

Implied Equity Duration: A Measure of Pandemic Shutdown Risk

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Abstract

Implied equity duration was originally developed to analyze the sensitivity of equity prices to discount rate changes. We demonstrate that implied equity duration is also useful for analyzing the sensitivity of equity prices to pandemic shutdowns. Pandemic shutdowns primarily impact short-term cash flows, thus they have a greater impact on low duration equities. We show that implied equity duration has a strong positive relation to US equity returns and analyst forecast revisions during the onset of the 2020 COVID-19 shutdown. Our analysis also demonstrates that the underperformance of ‘value’ stocks during this period is a rational response to their lower durations.

JEL Classification: M41, C23, D21, G32

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“The revenues and earnings for the majority of businesses over the next year or so will be extremely poor, and in some cases disastrous, but for companies with strong balance sheets, dominant market positions, and which do not need access to capital, the virus will likely only disrupt the next 12 to 24 months of cash flows. In a discounted cash flow valuation of a company, the loss or disruption of the first, and possibly second, year of cash flows, does not generally destroy more than 5% to 10% of the value of the business.”

-William A. Ackman, *Letter to the Shareholders of Pershing Square Holdings Ltd.*,
April 6, 2020

1 Introduction

Bond duration is a common summary measure of interest rate risk for fixed income securities. Dechow, Sloan, and Soliman [2004] adapt this measure to equity securities. They develop an algorithm for predicting the amount and timing of future cash flows on an equity security and then apply the standard duration formula to compute a measure of implied equity duration. They show that their measure of implied equity duration provides an effective measure of discount rate risk in equity securities.

In this paper, we demonstrate that implied equity duration is also effective in measuring the sensitivity of equity securities to unexpected macroeconomic events that disproportionately impact short run cash flows. Specifically, if an unexpected event causes near-term cash flows of firms to be severely curtailed but has relatively little impact on longer-term cash flows, then stocks with most of their expected future cash flows concentrated in the near-term (i.e., lower duration equities) will suffer the greatest loss in value.

The COVID-19 pandemic that broke out in early 2020 provides a natural setting to evaluate the ability of implied equity duration to capture this particular type of macroeconomic risk. It became clear during March of 2020 that many US firms would have to shut down or curtail their business activities. Return to normality was not expected until a vaccine became available, which was projected to take from 12 to 24 months. Thus, this event was anticipated to curtail the cash flows of many businesses for as long as two years. As investors adjusted their expectations to this new environment, it is reasonable to expect that equities with a greater proportion of their value based on near-term cash flows should suffer greater

declines in value.

We examine the ability of implied equity duration to explain US stock price behavior during the COVID-19 pandemic and find that it is effective in explaining both the magnitude and variability of equity returns. During the onset of the pandemic between January 2, 2020 and March 31, 2020, we find that the return from a hedge portfolio going long in the highest duration quintile (stocks with cash flows further into the future) and short in the lowest duration quintile exceeds 36%. We further find that this effect partially reverses around the announcement of unexpectedly good vaccine results in November of 2020, with the low duration stocks outperforming the high duration stocks by over 12%. Low duration equities also exhibit higher risk in the form of both higher shift in market beta and higher stock return volatility during the onset of the pandemic.

We extend our analysis to show how the concept of implied equity duration can also explain the poor performance of ‘value’ strategies over this time period. The value strategies that we consider are based on trailing earnings-to-price ratios and trailing book-to-market ratios measured prior to the onset of the pandemic. Dechow, Sloan, and Soliman [2004] show that these ratios are negatively correlated with implied equity duration. In particular, stocks with high earnings-to-price ratios and high book-to-market ratios tend to be stocks for which earnings and cash flows are in secular decline. Consequently, a greater proportion of their value is represented by near-term cash flows. Consistent with this explanation, we find that value stocks significantly underperform the market between January 2, 2020 and March 31, 2020. An implication of our analysis is that if the pandemic plays out as expected, curtailing cash flows for 12 to 24 months, then value stocks should suffer relatively greater permanent losses in value.

We conduct additional tests to both corroborate our explanation and evaluate alternative explanations. We first corroborate our explanation using analyst forecast revisions. An implication of our explanation is that the decline in investors’ forecasts of near-term cash flows around the onset of the pandemic will represent a greater proportion of firm value in

low duration stocks than in high duration stocks. We therefore investigate whether financial analysts' downward revisions in near-term earnings forecasts around the onset of the pandemic represent a greater proportion of firm value in low duration stocks than in high duration stocks. Our results are consistent with this prediction and establish a direct link between equity duration and changing expectations of near-term cash flows.

An alternative explanation for our findings is that our results are due to reductions in discount rates accompanying the onset of the pandemic that disproportionately benefit high duration stocks. Under this explanation, it is discount rate shocks, and not cash flow shocks, that explain our results. If discount rate changes are the main driver of our results, then high duration stocks should go up in value by more than low duration stocks. Yet, we show that our results are robust to eliminating observations that experienced increases in market value during the onset of the pandemic.

Another alternative explanation for our findings is that low duration equities happen to be in businesses whose operations are more seriously affected by a pandemic shutdown. For example, the pandemic shutdown causes a shift from in-person meetings to online meetings that disadvantages transportation and hotel stocks while benefiting technology stocks. However, we find that our results are robust to controlling for a variety of firm characteristics including industry membership and to eliminating observations with positive analyst forecast revisions around the onset of the pandemic.

Finally, our analysis indicates that both the low duration premium and the value premium can be explained by the 'disasters with quick recoveries' model proposed by Hasler and Marfe [2016]. Their model shows that short-term cash flows are more risky in a world that is characterized by rare disasters that are followed by quick recoveries. The reason is that longer-term cash flows are less affected by disasters due to the quick recovery time. The onset of the COVID-19 pandemic represents an example of a rare disaster that is expected to be followed by a quick recovery, through either herd immunity or the development of vaccines. Consistent with this explanation, we show that low duration stocks and value stocks suffer

greater declines in market value and greater increases in beta risk and volatility during the onset of the pandemic.

We conclude that implied equity duration is useful for evaluating the sensitivity of equities to pandemics and other rare disasters that are expected to have relatively quick recoveries. We hasten to add that a richer understanding of how any particular equity is affected by a pandemic requires a thorough analysis of a variety of firm characteristics including the extent to which the underlying business is impacted by pandemic shutdowns and the financial flexibility of the business to weather shutdowns. Nevertheless, implied equity duration serves as an intuitive measure for summarizing the exposure of individual equities and portfolios of equities to pandemic shutdowns as well as to other disasters that primarily impact short-run cash flows.

The remainder of the paper proceeds as follows. Section 2 reviews the literature on implied equity duration and describes the measure in more detail. Section 3 describes our sample, section 4 presents our empirical results, and section 5 concludes.

2 Background and Hypothesis Development

2.1 Prior Literature and Predictions

There is an extensive literature on bond duration and the measure is widely used by both practitioners and academics. Applying the concept of duration to equities, in contrast, is a newer and emerging area of research. The key challenge in estimating equity duration is in forecasting the amount and timing of future cash flows for equity securities. Dechow, Sloan, and Soliman [2004] generate cash flow forecasts using a fundamental analysis-based approach, which applies autoregressive processes to profitability and growth. They document that equity duration is positively correlated with various proxies for equity risk including price volatility and equity beta. Subsequent research employs alternative approaches to forecast future cash flows. For example, Da [2009] constructs an ex-post measure of equity

duration by discounting actual dividend payments, while Schroeder and Esterer [2016] use equity analysts' forecasts of earnings, and Goncalves [2020] uses an extended vector autoregression. Results are similar using these various approaches. We adopt the approach provided by Dechow, Sloan, and Soliman [2004] because it: (i) continues to be used in the finance literature [e.g., Weber, 2018]; (ii) is parsimonious and intuitive; and (iii) provides ex-ante forecasts of future cash flows using readily available data that allows us to analyze a broad sample of firms.¹

A prominent finding in the equity duration literature is that average future stock returns are lower for higher duration equities. A number of papers attempt to discern whether the differential returns are due to risk or mispricing. For example, Weber [2018] documents that the duration return spread is greater when market sentiment is higher. Similar to Dechow, Sloan, and Soliman [2004], Weber [2018] further finds that these returns are not explained by Fama and French [2015] risk factors. In contrast, Goncalves [2020] and Gormsen and Lazarus [2019] argue that the duration factor could be driven by a risk premium on near-term cash flows and find that risk-adjusted returns are higher on near-term cash flows than on more distant cash flows. Thus, there is mixed evidence on whether differential returns to the duration factor reflect risk or mispricing. We build on this stream of research by proposing that the higher long-run returns to low duration equities are consistent with a premium for the risk associated with short-term macroeconomic disasters that are followed by quick recoveries [see Nakamura, Steinsson, Barro, and Ursua, 2013; Hasler and Marfe, 2016]. High duration stocks provide ‘safety’ during such disasters, because their expected future cash flows are not concentrated in the next few years and hence are less vulnerable to short-run macroeconomic disasters.

Equity duration has also been used to better understand how default risk is priced by

¹In related research Binsbergen, Brandt, and Koijen [2012], Binsbergen, Hueskes, Koijen, and Vrugt [2013], and Binsbergen and Koijen [2017] document several stylized facts about the term structure of equity returns by analyzing short-term dividend claims on equity indices, including finding that short-term dividend claims have higher average returns than the aggregate market. Ai, Croce, Diercks, and Li [2018] propose a production-based general equilibrium model linking the timing of cash flows to expected returns both in the cross section of stocks and along the aggregate equity term structure.

investors. Alagarsamy [2019] documents that firms with higher default risk tend to have higher equity duration. Alagarsamy [2019] suggests that this occurs because more of the near-term cash flows for high default risk firms are used to cover their debt obligations. Therefore, high default risk firms take relatively longer to generate cash flows for their shareholders. Thus, Alagarsamy [2019] suggests that the empirical finding that high default risk firms earn lower future returns than firms with low default risk is because of a correlated duration effect (i.e., higher duration stocks earn relatively lower future returns). In our tests, we control for the effects of financial leverage and operating leverage. We do this because highly levered firms are likely to face greater default risk during the pandemic and hence experience greater reductions in value, *ceteris paribus*.

Our paper contributes to concurrent research seeking to understand the impact of the COVID-19 pandemic on equities. The impact of the COVID-19 pandemic on US consumers and the economy has been unprecedented. Coibion, Gorodnichenko, and Weber [2020a] show that the lockdowns associated with the onset of COVID-19 had a pronounced negative impact on economic conditions and household expectations, while Coibion, Gorodnichenko, and Weber [2020b] find that fiscal and monetary policy responses did little to improve household expectations. Indicators such as the University of Michigan’s Consumer Sentiment Index experienced drops not seen since the onset of the global financial crisis. In addition, the unemployment level in the United States hit a record 23 million by April 30, 2020. Sales at many companies, especially firms in the restaurant, bar, airline travel, and hotel businesses declined dramatically. Using text-based measures of the costs, benefits, and risks related to the spread of COVID-19, Hassan, Hollander, van Lent, and Tahoun [2020] find that the primary concerns of firms relate to the collapse of near-term demand as well as capacity reductions, closures, and employee welfare. In a related vein, Cheema-Fox, LaPerla, Serafeim, and Wang [2020] find that companies with more positive news coverage during the onset of the pandemic had less negative returns. Using dividend futures, Gormsen and Kojien [2020] explore how investors’ expectations about economic growth evolved across different

time horizons in response to the COVID-19 outbreak. Their forecasts of annual growth in dividends are lowest in the US and EU at the 2-year horizon, but show signs of catch-up growth from year 3 to year 10. Finally, Ding, Levine, Lin, and Xie [2020] examine firms across 56 economies and find that the decline in stock prices during the onset of the pandemic was milder among firms with stronger pre-2020 finances (more cash, less debt, and larger profits).²

The primary empirical prediction in our paper relates to the relation between implied equity duration and stock returns during the onset of the pandemic shutdown. The pandemic shutdown was expected to adversely impact the economy for the next one to two years. Thereafter, herd immunity and the development of vaccines and other medical innovations were widely anticipated to facilitate a broad recovery. Thus, we predict that firms with lower durations (i.e., firms with a larger proportion of their market value embedded in near term cash flows) will experience larger price declines during the onset of the pandemic shutdown. Moreover, to the extent that return co-movement and volatility during this period are primarily attributable to pandemic-related cash flow news, we predict that lower duration equities will have higher betas and higher return volatility during this period.

2.2 Measuring Implied Equity Duration

We employ the measure and estimation procedure for implied equity duration developed by Dechow, Sloan, and Soliman [2004] and subsequently refined by Weber [2018]. The estimation proceeds in two distinct steps. In the first step, estimates of future cash flows are generated. This step uses past financial variables along with autoregressive processes for profitability and growth to generate forecasts of future cash flows over a finite forecast horizon. Cash flows beyond the forecast horizon are assumed to be realized as a level

²A growing number of working papers explore other determinants of the cross-section of returns during the onset of the COVID-19 pandemic. Sinagl [2020] uses industry long-term cash-flow risk to explore the implications of the COVID-19 pandemic and finds that industries with firms having high cash-flow risk experienced abnormally low excess returns during the first three months of 2020. Pagano, Wagner, and Zechner [2020] find that firms that are more resilient, where resilience is defined as firms with operations that require less direct physical interaction, outperformed other stocks during the onset of the pandemic.

perpetuity and the current equity price is used in conjunction with an assumed discount rate to solve for the implied amount of this perpetuity. In the second step, the resulting cash flow stream is plugged into the standard bond duration formula to generate the implied equity duration. Note that the adjective ‘implied’ is included in this measure of equity duration because the terminal cash flows are imputed from the current market value of equity. This is in contrast to fixed income securities, for which all of the promised future cash flows are typically specified in advance. The resulting formula initially developed by Dechow, Sloan, and Soliman [2004] to measure implied equity duration is:

$$\text{Duration} = \frac{\sum_{t=1}^T t * \text{CF}_t / (1 + r)^t}{\text{ME}_0} + \left(T + \frac{1 + r}{r} \right) * \frac{\text{ME}_0 - \sum_{t=1}^T \text{CF}_t / (1 + r)^t}{\text{ME}_0} \quad (1)$$

Following Weber [2018], we use a finite forecast horizon (T) of 15 years and a discount rate (r) of 12%. ME_0 is the current market value of equity. We impute cash flows (CF) using the clean surplus relation:

$$\text{CF}_t = \text{Earnings}_t - \Delta \text{BE}_t = \text{BE}_{t-1}(\text{ROE}_t - g_t) \quad (2)$$

where ΔBE denotes the change in the book value of common equity and g_t denotes the growth rate in the book value of common equity. Following Dechow, Sloan, and Soliman [2004] and Weber [2018], we forecast ROE_t ($\text{Earnings}_t / \text{BE}_{t-1}$) by assuming that ROE_0 follows a first-order autoregressive process with a persistence coefficient of 0.39 and a long-run mean of 12% and we forecast growth in book equity (g_t) by assuming that g_0 follows a first-order autoregressive process with a persistence coefficient of 0.21 and long-run mean of 6%.³ Further, following Dechow, Sloan, and Soliman [2004], we estimate g_0 using sales rather than book value of equity because Nissim and Penman [2001] show current growth

³The choice of 12% for the discount rate and 6% for the long-run mean growth rate are chosen for consistency with Dechow, Sloan, and Soliman [2004] and Weber [2018]. The persistence coefficients are based on the pooled within sample estimates for our entire sample period. Dechow, Sloan, and Soliman [2004] and Weber [2018] use within sample estimates from their own samples and obtain persistence coefficients for ROE of 0.57 and 0.41 respectively and g of 0.24 and 0.24 respectively.

in sales provides a more accurate forecast of future growth in book equity than does using current growth in book equity.

