standard deviations of monthly portfolio returns in percent (σ), and annualized Sharpe ratios (SR_{ann}) alongside t -statistics based on bootstrapped standard errors (10,000 samples with replacement).

	Early	2	3	4	5	6	7	8	9	Late	Late-Early
r	1.06 (5.65)	1.02 (5.92)	1.11 (5.30)	1.03 (5.43)	1.21 (5.92)	1.13 (5.27)	0.95 (4.80)	1.01 (4.40)	1.30 (5.33)	0.93 (3.22)	-0.13 (-0.73)
σ	4.46	4.36	4.91	4.63	5.09	5.33	5.16	5.41	5.68	6.71	4.47
SR_{ann}	0.82 (5.27)	0.81 (5.13)	0.78 (5.06)	0.77 (5.08)	0.82 (5.28)	0.73 (4.76)	0.64 (4.21)	0.65 (4.16)	0.79 (5.12)	0.48 (3.19)	-0.10 (-0.69)

A.3 Conditional returns

In this section, we provide additional robustness tests for the relation between late-minus-early portfolio returns and mean returns conditional on various cyclical proxies.

Table A.4: Predicting late-minus-early portfolio returns with TIM based on large caps.

This table shows the regression coefficients from predictive regressions of h -month holding-period returns on two predictor variables. Returns are from July in year y to h months later (i.e., to the end of June in year $y + 1$ for $h = 12$) and are regressed onto the predictor variable computed at the end of June in year y . In Panel A, the predictor variable is the investment valuation spread (IVS) from June in year y . In Panel B, it is the market dividend price ratio (DP). We study returns on three portfolios: returns of late TIM stocks minus the returns of early TIM stocks (r^{l-e}) in Panels A.1 and B.1. We exclude stocks with market capitalizations below the 25th quantile of market equity of all NYSE stocks. Moreover, we analyze return differentials between the S&P 500 and the earliest timing dividends strips from van Binsbergen et al. (2012) and Golez and Jackwerth (2024) (r^{mkt-e}) in Panels A.2 and B.2. To avoid overlapping portfolio returns as much as possible, we only include yearly observations from July in each year. Holding-period returns are continuously compounded and are in percent per month. The dividend-price ratio is from the value-weighted market return provided by CRSP following Cochrane (2008). IVS is the difference in log book-to-market ratios between low and high investment portfolios with low book-to-market ratios (portfolios 1 and 5) based on the 25 portfolios sorted on investments and book-to-market on Kenneth French's website. t -statistics are based on bootstrapped standard errors that control for the contemporaneous correlation of holding period returns and the predictor and are robust to Stambaugh (1999) bias. Moreover, standard errors control for a potential autocorrelation if the holding period exceeds 1 year. For details, see Internet Appendix IA.3. The sample period ranges from July 1973 to December 2020 for TIM. We use the original samples for van Binsbergen et al. (2012) and Golez and Jackwerth (2024).

Panel A: Predictive regressions on the market dividend-price ratio (DP)

	A.1: Large late-minus-early stock portfolio			A.2: Market-minus-early dividend strips					
	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	van Binsbergen et al. (2012)			Golez and Jackwerth (2024)		
	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}
DP	6.85 (2.03)	6.69 (1.34)	6.36 (0.98)	68.19 (2.48)	104.70 (1.88)	126.13 (1.61)	56.24 (2.28)	88.90 (2.52)	86.83 (1.98)

Panel B: Predictive regressions on the investment valuation spread (IVS)

	B.1: Large late-minus-early stock portfolio			B.2: Market-minus-early dividend strips					
	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	van Binsbergen et al. (2012)			Golez and Jackwerth (2024)		
	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}
IVS	-33.58 (-2.91)	-41.98 (-2.77)	-44.58 (-2.30)	-37.16 (-1.73)	-41.93 (-1.88)	-33.20 (-1.54)	-19.41 (-0.89)	-28.75 (-2.31)	-45.54 (-3.04)

Table A.5: Predicting late-minus-early portfolio log returns.

This table shows the regression coefficients from predictive regressions of h -month holding-period returns in logs on two predictor variables. Log returns are from July in year y to h months later (i.e., to the end of June in year $y+1$ for $h = 12$) and are regressed onto the predictor variable computed at the end of June in year y . In Panel A, the predictor variable is the investment valuation spread (IVS) from June (t). In Panel B, it is the market dividend price ratio (DP). We study log returns on three portfolios: returns of late TIM stocks minus the returns of early TIM stocks (r^{l-e}) in Panels A.1 and B.1. Moreover, we analyze return differentials between the S&P 500 and the earliest timing dividends strips from van Binsbergen et al. (2012) and Golez and Jackwerth (2024) (r^{mkt-e}) in Panels A.2 and B.2. To avoid overlapping portfolio returns as much as possible, we only include yearly observations from July in each year. Holding-period returns are continuously compounded in logs and depicted in percent per month. The dividend-price ratio is from the value-weighted market return provided by CRSP following Cochrane (2008). IVS is the difference in log book-to-market ratios between low and high investment portfolios with low book-to-market ratios (portfolios 1 and 5) based on the 25 portfolios sorted on investments and book-to-market on Kenneth French's website. t -statistics are based on bootstrapped standard errors that control for the contemporaneous correlation of holding period returns and the predictor and are robust to Stambaugh (1999) bias. Moreover, standard errors control for a potential autocorrelation if the holding period exceeds 1 year. The sample period ranges from July 1973 to December 2020 for TIM. We use the original samples for van Binsbergen et al. (2012) and Golez and Jackwerth (2024).

Panel A: Predictive regressions on the market dividend-price ratio (DP)

	A.1: Late-minus-early stock portfolio			A.2: Market-minus-early dividend strips					
				van Binsbergen et al. (2012)			Golez and Jackwerth (2024)		
	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}
DP	6.11 (1.87)	7.52 (1.53)	5.84 (0.87)	99.74 (2.21)	147.85 (1.93)	193.54 (1.76)	64.35 (2.18)	106.75 (2.22)	113.49 (1.73)

Panel B: Predictive regressions on the investment valuation spread (IVS)

	B.1: Late-minus-early stock portfolio			B.2: Market-minus-early dividend strips					
				van Binsbergen et al. (2012)			Golez and Jackwerth (2024)		
	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}
IVS	-39.80 (-2.93)	-50.45 (-3.16)	-52.55 (-2.63)	-73.69 (-1.71)	-83.72 (-2.17)	-80.78 (-1.79)	-23.79 (-0.92)	-34.41 (-1.72)	-56.77 (-2.81)

Table A.6: Late-minus-early portfolio returns conditional on NBER recessions with TIM based on large caps.

This table shows returns on large-cap late/market-minus-early portfolios in recessions. Specifically, we show the returns on portfolios formed in all NBER recession months (Panel A) and in all NBER recession months excluding the first recession quarter (Panel B), which we denote with “NBER-”. Rows marked with Δ show the difference between the late minus early return in “NBER” or “NBER-” months and all other months. We study returns on three portfolios: returns of late TIM stocks minus the returns of early TIM stocks (r^{l-e}) excluding all stocks below the 25th percentile in the size distribution of NYSE stocks in Panels A.1 and B.1. Moreover, we analyze return differentials between the S&P 500 and the earliest timing dividends strips from van Binsbergen et al. (2012) and Golez and Jackwerth (2024) (r^{mkt-e}) in Panels A.2 and B.2. We consider various holding periods indicated by the subscripts next to the returns: 1 month (h1), 12 months (h12), 18 months (h18), and 24 months (h24). Holding-period returns are continuously compounded and are in percent per month. Newey and West (1987) corrected t -statistics are in brackets (the number of lags corresponds to the number of months in the holding period). The sample period ranges from July 1973 to December 2020 for TIM. We use the original samples for van Binsbergen et al. (2012) and Golez and Jackwerth (2024). Lastly, we show the number of observations (Nobs.).

Panel A: NBER recession periods

	A.1: Large late-minus-early stock portfolio				A.2: Market-minus-early dividend strips							
	r_{h1}^{l-e}	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	van Binsbergen et al. (2012)				Golez and Jackwerth (2024)			
	r_{h1}^{l-e}	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	r_{h1}^{mkt-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}	r_{h1}^{mkt-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}
NBER	-1.29 (-2.13)	-5.98 (-1.24)	-10.46 (-2.13)	-12.61 (-1.91)	-3.16 (-3.88)	-29.31 (-5.97)	-39.41 (-5.44)	-52.45 (-31.02)	-2.66 (-2.26)	-15.72 (-2.20)	-16.33 (-1.65)	-12.34 (-0.92)
Δ	-1.33 (-2.40)	-5.23 (-2.74)	-9.83 (-4.38)	-12.58 (-4.76)	-2.86 (-1.70)	-23.46 (-4.14)	-30.19 (-3.68)	-37.99 (-3.20)	-2.69 (-1.40)	-10.48 (-2.82)	-9.03 (-1.94)	-0.17 (-0.03)
Nobs.	570	559	553	547	165	154	148	142	324	313	307	301

Panel B: NBER recession periods excluding the first recession quarter

	B.1: Large late-minus-early stock portfolio				B.2: Market-minus-early dividend strips							
	r_{h1}^{l-e}	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	van Binsbergen et al. (2012)				Golez and Jackwerth (2024)			
	r_{h1}^{l-e}	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	r_{h1}^{mkt-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}	r_{h1}^{mkt-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}
NBER-	-1.53 (-1.85)	-5.30 (-1.20)	-10.86 (-2.52)	-13.32 (-1.88)	-2.11 (-3.52)	-25.86 (-5.87)	-36.03 (-5.09)	-47.70 (-60.10)	-2.69 (-2.36)	-11.85 (-1.50)	-11.40 (-1.15)	-5.63 (-0.43)
Δ	-1.55 (-2.43)	-4.29 (-1.98)	-9.92 (-3.88)	-12.91 (-4.29)	-1.55 (-0.82)	-18.69 (-2.71)	-25.36 (-2.25)	-32.24 (-2.13)	-2.65 (-1.18)	-6.07 (-1.38)	-3.51 (-0.64)	7.03 (1.20)
Nobs.	570	559	553	547	165	154	148	142	324	313	307	301

Table A.7: Late-minus-early portfolio returns in logs conditional on NBER recessions.

This table shows log returns on late/market-minus-early portfolios in recessions. Specifically, we show the returns on portfolios formed in all NBER recession months (Panel A) and in all NBER recession months excluding the first recession quarter (Panel B), which we denote with “NBER-”. Rows marked with Δ show the difference between the late minus early return in “NBER” or “NBER-” months and all other months. We study returns on three portfolios: returns of late TIM stocks minus the returns of early TIM stocks (r^{l-e}) in Panels A.1 and B.1. Moreover, we analyze return differentials between the S&P 500 and the earliest timing dividends strips from van Binsbergen et al. (2012) and Golez and Jackwerth (2024) (r^{mkt-e}) in Panels A.2 and B.2. We consider various holding periods indicated by the subscripts next to the returns: 1 month (h1), 12 months (h12), 18 months (h18), and 24 months (h24). Holding period returns are continuously compounded in logs and in percent per month. Newey and West (1987) corrected t -statistics are in brackets (the number of lags corresponds to the number of months in the holding period). The sample period ranges from July 1973 to December 2020 for TIM. We use the original samples for van Binsbergen et al. (2012) and Golez and Jackwerth (2024). Lastly, we show the number of observations (Nobs.).