The formula for implied equity duration embodied in equations (1) and (2) is related to three well-known characteristics of the underlying equity securities:

- (i) it is decreasing in the current earnings-to-price ratio ($\text{Earnings}_0/\text{ME}_0$),
- (ii) it is decreasing in the current book-to-market ratio (BE_0/ME_0), and
- (iii) it is increasing in the current growth rate (g_0).

Below, we consider four special cases that provide the intuition behind these relations.

Case 1: $\text{Earnings}_t = \text{BE}_t = 0$ for all $t \leq T$

In this case, the forecasts of cash flows in the finite forecast period are all zero and the formula for equity duration reduces to:

$$\text{Duration} = T + \frac{1+r}{r} \quad (3)$$

With $T=15$ and $r=12\%$, the resulting duration is 24.33 years. In such a firm, all value is embedded in future growth opportunities that are reflected in the terminal value. Thus, Case 1 provides a good calibration for a high duration stock. Note, that it is possible for duration to exceed 24.33 years in firms that plan to make investments during the finite forecasting period, and thus have negative cash flows during this period.

Case 2: $\text{ROE}_t = \text{ROE}_0$ and $g_t = 0$ for all $t \leq T$

In this case, Dechow, Sloan, and Soliman [2004] show that the formula for implied equity duration simplifies to:

$$\text{Duration} = T + \frac{1+r}{r} - \frac{\text{Earnings}_0}{\text{ME}_0} \times \frac{T}{r} \quad (4)$$

This expression highlights that duration is decreasing in the earnings-to-price ratio. Intuitively, the forecasts of cash flows in the finite forecast period are all equal to Earnings_0 and so a higher Earnings_0 implies a greater proportion of ME_0 is generated in the finite

forecast horizon, thus decreasing duration. Note that current book value is irrelevant in this special case. A limiting version of this special case arises when the earnings-to-price ratio equals the discount rate. Under such conditions, forecast cash flows are identical in all future periods and duration is equal to $\frac{1+r}{r}$, which is simply the formula for the duration of a level perpetuity. With $r = 12\%$, the duration of the level perpetuity is 9.33 years. Thus, a firm with no growth opportunities and generating a level stream of cash flows will have a duration of 9.33 years.

Case 3: $\text{ROE}_t = r$ and $g_t = 0$ for all $t \leq T$

In this case, Dechow, Sloan, and Soliman [2004] show that the formula for implied equity duration simplifies to:

$$\text{Duration} = T + \frac{1+r}{r} - \frac{\text{BE}_0}{\text{ME}_0} \times T \quad (5)$$

This expression highlights that duration is decreasing in the book-to-market ratio. Intuitively, the forecasts of cash flows in the finite forecast period are all equal to $r \times \text{BE}_0$ and so a higher BE_0 implies a greater proportion of ME_0 is generated in the finite forecast horizon, thus decreasing duration. Note that current earnings are irrelevant in this special case. A limiting version of this special case arises when the current book-to-market ratio equals one. Under such conditions, duration is again equal to $\frac{1+r}{r}$, since all cash flows are again realized as a level perpetuity. Finally, note that Cases 2 and 3 represent special cases where current ROE either persists indefinitely (Case 2) or immediately reverts to the discount rate (Case 3). In our more general model, ROE follows a first-order autoregressive process with a coefficient of 0.39, so forecasts of future cash flows incorporate information in both current earnings and current book value. A higher coefficient means that more weight is placed on current earnings versus current book value in forecasting future cash flows.

Case 4: $\text{ROE}_t = g_t > 0$ for all $t \leq T$

This case allows for positive growth that exactly equals the periodic ROE during the finite forecasting horizon. Under such conditions, all earnings are reinvested to support future growth and so all cash flows are zero during the finite future forecasting horizon. This means

that the duration measure is the same as in Case 1:

$$\text{Duration} = T + \frac{1+r}{r} \quad (6)$$

A comparison of Case 4 with Cases 2 and 3 highlights that duration is generally increasing in growth (g_t). Cash flows in the finite forecasting horizon are increasing in profitability but decreasing in growth. Intuitively, as the firm invests more in the finite forecast horizon, a smaller proportion of ME_0 is represented by cash flows from the finite forecast horizon, and so duration increases.

Our more general model incorporates several parameters that are assumed to be cross-sectionally and temporally constant including the discount rate (r), the terminal period profitability (ROE_T) and the terminal growth rate (g_T). Weber [2018] shows that the key results for duration are relatively insensitive to incorporating temporal changes across the entire sample. This is because most of the results are based on cross-sectional rankings of duration, so changing these parameters for all firms has little impact on the relative duration rankings within each cross-section. It is, however, reasonable to expect variation in both these parameters and the autoregressive coefficients across firms in a given cross-section. Doing so could lead to more accurate forecasts of future cash flows and hence better measures of duration. Following Dechow, Sloan, and Soliman [2004] and Weber [2018], we do not attempt this ambitious exercise and acknowledge that not doing so is a limitation of our duration estimates.⁴

We close this section by providing examples of a low duration equity and a high duration equity in the same industry at the end of 2019. We use a discount rate of 6% and a terminal growth rate of 0% in these examples because they more closely approximate the macroeconomic setting at the end of 2019. With these rates, the duration of the terminal

⁴Other researchers have attempted such improvements. For example, Fullana, Nave, and Toscano [2016] estimate equity duration using industry-specific parameters for forecasting and discounting future cash flows as opposed to the market-wide parameters used previously. They provide evidence that this new procedure improves the ability of implied equity duration to capture stock price risk. We employ the original approach for parsimony.

perpetuity is 32.67 years and the duration of a level annuity is 17.67 years. We use General Motors Corporation (GM) as an example of a low duration equity and Tesla, Inc. as an example of a high-duration equity. While both of these firms belong to the automobile industry, we recognize that they may serve different market segments and thus experience different shocks to demand during a pandemic. Thus, we use them as illustrative examples, while recognizing that they may differ on other characteristics in addition to duration.

At December 31, 2019, GM had an earnings-to-price ratio of 0.17, a book-to-market ratio of 0.85 and a sales growth rate of -1%. Its high value-to-price ratios are consistent with investors anticipating stagnating fundamentals, while the negative growth rate suggests that GM will have low future investment. GM's implied equity duration is only 17.14 years, which is less than the level annuity rate of 17.67 years. This is because GM's cash flows are expected to gradually decline. Panel A of [Figure 1](#) plots the forecast future cash flow stream entering GM's duration computation. Expected cash flows are highest in 2020 and steadily decline over the finite forecast horizon. Further, cash flows are forecast to stay about the same in year 2035, as we move beyond the finite forecast horizon. It is clear from this plot that the cash flows originally anticipated for 2020 and 2021 represent a significant proportion of GM's overall equity value. Setting cash flows to zero in years 2020 and 2021 reduces GM's value by 17 percent.

([Figure 1](#) here)

In comparison, Tesla had an earnings-to-price ratio of -0.01, a book-to-market ratio of 0.08 and a current growth rate of 39%. Its low value ratios imply that investors anticipate improving fundamentals and the high growth rate implies that new investment is likely a significant drag on short-term cash flows. Tesla's implied equity duration is 31.97 years, which is close to 32.67 years, the duration in the special case in which all cash flows are realized in the terminal perpetuity. Panel B plots the forecast cash flow stream entering the duration computation. Expected cash flows are negligible over the finite forecast horizon and then experience an abrupt increase in the terminal year (i.e., 2035). It is clear from this

plot that the cash flows originally anticipated for 2020 and 2021 represent an insignificant proportion of the overall value of Tesla's equity. Setting these cash flows to zero changes Tesla's equity value by less than 1 percent. This stark contrast to GM's 17 percent decline highlights the usefulness of implied equity duration in pinpointing which firms should lose more of their value at the onset of a pandemic shutdown, such as the shutdown for COVID-19.

3 Sample and Variable Measurement

We obtain daily stock return data from the Center for Research in Security Prices (CRSP), annual and quarterly financial data from Compustat, analyst forecast data from I/B/E/S and the market return and risk-free rate from Kenneth French's website. Our sample includes common shares (CRSP share code 10 or 11) of firms listed on the NYSE, Amex, or Nasdaq (CRSP exchange code of 1, 2, or 3). We set missing performance related delisting returns equal to -35% for NYSE and Amex listed firms and -55% for Nasdaq listed firms following Shumway [1997] and Shumway and Warther [1999]. We form portfolios at the end of each December and assume a 3-month lag on public availability of financial information. That is, we use financial information from fiscal periods ending no later than September-end when forming portfolios at December-end.

We use quarterly Compustat data supplemented with annual Compustat data when quarterly data is missing. For quarterly income statement items, we sum over the most recent four quarters to obtain an annual amount. Book-to-market (BE/ME) is the ratio of book equity (BE) computed as in Davis, Fama, and French [2000], to December-end market equity (ME). Earnings-to-price (earnings/ME) is the ratio of income before extraordinary items to December-end market equity. Financial leverage is calculated as total debt (debt in current liabilities plus long term debt) to total assets. Following Chen, Chen, Li, and Li [2020], operating leverage is calculated as fixed operating expenses (depreciation plus selling, gen-

eral, and administrative expenses) to assets. Following Dyreng and Hanlon [2020], we define a multinational corporation indicator variable (MNC) that equals one if the firm has non-missing values of pretax foreign income, foreign income taxes or deferred foreign income taxes, and zero otherwise. Excess return is the percent annualized stock return in excess of the risk-free rate (daily excess return \times 252).

We also compute three variables based on analyst forecasts for our pandemic sample. First, we compute the pre-pandemic forecast yield, defined as the median forecast of annual EPS for the next fiscal year (FY2) to the current price as of December-end 2019. Second, we compute the Q2 2020 earnings revision, defined as the change in the median forecast of quarterly EPS for the second calendar quarter of 2020 between December-end 2019 and May-end 2020. We define the second calendar quarter as any fiscal quarter ending in June, July, or August (i.e., the first full post-pandemic quarter) and we deflate the revision by price at December-end 2019. Third, we compute the Q2 2020 earnings surprise, defined as the difference between the I/B/E/S actual EPS and the corresponding median forecast at December-end 2019, again deflated by price at December-end 2019. When computing median analyst forecasts, we use the most recent forecast per analyst as long as it is not more than two months old. That is, a May-end forecast is based on the most recent forecast per analyst at May-end, as long as that forecast is made in either April or May. This ensures there are no stale pre-pandemic estimates in the sample. All forecasts and prices are adjusted for stock splits.

For value-weighted portfolios and regressions, we use beginning-of-period market values of equity as weights, $w_{it} = \text{ME}_{it-1} / \sum \text{ME}_{it-1}$, where $\sum \text{ME}_{it-1}$ denotes the sum of the lagged market values of equity of all stocks in the cross-section (for regression weights) or all stocks in the portfolio (for portfolio weights). For the Fama and MacBeth [1973] regressions in Tables 7, 8, and 9, we use explanatory variables based on information available as of December-end 2019, so that they do not reflect information relating to the onset of the pandemic. We winsorize all non-return variables at the one percent tails of the distribution in [Table 1](#) and

[Table 6](#), and likewise winsorize the sorting variables in Tables [3](#) through [5](#). In Tables [7](#), [8](#), and [9](#), we transform the explanatory variables into values ranging between zero and one using cross-sectional quintile ranks so that the magnitudes of the coefficients can be directly compared to the quintile sorts in Tables [3](#) through [5](#) and resemble the returns to a hedge portfolio. This transformation is given by: $(q\text{Rank}-1)/(4)$ where qRank is the cross-sectional quintile rank (1 for lowest quintile, 5 for highest quintile).

We present our primary results using daily stock return data. Previous research generally uses monthly stock returns but given the pandemic-onset period in our sample spans only 3 months, the use of monthly data provides an insufficient time series for parameter estimation and statistical inference. For ease of interpretation, we annualize all daily return statistics by multiplying by 252 (or $\sqrt{252}$ in the case of volatility). We estimate Dimson [1979] adjusted CAPM alphas and betas by running the following time-series regression for each quintile portfolio over 14,097 days (January 1964 – December 2019) during the pre-pandemic period, and over 62 trading days (January 2, 2020 – March 31, 2020) for the pandemic period:

$$r_t^p = \alpha + \beta_1 r_{t-1}^m + \beta_2 r_t^m + \beta_3 r_{t+1}^m + e_t \quad (7)$$

where r_t^p is the return on portfolio p , r_t^m is the return on the CRSP value-weighted market index in excess of the risk-free rate, $\beta_1 + \beta_2 + \beta_3$ is the CAPM beta, and α is the CAPM alpha. Incorporating a lead and a lag market return helps adjust for bias in beta estimation when using daily return data potentially caused by non-synchronous trading [Dimson, 1979].

4 Empirical Results

4.1 Descriptive Statistics

[Table 1](#) provides descriptive statistics for the primary variables in each of our two sample periods. We compare the pre-pandemic period (the 14,097 trading days from 1964 to 2019)

to the pandemic period, (the 62 trading days from January 2 to March 31, 2020). Panel A indicates that all variables have means that differ significantly across the two periods. All variables in the 2020 pandemic column excluding excess returns are calculated as of December-end 2019. The average duration is 19.28 years in the pandemic period versus 17.41 years in the pre-pandemic period, likely reflecting the changing composition of the US economy from manufacturing (lower duration firms) toward technology (higher duration firms). BE/ME falls from 0.85 to 0.70 and Earnings/ME falls from 0.09 to 0.06 from the pre-pandemic period to the pandemic period. This is consistent with stocks having lower discount rates and/or greater expected growth opportunities at the onset of the pandemic compared to the earlier time period. Financial leverage increases from 0.23 to 0.27, while operating leverage declines from 0.29 to 0.27. Finally, excess returns are highly negative during the pandemic period with a mean quarterly return of -28% (an annualized return of -112%), consistent with a strong negative market reaction to the realization that the economy faced a short-term pandemic-related shutdown.

Correlations between variables are provided in Panel B for the pandemic period and Panel C for the pre-pandemic period. In both panels, duration has a strong negative correlation with BE/ME and Earnings/ME and a strong positive correlation with sales growth. These correlations are consistent with the theoretical relations established in section 2.2. The Pearson correlation of duration with excess returns switches from negative (-0.01) in the pre-pandemic period to positive (0.01) in the pandemic time period. Thus, in ‘normal’ market conditions, high duration stocks earn lower future returns, consistent with our hypothesis that investors view them as having lower risk, while during the onset of the pandemic, high duration stocks earn higher future returns. We explore these relations in more detail in the remaining tables.

(Table 1 here)

Table 2 shows how duration varies across industries at the beginning of the pandemic period. The low duration industries are mainly in the energy and financial sectors, while the

high duration industries are primarily in the technology and health sectors. The final column of [Table 2](#) reports the average stock return for each industry during the first quarter of 2020. This ranges from a low of -63.33% for Coal to a high of 3.95% for Medical Equipment. The (untabulated) correlation between the average industry duration and the average industry return for the first quarter of 2020 is 0.62. Industry returns are likely to be impacted by other industry-level factors that may be correlated with duration (e.g., whether the industry involves personal interaction versus online interaction). We incorporate industry fixed effects in some of our subsequent analyses to control for the impact of potentially correlated omitted industry-level variables (see Tables [7](#), [8](#), and [9](#)).

([Table 2](#) here)

4.2 Primary Results

Our primary results are presented in Tables [3](#) through [5](#) and illustrated graphically in Figures [2](#) and [3](#). These results are based on quintile portfolios formed by sorting on the relevant firm characteristic (duration, book-to-market, and earnings-to-price respectively).

[Table 3](#) presents results for duration-sorted quintiles, with Panel A reporting value-weighted portfolio characteristics and Panel B reporting equal-weighted portfolio characteristics. To provide a direct comparison of how each portfolio characteristic changed in the pandemic period relative to the pre-pandemic period, we first present each portfolio characteristic for the pandemic period and then report the same characteristic for the pre-pandemic period immediately below.

The first two rows of Panel A of [Table 3](#) report the portfolio average duration, which is the sorting variable. In the pandemic period, duration ranges from 13.94 years for the lowest quintile to 23.53 years for the highest quintile, while in the pre-pandemic period the corresponding range is from 9.19 years to 23.25 years. The next two rows report the annualized excess returns for the two periods. Consistent with our primary prediction, the pandemic period excess returns are monotonically increasing in duration. The annualized

spread between the highest duration quintile and the lowest duration quintile is 145%, which is both statistically and economically significant. Recall that this is an annualized number, so it reflects a return differential over the 3-month pandemic period of about 36%. In contrast, the corresponding spread for the pre-pandemic period is -4%. This is consistent with prior research showing that returns have historically been decreasing in duration [see Dechow, Sloan, and Soliman, 2004; Weber, 2018]. The next two rows report the CAPM alphas. The spread in the pandemic period declines somewhat to 120%, while the pre-pandemic period spread is -5%. The next two rows report the CAPM betas and explain the lower CAPM alpha spread in the pandemic period. During this period, the lowest duration portfolio has the highest beta, reflecting its higher sensitivity to the pandemic shutdown. This contrasts with the pre-pandemic period, where the highest duration portfolio has the highest beta and this has been attributed to discount rate risk [see Dechow, Sloan, and Soliman, 2004]. The final two rows report volatility (i.e., the annualized standard deviation of daily portfolio returns). Stock return volatility is elevated in the pandemic period and the low duration portfolios have significantly greater volatility. These results suggest that short-run cash flow risk was the dominant source of risk in the pandemic period.

Panel B of [Table 3](#) reports the corresponding equal-weighted portfolio results. While qualitatively similar, the return spreads in the pandemic period are not as large (excess return of 101%) and the return spreads in the pre-pandemic period are stronger (-13%). The results for the risk characteristics are somewhat different using equal-weighting. Consistent with Dechow, Sloan, and Soliman [2004] we see that both CAPM beta and volatility are increasing in duration during the pre-pandemic period. Dechow, Sloan, and Soliman [2004] attribute this relation to the greater sensitivity of high duration equities to discount rate shocks. These relations are significantly attenuated in the pandemic period, but they do not reverse as they did in the value-weighted results. Thus, for the low duration stocks in the pandemic period, the heightened cash flow risk offsets the lower discount rate risk.

[Figure 2](#) and [Figure 3](#) provide a graphical illustration of the results in [Table 2](#). These

illustrations highlight the sharp divergence in the relation between duration and stock returns between the pandemic and pre-pandemic periods. The weak negative relation in the pre-pandemic period is replaced by a strong positive relation in the pandemic period.

([Table 3](#) and [Figure 2](#) and [Figure 3](#) here)

Next, we analyze whether forming portfolios based on common measures of value (i.e., BE/ME and Earnings/ME) produces similar results to portfolios based on duration. Recall that stocks with high scores on these measures of value tend to have low equity duration, so we expect the results in [Table 3](#) to reverse when forming portfolios using these value-to-price based measures. [Table 4](#) presents the results for forming portfolios on BE/ME. The results are basically the reverse of those in [Table 3](#), though the magnitudes of the high minus low quintile spreads are somewhat smaller. For example, the annualized excess return spread in the pandemic period is -122% when sorting on BE/ME versus 145% when sorting on duration. [Table 5](#) reports similar results for sorting on Earnings/ME. Again, the results are essentially the reverse of the [Table 3](#) results, but the magnitudes of the high minus low quintile spreads are somewhat smaller. For example, the annualized excess return spread in the pandemic period is -130% when sorting on Earnings/ME versus 145% when sorting on duration. These results suggest that the value measures serve as noisy proxies for duration, thus explaining the poor performance of value at the onset of the pandemic.

4.3 Additional Results

The results thus far both confirm the findings of previous research in the pre-pandemic period and show that these relations experienced a substantial shift in the pandemic period. Specifically, consistent with our primary empirical prediction, duration flips from having a negative relation with stock returns in the pre-pandemic period to a strong positive relation with stock returns during the onset of the pandemic. In this subsection, we report the results of several additional tests that seek to corroborate our explanation for these results.

4.3.1 Analyst Forecast Results

Our explanation involves investors reducing their forecasts of near-term cash flows during the onset of the pandemic, with this reduction having a greater impact on the value of lower duration stocks. In our next table, we provide corroborating evidence by using analyst forecasts of EPS to proxy for investor expectations of future cash flows. Specifically, we predict that once financial analysts become aware that a shutdown is imminent, they will revise their forecasts of near-term earnings downward, and these revisions will represent a greater proportion of firm value for lower duration stocks. In other words, we predict that there will be a positive relation between analysts' EPS forecast revisions (scaled by price) and duration.

[Table 6](#) examines the relation between duration and analysts' EPS forecasts during the onset of the pandemic. We begin by reporting pre-pandemic forward earnings yields. We construct this variable by dividing the consensus forecast of EPS for the next fiscal year (FY2) by stock price, with both variables being measured at December-end 2019. Our goal with this variable is to corroborate that our measure of duration is effective in identifying firms for which near-term expectations of earnings represent a greater proportion of firm value immediately prior to the pandemic. Panel A of [Table 6](#) reports the results using value-weighted averages. The forward earnings yield is monotonically decreasing in duration, confirming the validity of our measure of duration. Panel B of [Table 6](#) reports similar results using equal-weighted averages. While equal-weighting does not produce a perfectly monotonic negative relation between duration and forward earnings yields, the negative spread between the low duration quintile and the high duration quintile is even more pronounced. Higher forward earnings yields for lower duration equities are consistent with near term cash flows representing a larger proportion of market value in lower duration equities.

([Table 6](#) here)

Next, we examine the consensus revision in the forecast of EPS for the second calendar quarter of 2020 (i.e., the quarter ending in either June, July, or August 2020). The revision is

measured from December-end 2019 to May-end 2020. We take the ending consensus forecast at May-end 2020 even though our period for measuring pandemic stock returns ends at March-end 2020. We make this choice because we use forecasts that are up to two months old, and we want to make sure that all forecasts are made after March-end 2020 (i.e., we exclude stale forecasts made before analysts became aware of the pandemic when calculating the revision). We then divide the forecast revision by the stock price at December 31, 2019. Note that this choice of deflator is appropriate, because we predict that the reduction in near-term cash flows will represent a greater proportion of pre-pandemic firm value for low duration stocks. The results are presented in the second rows of Panels A and B in [Table 6](#). The average forecast revisions are negative for all duration quintiles and are monotonically increasing in duration (i.e., high duration equities have the smaller downward revisions). These results mirror the results that we saw for excess stock returns and CAPM alphas in [Table 3](#). Thus, they provide corroboratory evidence that the stock return results in [Table 3](#) reflect changing expectations of near-term cash flows.

One issue with the results in [Table 6](#) is that the magnitudes of the negative forecast revisions seem somewhat small when compared to the magnitude of the stock returns in [Table 3](#), particularly in the value-weighted results. For example, the stock returns at the onset of the pandemic for low duration stocks are about 30% lower than for high duration stocks. In contrast, the downward revisions in earnings for the second fiscal quarter of 2020 for the low duration stocks are 1.6% lower than for the high duration stocks. A differential of this magnitude would have to persist for about 20 quarters in order to explain the stock return differential. This seems too long given that the pandemic was generally expected to last between 4 to 8 quarters. There are, however, other explanations for this differential. First, analyst forecasts have historically been slow to fully reflect negative information [see Elliot, Philbrick, and Wiedman, 1995; Easterwood and Nutt, 2002], and given the uncertainty surrounding the pandemic, analysts may have chosen not to be overly pessimistic. Second, investors could have initially over-estimated the impact of the pandemic on near-term cash

flows. Third, the lower stock returns could reflect expectations of costs of financial distress caused by the pandemic but not yet fully reflected in Q2 2020 earnings.

Finally, we report the realized earnings surprise for the second calendar quarter of 2020, computed as the difference between the realized EPS reported on I/B/E/S and the median forecast of EPS at December-end 2019. We then divide the surprise by the stock price at December 31, 2019. The results are presented in the third rows of Panels A and B in [Table 6](#). The average EPS surprises are negative with the exception of a positive surprise for the high duration value-weighted portfolio, and are monotonically increasing in duration. These results are very similar to the results for revisions in the previous row. Thus, they indicate that low duration stocks not only had larger negative forecast revisions, but also large negative realized earnings surprises.⁵

4.3.2 Controls for Potential Correlated Omitted Variables

One concern with the stock return results presented in Tables 3 through 5 is that we have not controlled for other factors that could explain the differential stock price response and could also be correlated with duration (e.g., industry membership). Therefore, our next set of results, presented in [Table 7](#), employ regression analysis to incorporate additional controls into our stock return tests for the pandemic period. We include controls for financial leverage, operating leverage, loss firms, firm size, and multinational corporations. We also provide results incorporating industry fixed effects to control for the exposure of the underlying business to the pandemic shutdown. Note that all explanatory variables except for indicator variables are transformed to quintile ranks and scaled to range from 0 to 1. We estimate 62 daily cross-sectional regressions and report the time-series averages of the resulting coefficients [Fama and MacBeth, 1973].

The results are broadly consistent with those reported in Tables 3 through 5. For exam-

⁵In unreported tests, we find analogous analyst forecast results for quintile sorts on the book-to-market ratio and the earnings-to-price ratio. Recall that these ratios are negatively related to duration and so the relations are reversed relative to those reported for duration in [Table 6](#).

ple, the coefficient on duration in the column (1) of Panel A is 142.65, which corresponds to the 145.49% excess return in the third row of [Table 3](#) Panel A. The regressions in column (2) of Panel A incorporate industry fixed effects and we see that the explanatory power increases substantially and the coefficient on duration declines to 113.83% but remains statistically significant. The decline in coefficient magnitude arises because, as shown in [Table 2](#), low duration industries tended to have lower returns during the onset of the pandemic. Yet, the relation between duration and returns remains strong even after controlling for industry membership. Columns (3) through (6) show that stock returns also continue to have a strong negative relation with the two value-to-price measures. The additional controls are generally insignificant (with the exception of leverage and ME in some specifications and several industry indicators, which are not reported). Financial leverage consistently enters the regressions with a negative coefficient but is generally insignificant.

([Table 7](#) here)

4.3.3 Evaluation of Alternative Potential Explanations

The results presented thus far are consistent with our prediction that low duration stocks under-performed high duration stocks because a larger proportion of their cash flow stream is negatively impacted by the coronavirus shutdown. We next discuss two other potential explanations for our results.