Panel A: NBER recession periods

	A.1: Late-minus-early stock portfolio				A.2: Market-minus-early dividend strips							
	r_{h1}^{l-e}	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	van Binsbergen et al. (2012)				Golez and Jackwerth (2024)			
	r_{h1}^{l-e}	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	r_{h1}^{mkt-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}	r_{h1}^{mkt-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}
NBER	-1.37 (-2.15)	-8.73 (-1.81)	-13.77 (-2.60)	-18.45 (-2.47)	-3.44 (-3.72)	-35.74 (-5.03)	-52.64 (-4.44)	-75.71 (-20.94)	-3.29 (-2.72)	-19.06 (-2.27)	-21.46 (-1.66)	-18.89 (-1.09)
Δ	-1.22 (-2.16)	-5.81 (-2.84)	-10.00 (-4.07)	-14.35 (-4.94)	-2.77 (-1.49)	-24.91 (-3.08)	-35.70 (-2.98)	-49.09 (-2.61)	-2.81 (-1.35)	-11.32 (-2.52)	-9.85 (-1.64)	-0.63 (-0.09)
Nobs.	570	559	553	547	165	154	148	142	324	313	307	301

Panel B: NBER recession periods excluding the first recession quarter

	B.1: Late-minus-early stock portfolio				B.2: Market-minus-early dividend strips							
	r_{h1}^{l-e}	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	van Binsbergen et al. (2012)				Golez and Jackwerth (2024)			
	r_{h1}^{l-e}	r_{h12}^{l-e}	r_{h18}^{l-e}	r_{h24}^{l-e}	r_{h1}^{mkt-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}	r_{h1}^{mkt-e}	r_{h12}^{mkt-e}	r_{h18}^{mkt-e}	r_{h24}^{mkt-e}
NBER-	-1.48 (-1.66)	-8.27 (-1.90)	-14.64 (-3.09)	-20.25 (-2.45)	-2.31 (-3.76)	-30.60 (-5.11)	-46.66 (-4.43)	-65.47 (-42.05)	-3.03 (-2.43)	-14.69 (-1.61)	-15.32 (-1.23)	-10.59 (-0.66)
Δ	-1.29 (-1.99)	-5.09 (-2.18)	-10.60 (-3.80)	-15.82 (-4.80)	-1.36 (-0.65)	-18.24 (-1.87)	-27.91 (-1.71)	-37.40 (-1.56)	-2.46 (-1.01)	-6.33 (-1.20)	-3.01 (-0.43)	8.28 (1.02)
Nobs.	570	559	553	547	165	154	148	142	324	313	307	301

Table A.8: Late-minus-early timing returns and Fama and French (2015) factor returns during individual NBER recessions.

This table shows the following 1-month returns conditional on specific NBER recessions (r^{NBER}): Fama and French (2015) factor returns, late-minus-early cash-flow timing returns for TIM implied by the Fama and French (2015) five factor model (TIM^{FF5}), late-minus-early returns based on the cash-flow timing measure TIM, and late-minus-early returns based on the cash-flow timing measure that excludes stocks with smaller market capitalizations than the 25th quantile of market equity of all NYSE stocks ($\text{TIM}^{\text{Large}}$). Moreover, we show for each recession the difference in returns during the recession months compared to all other non-recession months (Δ). Returns are in percent per month, and Newey and West (1987) corrected t -statistics with 6 lags are in brackets. We reduce the lags to the highest possible number of lags in case there are too few observations for 6 lags. The sample period is from July 1973 to December 2020.

Recession	Statistic	MKT	SMB	HML	RMW	CMA	TIM^{FF5}	TIM	$\text{TIM}^{\text{Large}}$
12/1973 - 03/1975	r^{NBER}	-0.92 (-0.44)	0.75 (0.95)	1.35 (2.14)	-0.45 (-0.76)	1.67 (2.64)	-0.89 (-0.70)	-1.39 (-1.21)	-1.57 (-1.50)
	Δ	-1.74 (-1.60)	0.53 (0.70)	1.10 (1.52)	-0.69 (-1.18)	1.42 (2.96)	-0.97 (-1.28)	-1.32 (-1.20)	-1.61 (-1.49)
02/1980 - 07/1980	r^{NBER}	0.78 (0.30)	-0.02 (-0.01)	-1.02 (-1.02)	0.61 (1.06)	-0.36 (-0.53)	0.17 (0.11)	0.86 (0.63)	0.78 (0.59)
	Δ	-0.04 (-0.02)	-0.23 (-0.20)	-1.27 (-1.11)	0.37 (0.40)	-0.61 (-0.80)	0.09 (0.08)	0.93 (0.53)	0.73 (0.43)
08/1981 - 11/1982	r^{NBER}	0.05 (0.03)	0.24 (0.55)	1.12 (1.44)	0.00 (0.00)	1.09 (2.91)	-0.57 (-0.69)	-0.87 (-0.68)	-1.11 (-0.79)
	Δ	-0.76 (-0.72)	0.02 (0.03)	0.87 (1.22)	-0.24 (-0.42)	0.84 (1.78)	-0.65 (-0.88)	-0.81 (-0.74)	-1.15 (-1.07)
08/1990 - 03/1991	r^{NBER}	0.64 (0.25)	-0.03 (-0.02)	-0.74 (-1.53)	0.84 (2.99)	-0.70 (-0.74)	0.25 (0.12)	0.53 (0.30)	0.39 (0.32)
	Δ	-0.17 (-0.12)	-0.25 (-0.24)	-0.98 (-1.00)	0.60 (0.74)	-0.95 (-1.42)	0.17 (0.16)	0.59 (0.39)	0.35 (0.24)
04/2001 - 11/2001	r^{NBER}	-0.14 (-0.10)	1.05 (1.73)	0.13 (0.19)	0.98 (0.98)	0.48 (0.63)	-0.44 (-0.31)	-1.45 (-0.90)	-1.43 (-0.91)
	Δ	-0.96 (-0.64)	0.83 (0.80)	-0.11 (-0.11)	0.73 (0.89)	0.23 (0.34)	-0.52 (-0.49)	-1.38 (-0.91)	-1.47 (-0.98)
01/2008 - 06/2009	r^{NBER}	-2.09 (-1.10)	0.56 (1.28)	-0.52 (-0.64)	1.10 (2.08)	-0.07 (-0.16)	-0.98 (-0.83)	-2.60 (-2.02)	-2.52 (-1.98)
	Δ	-2.91 (-2.83)	0.35 (0.50)	-0.77 (-1.12)	0.86 (1.58)	-0.32 (-0.71)	-1.05 (-1.47)	-2.53 (-2.43)	-2.57 (-2.49)
03/2020 - 04/2020	r^{NBER}	0.13 (0.01)	-2.87 (-0.53)	-7.60 (-1.18)	0.58 (0.27)	0.13 (0.11)	-1.51 (-0.24)	-1.44 (-0.17)	-1.64 (-0.17)
	Δ	-0.68 (-0.23)	-3.09 (-1.49)	-7.85 (-3.94)	0.34 (0.21)	-0.12 (-0.09)	-1.59 (-0.76)	-1.37 (-0.45)	-1.69 (-0.57)

Table A.9: Late-minus-early timing holding period returns and Fama and French (2015) factor 12 month holding period returns during individual NBER recessions.

This table shows the following 12-month returns initiated during specific NBER recessions months (r^{NBER}): Fama and French (2015) factor returns, late-minus-early cash-flow timing returns for TIM implied by the Fama and French (2015) five factor model (TIM^{FF5}), late-minus-early returns based on the cash-flow timing measure TIM, and late-minus-early returns based on the cash-flow timing measure that excludes stocks with smaller market capitalizations than the 25th quantile of market equity of all NYSE stocks ($\text{TIM}^{\text{Large}}$). Moreover, we show for each recession the difference in holding-period returns during the recession months compared to all other non-recession months (Δ). Holding-period returns are continuously compounded, in percent per month, and Newey and West (1987) corrected t -statistics with 6 lags are in brackets. We reduce the lags to the highest possible number of lags in case there are too few observations for 6 lags. The sample period is from July 1973 to December 2020.

Recession	Statistic	MKT	SMB	HML	RMW	CMA	TIM^{FF5}	TIM	$\text{TIM}^{\text{Large}}$
12/1973 - 03/1975	r^{NBER}	5.14 (0.46)	6.10 (3.16)	10.15 (7.26)	-3.63 (-1.71)	10.36 (8.09)	-0.99 (-0.23)	-11.57 (-4.34)	-10.38 (-3.05)
	Δ	-3.14 (-0.82)	5.73 (2.25)	7.16 (2.18)	-6.28 (-2.84)	8.83 (5.18)	-1.72 (-0.71)	-9.83 (-2.70)	-9.62 (-2.66)
02/1980 - 07/1980	r^{NBER}	16.58 (7.42)	19.15 (4.21)	-11.47 (-20.21)	9.78 (14.54)	-11.92 (-8.31)	14.88 (5.77)	29.95 (12.89)	27.57 (12.24)
	Δ	8.30 (1.37)	18.78 (4.50)	-14.46 (-2.70)	7.13 (1.99)	-13.45 (-4.84)	14.16 (3.61)	31.69 (5.35)	28.32 (4.82)
08/1981 - 11/1982	r^{NBER}	21.41 (2.12)	17.11 (3.57)	5.45 (1.49)	0.94 (1.23)	10.90 (7.53)	5.53 (0.93)	-11.34 (-1.69)	-9.66 (-1.02)
	Δ	13.13 (3.42)	16.75 (6.48)	2.46 (0.75)	-1.71 (-0.78)	9.36 (5.50)	4.80 (1.95)	-9.60 (-2.61)	-8.91 (-2.40)
08/1990 - 03/1991	r^{NBER}	20.97 (12.35)	13.64 (4.12)	-5.53 (-4.47)	8.08 (8.94)	-12.95 (-13.79)	16.09 (7.34)	10.39 (6.12)	11.48 (13.29)
	Δ	12.69 (2.42)	13.28 (3.68)	-8.52 (-1.84)	5.43 (1.75)	-14.49 (-6.02)	15.37 (4.53)	12.12 (2.37)	12.23 (2.40)
04/2001 - 11/2001	r^{NBER}	-15.36 (-6.24)	12.08 (8.62)	15.41 (13.49)	16.96 (22.79)	12.16 (11.02)	-16.20 (-8.10)	-15.91 (-10.09)	-15.20 (-12.82)
	Δ	-23.64 (-4.51)	11.72 (3.26)	12.42 (2.68)	14.31 (4.62)	10.63 (4.42)	-16.93 (-5.00)	-14.18 (-2.77)	-14.45 (-2.84)
01/2008 - 06/2009	r^{NBER}	-1.16 (-0.07)	3.16 (1.82)	-2.72 (-0.78)	2.14 (3.21)	0.74 (1.60)	-0.86 (-0.13)	-13.80 (-1.72)	-13.64 (-1.64)
	Δ	-9.44 (-2.48)	2.79 (1.16)	-5.71 (-1.83)	-0.51 (-0.25)	-0.79 (-0.49)	-1.59 (-0.68)	-12.06 (-3.44)	-12.89 (-3.69)

A.4 Equity duration/timing measures based on Dechow et al. (2004)

This section provides cash-flows, returns, and alphas for the Dechow et al. (2004) equity duration (DUR^{DSS}) and for TIM^{DSS} -timing (based on the Dechow et al. (2004) equity duration with forecast implied prices).

Table A.10: Cash-flow growth rates after formation for timing/duration-sorted portfolios based on versions of the Dechow et al. (2004) measure.

This table shows the time-series averages of realized cash-flow growth rates after portfolio formation for portfolios sorted from early to late cash-flow timing in Panel A, and for portfolios sorted from low to high equity duration in Panel B. TIM^{DSS} is the cash-flow timing measure based on Dechow et al. (2004) with forecast implied market prices, and DUR^{DSS} is the Dechow et al. (2004) equity duration. Realized cash-flow growth rates correspond to the average dividend and repurchase growth (DRG), the average EBITDA growth (EBITDAG), and the average net cash-flow to equity growth (CG) in the five years ($t, t+5$), and in the ten years ($t, t+10$) after portfolio formation. All growth rates are annualized and in percent per year. We document the details to construct each growth rate in the Internet Appendix IA.2. Newey and West (1987) corrected t -statistics with 6 lags are in brackets, and the sample period is from July 1963 to December 2020.

Panel A: TIM^{DSS} cash-flow timing excluding discount rate information

	Early	2	3	4	5	6	7	8	9	Late	Late-Early
DRG _{t,t+5}	10.7 (12.3)	12.1 (13.0)	11.3 (14.0)	12.0 (15.3)	12.9 (16.4)	12.5 (14.8)	13.0 (13.8)	12.4 (12.5)	13.6 (13.0)	15.9 (14.8)	5.21 (5.56)
DRG _{t,t+10}	9.47 (19.2)	10.4 (23.1)	10.2 (26.3)	10.2 (23.7)	10.3 (26.9)	10.4 (27.9)	10.1 (21.5)	10.4 (25.3)	10.6 (23.1)	13.1 (22.4)	3.60 (5.54)
EBITDAG _{t,t+5}	7.53 (23.0)	7.58 (23.4)	7.38 (23.2)	6.96 (22.0)	7.69 (24.5)	7.87 (22.8)	8.45 (24.2)	10.0 (25.5)	12.7 (31.1)	17.6 (39.6)	10.1 (29.8)
EBITDAG _{t,t+10}	7.23 (25.8)	7.49 (31.7)	7.16 (31.6)	7.22 (34.6)	7.57 (39.0)	7.54 (36.8)	7.91 (34.8)	8.73 (35.9)	10.5 (39.1)	13.2 (41.5)	5.99 (20.6)
CG _{t,t+5}	9.77 (13.6)	11.1 (14.3)	10.4 (14.3)	11.2 (16.8)	11.5 (17.6)	11.1 (15.7)	10.2 (13.8)	9.44 (11.4)	10.8 (12.2)	13.1 (14.1)	3.32 (4.22)
CG _{t,t+10}	9.07 (21.4)	10.0 (27.1)	9.70 (28.8)	9.51 (27.6)	9.54 (27.2)	9.32 (24.3)	8.38 (20.6)	8.73 (25.8)	9.17 (18.3)	11.3 (22.5)	2.27 (4.24)

Panel B: DUR^{DSS} equity duration including discount rate information

	Low	2	3	4	5	6	7	8	9	High	High-Low
DRG _{t,t+5}	10.1 (11.7)	9.50 (11.1)	10.8 (12.8)	11.3 (13.9)	10.5 (15.2)	11.7 (14.1)	13.9 (15.6)	14.8 (17.7)	17.1 (18.9)	16.6 (15.2)	6.53 (10.7)
DRG _{t,t+10}	8.70 (17.5)	8.19 (20.5)	8.79 (24.3)	9.10 (24.1)	9.53 (30.0)	10.1 (29.4)	10.9 (27.3)	12.1 (28.5)	14.0 (36.3)	13.6 (22.9)	4.92 (12.7)
EBITDAG _{t,t+5}	5.28 (12.6)	5.69 (14.6)	6.97 (19.7)	7.52 (20.2)	8.33 (24.5)	8.86 (25.3)	9.99 (30.9)	11.5 (33.3)	14.3 (34.3)	17.9 (39.5)	12.6 (28.4)
EBITDAG _{t,t+10}	5.91	6.35	6.83	7.15	7.69	7.96	8.73	9.82	11.5	13.3	7.37

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Table A.10 (continued): Cash-flow growth rates after formation for timing/duration-sorted portfolios based on versions of the Dechow et al. (2004) measure.

	(19.8)	(26.9)	(32.0)	(29.7)	(34.2)	(37.8)	(42.8)	(43.8)	(40.0)	(41.0)	(22.7)
CG _{t,t+5}	8.38	8.47	9.24	9.70	9.32	10.6	12.0	12.9	14.6	14.8	6.46
	(11.3)	(12.0)	(14.5)	(13.2)	(15.3)	(15.6)	(16.4)	(19.7)	(19.9)	(15.4)	(11.2)
CG _{t,t+10}	7.80	7.60	7.93	8.53	8.65	9.37	9.94	11.0	12.3	12.2	4.44
	(19.5)	(19.9)	(24.3)	(26.3)	(28.8)	(30.1)	(31.3)	(29.6)	(34.1)	(25.2)	(11.2)

Table A.11: Unconditional returns of timing/duration-sorted portfolios based on versions of the Dechow et al. (2004) measure.

This table shows the time-series averages of monthly returns (r) for portfolios sorted from early to late cash-flow timing in Panel A, and for portfolios sorted from low to high equity duration in Panel B. TIM^{DSS} is the cash-flow timing measure based on Dechow et al. (2004) with forecast implied market prices, and DUR^{DSS} is the Dechow et al. (2004) equity duration measure. Portfolio returns are calculated from July 1963 until December 2020 and reported in percent per month. We weight individual stock returns with their market capitalization when aggregating them into portfolio returns. Numbers in brackets are Newey and West (1987) t -statistics with 6 lags. Moreover, we report the standard deviations of monthly portfolio returns in percent (σ) and annualized Sharpe ratios (SR_{ann}) alongside t -statistics based on bootstrapped standard errors (10,000 samples with replacement). Additionally, we report mean pricing errors (α^{FF5}) relative to the Fama and French (2015) five-factor model.

Panel A: TIM^{DSS} cash-flow timing excluding discount rate information

	Early	2	3	4	5	6	7	8	9	Late	Late-Early
r	0.98	1.05	0.97	0.96	1.01	1.03	0.96	0.97	1.01	1.08	0.10
	(5.35)	(6.09)	(5.53)	(5.08)	(5.78)	(5.79)	(5.31)	(4.81)	(4.52)	(3.83)	(0.53)
α^{FF5}	0.42	0.49	0.41	0.40	0.41	0.39	0.25	0.38	0.34	0.36	-0.06
	(6.60)	(8.02)	(5.61)	(6.21)	(5.10)	(4.67)	(3.24)	(4.34)	(3.74)	(3.36)	(-0.45)
σ	4.68	4.39	4.71	4.79	4.75	4.95	4.77	5.04	5.82	6.75	4.25
SR _{ann}	0.73	0.83	0.71	0.70	0.74	0.72	0.70	0.67	0.60	0.56	0.08
	(5.24)	(5.86)	(5.10)	(4.93)	(5.25)	(5.21)	(4.88)	(4.84)	(4.29)	(4.09)	(0.60)

Panel B: DUR^{DSS} equity duration including discount rate information

	Low	2	3	4	5	6	7	8	9	High	High-Low
r	1.22	1.16	1.20	1.16	0.97	0.98	1.03	1.03	1.04	0.79	-0.43
	(5.86)	(6.00)	(6.34)	(6.52)	(5.68)	(5.45)	(6.22)	(5.85)	(5.17)	(2.91)	(-2.11)
α^{FF5}	0.40	0.38	0.42	0.44	0.30	0.24	0.37	0.42	0.50	0.31	-0.08
	(4.28)	(4.13)	(5.14)	(5.07)	(3.71)	(3.51)	(4.72)	(7.47)	(7.10)	(2.55)	(-0.54)
σ	5.51	5.12	4.87	4.72	4.57	4.59	4.54	4.64	5.14	6.51	4.81
SR _{ann}	0.77	0.78	0.85	0.85	0.73	0.74	0.78	0.77	0.70	0.42	-0.31
	(5.36)	(5.43)	(5.96)	(6.07)	(5.23)	(5.25)	(5.53)	(5.55)	(5.13)	(3.08)	(-2.33)

A.5 Equity duration measures based on Gonçalves (2021)

This section provides realized cash-flows, returns, and alphas for the Gonçalves (2021) equity duration measure (DUR^G), the Gonçalves (2021) equity duration measure with a uniform discount rate (DUR^{G-U}), and a version of the Gonçalves (2021) equity duration measure with a uniform discount rate of 12% and with firm fixed effects in the VAR (DUR^{G-U*}).

Table A.12: Cash-flow growth rates after formation for duration-sorted portfolios based on versions of the Gonçalves (2021) equity duration measure.

This table shows the time-series averages of realized cash-flow growth rates after portfolio formation for portfolios sorted from low to high equity duration. DUR^G is the Gonçalves (2021) equity duration measure, and DUR^{G-U} is the Gonçalves (2021) equity duration measure with a uniform discount rate of 12%. DUR^{G-U*} is the Gonçalves (2021) equity duration measure with a uniform discount rate of 12% and with firm fixed effects in the VAR. Realized cash-flow growth rates correspond to the average dividend and repurchase growth (DRG), the average EBITDA growth (EBITDAG), and the average net cash-flow to equity growth (CG) in the five years ($t, t+5$), and in the ten years ($t, t+10$) after portfolio formation. All growth rates are annualized and in percent per year. We document the details to construct each growth rate in the Internet Appendix IA.2. Newey and West (1987) corrected t -statistics with 6 lags are in brackets, and the sample period is from July 1973 to December 2020.

Panel A: DUR^G equity duration including discount rate information

	Low	2	3	4	5	6	7	8	9	High	High-Low
DRG _{t,t+5}	8.26 (9.74)	10.1 (11.5)	11.2 (12.6)	11.9 (13.3)	12.2 (14.4)	12.7 (15.1)	13.6 (14.1)	13.2 (13.9)	16.6 (17.7)	18.6 (20.3)	10.3 (18.5)
DRG _{t,t+10}	7.69 (18.7)	8.24 (21.7)	9.36 (22.5)	9.68 (24.0)	10.1 (27.0)	10.4 (32.2)	11.1 (28.9)	11.6 (24.7)	13.0 (28.0)	14.2 (29.9)	6.53 (18.1)
EBITDAG _{t,t+5}	6.62 (16.6)	6.83 (17.2)	7.33 (19.2)	7.28 (18.7)	8.40 (22.0)	8.57 (23.3)	9.10 (23.7)	10.3 (26.6)	11.7 (26.8)	15.1 (35.0)	8.50 (28.6)
EBITDAG _{t,t+10}	6.64 (28.1)	6.44 (30.7)	6.85 (33.9)	6.75 (31.7)	7.20 (37.8)	7.63 (44.1)	7.69 (36.0)	8.48 (38.1)	9.16 (30.1)	11.1 (38.1)	4.46 (21.7)
CG _{t,t+5}	7.37 (9.07)	9.57 (12.1)	10.0 (12.8)	11.0 (12.5)	11.3 (14.3)	11.7 (15.7)	13.3 (14.2)	12.4 (13.7)	15.9 (18.1)	17.0 (18.8)	9.65 (19.0)
CG _{t,t+10}	7.04 (17.4)	7.82 (20.8)	8.73 (22.0)	9.39 (21.9)	9.51 (26.7)	10.3 (30.4)	10.7 (27.7)	11.0 (24.3)	12.2 (26.4)	12.9 (24.4)	5.89 (13.6)

Panel B: DUR^{G-U} equity duration including discount rate information

	Low	2	3	4	5	6	7	8	9	High	High-Low
DRG _{t,t+5}	6.42 (8.27)	9.64 (11.7)	10.6 (12.2)	11.6 (12.8)	12.2 (15.0)	13.3 (14.8)	14.4 (15.0)	16.5 (17.3)	17.4 (18.0)	19.8 (19.6)	13.4 (21.7)
DRG _{t,t+10}	6.35 (16.1)	8.19 (20.2)	9.34 (28.2)	9.00 (21.1)	10.6 (28.1)	11.3 (29.3)	11.8 (31.4)	12.7 (27.3)	14.1 (28.4)	14.6 (26.1)	8.28 (21.3)
EBITDAG _{t,t+5}	6.72	6.72	7.20	7.51	7.85	8.78	9.36	10.3	11.8	14.1	7.41

Continued on the next page

Table A.12 (continued): Cash-flow growth rates after formation for duration-sorted portfolios based on versions of the Gonçalves (2021) equity duration measure.

	(15.5)	(17.9)	(20.2)	(20.1)	(22.0)	(23.7)	(24.8)	(27.6)	(26.6)	(31.2)	(24.2)
EBITDAG _{t,t+10}	6.61	6.43	6.71	6.80	7.28	7.74	7.90	8.62	9.36	10.4	3.75
	(29.1)	(28.5)	(33.2)	(35.9)	(35.4)	(45.0)	(37.8)	(36.5)	(29.6)	(37.9)	(18.5)
CG _{t,t+5}	5.77	9.42	9.88	11.2	11.2	12.4	14.1	15.8	16.8	18.8	13.0
	(7.80)	(11.7)	(12.3)	(11.6)	(14.5)	(14.8)	(15.7)	(18.2)	(19.2)	(19.0)	(18.9)
CG _{t,t+10}	5.83	7.59	9.14	8.73	10.1	11.2	11.6	12.2	12.6	14.1	8.28
	(15.1)	(18.8)	(27.9)	(18.6)	(27.3)	(31.9)	(31.8)	(27.0)	(22.7)	(25.2)	(22.0)

Panel C: DUR^{G-U*} equity duration including discount rate information

	Low	2	3	4	5	6	7	8	9	High	High-Low
DRG _{t,t+5}	7.03	9.37	10.7	11.5	11.9	14.3	13.8	15.9	18.6	21.1	14.1
	(8.30)	(12.7)	(12.0)	(12.7)	(14.1)	(15.1)	(15.1)	(17.0)	(19.1)	(18.6)	(19.9)
DRG _{t,t+10}	6.70	8.22	9.00	9.61	10.0	11.3	11.2	12.9	13.8	16.6	9.93
	(15.7)	(23.0)	(23.6)	(23.4)	(26.9)	(29.8)	(28.8)	(32.3)	(30.1)	(29.6)	(22.0)
EBITDAG _{t,t+5}	6.73	6.85	7.05	7.52	8.00	8.76	9.52	10.3	11.6	14.8	8.08
	(16.1)	(18.3)	(19.5)	(19.0)	(20.7)	(22.8)	(25.0)	(26.5)	(32.0)	(30.9)	(26.1)
EBITDAG _{t,t+10}	6.65	6.58	6.78	6.93	7.00	7.47	7.94	8.44	9.31	10.8	4.20
	(28.1)	(33.3)	(32.7)	(39.6)	(35.8)	(34.0)	(35.3)	(38.4)	(39.5)	(31.3)	(18.0)
CG _{t,t+5}	6.27	8.94	10.1	10.7	10.6	14.0	13.3	15.3	17.7	19.0	12.8
	(8.33)	(11.9)	(12.6)	(12.2)	(12.2)	(15.1)	(15.8)	(17.1)	(20.9)	(16.9)	(17.4)
CG _{t,t+10}	5.99	7.70	8.37	9.51	9.79	11.2	11.3	12.4	13.1	14.8	8.85
	(14.9)	(21.4)	(24.4)	(23.9)	(27.7)	(31.0)	(28.5)	(31.6)	(20.6)	(23.5)	(19.7)

Table A.13: Unconditional returns of equity duration-sorted portfolios based on versions of the Gonçalves (2021) equity duration measure.