First, the pandemic was accompanied by a significant reduction in interest rates. For example, the yield on the 10-year US Treasury note fell from 1.9% on December 31, 2019 to 0.7% on March 31, 2020. If the reduction in interest rates led to a reduction in the discount rates on equities, it should cause an increase in equity values. Moreover, the increase in equity values should be greater for higher duration equities (since their cash flows are more distant and hence more heavily discounted). Note that falling discount rates can provide only a partial explanation for our results. It can explain why low duration stocks under-

performed high duration stocks, but not why both low and high duration stocks experienced negative average returns. Moreover, we have already demonstrated that the magnitude of downward revisions in analysts' forecasts of near-term earnings during the onset of the pandemic were greater for low duration stocks than for high duration stocks. These results establish a direct link between equity duration and changing expectations of near-term cash flows. To further examine the discount rate explanation, we check whether the positive relation between duration and pandemic stock returns is robust to eliminating firms with positive stock returns. In doing so, we seek to eliminate stocks that experienced an increase in value due to a reduction in discount rates.

Second, it is possible that duration happens to sort equities on characteristics of their underlying businesses that determine the inherent exposure of their sales, profits, and cash flows to a pandemic shutdown. While our explanation essentially assumes that all firms suffer a proportionate decline in near-term cash flows, firms in some lines of business should suffer a sharp decline (e.g., airlines), while firms in other lines of business should experience an increase (e.g., videoconferencing technology). We provide two sets of tests that help discriminate our explanation from this differential business exposure explanation. First, we have already shown that the relation between duration and stock returns during the onset of the pandemic is robust to controlling for a number of firm characteristics including industry membership. Second, we also examine whether the relation is robust to eliminating firms for which analysts had upward revisions in earnings forecasts during the onset of the pandemic.

Table 8 replicates the results in **Table 7** after excluding all observations with a positive cumulative return for the first quarter of 2020. A positive stock return during the onset of the pandemic is inconsistent with the expected curtailment of near-term cash flows and consistent with either lower discount rates or higher expected cash flows. Thus, we seek to rule out the possibility that these other explanations drive our results. The exclusion of observations with positive returns reduces the sample size by 7.5%. Eliminating these observations has little impact on our results. For example, the coefficient on duration in

column (1) of Panel A drops only slightly from 142.65 ($t=3.91$) to 135.48 ($t=3.89$).

(Table 8 here)

Table 9 replicates the results in **Table 7** after excluding all observations with a positive revision in analysts' consensus forecast of earnings for the second quarter of 2020. A positive forecast revision during the onset of the pandemic is inconsistent with the expected curtailment of near-term cash flows. Thus, we seek to rule out the possibility that such observations drive our results. The exclusion of observations with either positive forecast revisions or observations that are missing forecast revisions (i.e., firms not covered by analysts) reduces the sample size to 57% of the full sample. Eliminating these observations has little impact on our results. For example, the coefficient on duration in column (1) of Panel A changes only slightly from 142.65 ($t=3.91$) to 144.82 ($t=3.90$).

(Table 9 here)

In summary, our additional tests provide direct evidence that low duration stocks experienced larger downward revisions in near-term earnings during the onset of the pandemic. Moreover, we find that our results are robust to controlling for characteristics that reflect other explanations for sensitivity to a pandemic shutdown. We close this section by providing some additional descriptive evidence on the performance of duration-sorted quintile portfolios during the onset of the pandemic and during the subsequent announcements of promising vaccines.

4.3.4 Performance of Duration Portfolios During Onset of Pandemic

Figure 4 and **Figure 5** provide evidence on the properties of a 'duration factor.' In the spirit of Weber [2018] we construct this factor as the return on a hedge portfolio that goes long in the lowest duration quintile and goes short in the highest duration quintile. Weber [2018, Figure 3] plots the time-series relation between the hedge returns for the duration factor and the market return from 1964 to 2014. He finds that the correlation between the equal-weighted duration factor and the market is -29.17%. We provide a similar time-series

analysis in [Figure 4](#) but extend the time period from 2014 to March 2020 (i.e., we include the onset of the pandemic).

[Figure 4](#) Panel A presents returns for a value-weighted duration factor and Panel B presents returns for an equal-weighted duration factor. Note that the duration factor is the return to quintile Q1 (low duration stocks) minus quintile Q5 (high duration stocks) and has an historical positive average return spread. We shade time periods of NBER economic recessions in grey. [Figure 4](#) shows that, consistent with Weber [2018], there is generally a negative relation between the duration factor and the market return. We find a similar negative correlation of -25.63% in our extended sample (excluding the pandemic period to facilitate comparison to Weber [2018]) for the equal-weighted duration factor, while the value-weighted duration factor has a correlation of -0.71%. However, this negative relation reverses during the financial crisis (2008-2009) and the pandemic (2020). We posit that this reversal arises because the temporary curtailment of cash flows during these two short-term macroeconomic disasters has a disproportionately negative impact on the value of low duration stocks.

([Figure 4](#) and [Figure 5](#) here)

[Figure 5](#) provides a short-window analysis of the duration quintile portfolios during the pandemic onset period from January 2, 2020 to March 31, 2020. This figure includes the news events that Gormsen and Koijen [2020] identified to be important in updating investors on the severity of the pandemic. The spread between the high duration and low duration portfolios widens considerably during the middle of March, which coincides with the EU travel ban and the declaration of a national emergency in the US. [Figure 5](#) illustrates how duration is effective in identifying securities with greater exposure to pandemic risk.

([Figure 6](#) here)

4.3.5 Performance of Duration Portfolios During Vaccine Breakthroughs

Figure 6 provides a short-window analysis of the duration quintile portfolios around the announcements of two successful vaccine trials in November of 2020. These announcements improved expectations of a timely resolution to the pandemic. The first announcement, made by Pfizer on November 9, revealed that its vaccine candidate was found to be more than 90% effective in preventing COVID-19. Dr. Anthony Fauci, the U.S. government's top infectious-disease expert, said these results were "just extraordinary," adding: "Not very many people expected it would be as high as that." The second announcement, made by Moderna on November 16, revealed that Moderna's vaccine efficacy was 94.5%. This announcement was also notable in that Moderna's vaccine did not require the same extreme cold storage conditions as Pfizer's vaccine, thus making it easier to distribute. Dr. Fauci, described these results as "an extraordinarily important advance." The stock market responded positively to both announcements, with the S&P 500 rising 1.2% on November 9 and 1.2% on November 16. These announcements reduced the likelihood that the pandemic would extend beyond the summer of 2021. Before these announcements, there was concern that the pandemic could continue through to 2022.⁶

Since these announcements improved forecasts of business conditions for the latter part of 2021 through the end of 2022, they are expected to primarily increase the valuations of lower duration stocks. Figure 6 shows that this is indeed the case. In a reversal of what we saw during the onset of the pandemic, the lower duration stocks have the highest returns and the high duration stocks have the lowest returns. The magnitude of the return differentials are striking. For the eight trading days from November 6 through November 17, the low duration portfolio outperforms the high duration portfolio by over 12% using value weighting and over 7% using equal weighting. These differences are highly economically and

⁶The Pfizer and Moderna announcements can be accessed at [Pfizer](#) and [Moderna](#). The quotes from Dr. Fauci can be found at [AP](#) and [NPR](#).

statistically significant.⁷

5 Conclusion

We show that the measure of implied equity duration developed in Dechow, Sloan, and Soliman [2004] provides an intuitive and effective measure of the sensitivity of an equity security to a pandemic shutdown. Low duration equities have relatively more of their value in near-term cash flows, and since a pandemic shutdown curtails near-term cash flows, low duration equities lose more of their value during the shutdown. More generally, low duration equities should be more sensitive to any disaster that leads to a short-term drop in macroeconomic activity. Our results build on Weber [2018], who finds that low duration equities significantly underperformed during the financial crisis in 2008-2009. Weber [2018] proposes sentiment-based explanations for his findings, positing that the duration premium will be smaller during periods of low sentiment (e.g., the financial crisis). In contrast, the insight of our paper is to demonstrate that investors rationally anticipate that a disaster followed by a quick recovery will have a disproportionately negative impact on the values of low duration stocks.

We also show how our implied equity duration framework can be used to understand the significant underperformance of ‘value’ stocks during the onset of the pandemic shutdown. Value stocks are traditionally defined as stocks with high ratios of recent past book value and earnings to their current market values. These stocks tend to be in secular decline and hence tend to have low duration. Given their lower durations, value stocks should lose more of their market value during a short-term decline in macroeconomic activity. Thus, the larger relative declines in value stocks can be viewed as a rational response to the onset of the pandemic shutdown. Our framework also explains why previous research has found that the

⁷It is interesting to note that the second lowest duration portfolio rebounds by about the same amount as the lowest duration portfolio. This is consistent with improved expectations relating to cash flows occurring beyond the first year of the pandemic. Cash flows lost during the first year are not affected by this news, thus dampening the rebound for the lowest duration quintile.

cash flows of value stocks are more sensitive to the onset of recessions [see Kojen, Lustig, and Van Nieuwerburgh, 2017]. More generally, we reinforce Dechow, Sloan, and Soliman [2004] in demonstrating that duration provides a sound theoretical basis for understanding previous results relating to the ‘value’ factor. Value serves as a noisy proxy for duration and we suggest that subsequent research focus on developing improved measures of equity duration rather than relying on ad hoc measures of value, such as BE/ME and E/P ratios. Goncalves [2020] is a good reference in this respect.

Finally, our analysis shows that both the low duration premium and the value premium are consistent with the ‘disasters with quick recoveries’ explanation proposed by Hasler and Marfe [2016]. They argue that short-term cash flows are more risky in a world characterized by rare disasters that are followed by quick recoveries. Longer-term cash flows are less affected by disasters due to the quick recovery time. The onset of the COVID-19 pandemic provides a prime example of a disaster that is expected to be followed by a quick recovery, through either herd immunity or the development of a vaccine. Consistent with this explanation, we show that low duration stocks and value stocks suffer the greatest declines in value and greatest increases in risk during the onset of the pandemic. This heightened riskiness of short-term cash flows during temporary macroeconomic downturns can also explain why the term structure of equity risk premia is downward sloping during recessions (see Binsbergen, Hueskes, Kojen, and Vrugt [2013], Bansal, Miller, Song, and Yaron [2019] and Giglio, Kelly, and Kozak [2020]).

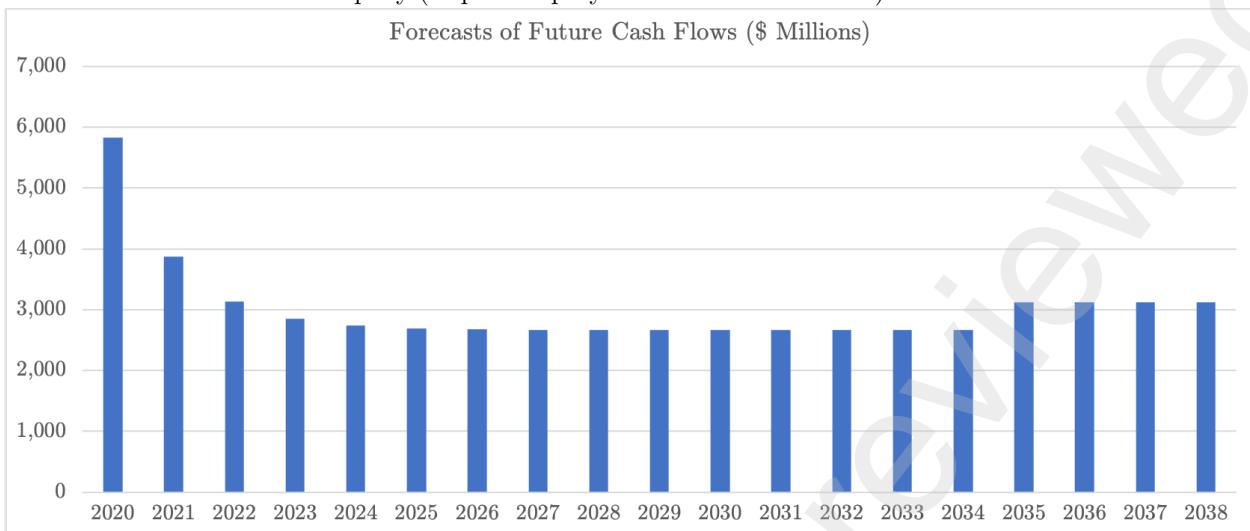
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Panel A: General Motors Company (Implied Equity Duration = 17.1 Years)



Panel B: Tesla, Inc. (Implied Equity Duration = 32.0 Years)

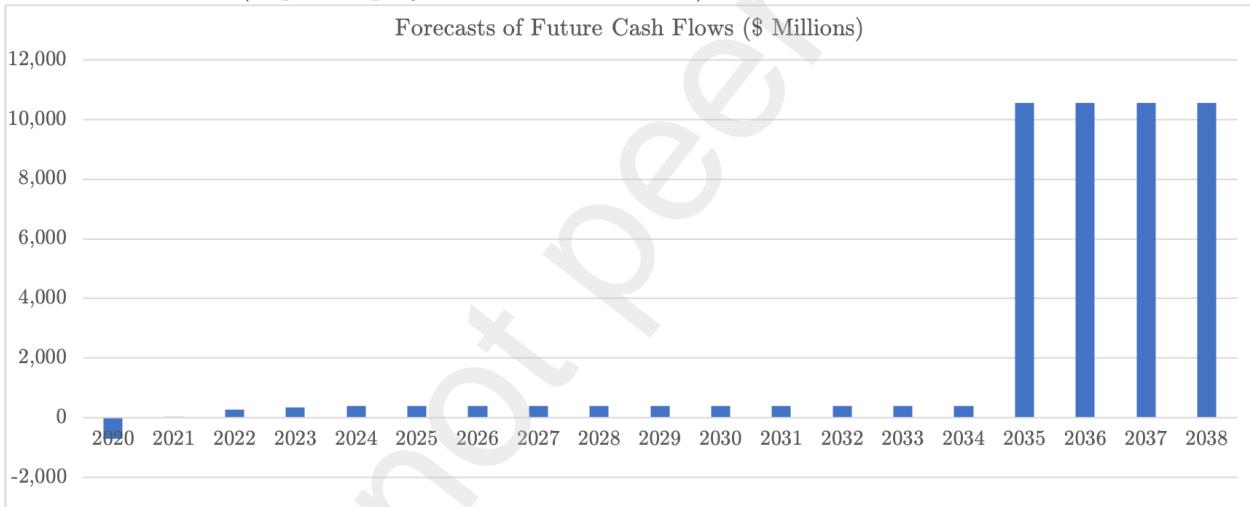


Fig. 1. — Forecasts of future cash flows for General Motors Company (a low duration equity) and Tesla, Inc. (a high duration equity) at December 31, 2019. The forecasts are generated by the forecasting algorithm introduced by Dechow, Sloan, and Soliman [2004] and further refined by Weber [2018]. For these examples, we use a discount rate of 6% and a terminal period growth rate of 0%.

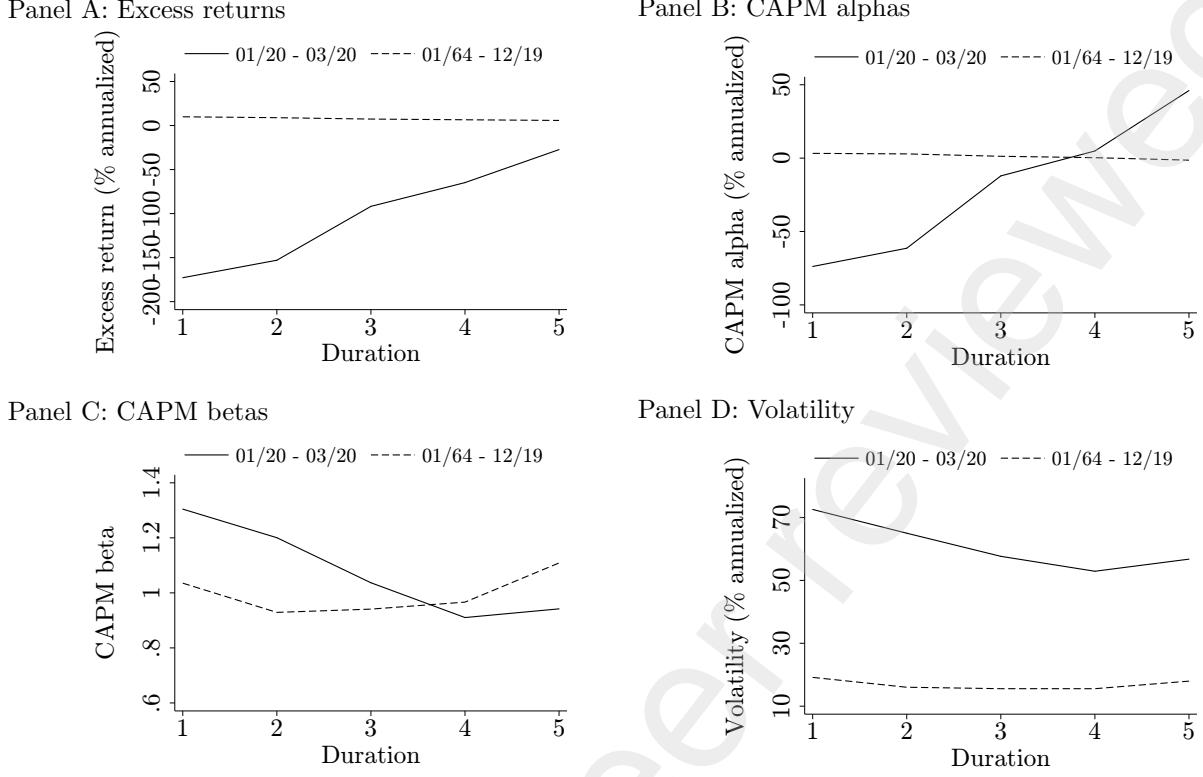


Fig. 2. — Value-weighted duration portfolio characteristics. This figure presents portfolio excess returns, CAPM alphas, CAPM betas, and volatility. Excess return is the portfolio return in excess of the risk-free rate, CAPM alpha is the intercept from a regression of portfolio returns on the $t - 1, t, t + 1$ CRSP value-weighted market index, CAPM beta is the sum of the $t - 1, t, t + 1$ slope estimates (Dimson [1979] adjusted with 1 lead and 1 lag), and volatility is the standard deviation of portfolio returns. We use daily data and annualize returns and alphas by multiplying by 252 and annualize daily volatility by multiplying by $\sqrt{252}$. At the end of each December, we form quintile portfolios based on implied equity duration [see Dechow, Sloan, and Soliman, 2004; Weber, 2018] using accounting information lagged 3 months and market values from the end of December for stocks listed on NYSE, Amex, or Nasdaq. We use quarterly accounting data supplemented with annual data when quarterly data is missing. Lagged market values of equity are portfolio weights.

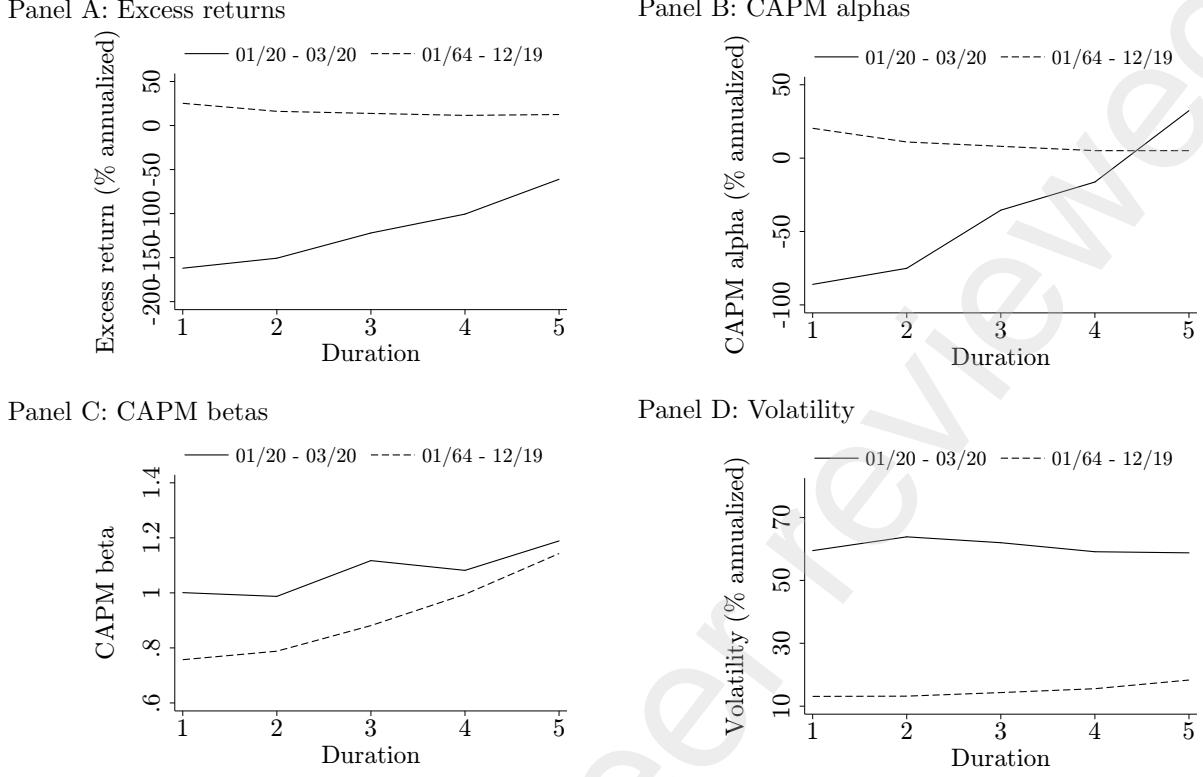
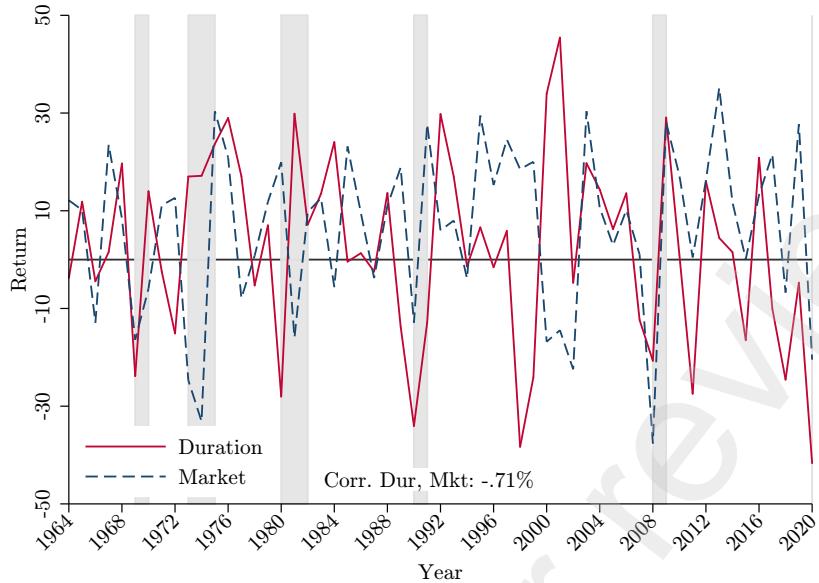


Fig. 3. — Equal-weighted duration portfolio characteristics. This figure presents portfolio excess returns, CAPM alphas, CAPM betas, and volatility. Excess return is the portfolio return in excess of the risk-free rate, CAPM alpha is the intercept from a regression of portfolio returns on the $t - 1, t, t + 1$ CRSP value-weighted market index, CAPM beta is the sum of the $t - 1, t, t + 1$ slope estimates (Dimson [1979] adjusted with 1 lead and 1 lag), and volatility is the standard deviation of daily portfolio returns. We use daily data and annualize returns and alphas by multiplying by 252 and annualize daily volatility by multiplying by $\sqrt{252}$. At the end of each December, we form quintile portfolios based on implied equity duration [see Dechow, Sloan, and Soliman, 2004; Weber, 2018] using accounting information lagged 3 months and market values from the end of December for stocks listed on NYSE, Amex, or Nasdaq. We use quarterly accounting data supplemented with annual data when quarterly data is missing.

Panel A: Value-weighted duration factor returns



Panel B: Equal-weighted duration factor returns

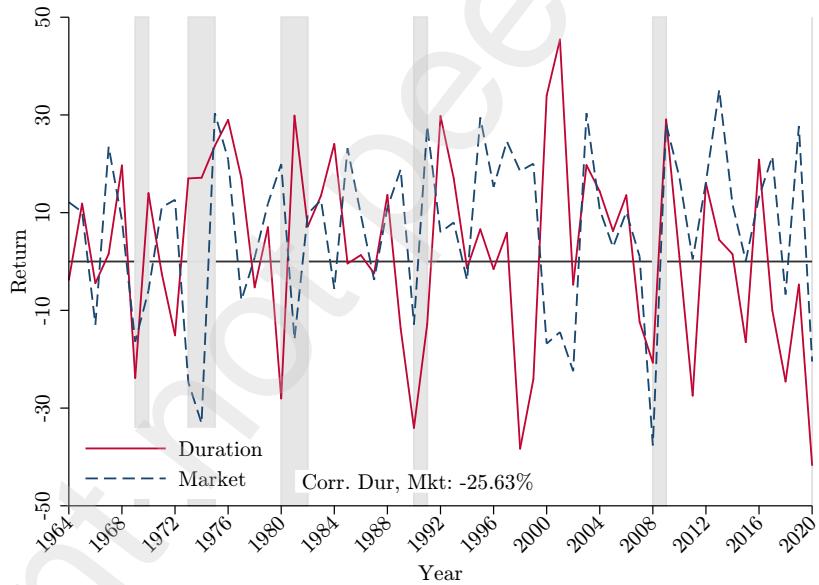
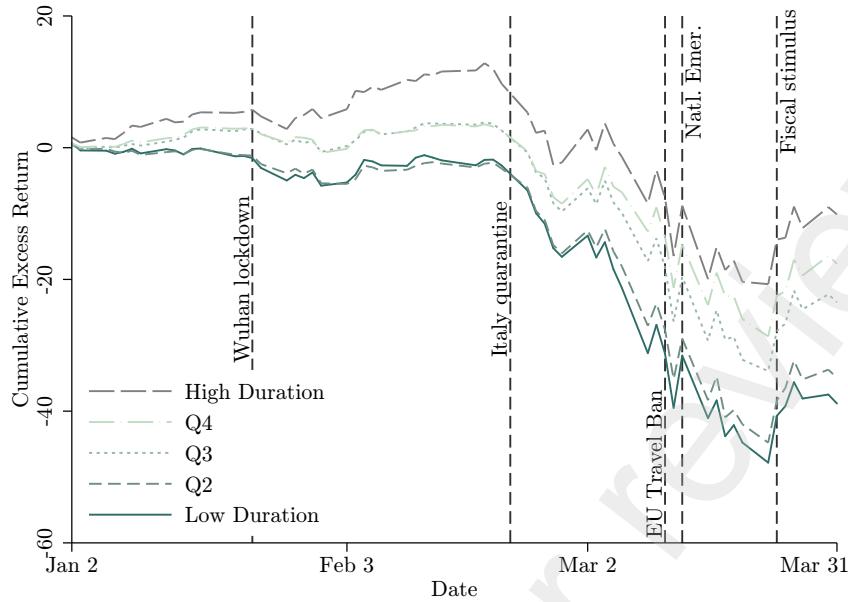


Fig. 4. — Duration factor and market returns over time. This figure presents annual returns for 1964-2019 and returns for the first quarter of 2020 for the CRSP value-weighted market return and for a hedge portfolio capturing the duration premium (Q1-Q5). We use daily data in the 2020 sample and we use monthly data in the pre-2020 sample. Returns are in percent. At the end of each December, we form quintile portfolios based on implied equity duration [see Dechow, Sloan, and Soliman, 2004; Weber, 2018] using accounting information lagged 3 months and market values from the end of December for stocks listed on NYSE, Amex, or Nasdaq. We use quarterly accounting data supplemented with annual data when quarterly data is missing. Lagged market values of equity are portfolio weights in Panel A, and we use equal weights in Panel B. The correlation between duration and the market excludes the first quarter of 2020. NBER recession years and the first quarter of 2020 are shaded.