This table shows the time-series averages of monthly returns (r) for portfolios sorted from low to high equity duration. DUR^G is the Gonçalves (2021) equity duration measure, and DUR^{G-U} is the Gonçalves (2021) equity duration measure with a uniform discount rate of 12%. DUR^{G-U*} is the Gonçalves (2021) equity duration measure with a uniform discount rate of 12% and with firm fixed effects in the VAR. Portfolio returns are calculated from July 1973 until December 2020 and reported in percent per month. We weight individual stock returns with their market capitalization when aggregating them into portfolio returns. Numbers in brackets are Newey and West (1987) t -statistics with 6 lags. Moreover, we report the standard deviations of monthly portfolio returns in percent (σ) and annualized Sharpe ratios (SR_{ann}) alongside t -statistics based on bootstrapped standard errors (10,000 samples with replacement). Additionally, we report mean pricing errors (α^{FF5}) relative to the Fama and French (2015) five-factor model.

Panel A: DUR^G equity duration including discount rate information

	Low	2	3	4	5	6	7	8	9	High	High-Low
r	1.44 (6.36)	1.28 (6.50)	1.32 (6.62)	1.30 (6.08)	1.26 (6.09)	1.16 (6.28)	1.15 (6.03)	1.14 (6.17)	1.03 (5.00)	0.73 (2.91)	-0.71 (-3.45)
α^{FF5}	0.51 (4.42)	0.47 (5.00)	0.49 (4.84)	0.44 (5.50)	0.44 (5.11)	0.45 (4.68)	0.41 (5.55)	0.43 (5.18)	0.32 (4.38)	0.11 (1.42)	-0.40 (-2.98)
σ	5.67	4.88	5.04	5.10	5.05	4.83	4.78	4.67	4.93	5.66	4.32
SR_{ann}	0.88 (5.59)	0.91 (5.85)	0.90 (5.80)	0.88 (5.64)	0.86 (5.34)	0.83 (5.26)	0.83 (5.27)	0.84 (5.32)	0.72 (4.74)	0.45 (3.03)	-0.57 (-4.01)

Panel B: DUR^{G-U} equity duration including discount rate information

	Low	2	3	4	5	6	7	8	9	High	High-Low
r	1.40 (7.18)	1.20 (5.98)	1.30 (7.09)	1.16 (6.16)	1.17 (6.59)	1.14 (6.03)	1.09 (5.60)	1.02 (5.18)	0.91 (3.59)	0.94 (3.41)	-0.46 (-2.37)
α^{FF5}	0.59 (5.80)	0.39 (4.02)	0.46 (5.72)	0.42 (4.85)	0.44 (4.96)	0.39 (5.34)	0.29 (3.93)	0.29 (3.89)	0.18 (2.08)	0.28 (2.69)	-0.31 (-2.30)
σ	4.99	4.79	4.64	4.67	4.70	4.57	4.79	4.94	5.74	6.37	4.26
SR_{ann}	0.97 (6.24)	0.87 (5.46)	0.97 (6.04)	0.86 (5.41)	0.86 (5.46)	0.86 (5.41)	0.79 (5.10)	0.72 (4.71)	0.55 (3.68)	0.51 (3.35)	-0.37 (-2.58)

Panel C: DUR^{G-U*} equity duration including discount rate information

	Low	2	3	4	5	6	7	8	9	High	High-Low
r	1.22 (6.15)	1.19 (6.25)	1.19 (5.95)	1.22 (6.56)	1.17 (6.34)	0.93 (4.42)	1.01 (4.90)	1.00 (4.82)	0.97 (3.99)	1.00 (3.38)	-0.22 (-1.29)
α^{FF5}	0.52 (5.05)	0.53 (5.91)	0.48 (4.85)	0.55 (5.54)	0.41 (4.67)	0.27 (4.22)	0.31 (4.16)	0.22 (2.76)	0.27 (2.78)	0.18 (1.67)	-0.34 (-2.35)
σ	4.96	4.79	4.81	4.97	4.69	4.90	4.87	5.28	5.64	6.40	3.74
SR_{ann}	0.86 (5.66)	0.86 (5.41)	0.86 (5.37)	0.85 (5.39)	0.86 (5.52)	0.65 (4.27)	0.72 (4.81)	0.66 (4.39)	0.59 (3.94)	0.54 (3.55)	-0.21 (-1.49)

A.6 Correlations

Table A.14: Correlations between duration/timing measures.

Panel A shows the time-series averages of rank correlations between timing measures, duration measures, and the book-to-market ratio (BM). Panel B shows return correlations between late-minus-early timing portfolios, high-minus-low equity duration portfolios, and high-minus-low book-to-market portfolios. TIM is the cash-flow timing measure based on Gonçalves (2021) with a uniform discount rate and no market-based state variables in the VAR. TIM^{DSS} is the cash-flow timing measure based on Dechow et al. (2004) with forecast implied market prices, DUR^{DSS} the Dechow et al. (2004) equity duration measure, and DUR^G the Gonçalves (2021) equity duration measure. For TIM^{DSS} and DUR^{DSS} , the sample period ranges from July 1963 to December 2020, and for TIM and DUR^G from July 1973 to December 2020.

	TIM	TIM^{DSS}	DUR^G	DUR^{DSS}	BM
Panel A: Rank correlations					
TIM	1.00				
TIM^{DSS}	0.19	1.00			
DUR^G	0.44	-0.09	1.00		
DUR^{DSS}	0.19	0.32	0.52	1.00	
BM	-0.02	0.48	-0.62	-0.48	1.00
Panel B: Return Correlations					
TIM	1.00				
TIM^{DSS}	0.41	1.00			
DUR^G	0.27	-0.27	1.00		
DUR^{DSS}	0.44	0.14	0.52	1.00	
BM	0.01	0.50	-0.68	-0.45	1.00

Internet Appendix for

“Cross-sectional evidence on the equity term structure”

IA.1 Construction of cash-flow timing and equity duration measures

In this section, we provide additional details on the construction of all empirical cash-flow timing and equity duration measures. We start with our cash-flow timing measure, TIM. Moreover, we follow Dechow et al. (2004) / Weber (2018) and Gonçalves (2021) to construct the original measures DUR^{DSS} and DUR^G . Lastly, we follow Chen and Li (2018) and Chen (2011) to construct DUR^{CL} and DUR^{CH} .

IA.1.1 Details for the cash-flow timing measure TIM

For each stock j we select 8 out of 12 state variables from Gonçalves (2021) for the vector $s_{j,t}$ that do not directly use market price information:

Growth measures

$$\text{Equity growth: } EG_{j,t} = \log\left(\frac{BE_{j,t}}{BE_{j,t-1}}\right)$$

$$\text{Asset growth: } AG_{j,t} = \log\left(\frac{AT_{j,t}}{AT_{j,t-1}}\right)$$

$$\text{Sales growth: } SG_{j,t} = \log\left(\frac{SALE_{j,t}}{SALE_{j,t-1}}\right)$$

Profitability measures

$$\text{Clean surplus profitability: } CPROF_{j,t} = \log\left(1 + \frac{PO_{j,t} + \Delta BE_{j,t}}{BE_{j,t-1}}\right)$$

$$\text{Return on equity: } ROE_{j,t} = \log\left(1 + \frac{E_{j,t}}{\frac{1}{2}BE_{j,t} + \frac{1}{2}BE_{j,t-1}}\right)$$

$$\text{Gross profitability: } GPA_{j,t} = \log\left(1 + \frac{G_{j,t}}{\frac{1}{2}AT_{j,t} + \frac{1}{2}AT_{j,t-1}}\right)$$

Capital structure measures

$$\text{Book leverage: } BLEV_{j,t} = \frac{BD_{j,t}}{AT_{j,t}}$$

$$\text{Cash holdings: } CASH_{j,t} = \frac{CHE_{j,t}}{AT_{j,t}}.$$

BE is book equity defined as in Davis et al. (2000) and we provide details in Appendix IA.2. We follow Boudoukh et al. (2007) to construct net payouts (PO), as described in Internet Appendix IA.2. SALE and AT correspond to the Compustat items sales and total assets, respectively. BD represents total book debt, defined as the sum of items DLTT and DLC, while CHE represents cash holdings (item CHE). E corresponds to income before extraordinary items (item IB) and G measures gross profits

(SALE - COGS) as described in Novy-Marx (2013). We follow Gonçalves (2021) and deflate all raw level quantities by the Consumer Price Index (CPI).^{IA.1}

Thereafter, we estimate Γ and the covariance matrix of firm-demeaned residuals (Σ) from the VAR $s_t = \Gamma s_{t-1} + \epsilon_t$ where $Var(\epsilon) = \Sigma$ by pooling all observations with an expanding window. Specifically, we estimate the Γ matrix line by line with Fama and MacBeth (1973) cross-sectional regressions that weight each cross-section with the corresponding number of firms in that cross-section. As in Gonçalves (2021), we exclude the 20% smallest stocks based on NYSE breakpoints when estimating the VAR. Moreover, we follow Gonçalves (2021) and obtain the intercepts in Γ such that the long-run expectations of the state variables in the vector s_t equal the product of Γ and the vector of time-series averages of cross-sectional medians for each state variable. Estimates for Γ , Σ , and the steady state growth rates over the full sample period can be found in Table IA.1. After calculating the VAR-implied parameters v_1 and v_2 from Gonçalves (2021), we forecast future cash-flows to shareholders C for a forecasting horizons h from 1 to 1000 years. We compute these cash-flow forecasts for each stock j .^{IA.2}

$$\frac{\mathbb{E}_t[C_{j,t+h}]}{BE_{j,t}} = \left(e^{(\mathbf{1}_{CPROF} - \mathbf{1}_{EG})' \Gamma^h \cdot s_{j,t} + v_1(h)} - 1 \right) \cdot e^{\mathbf{1}_{EG}' \left(\sum_{\tau=1}^h \Gamma^\tau \right) \cdot s_{j,t} + h \cdot v_2(h)} . \quad (\text{IA.1})$$

In this step, accounting data is from fiscal years ending in $t - 1$. Moreover, note that $\mathbf{1}_x$ is defined as a selector vector such that $\mathbf{1}_x s_t = x_t$. Moreover, v_1 and v_2 are parameters that do not vary in the cross-section, because they only depend on Γ , Σ , and the forecasting time step h .

Then, we estimate the cash-flow timing measure TIM for each stock j and each fiscal year t with the forecast cash-flows from Equation (IA.1):^{IA.3}

$$TIM_{j,t} = \left(\frac{BE_{j,t}}{P_{j,t}^{FI}} \right) \sum_{h=1}^{\infty} h \left(e^{(\mathbf{1}_{CPROF} - \mathbf{1}_{EG})' \Gamma^h \cdot s_{j,t} + v_1(h)} - 1 \right) e^{\mathbf{1}_{EG}' \left(\sum_{\tau=1}^h \Gamma^\tau \right) \cdot s_{j,t} + h \cdot v_2(h) - h \cdot r} . \quad (\text{IA.2})$$

^{IA.1}We follow Gonçalves (2021) and impose the following selection criteria: Any negative item AT , BE , $SALE$, CHE , BD and DVC is set to missing. Moreover, we set to missing values of BE , CHE , and BD that are larger than AT . Similar to Vuolteenaho (2002) any BE value higher than $(50 \cdot ME)$ or smaller than $(\frac{1}{50} \cdot ME)$ is set to missing. Profitability ratios are trimmed at -99%. Lastly, we winsorize all non-bounded state variables at the 1% and 99 % quantiles of their distributions in every fiscal year.

^{IA.2}Note that we follow Gonçalves (2021) and shrink the intercepts in Γ to the long-run medians when we calculate v_1 and v_2 . This speeds up the convergence of the variance and covariance terms needed for v_1 and v_2 . Details on the adjustment can be found in the Appendix of Gonçalves (2021).

^{IA.3}Note that we apply a finite forecast horizon of 1000 years and apply the same approximation for the infinite forecasting horizon as in Gonçalves (2021) with the exception that we do not use discount rate information for the approximation.

In contrast to DUR^G , we use a uniform discount rate (r) of 12%, no market based state variables (excluding book-to-market, payout yield, sales yield and market leverage), and a forecast-implied price ($P_{j,t}^{FI}$) for all stocks.^{IA.4}

$$P_{j,t}^{FI} = \sum_{h=1}^{1000} C_{j,t+h} \cdot e^{-h \cdot r} + C_{j,t+1000} \cdot e^{-1000 \cdot r} \cdot \frac{e^{\overline{EG} + \overline{v}_2 - r}}{1 - e^{\overline{EG} + \overline{v}_2 - r}}, \quad (\text{IA.3})$$

where $\overline{EG}$ is the growth rate of book equity in the steady state from the VAR and $\overline{v}_2$ is the limit of $v_2(h)$ as the forecasting horizon h goes to infinity. We follow Gonçalves (2021) and approximate this limit with $v_2(1000)$.

IA.1.2 Details for the equity duration measures based on Gonçalves (2021)

We precisely follow Gonçalves (2021) to construct DUR^G . As opposed to TIM, we use all 12 state variables from Gonçalves (2021) for the state vector $s_{j,t}$:

Growth measures

$$\begin{aligned} \text{Equity growth: } EG_{j,t} &= \log\left(\frac{BE_{j,t}}{BE_{j,t-1}}\right) \\ \text{Asset growth: } AG_{j,t} &= \log\left(\frac{AT_{j,t}}{AT_{j,t-1}}\right) \\ \text{Sales growth: } SG_{j,t} &= \log\left(\frac{SALE_{j,t}}{SALE_{j,t-1}}\right) \end{aligned}$$

Profitability measures

$$\begin{aligned} \text{Clean surplus profitability: } CPROF_{j,t} &= \log\left(1 + \frac{PO_{j,t} + \Delta BE_{j,t}}{BE_{j,t-1}}\right) \\ \text{Return on equity: } ROE_{j,t} &= \log\left(1 + \frac{E_{j,t}}{\frac{1}{2}BE_{j,t} + \frac{1}{2}BE_{j,t-1}}\right) \\ \text{Gross profitability: } GPA_{j,t} &= \log\left(1 + \frac{G_{j,t}}{\frac{1}{2}AT_{j,t} + \frac{1}{2}AT_{j,t-1}}\right) \end{aligned}$$

Valuation measures

$$\begin{aligned} \text{Book-to-market: } BM_{j,t} &= \log\left(\frac{BE_{j,t}}{ME_{j,t}}\right) \\ \text{Payout yield: } POY_{j,t} &= \log\left(1 + \frac{PO_{j,t}}{ME_{j,t}}\right) \\ \text{Sales yield: } SY_{j,t} &= \log\left(\frac{SALE_{j,t}}{ME_{j,t}}\right) \end{aligned}$$

Capital structure measures

$$\begin{aligned} \text{Market leverage: } MLEV_{j,t} &= \frac{BD_{j,t}}{ME_{j,t} + BD_{j,t}} \\ \text{Book leverage: } BLEV_{j,t} &= \frac{BD_{j,t}}{AT_{j,t}} \\ \text{Cash holdings: } CASH_{j,t} &= \frac{CHE_{j,t}}{AT_{j,t}}, \end{aligned}$$

where ME is market equity from CRSP. Based on these 12 state variables, we forecast future cash flows to shareholders based on Equation (IA.1) after estimating Γ , Σ , v_1 , and v_2 with the VAR. Based on the forecast cash-flows C , we follow Gonçalves (2021) and assign each stock j a stock-specific discount rate $r_{j,t}$ which we

^{IA.4}Note that roughly 2.5% of the observations for TIM in our sample become negative due to negative forecast implied prices. We exclude these negative observations for TIM.

estimate by solving the following equation with a root-finding algorithm:

$$\frac{ME_{j,t}}{BE_{j,t}} = \sum_{h=1}^{\infty} \left(e^{(\mathbf{1}_{CPROF} - \mathbf{1}_{EG})' \Gamma^h \cdot s_{j,t} + v_1(h)} - 1 \right) \cdot e^{\mathbf{1}_{EG}' \left(\sum_{\tau=1}^h \Gamma^{\tau} \right) \cdot s_{j,t} + h \cdot v_2(h) - h \cdot r_{j,t}}. \quad (\text{IA.4})$$

Based on these stock-specific discount rates and cash-flow forecasts, we follow Gonçalves (2021) and estimate DUR^G as^{IA.5}:

$$\text{DUR}_{j,t}^G = \left(\frac{BE_{j,t}}{ME_{j,t}} \right) \sum_{h=1}^{\infty} h \left(e^{(\mathbf{1}_{CPROF} - \mathbf{1}_{EG})' \Gamma^h s_{j,t} + v_1(h)} - 1 \right) e^{\mathbf{1}_{EG}' \left(\sum_{\tau=1}^h \Gamma^{\tau} \right) s_{j,t} + h \cdot v_2(h) - h \cdot r_{j,t}}. \quad (\text{IA.5})$$

Additionally, we calculate DUR^{G-U} based on the cash-flow forecasts from DUR^G by replacing stock-specific discount rates $r_{j,t}$ with a uniform discount rate r of 12% across all stocks and using a forecast implied price $P_{j,t}^{FI}$. However, DUR^{G-U} still includes all state variables in the VAR. Lastly, we also calculate a version of this measure with firm fixed effects in the VAR by additionally demeaning all state variables for each firm: DUR^{G-U*} .^{IA.6}

^{IA.5}Due to a finite forecast horizon of 1000 years, we apply the same approximation for the calculation of equity duration as Gonçalves (2021). Moreover, we obtain rank correlations of roughly 90% between our DUR^G estimate and the original equity duration estimates published by Andrei Gonçalves. However, we note that small changes in the definition of state variables and in the construction of the VAR can lead to different outcomes. The reasons are twofold: First, small estimation differences in the VAR can have a substantial effect on the convergence of the VAR parameters v_1 and v_2 . Second, the VAR is estimated with an expanding window.

^{IA.6}Note that roughly 3.6% of the observations for DUR^{G-U} in our sample become negative due to negative forecast implied prices. Moreover, approximately 2.4% of the observations for DUR^{G-U*} in our sample become negative due to negative forecast implied prices. We exclude these negative observations for DUR^{G-U} and DUR^{G-U*} .

Table IA.1: VAR parameters for the TIM cash-flow timing measure.

This table shows the Γ matrix from the VAR over the full sample period from July 1973 to December 2020 for the cash-flow timing measure TIM in Panel A. We estimate the VAR by regressing each state variable separately on all the state variables of the previous year for every year in our sample. We weight each cross-section with the number of firms in that cross-section when we average coefficients across years. Moreover, we obtain the constant (Cons) in the VAR, such that the long-run expectations of the state variables in the vector s_t equal the product of Γ and the vector of time-series averages of cross-sectional medians for each state variable. Standard errors for the t-statistics in brackets are based on the standard deviation of the cross-sectional estimates that we obtain every year. Panel B shows the variance-covariance matrix Σ of firm-demeaned residuals over the full sample period, and Panel C shows the steady state means of the full sample period (time-series averages of cross-sectional medians).

	Cons	EG	AG	SG	CPROF	ROE	GPA	BLEV	CASH
Panel A: Coefficients of Γ									
EG	-0.05	0.12 (1.01)	0.06 (0.55)	0.15 (1.49)	-0.07 (-0.44)	0.14 (0.36)	0.15 (1.10)	0.13 (1.53)	0.11 (0.88)
AG	0.02	0.12 (1.51)	0.08 (0.85)	0.13 (1.45)	-0.05 (-0.55)	0.05 (0.30)	0.07 (0.80)	-0.07 (-0.91)	0.06 (0.47)
SG	0.06	0.04 (0.40)	0.32 (3.93)	0.07 (0.69)	-0.07 (-0.59)	-0.01 (-0.08)	-0.05 (-0.48)	-0.03 (-0.36)	0.08 (0.61)
CPROF	-0.05	-0.08 (-0.55)	0.02 (0.18)	0.03 (0.17)	0.15 (0.82)	0.34 (0.98)	0.28 (1.17)	0.08 (0.71)	0.00 (0.02)
ROE	-0.00	-0.05 (-0.46)	-0.01 (-0.07)	-0.01 (-0.13)	0.07 (0.51)	0.44 (1.73)	0.24 (1.25)	-0.02 (-0.17)	-0.10 (-0.70)
GPA	0.02	-0.00 (-0.13)	-0.05 (-1.53)	-0.00 (-0.03)	-0.02 (-0.51)	-0.03 (-0.89)	0.95 (24.60)	-0.00 (-0.12)	0.01 (0.23)
BLEV	0.04	0.01 (0.24)	0.01 (0.34)	-0.00 (-0.08)	-0.00 (-0.08)	0.00 (0.03)	-0.03 (-1.21)	0.87 (26.02)	-0.04 (-1.04)
CASH	0.02	-0.01 (-0.25)	-0.03 (-1.31)	0.02 (0.74)	0.00 (0.23)	-0.01 (-0.22)	0.01 (0.31)	-0.04 (-1.36)	0.83 (16.61)
Panel B: Variance-covariance matrix (Σ)									
EG	.	0.057	0.028	0.017	0.034	0.022	0.002	-0.005	0.002
AG	.	0.028	0.033	0.018	0.014	0.007	0.000	0.003	0.000
SG	.	0.017	0.018	0.035	0.011	0.007	0.005	0.000	-0.001
CPROF	.	0.034	0.014	0.011	0.074	0.035	0.002	-0.003	0.000
ROE	.	0.022	0.007	0.007	0.035	0.063	0.003	-0.002	0.000
GPA	.	0.002	0.000	0.005	0.002	0.003	0.003	-0.001	0.000
BLEV	.	-0.005	0.003	0.000	-0.003	-0.002	-0.001	0.004	-0.001
CASH	.	0.002	0.000	-0.001	0.000	0.000	0.000	-0.001	0.004
Panel C: Time-series averages of cross-sectional medians									
Steady states	.	0.06	0.05	0.06	0.10	0.12	0.31	0.21	0.08

IA.1.3 Details for Dechow et al. (2004)-type cash-flow timing and equity duration

To forecast future cash flows C to shareholders with Equation (5), we follow Dechow et al. (2004) and assume that ROE and EG follow mean-reverting processes, which are modeled by the following first-order autoregressive processes:

$$ROE_t = \beta_{roe} + \rho_{roe} \cdot ROE_{t-1} + \varepsilon_t^{roe} \quad (\text{IA.6})$$

$$EG_t = \beta_{eg} + \rho_{eg} \cdot EG_{t-1} + \varepsilon_t^{eg} \quad (\text{IA.7})$$

We estimate the autoregressive parameters ρ_{roe} and ρ_{eg} for return on equity and book equity growth separately from a pooled regression over the full sample period. Our estimates can be found in Table IA.2 and are fairly similar to those of Weber (2018). We use income before extraordinary items (IB) divided by book equity for ROE . The definition of book equity follows Davis et al. (2000), and we provide details in Appendix IA.2. Moreover, we follow Dechow et al. (2004) or Weber (2018) and use sales growth data (item SALE) for EG to estimate the AR (1) coefficient for book equity growth.^{IA.7} As in Dechow et al. (2004), we assume that ROE reverts to the long-run cost of equity (μ_{roe}) of 12 % and equity growth (EG) to the long-run macroeconomic growth rate (μ_{eg}) of 6 %. Thereafter, we plug in ROE and EG values with data from time $t - 1$ into the AR (1) processes to forecast future cash-flows to shareholders at time t in Equation (5). In this step, EG is measured by book equity growth. As in Weber (2018), we repeat this procedure for a finite forecasting horizon of 15 years.

Then we estimate the following versions of the Dechow et al. (2004) equity duration measure: First, we obtain the original measure DUR^{DSS} in Equation (7) using the forecast cash-flows C , together with a uniform discount rate r of 12% ($R = 1 + r$), the market equity P from CRSP, and a forecasting horizon H of 15 years. Second, we obtain an estimate for the corresponding cash-flow timing measure TIM^{DSS} in Equation (9) based on the cash-flow forecast C , a constant discount rate of 12%, and a forecast implied market equity P^{FI} implied by the model:

$$P_{j,t}^{FI} = \sum_{h=1}^T \frac{C_{j,t+h}}{(1+r)^h} + \frac{C_{j,t+H} \cdot (1+g)}{(1+r)^H \cdot (r-g)} \quad (\text{IA.8})$$

We assume a model-implied and uniform long-run growth rate g of 6% when estimating forecast-implied prices.^{IA.8}

^{IA.7}To be consistent with the TIM measure, we also exclude the 20% smallest stocks based on NYSE breakpoints when estimating the AR(1) coefficients for TIM^{DSS} . To be consistent with Dechow et al. (2004) and Weber (2018), we include all observations to estimate the AR (1) coefficients in Table IA.2 for the original DUR^{DSS} measure.