Panel A: Value-weighted



Panel B: Equal-weighted

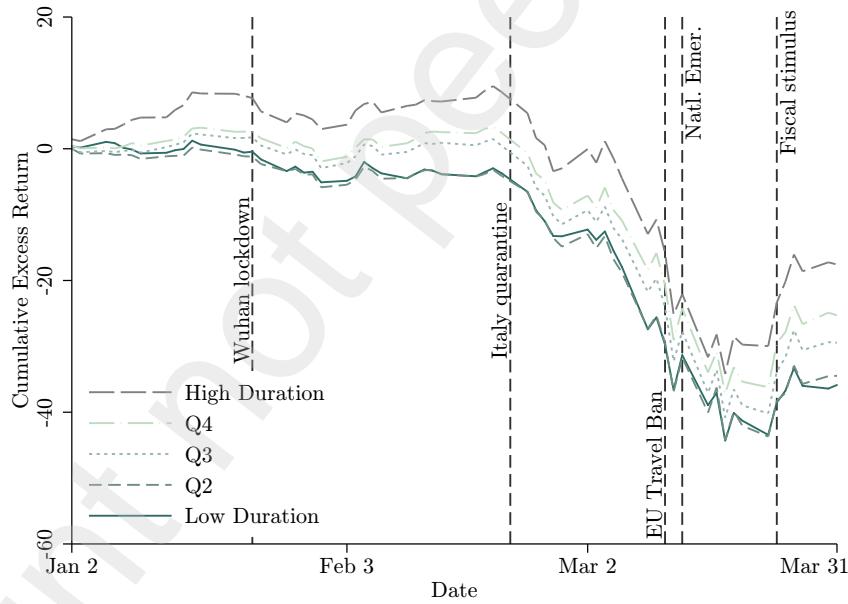
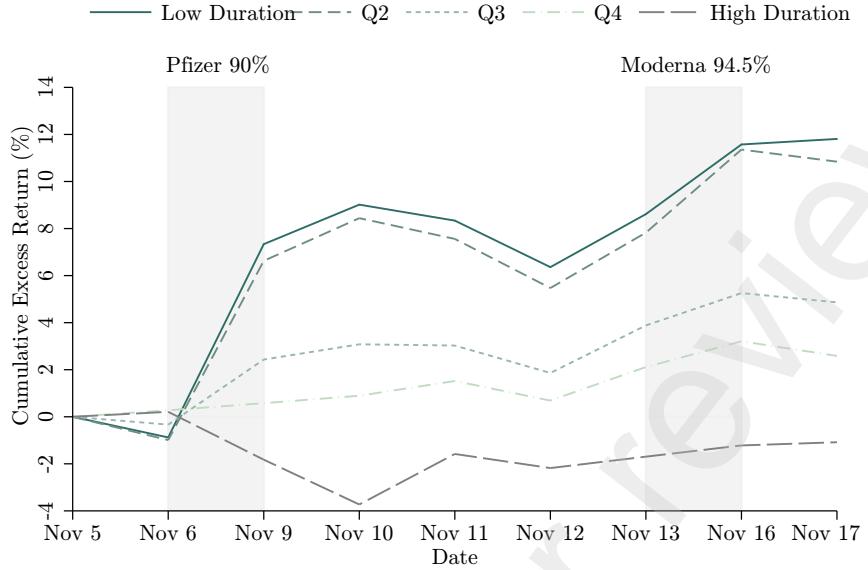


Fig. 5. — Cumulative returns for duration portfolios during onset of pandemic. This figure presents cumulative returns for the first quarter of 2020 for implied equity duration sorted portfolios. Returns are in percent. At the end of December 2019, we form quintile portfolios based on implied equity duration [see Dechow, Sloan, and Soliman, 2004; Weber, 2018] using accounting information lagged 3 months and market values from December 2019 for stocks listed on NYSE, Amex, or Nasdaq. We use quarterly accounting data supplemented with annual data when quarterly data is missing. Lagged market values of equity are portfolio weights in Panel A, and we use equal weights in Panel B.

Panel A: Value-weighted



Panel B: Equal-weighted

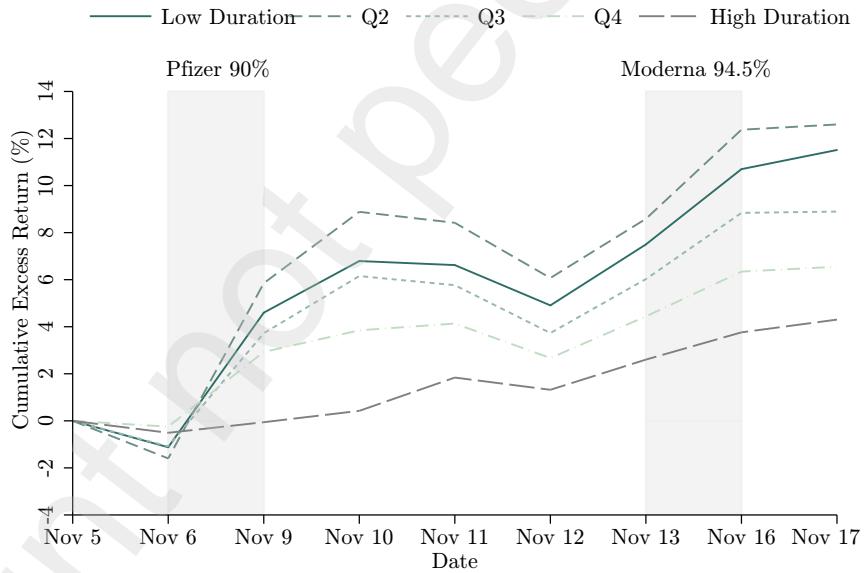


Fig. 6. — Cumulative returns for duration portfolios during vaccine breakthroughs. This figure presents cumulative returns for implied equity duration sorted portfolios based on holdings at the end of the day on November 5, 2020 held until the end of November 17, 2020. The shaded region under “Pfizer 90%” shows portfolio reactions to Pfizer’s announcement of 90% vaccine efficacy on November 9, 2020, and the shaded region under “Moderna 94.5%” shows portfolio reactions to Moderna’s announcement of 94.5% vaccine efficacy on November 16, 2020. Returns are in percent. At the end of December 2019, we form quintile portfolios based on implied equity duration [see Dechow, Sloan, and Soliman, 2004; Weber, 2018] using accounting information lagged 3 months and market values from December 2019 for stocks listed on NYSE, Amex, or Nasdaq. We use quarterly accounting data supplemented with annual data when quarterly data is missing. Lagged market values of equity are portfolio weights in Panel A, and we use equal weights in Panel B. Returns and market values are from FactSet.

TABLE 1
Descriptive Statistics

Panel A: Distributions

Variable	2020			1964-2019			Dif. in Means
	Mean	Median	SD	Mean	Median	SD	
Duration	19.28	20.30	6.79	17.41	18.76	7.23	1.87***
BE/ME	0.70	0.49	0.80	0.85	0.63	0.77	-0.15***
Earnings/ME	0.06	0.05	0.07	0.09	0.07	0.07	-0.02***
Sales growth	0.14	0.06	0.58	0.19	0.08	0.70	-0.05***
Financial leverage	0.27	0.23	0.24	0.23	0.20	0.20	0.04***
Operating leverage	0.27	0.17	0.33	0.29	0.22	0.29	-0.03***
ME (bn)	7.20	0.79	21.27	1.28	0.10	4.29	5.93***
Excess return (annualized)	-112.45	-69.69	1,921.66	17.05	-5.80	1,138.65	-129.50***

Panel B: Correlations (2020)

	Dur	BE/ME	E/ME	SaleGr	FinLev	OpLev	ME	ExRet
Duration	1.00	-0.80	-0.51	0.19	0.09	0.32	0.15	0.03
BE/ME	-0.73	1.00	0.43	-0.16	-0.12	-0.26	-0.41	-0.04
Earnings/ME	-0.54	0.54	1.00	0.03	-0.00	-0.25	-0.16	-0.04
Sales growth	0.27	-0.08	0.10	1.00	-0.06	-0.08	0.11	0.01
Financial leverage	0.01	-0.01	0.11	0.03	1.00	0.08	0.21	-0.01
Operating leverage	0.24	-0.11	-0.10	-0.04	-0.01	1.00	-0.18	-0.01
ME (bn)	0.08	-0.15	-0.10	-0.03	0.07	-0.09	1.00	0.03
Excess return	0.01	-0.01	-0.02	0.00	-0.01	0.01	0.00	1.00

Panel C: Correlations (1964-2019)

	Dur	BE/ME	E/ME	SaleGr	FinLev	OpLev	ME	ExRet
Duration	1.00	-0.86	-0.60	0.28	-0.09	0.17	0.27	-0.00
BE/ME	-0.81	1.00	0.56	-0.16	0.12	-0.15	-0.37	0.00
Earnings/ME	-0.56	0.53	1.00	0.02	0.12	-0.08	-0.26	-0.00
Sales growth	0.37	-0.09	-0.01	1.00	0.01	-0.01	0.12	-0.00
Financial leverage	-0.07	0.11	0.11	0.01	1.00	-0.11	-0.03	-0.01
Operating leverage	0.12	-0.09	0.03	-0.01	-0.12	1.00	-0.23	-0.01
ME (bn)	0.11	-0.16	-0.12	-0.01	0.02	-0.10	1.00	0.02
Excess return	-0.01	0.01	0.01	-0.00	-0.00	0.00	-0.00	1.00

This table presents descriptive statistics. Panel A presents distributions and Panels B and C present correlations (Spearman correlations are above the diagonal and Pearson correlations are below the diagonal). Duration is implied equity duration [see Dechow, Sloan, and Soliman, 2004; Weber, 2018], BE/ME is the ratio of book equity [from Davis, Fama, and French, 2000] to market equity, earnings/ME is the ratio of earnings before extraordinary items (IB) to market equity (excluding negatives), financial leverage is the ratio of debt (DLC+DLTT) to assets (AT), operating leverage is the ratio of fixed operating expenses (XSGA+DP) to assets (AT), ME is the lagged market value of equity in billions, and excess return is the annualized return in excess of the risk-free rate. We annualize daily returns by multiplying by 252. We lag accounting data 3 months and use quarterly accounting data supplemented with annual data when missing. Non-return variables are winsorized at the 1% tails of the distribution. In Panel A, the *t*-value for differences in means between samples is reported in the rightmost column.

TABLE 2
Duration Distributions and 2020 Q1 Returns for the 49 Fama and French Industries

Industry	Dur. Mean	Dur. SD	Dur. P25	Dur. P50	Dur. P75	N	2020 Q1 Return
Coal	0.01	12.09	-10.49	-0.33	9.07	5.00	-63.33
Shipbuilding, Railroad Equipment	12.69	10.63	5.18	12.69	20.21	2.00	-46.76
Petroleum and Natural Gas	12.76	11.84	5.74	16.39	19.54	102.00	-61.94
Beer & Liquor	15.21	12.11	13.07	21.02	21.76	8.00	-17.77
Non-Metallic and Industrial Metal Mining	15.58	11.22	12.77	19.94	21.61	21.00	-39.99
Insurance	15.85	5.97	13.60	17.43	19.57	80.00	-24.36
Communication	15.94	9.26	13.43	19.29	21.85	56.00	-24.62
Automobiles and Trucks	16.08	6.92	14.94	18.53	20.31	40.00	-45.49
Banking	16.94	2.97	16.18	17.29	18.28	294.00	-36.59
Construction	17.08	5.37	15.77	18.65	20.58	34.00	-38.26
Steel Works Etc	17.16	4.57	16.92	18.38	20.11	28.00	-38.53
Real Estate	17.23	5.68	14.86	19.30	20.97	26.00	-34.58
Textiles	17.35	3.24	16.35	17.55	19.40	8.00	-38.06
Business Supplies	17.37	8.05	18.73	19.81	20.88	18.00	-33.88
Trading	17.46	7.21	15.77	18.31	21.46	111.00	-29.56
Chemicals	17.75	7.58	16.91	19.80	22.21	53.00	-35.13
Apparel	17.76	7.96	17.09	19.46	21.99	21.00	-43.60
Retail	18.02	6.79	15.95	19.33	22.16	119.00	-34.66
Wholesale	18.08	5.00	16.11	19.48	21.31	99.00	-33.53
Fabricated Products	18.26	5.26	16.56	19.92	20.71	7.00	-46.15
Transportation	18.30	6.12	15.51	19.72	21.20	50.00	-33.26
Entertainment	18.67	6.92	18.47	21.11	22.64	21.00	-44.68
Restaurants, Hotels, Motels	18.89	5.41	16.00	20.60	22.54	35.00	-50.35
Printing & Publishing	19.10	3.26	17.88	19.22	22.27	18.00	-39.99
Machinery	19.29	5.72	18.69	20.78	21.93	82.00	-34.63
Aircraft	19.34	3.74	16.76	21.15	21.46	12.00	-43.70
Construction Materials	19.34	6.18	19.10	20.92	21.57	35.00	-35.27
Consumer Goods	19.66	4.92	16.36	20.42	22.16	32.00	-36.51
Utilities	19.86	1.64	19.21	20.08	20.84	70.00	-17.99
Agriculture	19.88	1.81	17.95	20.08	20.76	6.00	-21.71
Recreation	20.10	4.89	19.39	21.57	22.41	20.00	-33.02
Personal Services	20.10	2.31	17.67	20.59	21.80	23.00	-29.50
Electronic Equipment	20.32	5.81	19.28	21.41	22.42	117.00	-25.69
Shipping Containers	20.34	3.27	16.60	21.14	22.67	7.00	-29.07
Rubber and Plastic Products	20.51	4.42	19.44	21.40	22.82	16.00	-24.35
Healthcare	20.53	6.91	20.12	21.75	22.67	32.00	-25.46
Electrical Equipment	20.64	6.42	18.93	21.30	22.72	32.00	-29.97
Business Services	20.65	5.39	19.16	21.24	23.04	199.00	-28.69
Food Products	20.70	4.80	18.68	21.05	22.45	33.00	-17.30
Precious Metals	21.15	3.56	18.23	20.55	24.77	6.00	-32.38
Defense	21.17	4.13	18.48	20.87	23.04	8.00	-5.70
Candy & Soda	21.26	2.51	20.90	22.47	22.81	10.00	-17.19
Measuring and Control Equipment	21.27	3.12	19.95	21.97	22.91	43.00	-24.10
Computer Hardware	21.42	3.44	20.55	22.24	23.71	32.00	-29.21
Other	21.54	7.39	18.60	22.49	24.41	568.00	-27.25
Pharmaceutical Products	21.76	6.81	19.63	22.62	24.52	113.00	-9.37
Medical Equipment	21.82	5.20	21.14	22.42	23.49	74.00	3.95
Tobacco Products	21.93	1.45	20.36	22.21	23.21	3.00	-37.47
Computer Software	22.17	4.76	20.97	22.80	23.79	123.00	-19.35
Average FF49 Industry	18.50	5.76	16.52	19.76	21.65	60.24	-31.96

This table presents distributional statistics [mean, standard deviation (SD), 25th percentile (P25), median (P50), 75th percentile (P75), and number of firms (N)] for each Fama and French 49 industry for implied equity duration [see Dechow, Sloan, and Soliman, 2004; Weber, 2018]. 2020 Q1 Return is the industry average stock return for the first quarter of 2020. Duration is calculated using market values of equity at December-end 2019 using financial statement items from fiscal periods ending no later than September 2019. Duration is winsorized at the 1% tails of the distribution.