^{IA.8}Note that around 2.8% of the DUR^{DSS} observations have negative values. Moreover, around 7.2% of the TIM^{DSS} observations are negative in our sample period due to negative forecast-implied prices. We exclude these observations with negative values for the corresponding equity duration and cash-flow timing measure.

Table IA.2: AR(1) parameters for Dechow et al. (2004) equity duration.

This table shows the parameters for the autoregressive processes of order one (AR(1)) for return on equity (ROE), $ROE_t = \beta_{ROE} + \rho_{ROE} \cdot ROE_{t-1}$ and book equity growth (EG), $EG_t = \beta_{EG} + \rho_{EG} \cdot EG_{t-1}$. μ corresponds to the long run mean, β to the constant in the AR(1) process and ρ is the AR(1) coefficient. It holds that $\mu = \frac{\beta}{1-\rho}$. We winsorize each variable at the 2.5th and 97.5th percentiles in every fiscal year. Moreover, we estimate these coefficients for ROE and EG separately from pooled autoregressions over the full sample period from July 1963 to December 2020.

	μ	β	ρ
ROE	0.120	0.031	0.741
EG	0.060	0.048	0.208

IA.1.4 Details for additional cash-flow timing and equity duration measures

We follow Chen and Li (2018) to replicate their equity duration measure DUR^{CL} . Based on the cash-flow forecasts for DUR^{CL} , we compute forecast implied prices as in Equation (IA.8). We use these forecast implied prices together with a uniform discount rate of 12%, a uniform growth rate of 6% across all stocks, and a finite forecasting horizon of 15 years to compute a cash-flow timing measure TIM^{CL} based on Equation (9).^{IA.9}

Moreover, we follow Chen (2011) to replicate the equity duration measure DUR^C that incorporates default risk. Based on the cash-flow forecasts for DUR^C , we compute a measure of cash-flow timing TIM^C . Specifically, we compute forecast implied prices as in Equation (IA.8) based on the cash-flow forecasts from Chen (2011). We use these forecast implied prices together with a uniform discount rate of 12%, a uniform growth rate of 6% across all stocks, stock-specific default probabilities, and a finite forecasting horizon of 15 years to compute a cash-flow timing measure TIM^C .^{IA.10}

^{IA.9}Note that around 4.5% of the observations for DUR^{CL} and 0.005% of the observations for TIM^{CL} are negative. We exclude these negative observations for DUR^{CL} and TIM^{CL} .

^{IA.10}Around 2% of the observations for TIM^C are negative due to negative forecast implied prices. We exclude these negative observations for TIM^C . There are no negative observations for DUR^C .

IA.2 Construction of additional variables

In the following, we describe the construction of additional variables. In brackets are the Compustat abbreviations for each item.

Asset growth. We estimate the asset growth for each stock at the end of June in each year t from Compustat data as the relative change in total assets (AT) from the fiscal year ending in $t - 2$ to the fiscal year ending in $t - 1$:

$$\text{Asset growth} = \frac{AT_{t-1} - AT_{t-2}}{AT_{t-2}} .$$

Book equity. We follow Davis et al. (2000) and define book equity (BE) as shareholders' equity plus deferred taxes and investment tax credit minus the book value of preferred stocks. Depending on data availability, shareholders' equity is (in the following order) shareholders' equity (SEQ), or common equity (CEQ) plus the carrying value of preferred stocks (PSTK), or total assets (AT) minus total liabilities (LT). We also follow Davis et al. (2000) and add hand-collected book equity data from Moody's manual. The book value of preferred stocks reflects either the redemption value (PSTKRV), the liquidating value (PSTKL), or the carrying value of preferred stocks (PSTK) in that order, in case one of the items is missing. Deferred taxes and investment tax credit are Compustat item TXDITC or item TXDB, plus item ITCB in case TXDITC is missing. Lastly, we replace missing values for deferred taxes and investment tax credit with zero.

Book equity growth. We estimate the book equity growth for each stock at the end of June in each year t as the growth rate in book equity from the fiscal year ending in $t - 2$ until the fiscal year ending in $t - 1$.

Book leverage. We construct the book leverage for each stock at the end of June in each year t as total debt (item DLTT plus item DLC) divided by total assets (AT). Total debt and total assets are from the fiscal year ending in $t - 1$.

Book-to-market ratio. We follow Fama and French (1992) and obtain the book-to-market ratio for each stock at the end of June in each year t by scaling the book equity from the fiscal year ending in year $t - 1$ with the market equity from CRSP, which we measure at the end of December in year $t - 1$. The market-to-book ratio is then the inverse of this ratio.

Cash. We divide cash holdings (item CHE) by total assets (item AT) from fiscal years ending in $t - 1$ to measure cash for each firm at the end of June in each year t .

Cash-flows to equity growth. We estimate the growth in cash-flows to shareholders for each stock at the end of June in each year t as the growth in net payouts (see below) from the fiscal year ending in $t - 2$ to the fiscal year ending in $t - 1$. We require growth rates larger than -100% to compute annualized growth rates.

Clean surplus profitability. We estimate the clean surplus profitability for each stock at the end of June in each year t as net payouts (see below) from the fiscal year ending in $t - 1$ plus the change in book equity from the fiscal year ending in $t - 2$ to the fiscal year ending in $t - 1$. We scale these clean surplus profits with the average book equity from the fiscal year ending in $t - 2$ and from the fiscal year ending in $t - 1$.

Dividend and repurchase growth. We estimate the dividend and repurchase growth for each stock at the end of June in each year t as the growth rate in dividends and repurchases from the fiscal year ending in $t - 2$ until the fiscal year ending in $t - 1$. Dividends are common dividends (DVC), and repurchases are the value of purchased common and preferred stock (PRSTKC) plus any reduction in the book value of preferred stock. The book value of preferred stocks reflects either the redemption value (PSTKRV), the liquidating value (PSTKL), or the carrying value of preferred stocks (PSTK) in that order, in case one of the items is missing. We require growth rates larger than -100% to compute annualized growth rates.

Dividend ratio. We calculate the dividend ratio for each stock at the end of June in each year t as the ratio of common dividends (DVC) to income before extraordinary items (IB). Both accounting variables are from the fiscal year ending in $t - 1$.

EBITDA growth. We estimate the EBITDA growth for each stock at the end of June in each year t as the growth rate in earnings before income, taxes, depreciation, and amortization (item EBITDA) from the fiscal year ending in $t - 2$ until the fiscal year ending in $t - 1$. We require growth rates larger than -100% to compute annualized growth rates.

Issuance ratio. We estimate the issuance ratio for each stock at the end of June in each year t as:

$$\text{Issuance ratio} = \frac{SSTK_{t-1} - \mathbb{1}_{\Delta BVPS > 0}(BVPS_{t-1} - BVPS_{t-2})}{BE_{t-1}} .$$

SSTK corresponds to the sale of common and preferred stock, BVPS is the book value of preferred stocks, and $\mathbb{1}_{\Delta BVPS > 0}$ is an indicator being one if the book value of preferred stocks increased over the last period and is zero otherwise. BE is book equity. The book value of preferred stocks reflects either the redemption value (PSTKRV), the liquidating value (PSTKL), or the carrying value of preferred stocks (PSTK) in that order, in case one of the items is missing. The time subscripts correspond to the fiscal year ending in the denoted year.

Market beta. In each month t we estimate the market beta for stock j as the slope coefficient from the following regression:

$$r_{j,t} - r_{f,t} = \alpha + \beta \cdot (r_{m,t} - r_{f,t}) + u_{j,t}$$

where r_j is the return of stock j , r_f the risk free rate, and r_m the market return. We run this regression in each month t using the observations from the previous 120 months. Moreover, we require a minimum of 24 monthly observations for each regression.

Net payouts. We follow Boudoukh et al. (2007) and define net payouts (PO) as dividends on common stock (DVC) plus repurchases minus equity issuance. Repurchases are computed as the purchase of common and preferred stock (PRSTKC) plus any reduction in the value of the net number of preferred stocks outstanding. Equity issuance reflects the sale of common and preferred stock (SSTK) minus any increase in the value of the net number of preferred stocks outstanding. The book value of preferred stocks reflects either the redemption value (PSTKRV), the liquidating value (PSTKL), or the carrying value of preferred stocks (PSTK). Following this precise order, we replace the book value of preferred stocks in case one of the aforementioned data items is not available. Since Compustat data for equity issuances and repurchases starts around 1971, we follow Boudoukh et al. (2007) and compute net payouts before 1971 as: $PO_{j,t} = DVC_{j,t} - ((SHROUT_t \cdot CFACSHR_t) - (SHROUT_{t-1} \cdot CFACSHR_{t-1})) \cdot \frac{1}{2} \left(\frac{PRC_t}{CFACPR_t} + \frac{PRC_{t-1}}{CFACPR_{t-1}} \right)$. Note that SHROUT is shares outstanding, CFACSHR the cumulative factor to adjust shares outstanding, PRC the price, and CFACPR the cumulative factor to adjust the price.

Operating profitability. We follow Fama and French (2015) and obtain operating profitability for each stock at the end of June in each year t as:

$$\text{Operating profitability} = \frac{REVT_{t-1} - COGS_{t-1} - XSGA_{t-1} - XINT_{t-1}}{BE_{t-1}} .$$

REVT are revenues, COGS are costs of goods sold, XSGA selling and administrative expenses, XINT interest expenses, and BE is book equity. All accounting variables are from the fiscal year ending in $t - 1$. We replace missing values of COGS, XSGA, and XINT with zero as long as at least one of these three accounting variables is available.

Profits-to-assets. We estimate gross profits-to-assets for each stock at the end of June in each year t as:

$$\text{Profits-to-assets} = \frac{REVT_{t-1} - COGS_{t-1}}{0.5 \cdot AT_{t-1} + 0.5 \cdot AT_{t-2}} .$$

REVT are revenues, COGS are costs of goods sold, and AT are total assets. The time subscripts correspond to the fiscal year ending in the denoted year.

Repurchase ratio. We estimate the repurchase ratio for each stock at the end of June in each year t as:

$$\text{Repurchase ratio} = \frac{BVPS_{t-1} + \mathbb{1}_{\Delta BVPS < 0}(BVPS_{t-1} - BVPS_{t-2})}{IB_{t-1}} .$$

PRSTKC corresponds to the value of purchased common and preferred stock, BVPS is the value of preferred stocks outstanding, and $\mathbb{1}_{\Delta BVPS < 0}$ is an indicator that is one if the book value of preferred stock decreased and is zero otherwise. BE is book equity. The book value of preferred stocks reflects either the redemption value (PSTKRV), the liquidating value (PSTKL), or the carrying value of preferred stocks (PSTK) in that order, in case one of the items is missing. The time subscripts correspond to the fiscal year ending in the denoted year.

Return on equity. We calculate the return on equity for each stock at the end of June in each year t by scaling income before extraordinary items (IB) from the fiscal year ending in $t - 1$ with the average book equity from the fiscal year ending in $t - 1$ and from the fiscal year ending in $t - 2$.