TABLE 3
Duration Portfolio Characteristics

Panel A: Value-weighted portfolios

	Duration					
	Low	Q2	Q3	Q4	High	Q5-Q1
Duration (01/20 - 03/20)	13.94	18.12	20.34	22.31	23.53	9.59
Duration (01/64 - 12/19)	9.19	15.18	17.97	20.30	23.25	14.07
Excess return (01/20 - 03/20)	-172.83	-152.99	-91.81	-64.82	-27.34	145.49*** [2.71]
Excess return (01/64 - 12/19)	9.94	8.90	7.34	6.55	5.79	-4.15** [-2.23]
α_{CAPM} (01/20 - 03/20)	-73.83	-61.40	-12.12	4.87	46.04	119.87*** [2.68]
α_{CAPM} (01/64 - 12/19)	3.24	2.88	1.25	0.31	-1.39	-4.63** [-2.50]
β_{CAPM} (01/20 - 03/20)	1.30	1.20	1.04	0.91	0.94	-0.36*** [9.77]
β_{CAPM} (01/64 - 12/19)	1.04	0.93	0.94	0.97	1.11	0.07*** [33.85]
Volatility (01/20 - 03/20)	72.56	65.01	57.65	52.90	56.76	-15.80* [1.63]
Volatility (01/64 - 12/19)	19.16	16.02	15.57	15.56	17.97	-1.19*** [1.14]

Panel B: Equal-weighted portfolios

	Duration					
	Low	Q2	Q3	Q4	High	Q5-Q1
Duration (01/20 - 03/20)	9.97	17.85	20.26	22.16	26.00	16.04
Duration (01/64 - 12/19)	7.05	15.01	17.88	20.23	24.51	17.45
Excess return (01/20 - 03/20)	-162.04	-150.68	-122.03	-100.60	-61.04	101.00*** [2.66]
Excess return (01/64 - 12/19)	25.24	16.12	13.76	11.53	12.50	-12.73*** [-9.33]
α_{CAPM} (01/20 - 03/20)	-86.03	-75.08	-35.46	-16.29	32.33	118.36*** [3.18]
α_{CAPM} (01/64 - 12/19)	20.32	11.00	8.05	5.10	5.11	-15.22*** [-13.18]
β_{CAPM} (01/20 - 03/20)	1.00	0.99	1.12	1.08	1.19	0.19* [3.80]
β_{CAPM} (01/64 - 12/19)	0.76	0.79	0.88	0.99	1.14	0.39*** [2,402.86]
Volatility (01/20 - 03/20)	59.47	63.85	61.99	59.11	58.76	-0.70 [1.02]
Volatility (01/64 - 12/19)	13.11	13.19	14.32	15.56	18.31	5.20*** [1.95]

This table presents portfolio excess returns, CAPM alphas, CAPM betas, and volatility. Excess return is the portfolio return in excess of the risk-free rate, CAPM alpha is the intercept from a regression of portfolio returns on the $t - 1, t, t + 1$ CRSP value-weighted market index, CAPM beta is the sum of the $t - 1, t, t + 1$ slope estimates (Dimson [1979] adjusted with 1 lead and 1 lag), and volatility is the standard deviation of daily portfolio returns. We use daily data and annualize returns and alphas by multiplying by 252 and annualize daily volatility by multiplying by $\sqrt{252}$. At the end of each December, we form quintile portfolios based on implied equity duration [see Dechow, Sloan, and Soliman, 2004; Weber, 2018] using accounting information lagged 3 months and market values from the end of December for stocks listed on NYSE, Amex, or Nasdaq. We use quarterly accounting data supplemented with annual data when quarterly data is missing. Lagged market values of equity are portfolio weights in Panel A. t -values (estimate equals 0) are in brackets for excess return and alpha and F -values are in brackets for beta (sum of slope estimates equals zero) and volatility (equality of variances). Significance at the .10, .05, and .01 level denoted by *, **, *** respectively.

TABLE 4
Book-to-market Portfolio Characteristics

Panel A: Value-weighted portfolios

	Book-to-market					
	Low	Q2	Q3	Q4	High	Q5-Q1
Book-to-market (01/20 - 03/20)	0.09	0.26	0.49	0.74	1.25	1.16
Book-to-market (01/64 - 12/19)	0.22	0.47	0.71	1.02	1.70	1.48
Excess return (01/20 - 03/20)	-43.91	-72.02	-108.03	-168.75	-165.63	-121.72** [-2.38]
Excess return (01/64 - 12/19)	6.21	6.28	7.35	8.81	9.82	3.62** [1.97]
α_{CAPM} (01/20 - 03/20)	29.39	-1.40	-23.02	-76.10	-64.75	-94.13** [-2.20]
α_{CAPM} (01/64 - 12/19)	-0.69	0.01	1.29	2.60	2.94	3.63** [1.99]
β_{CAPM} (01/20 - 03/20)	0.95	0.92	1.11	1.22	1.32	0.38*** [11.57]
β_{CAPM} (01/64 - 12/19)	1.07	0.97	0.94	0.96	1.06	-0.01 [0.20]
Volatility (01/20 - 03/20)	55.25	53.71	60.66	66.32	71.12	15.87* [1.66]
Volatility (01/64 - 12/19)	17.09	15.57	15.51	16.89	19.90	2.81*** [1.36]

Panel B: Equal-weighted portfolios

	Book-to-market					
	Low	Q2	Q3	Q4	High	Q5-Q1
Book-to-market (01/20 - 03/20)	0.10	0.27	0.49	0.77	1.78	1.68
Book-to-market (01/64 - 12/19)	0.21	0.47	0.72	1.04	2.01	1.79
Excess return (01/20 - 03/20)	-65.88	-92.44	-120.59	-148.08	-138.38	-72.51* [-1.95]
Excess return (01/64 - 12/19)	8.85	11.14	13.73	17.05	28.32	19.47*** [13.89]
α_{CAPM} (01/20 - 03/20)	24.99	-7.58	-34.98	-69.56	-65.95	-90.94*** [-2.71]
α_{CAPM} (01/64 - 12/19)	1.46	4.80	8.09	11.91	23.30	21.84*** [18.76]
β_{CAPM} (01/20 - 03/20)	1.16	1.09	1.11	1.02	0.95	-0.20** [5.31]
β_{CAPM} (01/64 - 12/19)	1.14	0.98	0.87	0.79	0.77	-0.37*** [2,176.12]
Volatility (01/20 - 03/20)	59.29	60.34	61.89	61.96	55.56	-3.72 [1.14]
Volatility (01/64 - 12/19)	17.97	15.46	14.20	13.23	13.55	-4.41*** [1.76]

This table presents portfolio excess returns, CAPM alphas, CAPM betas, and volatility. Excess return is the portfolio return in excess of the risk-free rate, CAPM alpha is the intercept from a regression of portfolio returns on the $t-1, t, t+1$ CRSP value-weighted market index, CAPM beta is the sum of the $t-1, t, t+1$ slope estimates, and volatility is the standard deviation of daily portfolio returns. We use daily data and annualize returns and alphas by multiplying by 252 and annualize daily volatility by multiplying by $\sqrt{252}$. At the end of each December, we form quintile portfolios based on book-to-market using accounting information lagged 3 months and market values from the end of December for stocks listed on NYSE, Amex, or Nasdaq. Book value of equity is computed as in Davis, Fama, and French [2000] and excludes negative book values. We use quarterly accounting data supplemented with annual data when quarterly data is missing. Lagged market values of equity are portfolio weights in Panel A. t -values (estimate equals 0) are in brackets for excess return and alpha and F -values are in brackets for beta (sum of slope estimates equals zero) and volatility (equality of variances). Significance at the .10, .05, and .01 level denoted by *, **, *** respectively.

TABLE 5
Earnings-to-price Portfolio Characteristics

Panel A: Value-weighted portfolios

	Earnings-to-price					
	Low	Q2	Q3	Q4	High	Q5-Q1
Earnings-to-price (01/20 - 03/20)	0.01	0.03	0.05	0.07	0.11	0.10
Earnings-to-price (01/64 - 12/19)	0.03	0.05	0.07	0.10	0.16	0.13
Excess return (01/20 - 03/20)	-42.71	-58.73	-81.72	-99.68	-172.76	-130.05** [-2.54]
Excess return (01/64 - 12/19)	5.99	6.06	7.64	8.95	9.46	3.47** [2.37]
α_{CAPM} (01/20 - 03/20)	29.41	12.50	1.91	-27.88	-71.67	-101.08** [-2.59]
α_{CAPM} (01/64 - 12/19)	-1.56	-0.21	1.86	3.22	3.04	4.60*** [3.23]
β_{CAPM} (01/20 - 03/20)	0.92	0.93	1.09	0.94	1.32	0.40*** [15.68]
β_{CAPM} (01/64 - 12/19)	1.17	0.97	0.89	0.88	0.99	-0.17*** [320.76]
Volatility (01/20 - 03/20)	53.62	54.23	60.10	57.59	71.14	17.52** [1.76]
Volatility (01/64 - 12/19)	18.79	15.74	14.74	14.99	17.05	-1.73*** [1.21]

Panel B: Equal-weighted portfolios

	Earnings-to-price					
	Low	Q2	Q3	Q4	High	Q5-Q1
Earnings-to-price (01/20 - 03/20)	0.01	0.03	0.05	0.07	0.16	0.14
Earnings-to-price (01/64 - 12/19)	0.02	0.05	0.08	0.10	0.18	0.16
Excess return (01/20 - 03/20)	-90.19	-118.27	-112.70	-144.90	-189.39	-99.20*** [-2.91]
Excess return (01/64 - 12/19)	12.56	11.41	12.46	14.20	17.70	5.14*** [4.95]
α_{CAPM} (01/20 - 03/20)	-13.93	-37.77	-34.69	-67.85	-99.13	-85.20*** [-2.71]
α_{CAPM} (01/64 - 12/19)	5.66	5.34	7.01	9.11	12.27	6.62*** [7.07]
β_{CAPM} (01/20 - 03/20)	0.98	1.04	1.01	1.01	1.18	0.19** [5.69]
β_{CAPM} (01/64 - 12/19)	1.07	0.94	0.84	0.78	0.84	-0.23*** [1,301.68]
Volatility (01/20 - 03/20)	58.35	59.04	59.55	63.89	68.29	9.94 [1.37]
Volatility (01/64 - 12/19)	16.85	14.73	13.54	13.03	13.97	-2.89*** [1.46]

This table presents portfolio excess returns, CAPM alphas, CAPM betas, and volatility. Excess return is the portfolio return in excess of the risk-free rate, CAPM alpha is the intercept from a regression of portfolio returns on the $t - 1, t, t + 1$ CRSP value-weighted market index, CAPM beta is the sum of the $t - 1, t, t + 1$ slope estimates, and volatility is the standard deviation of daily portfolio returns. We use daily data and annualize returns and alphas by multiplying by 252 and annualize daily volatility by multiplying by $\sqrt{252}$. At the end of each December, we form quintile portfolios based on earnings-to-price using accounting information lagged 3 months and market values from the end of December for stocks listed on NYSE, Amex, or Nasdaq. Earnings is income before extraordinary items (IB) and excludes loss firms. We use quarterly accounting data supplemented with annual data when quarterly data is missing. Lagged market values of equity are portfolio weights in Panel A. t -values (estimate equals 0) are in brackets for excess return and alpha and F -values are in brackets for beta (sum of slope estimates equals zero) and volatility (equality of variances). Significance at the .10, .05, and .01 level denoted by *, **, *** respectively.

TABLE 6
Consensus Analyst Forecast Variables for Duration Portfolios During Pandemic

Panel A: Value-weighted Portfolios

	Duration					
	Low	Q2	Q3	Q4	High	Q5-Q1
Pre-pandemic Forward Yield (FY2/P)	8.76	7.42	6.01	5.44	3.30	-5.46*** [-18.63]
N	319	402	440	444	440	
Q2 2020 Earnings Revision	-1.89	-1.38	-0.75	-0.44	-0.29	1.60*** [11.23]
N	301	395	438	433	411	
Q2 2020 Earnings Surprise	-1.61	-1.29	-0.49	-0.24	0.35	1.96*** [11.25]
N	307	401	442	437	424	

Panel B: Equal-weighted Portfolios

	Duration					
	Low	Q2	Q3	Q4	High	Q5-Q1
Pre-pandemic Forward Yield (FY2/P)	4.01	5.38	4.62	2.80	-11.81	-15.82*** [-8.35]
N	319	402	440	444	440	
Q2 2020 Earnings Revision	-3.42	-1.45	-1.28	-0.93	-0.30	3.12*** [10.10]
N	301	395	438	433	411	
Q2 2020 Earnings Surprise	-2.58	-0.93	-0.82	-0.74	-0.14	2.44*** [4.78]
N	307	401	442	437	424	

This table presents portfolio average analyst pre-pandemic forward earnings yield (FY2/P), 2020 Q2 forecast revision, and 2020 Q2 earnings surprise for quintile portfolios formed on duration [see Dechow, Sloan, and Soliman, 2004; Weber, 2018] using accounting information lagged 3 months and market values from the end of December 2019 for stocks listed on NYSE, Amex, or Nasdaq. Forward earnings is the median forecasted FY2 annual EPS at December-end 2019. Q2 forecast revision is the change in quarterly forecasted earnings per share (FEPS) from December-end 2019 to May-end 2020, where Q2 FEPS is the median forecasted quarterly EPS for fiscal quarters ending in June, July, or August 2020. Q2 earnings surprise is the difference between actual Q2 EPS and the median forecast of Q2 EPS at the end of December 2019. All measures are scaled by December-end Price. All forecasts and prices are adjusted for splits, and median forecasts are based on a sample of most recent analyst forecasts no older than 2 months at the time of computation. December-end 2019 market values of equity are portfolio weights for value-weighted portfolios. The number of observations differs across portfolios due to uneven analyst forecast coverage across portfolios. *t*-values are in brackets. Variables are winsorized at the .10, .05, and .01 level denoted by *, **, *** respectively.