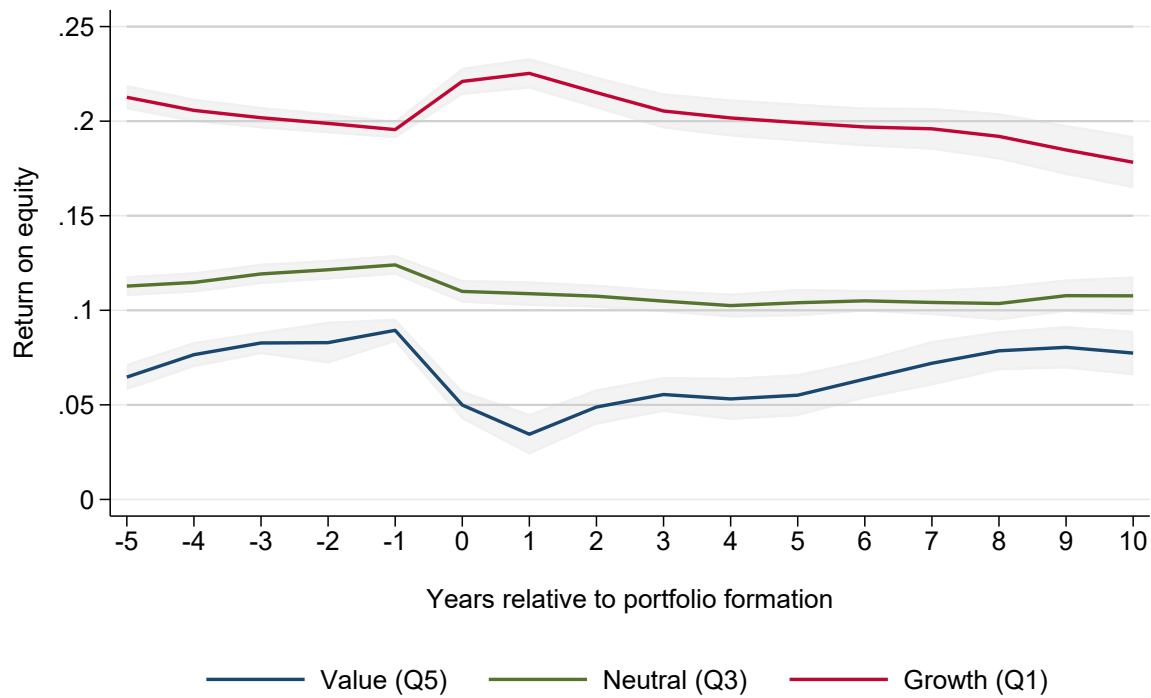
Sales growth. We estimate sales growth for each stock at the end of June in each year t as the growth rate in sales (item SALE) from the fiscal year ending in $t - 2$ until the fiscal year ending in $t - 1$.

Size. We calculate the size of each stock in every month as the natural logarithm of the market capitalization, denoted in U.S. dollars from CRSP.

Total payout ratio. We estimate the total payout ratio for each stock at the end of June in each year t by dividing net payouts for the fiscal year ending in $t - 1$ by the book equity from the fiscal year ending in $t - 1$.

Figure IA.1: Return on equity for portfolios sorted on the book-to-market ratio.

We sort the cross-section of stocks at the end of June in each year t into quintiles based on the book-to-market ratio. We rebalance these portfolios yearly and investigate for each portfolio in each year t the value-weighted return on equity (ROE) in the 5 years before portfolio formation ($t-1$ to $t-5$) and in the following 10 years after portfolio formation (t to $t+10$). We take the time-series average across all portfolio formation years. We depict these ROEs for the highest quintile (value), the third quintile (neutral), and the lowest quintile (growth) based on the book-to-market ratio. We describe the details to construct return on equity and the book-to-market ratio in Internet Appendix IA.2. 95 % confidence intervals correspond to Newey and West (1987) corrected standard errors with 6 lags and are depicted in gray.



IA.3 The bootstrap in the predictive regressions

Our bootstrap procedure accounts for the autocorrelation of error terms as well as violations of strict exogeneity due to a contemporaneous correlation between the dependent variable (returns) and the predictor variable (valuation ratios). Since the valuation ratios are used with a lag, there is no issue with weak exogeneity. The standard reference for this issue is Stambaugh (1999).

Our procedure to deal with the Stambaugh (1999) bias follows the approach in Goyal and Welch (2008) but is adapted for a setting with autocorrelation in the dependent variable induced by overlapping returns for horizons $h > 12$. The t -statistics in Tables 5, A.4, and Table A.5 are those implied by the probability under the null of no predictability (p) of observing a coefficient larger (in absolute terms) than those estimated in the regression. The probability p is computed using 10,000 data sets. Each of the data sets under the null is generated as follows:

$$y_{t+1} = \mu + \rho_y y_t + \epsilon_{y,t+1} \quad (\text{IA.9})$$

$$x_{t+1} = \alpha + \rho_x x_t + \epsilon_{x,t+1} \quad (\text{IA.10})$$

where y is the return on the respective portfolios and x is the valuation ratio variable DP or IVS. The parameters μ , ρ_y , α and ρ_x are estimated in sample. The residuals are drawn from the full vector of errors at t , ϵ_t , i.e., ϵ_x and ϵ_y . The randomly drawn data, i.e., 10,000 sets of vector pairs $(\hat{y}, \hat{x})$ generated under the null, is then used to compute 10,000 slope coefficients β from the regression

$$y_{t+1} = a + \beta x_{t-1} + u_{t+1} \quad (\text{IA.11})$$

This specification corrects for auto-correlated dependent variables y (as is the case for $h > 12$) via the inclusion of $\rho_y \neq 0$ and, by drawing residuals from the vector $\epsilon_t = (\epsilon_{x,t}, \epsilon_{y,t})$, which captures the correlation of the errors in the valuation ratios x and the returns on the portfolios y . In the case of the market portfolio, the correlation is strong and obvious; for the late-minus-early TIM portfolio, it is more indirect but still potentially important.

IA.4 Additional cash-flow timing/duration-sorted portfolios

Table IA.3: Unconditional returns for portfolios sorted on other cash-flow timing/equity duration measures.

This table shows the time-series averages of monthly returns (r) for portfolios sorted from early to late cash-flow timing in Panel A, and for portfolios sorted from low to high equity duration in Panel B. TIM^{CL} (DUR^{CL}) corresponds to the Chen and Li (2018) cash-flow timing (duration) measure, whereas TIM^C (DUR^C) is the Chen (2011) cash-flow timing (duration) measure. We provide construction details for these measures in Internet Appendix IA.1. Portfolio returns are reported in percent per month. We weight individual stock returns with their market capitalization when aggregating them into portfolio returns. Numbers in brackets are Newey and West (1987) t -statistics with 6 lags. Moreover, we report the standard deviations of monthly portfolio returns in percent (σ), and annualized Sharpe ratios (SR_{ann}) alongside t -statistics based on bootstrapped standard errors (10,000 samples with replacement). The sample period ranges from July 1963 until December 2020 for TIM^{CL} and DUR^{CL} , while the sample period ranges from July 1980 to December 2020 for TIM^C and DUR^C .

Panel A: Cash-flow timing measures excluding discount rate information

	Early	2	3	4	5	6	7	8	9	Late	Late-Early
TIM ^{CL} cash-flow timing											
r	1.04 (5.70)	1.00 (6.01)	1.00 (5.86)	0.90 (4.65)	0.99 (5.44)	1.05 (5.68)	1.12 (5.96)	0.92 (4.77)	0.96 (4.56)	1.10 (4.01)	0.06 (0.35)
σ	4.56	4.47	4.62	4.88	4.90	4.96	5.09	5.14	5.48	6.71	4.31
SR_{ann}	0.79 (5.64)	0.78 (5.61)	0.75 (5.39)	0.64 (4.52)	0.70 (5.07)	0.74 (5.25)	0.76 (5.29)	0.62 (4.50)	0.60 (4.28)	0.57 (4.17)	0.05 (0.39)
TIM ^C cash-flow timing											
r	1.02 (4.75)	1.23 (6.09)	1.04 (5.30)	1.02 (4.47)	0.98 (3.89)	1.06 (5.09)	1.01 (4.50)	1.09 (4.66)	1.13 (4.11)	1.10 (3.36)	0.09 (0.39)
σ	4.57	4.50	4.41	4.92	5.18	4.93	5.11	5.22	5.83	6.84	4.16
SR_{ann}	0.77 (4.42)	0.94 (5.38)	0.81 (4.77)	0.72 (4.17)	0.66 (3.85)	0.74 (4.29)	0.69 (4.10)	0.73 (4.16)	0.67 (3.85)	0.56 (3.39)	0.07 (0.45)

Panel B: Equity duration measures including discount rate information

	Low	2	3	4	5	6	7	8	9	High	High-Low
DUR ^{CL} equity duration											
r	1.28 (6.34)	1.28 (7.05)	1.25 (7.34)	1.20 (6.82)	1.06 (6.55)	1.00 (6.01)	0.98 (5.75)	0.99 (5.47)	0.85 (3.70)	0.66 (2.35)	-0.62 (-2.97)
σ	5.35	4.92	4.63	4.72	4.38	4.56	4.56	4.62	5.81	6.90	4.36
SR_{ann}	0.83	0.90	0.93	0.88	0.84	0.76	0.74	0.74	0.51	0.33	-0.49

Continued on the next page

Table IA.3 (continued): Unconditional returns for portfolios sorted on other cash-flow timing/equity duration measures.

	(5.81)	(6.23)	(6.65)	(6.28)	(5.91)	(5.44)	(5.28)	(5.37)	(3.72)	(2.47)	(-3.66)
	DUR ^C equity duration										
r	1.30	1.27	1.04	1.12	1.03	1.07	1.04	1.14	1.06	1.06	-0.25
	(4.98)	(4.97)	(4.33)	(5.24)	(5.01)	(4.96)	(5.01)	(5.54)	(5.00)	(4.28)	(-0.98)
σ	5.62	5.31	5.17	4.97	4.78	4.77	4.65	4.67	4.68	5.10	4.36
SR _{ann}	0.80	0.83	0.69	0.78	0.75	0.78	0.77	0.85	0.79	0.72	-0.19
	(4.51)	(4.67)	(4.02)	(4.39)	(4.18)	(4.48)	(4.44)	(4.83)	(4.57)	(4.35)	(-1.22)

IA.5 A model of the cross section of timing-sorted stocks with procyclical return differentials

In our model, there are two mechanisms that govern the shape of cross-sectional return differences. Firms with higher exposure to persistent dividend growth have later cash-flow timing. On the one hand, stocks with high long-term growth exposure earn higher risk premia for this exposure. On the other hand, because innovations to persistent and local dividend growth are negatively correlated, late timing stocks are therefore a hedge against local dividend risk. Because this risk is higher in recessions, the term structure is downward sloping in recessions but slightly upward sloping in low-volatility expansion times. When volatility is at its long-run mean, the two effects roughly cancel out, leading to a flat unconditional return differential.

Late timing stocks in our model are a hedge against volatility. This is in line with their negative CMA exposure, and the finding in Cooper and Maio (2019a) that the investment factor measures exposure to a volatility state variable. Similarly, late timing stocks have negative RMW exposure, which has been linked to low exposure to current economic growth in Cooper and Maio (2019a).

IA.5.1 Model setup

Dividends of stock i evolve according to:

$$\Delta d_{i,t+1} = \mu + \phi_i z_t + \sqrt{x_t} \sigma_d \epsilon_{d,t+1} \quad (\text{IA.12})$$

$$z_{t+1} = \rho z_t + \sigma_z (\epsilon_{z,t+1} + \phi_d \sqrt{x_t} \epsilon_{d,t+1}) \quad (\text{IA.13})$$

$$x_{t+1} = \bar{x} + \rho_x x_t + \sqrt{x_t} \sigma_x \epsilon_{x,t+1}, \quad (\text{IA.14})$$

with standard-normal shocks ϵ_z, ϵ_d and ϵ_x . Cash-flow timing is governed by exposure to the persistent dividend growth process ϕ_i . The reduced-form log pricing-kernel $\ln(M) = m$ is assumed to be

$$m_{t+1} = -r_f - \frac{1}{2} \lambda_z^2 - \frac{1}{2} \lambda_x^2 x_t - \frac{1}{2} \lambda_d^2 x_t - \lambda_z \epsilon_{z,t+1} - \lambda_d \sqrt{x_t} \epsilon_{d,t+1} + \lambda_x \sqrt{x_t} \epsilon_{x,t+1}, \quad (\text{IA.15})$$

As in Gormsen (2021), the second term is set such that the risk-free rate is a constant r_f . The market prices of risk parameters λ_d, λ_x , and λ_z are assumed to be larger than zero, s.t. in line with standard intuition, a state of the world with high volatility of dividends and dividend growth is considered a bad state, associated with a negative market price of risk.