TABLE 7
Fama and MacBeth Regressions

Panel A: Value-weighted Fama and MacBeth regressions

	Daily excess return $\times 252$					
	(1)	(2)	(3)	(4)	(5)	(6)
Duration	142.65*** [3.91]	113.83*** [4.09]				
BE/ME			-129.47*** [-3.39]	-98.39*** [-3.52]		
Earnings/ME					-91.10*** [-3.49]	-69.12*** [-3.08]
Financial leverage	-34.02 [-1.52]	-35.09 [-1.60]	-27.26 [-1.26]	-26.97 [-1.22]	-7.48 [-0.37]	-13.29 [-0.67]
Operating leverage	27.38 [0.50]	-4.91 [-0.14]	35.35 [0.67]	1.11 [0.03]	59.81 [1.07]	16.72 [0.46]
Loss	0.58 [0.01]	-1.47 [-0.04]	14.63 [0.38]	9.79 [0.28]	-26.63 [-0.67]	-20.43 [-0.58]
ME	124.24 [1.51]	102.82 [1.41]	117.26 [1.48]	93.74 [1.32]	157.42* [1.82]	124.66* [1.68]
MNC	-5.85 [-0.20]	7.04 [0.29]	-2.66 [-0.09]	10.60 [0.44]	9.42 [0.32]	11.81 [0.49]
Avg. Adj. R^2	0.072	0.251	0.068	0.250	0.064	0.249
FF 49 Indicators	No	Yes	No	Yes	No	Yes
Avg. N	2939	2939	2939	2939	2939	2939

Panel B: Equal-weighted Fama and MacBeth regressions

	Daily excess return $\times 252$					
	(1)	(2)	(3)	(4)	(5)	(6)
Duration	106.64*** [2.74]	75.91** [2.48]				
BE/ME			-111.13*** [-2.77]	-80.29** [-2.58]		
Earnings/ME					-94.63*** [-2.92]	-59.96*** [-2.73]
Financial leverage	-76.02* [-1.68]	-70.06 [-1.56]	-75.76* [-1.68]	-69.37 [-1.55]	-75.33* [-1.69]	-67.38 [-1.52]
Operating leverage	-7.39 [-0.31]	-15.60 [-0.77]	-10.12 [-0.42]	-17.77 [-0.87]	1.99 [0.09]	-6.61 [-0.35]
Loss	13.02 [0.65]	5.20 [0.28]	33.50 [1.66]	19.18 [1.05]	-7.03 [-0.28]	-8.35 [-0.39]
ME	-9.19 [-0.17]	-19.83 [-0.37]	-24.86 [-0.47]	-31.62 [-0.60]	15.37 [0.29]	0.08 [0.00]
MNC	0.56 [0.02]	9.04 [0.36]	-0.26 [-0.01]	8.83 [0.35]	0.54 [0.02]	13.28 [0.53]
Avg. Adj. R^2	0.020	0.040	0.020	0.040	0.018	0.038
FF 49 Indicators	No	Yes	No	Yes	No	Yes
Avg. N	2939	2939	2939	2939	2939	2939

This table presents estimates from daily Fama and MacBeth [1973] regressions of annualized excess returns on explanatory variables spanning 62 days in January–March 2020. Excess returns are stock returns in excess of the risk-free rate in annualized percent (daily excess return $\times 252$). Duration is implied equity duration [see Dechow, Sloan, and Soliman, 2004; Weber, 2018], BE/ME is the ratio of book equity [Davis, Fama, and French, 2000] to market equity, earnings/ME is the ratio of earnings before extraordinary items (IB) to market equity (set equal to zero if negative), loss is an indicator variable equal to one if earnings is negative, financial leverage is the ratio of debt (DLC+DLTT) to assets (AT) (set to zero if missing), operating leverage is the ratio of fixed operating expenses (XSGA+DP) to assets (AT), ME is the market value of equity, and MNC is an indicator variable for multinational corporations (firms with non-missing values of PIFO, TXFO, or TXDFO in Compustat). Indicator variables for the 49 Fama and French industries are included in even numbered columns. We use market values from December-end 2019 and assume a 3 month lag on public availability of financial information. We use quarterly accounting data supplemented with annual data when missing. All continuous independent variables are transformed using quintile ranks to range from 0 to 1 ($\frac{qRank-1}{4}$). We use lagged market values of equity as regression weights in Panel A. t -values are in brackets. Significance at the .10, .05, and .01 level denoted by *, **, *** respectively.

TABLE 8
Fama and MacBeth Regressions Excluding Stocks with Positive 2020 Q1 Returns

Panel A: Value-weighted Fama and MacBeth regressions

Duration	Daily excess return $\times 252$					
	(1)	(2)	(3)	(4)	(5)	(6)
135.48*** [3.89]	103.32*** [3.89]					
BE/ME		-128.53*** [-3.59]	-95.18*** [-3.48]			
Earnings/ME				-82.12*** [-3.13]	-57.73** [-2.54]	
Financial leverage	-28.77 [-1.28]	-29.64 [-1.32]	-24.41 [-1.11]	-25.93 [-1.13]	-3.02 [-0.14]	-8.73 [-0.43]
Operating leverage	12.99 [0.28]	-20.91 [-0.79]	10.99 [0.25]	-26.10 [-1.02]	48.05 [0.96]	3.10 [0.12]
Loss	-36.53 [-1.17]	-37.25 [-1.21]	-22.94 [-0.78]	-27.57 [-0.94]	-66.37* [-1.91]	-57.83* [-1.86]
ME	116.80 [1.33]	88.34 [1.16]	109.56 [1.27]	80.94 [1.08]	152.65 [1.64]	110.74 [1.43]
MNC	-10.32 [-0.32]	5.66 [0.23]	-3.94 [-0.12]	9.94 [0.41]	6.78 [0.22]	11.01 [0.46]
Avg. Adj. R^2	0.069	0.267	0.063	0.265	0.060	0.265
FF 49 Indicators	No	Yes	No	Yes	No	Yes
Avg. N	2718	2718	2718	2718	2718	2718

Panel B: Equal-weighted Fama and MacBeth regressions

Duration	Daily excess return $\times 252$					
	(1)	(2)	(3)	(4)	(5)	(6)
91.65** [2.46]	68.14** [2.43]					
BE/ME		-101.88** [-2.54]	-78.17** [-2.60]			
Earnings/ME				-85.42*** [-2.70]	-57.73*** [-2.66]	
Financial leverage	-69.28 [-1.50]	-64.64 [-1.39]	-69.36 [-1.50]	-64.23 [-1.39]	-68.22 [-1.49]	-62.13 [-1.36]
Operating leverage	-13.85 [-0.67]	-16.64 [-0.93]	-16.58 [-0.79]	-19.16 [-1.04]	-3.93 [-0.19]	-7.17 [-0.42]
Loss	-11.66 [-0.55]	-16.67 [-0.84]	5.23 [0.25]	-4.36 [-0.23]	-32.05 [-1.19]	-31.16 [-1.33]
ME	18.30 [0.35]	6.69 [0.13]	3.35 [0.06]	-5.66 [-0.11]	39.52 [0.76]	25.18 [0.48]
MNC	-7.19 [-0.26]	3.37 [0.14]	-8.67 [-0.32]	2.03 [0.08]	-8.60 [-0.32]	5.48 [0.23]
Avg. Adj. R^2	0.023	0.048	0.024	0.049	0.022	0.047
FF 49 Indicators	No	Yes	No	Yes	No	Yes
Avg. N	2718	2718	2718	2718	2718	2718

This table presents estimates from daily Fama and MacBeth [1973] regressions of annualized excess returns on explanatory variables spanning 62 days in January–March 2020. This subsample excludes stocks with positive cumulative excess returns for 2020 Q1. Excess returns are stock returns in excess of the risk-free rate in annualized percent (daily excess return $\times 252$). Duration is implied equity duration [see Dechow, Sloan, and Soliman, 2004; Weber, 2018], BE/ME is the ratio of book equity [Davis, Fama, and French, 2000] to market equity, earnings/ME is the ratio of earnings before extraordinary items (IB) to market equity (set equal to zero if negative), loss is an indicator variable equal to one if earnings is negative, financial leverage is the ratio of debt (DLC+DLTT) to assets (AT) (set to zero if missing), operating leverage is the ratio of fixed operating expenses (XSGA+DP) to assets (AT), ME is the market value of equity, and MNC is an indicator variable for multinational corporations (firms with non-missing values of PIFO, TXFO, or TXDFO in Compustat). Indicator variables for the 49 Fama and French industries are included in even numbered columns. We use market values from December-end 2019 and assume a 3 month lag on public availability of financial information. We use quarterly accounting data supplemented with annual data when missing. All continuous independent variables are transformed using quintile ranks to range from 0 to 1 ($\frac{qRank-1}{4}$). We use lagged market values of equity as regression weights in Panel A. t -values are in brackets. Significance at the .10, .05, and .01 level denoted by *, **, *** respectively.

TABLE 9
Fama and MacBeth Regressions in the IBES Subsample Excluding Stocks with Positive 2020 Q2 Forecast Revisions

Panel A: Value-weighted Fama and MacBeth regressions

Duration	Daily excess return $\times 252$					
	(1)	(2)	(3)	(4)	(5)	(6)
BE/ME			-130.76*** [-3.78]	-97.20** [-4.01]		
Earnings/ME					-92.77*** [-3.51]	-64.83** [-2.57]
Financial leverage	-42.53 [1.58]	-32.36 [-1.37]	-39.63 [-1.51]	-28.78 [-1.23]	-25.46 [-1.07]	-16.43 [-0.77]
Operating leverage	19.90 [0.34]	-14.43 [-0.32]	28.96 [0.49]	-12.11 [-0.26]	55.09 [0.90]	-1.90 [-0.04]
Loss	-1.19 [-0.03]	-5.73 [-0.15]	10.96 [0.27]	3.86 [0.10]	-33.45 [-0.80]	-27.46 [-0.74]
ME	130.61* [1.80]	107.71* [1.81]	134.33* [1.85]	106.85* [1.81]	164.58** [2.09]	127.43** [2.06]
MNC	-5.36 [-0.18]	7.25 [0.26]	-2.76 [-0.09]	8.65 [0.32]	11.22 [0.38]	12.03 [0.44]
Avg. Adj. R^2	0.091	0.279	0.085	0.277	0.078	0.277
FF 49 Indicators	No	Yes	No	Yes	No	Yes
Avg. N	1675	1675	1675	1675	1675	1675

Panel B: Equal-weighted Fama and MacBeth regressions

Duration	Daily excess return $\times 252$					
	(1)	(2)	(3)	(4)	(5)	(6)
BE/ME			-136.16** [-2.33]	-96.03** [-2.17]		
Earnings/ME					-96.85** [-2.54]	-58.97** [-2.29]
Financial leverage	-86.36 [-1.57]	-75.76 [-1.46]	-88.84 [-1.60]	-76.83 [-1.48]	-85.89 [-1.57]	-73.08 [-1.43]
Operating leverage	-10.57 [-0.33]	-5.50 [-0.19]	-9.63 [-0.30]	-5.93 [-0.21]	11.80 [0.34]	9.82 [0.33]
Loss	0.60 [0.03]	-8.66 [-0.48]	22.67 [1.34]	6.08 [0.38]	-22.01 [-0.93]	-23.15 [-1.10]
ME	54.49 [1.07]	48.32 [0.98]	42.95 [0.85]	39.14 [0.80]	84.93 [1.58]	72.53 [1.43]
MNC	-3.82 [-0.13]	16.10 [0.70]	-5.51 [-0.18]	15.75 [0.68]	-0.58 [-0.02]	20.59 [0.90]
Avg. Adj. R^2	0.037	0.084	0.039	0.085	0.033	0.082
FF 49 Indicators	No	Yes	No	Yes	No	Yes
Avg. N	1675	1675	1675	1675	1675	1675

This table presents estimates from daily Fama and MacBeth [1973] regressions of annualized excess returns on explanatory variables spanning 62 days in January–March 2020. This subsample is limited to stocks with IBES coverage and excludes 366 stocks with positive analyst forecast revisions for fiscal quarters ending in June, July, or August 2020 (see Table 6 for revision calculation). Excess returns are stock returns in excess of the risk-free rate in annualized percent (daily excess return $\times 252$). Duration is implied equity duration [see Dechow, Sloan, and Soliman, 2004; Weber, 2018], BE/ME is the ratio of book equity [Davis, Fama, and French, 2000] to market equity, earnings/ME is the ratio of earnings before extraordinary items (IB) to market equity (set equal to zero if negative), loss is an indicator variable equal to one if earnings is negative, financial leverage is the ratio of debt (DLC+DLTT) to assets (AT) (set to zero if missing), operating leverage is the ratio of fixed operating expenses (XSGA+DP) to assets (AT), ME is the market value of equity, and MNC is an indicator variable for multinational corporations (firms with non-missing values of PIFO, TXFO, or TXDFO in Compustat). Indicator variables for the 49 Fama and French industries are included in even numbered columns. We use market values from December-end 2019 and assume a 3 month lag on public availability of financial information. We use quarterly accounting data supplemented with annual data when missing. All continuous independent variables are transformed using quintile ranks to range from 0 to 1 ($\frac{qRank-1}{4}$). We use lagged market values of equity as regression weights in Panel A. t -values are in brackets. Significance at the .10, .05, and .01 level denoted by *, **, *** respectively.