IA.5.2 Model solution

We impose the Euler equation in terms of price-dividend ratios of “zero-coupon equity” dividend claims with maturities n and $n-1$ under the conjecture of an affine log price-dividend ratio $P_t^{(n)}/D_t = \exp(A^{(n)} + B^{(n)} z_t + C^{(n)} x_t)$:

$$\frac{P_t^{(n)}}{D_t} = E_t \left[M_{t+1} \frac{D_{t+1}}{D_t} \frac{P_{t+1}^{(n-1)}}{D_{t+1}} \right] \quad (\text{IA.16})$$

$$= \exp \left(A^{(n)} + B^{(n)} z_t + C^{(n)} x_t \right) \quad (\text{IA.17})$$

$$\begin{aligned} &= \exp \left(-r_f + \mu + \phi_i z_t + \frac{1}{2} x_t \sigma_d^2 + A^{(n)} + B^{(n)} \rho z_t + \frac{1}{2} \left(B^{(n-1)} \right)^2 (1 + \phi_d^2 x_t) \sigma_z^2 + \right. \\ &\quad C^{(n-1)} (\bar{x} + \rho_x x_t) + \frac{1}{2} x_t \sigma_x^2 \left(C^{(n-1)} \right)^2 - \lambda_d x_t \sigma_d - \lambda_z \sigma_z B^{(n-1)} - \lambda_d x_t \phi_d \sigma_z B^{(n-1)} \\ &\quad \left. + \lambda_x \sigma_x x_t C^{(n-1)} + x_t \sigma_d \sigma_z \phi_d \right) \end{aligned} \quad (\text{IA.18})$$

Matching coefficients yields:

$$A^{(n)} = A^{(n-1)} - r_f + \mu + \frac{1}{2} \left(B^{(n-1)} \right)^2 \sigma_z^2 + C^{(n-1)} \bar{x} - \lambda_z \sigma_z B^{(n-1)}, \quad (\text{IA.19})$$

$$B^{(n)} = \phi_i + B^{(n-1)} \rho \Leftrightarrow \phi_i \frac{1 - \rho^n}{1 - \rho}, \quad (\text{IA.20})$$

$$\begin{aligned} C^{(n)} = & \frac{1}{2} \sigma_d^2 + \frac{1}{2} \left(B^{(n-1)} \right)^2 (\phi_d^2) \sigma_z^2 + C^{(n-1)} \rho_x + \frac{1}{2} \sigma_x^2 \left(C^{(n-1)} \right)^2 - \lambda_d \sigma_d \\ & - \lambda_d \phi_d \sigma_z B^{(n-1)} + \lambda_x \sigma_x C^{(n-1)} + \sigma_d \sigma_z \phi_d. \end{aligned} \quad (\text{IA.21})$$

B is positive and rises monotonically in n , i.e., longer-maturity claims are more positively exposed to persistent cash-flow growth.

The sign and maturity-dependence of C depends on the market prices of risk and the correlation structure of shocks ϵ_d, ϵ_x and ϵ_z governed by ϕ_d . As in Gormsen (2021), we suggest a negative correlation between persistent growth z and local growth d , i.e., $\phi_d < 0$. With sufficiently high λ_d and λ_x , this results in a negative but soon increasing C . Together with sufficiently high $r_f - \mu$, this results in a negative A that is declining in n . To sum up, claims with longer maturity are more positively exposed to persistent cash-flow growth, negatively influenced by cash-flow volatility (but less so than short-maturity claims), and—absent any risk premia—would have lower prices than short-maturity claims.

IA.5.3 Cyclical returns

Log returns on dividend claims with maturity n are given by

$$r_{t+1}^{(n)} = \ln \left(\frac{P_{t+1}^{(n-1)}}{D_{t+1}} \frac{D_t}{P_t^{(n)}} \frac{D_{t+1}}{D_t} \right) \quad (\text{IA.22})$$

$$= \mathbf{X}_t + B^{(n-1)} \sigma_z (\epsilon_{z,t+1} + \phi_d \sqrt{x_t} \epsilon_{d,t+1}) + C^{(n-1)} \sigma_x \sqrt{x_t} \epsilon_{x,t+1} + \sqrt{x_t} \sigma_d \epsilon_{d,t+1} \quad (\text{IA.23})$$

where $\mathbf{X}_t$ contains all t -measurable terms in $r_{t+1}^{(n)}$. Expected excess log returns are given by

$$-\text{Cov}(m_{t+1}, r_{t+1}^{(n)}) = \lambda_d \sigma_d x_t + \lambda_d \sigma_z B^{(n-1)} \phi_d x_t + \lambda_z B^{(n-1)} \sigma_z - \lambda_x C^{(n-1)} \sigma_x x_t \quad (\text{IA.24})$$

$$= \lambda_d \sigma_d x_t + B^{(n-1)} x_t (\lambda_d \sigma_z \phi_d) + \lambda_z B^{(n-1)} \sigma_z - \lambda_x C^{(n-1)} \sigma_x x_t \quad (\text{IA.25})$$

The first term changes the level of returns for all maturities depending on the level of x_t . The second term is negative and decreasing in n and x_t if $\lambda_d \sigma_z \phi_d < 0$, which is the case if local dividend growth is negatively correlated with persistent dividend growth. The third term increases in n and does not depend on x_t . The fourth term is positive and increasing in n and x_t . Because the second term is larger than the fourth (in particular for stocks with higher exposure to persistent growth ϕ_i and thus higher $B^{(n)}$), the term structure is decreasing in high volatility times. Because the third term is increasing in n but does not depend on x_t , it largely offsets this effect in average volatility times, leading to a flat term structure. When the volatility is low, this effect trumps the downward-sloping effect of the second term, leading to a slightly upward-sloping term structure.

Turning to the cross-sectional return differentials R_{LS} that are the focus of this paper, it is enough to consider the last three terms that feature a $B^{(n)}$ term that depends linearly on persistent growth exposure ϕ_i :

$$\begin{aligned} R_{LS} = & \left[B^{(n-1)}(\phi_{\text{high}}) - B^{(n-1)}(\phi_{\text{low}}) \right] x_t (\lambda_d \sigma_z \phi_d) + \lambda_z \left[B^{(n-1)}(\phi_{\text{high}}) - B^{(n-1)}(\phi_{\text{low}}) \right] \sigma_z \\ & + \lambda_x \sigma_x x_t \left[C^{(n-1)}(B^{(n-1)}(\phi_{\text{low}})) - C^{(n-1)}(B^{(n-1)}(\phi_{\text{high}})) \right] \end{aligned} \quad (\text{IA.26})$$

In ‘bad’, volatile, high x times, the first and third terms in (IA.26) are particularly negative, leading to a

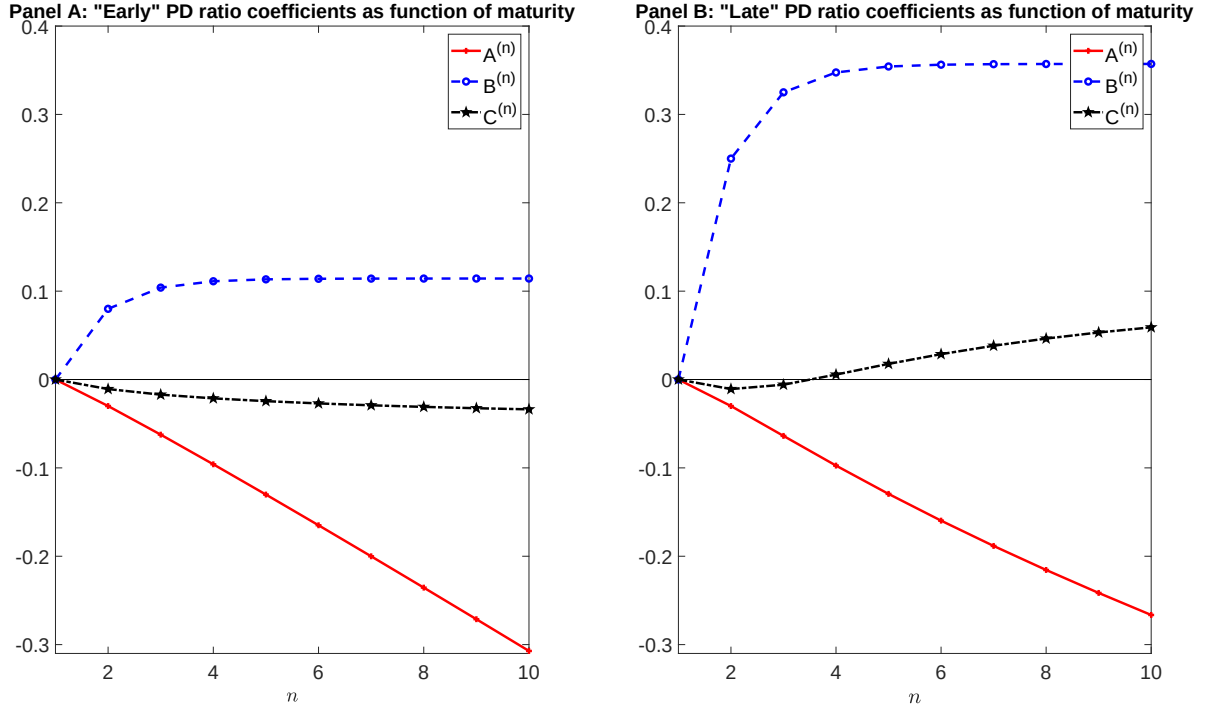


Figure IA.2: PD ratio coefficients of early and late dividend claims

PD-ratio coefficients $A^{(n)}$, $B^{(n)}$ and $C^{(n)}$ as functions of time to maturity n . The parameters are: $\mu = 0.01$, $\phi_i = 0.08$ (in Panel A) and $\phi = 0.25$ (in Panel B), $\sigma_d = 0.02$, $\rho_z = 0.3$, $\sigma_z = 0.1$, $\bar{x} = 0.15$, $\rho_x = 0.8$, $\sigma_x = 0.05$, $\phi_d = -0.5$, $\lambda_d = 0.5$, $\lambda_x = 0.7$, $\lambda_z = 0.1$, $r_f = 0.04$, $x_{low} = 0.1$, $x_{high} = 0.4$.

negative return differential between late and early timing stocks. In low volatility times, the effect of the second and third terms is prevalent, leading to a slightly positive return differential. When x is near its long-run mean, the two effects offset each other, and the return differential is close to zero.

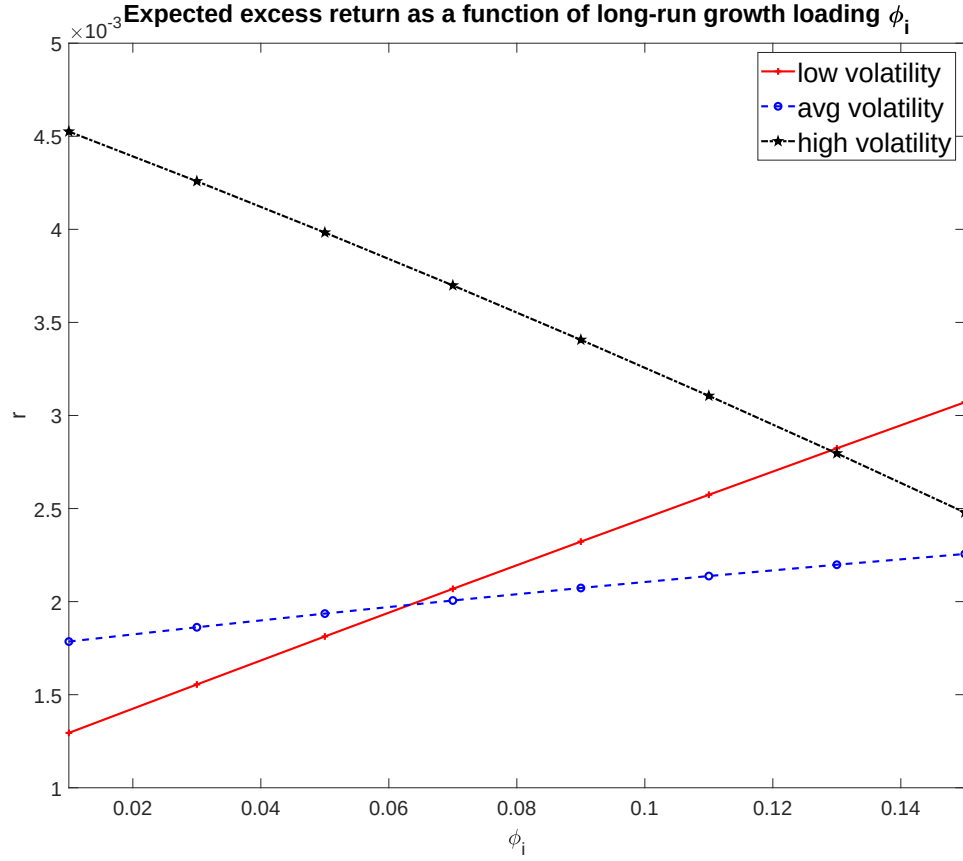


Figure IA.3: Conditional mean returns on dividend claims

Returns on dividend claims as functions of loading on persistent dividend growth ϕ_i . The parameters are as follows: $\mu = 0.01$, $\sigma_d = 0.02$, $\rho_z = 0.3$, $\sigma_z = 0.1$, $\bar{x} = 0.15$, $\rho_x = 0.8$, $\sigma_x = 0.05$, $\phi_d = -0.5$, $\lambda_d = 0.5$, $\lambda_x = 0.7$, $\lambda_z = 0.1$, $r_f = 0.04$, $x_{low} = 0.1$, $x_{high} = 0.4$.