Flight to Safety in Real Estate

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Abstract

Flight to safety (FTS) affects the markets for risky assets such as stocks, corporate bonds, and commodities. Yet, little is known about the effects on commercial real estate. We show that REITs offer a hedge against FTS, with daily total returns being less sensitive to FTS than many other industries and measures of REIT liquidity actually improving on FTS days. However, a cluster of FTS days signals a decline in economic fundamentals in the long run. We find that the odds of a drop in REIT quarterly revenue increase by 15 percent after an FTS cluster, ceteris paribus. This effect persists for up to four quarters. We also find that commercial real estate price appreciation is all but wiped out over up to four quarters following an FTS cluster. Our findings benefit investors by providing estimates of the short-term return and liquidity response of REITs to FTS episodes, and by documenting long-term effects on REIT revenues and real asset values.

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1 Introduction

Flight to Safety (FTS) is a period of substantial multi-market distress, typically defined by the joint occurrence of large negative equity returns and large positive government bond returns (Baele, Bekaert, Inghelbrecht, and Wei, 2014).[1] Research has documented FTS in stock, bond, currency, commodities, and credit markets.[2] By contrast, there is virtually no evidence on the effects of FTS in the real estate market, despite the growing economic significance of this asset class (Plazzi, Torous, and Valkanov, 2010). Our principal aim in this paper is to close this gap in the existing literature.

There is reason to be skeptical that FTS may be relevant for real estate. FTS is often confined to a single day and rarely lasts longer than three days (Baele, Bekaert, Inghelbrecht, and Wei, 2014). However, trades in real estate occur far less frequently. To make progress on understanding the relevance of FTS for real estate, we require a proxy for the performance of real estate that we can observe daily. In our work here, we focus on U.S. listed equity Real Estate Investment Trusts, or REITs. REITs represent the vast majority of firms in the GICS Real Estate sector. The market capitalization of the sector is approximately $1.12 trillion, which is similar to Utilities or Telecommunications. Almost 200 equity REITs provide exposure to the cash flows and valuation of major property types and geographies of the

[1] FTS is thus sharply distinguished from general turmoil in the equity market alone. It is also distinct from market variation related to long-term business cycles. In some consumption-based asset pricing models, FTS denotes the joint occurrence of high uncertainty, low stock prices and high real rates (Barsky, 1989; Bekaert and Engstrom, 2009; Bekaert, Engstrom, and Xing, 2009). FTS is also characterized by very significant equity market volatility, an issue of first-order concern to many investors, especially during bear markets. Furthermore, in FTS periods, Treasury securities attract a flight-to-liquidity premium (Longstaff, 2004). Adrian, Crump, and Vogt (2016) document non-linear relationships between volatility and asset prices, as predicted in theoretical models of FTS. Using evidence from the Euro Area bond market, Beber, Brandt, and Kavajecz (2009) show empirically that FTS has two components, flight to quality and flight to liquidity.

[2] See, for instance, Acharya, Amihud, and Bharath (2013); Baele, Bekaert, Inghelbrecht, and Wei (2014); Baur and Lucey (2009); Bernanke, Gertler, and Gilchrist (1996); Lang and Nakamura (1995).

underlying U.S. commercial real estate market, which Savills estimates to be worth about $8 trillion (equivalent to approximately 30 percent of the U.S. stock market).

Our work proceeds in several stages. First, we define FTS days using conventions described in Baele, Bekaert, Inghelbrecht, and Wei (2014). We then measure the returns of the REIT industry on FTS days, and find that the overall decline in daily total returns from non-FTS days to FTS days is 2.49 percent, significantly smaller than in many other industries. Conditioning on common asset pricing factors, we find that the marginal effect of FTS on REIT returns is significantly positive (between 0.25 and 0.28 percent, depending on model specification); many other industries have substantially negative marginal FTS pricing effects. In contrast to many other industries, we also find that measures of REIT liquidity, notably price impact of trade and trading volume, improve significantly during FTS. Collectively, our results constitute some evidence that REITs offer a partial hedge against the otherwise negative equity returns seen during FTS episodes.

These findings on returns and liquidity are interesting since large cap equities tend to bear the brunt of FTS in equities. Savvy traders might be expected to target large caps with deep, liquid markets and small spreads for the bulk of the de-risking trades (we refer to this as the 'microstructure channel'). It is noteworthy that the 32 REITs currently in the S&P 500 Large Cap Index account for 58.7 percent of the total equity market capitalization of the FTSE Nareit All REITs Index. So, despite the fact that on a value-weighted basis, our index mimics the large cap index, REITs outperform many other sectors on FTS days. We conjecture that this may reflect the fact that REIT cash flows are derived primarily from longer-term leases on 'hard' assets, but this remains a potential topic for future research.

We then show that FTS days sometimes occur in clusters. In our sample, the likelihood that a given calendar quarter experiences such a cluster of FTS days (i.e. two or more) is almost 24%. This is potentially important since Baele, Bekaert, Inghelbrecht, and Wei (2014) show that FTS clusters have implications for economic fundamentals in the long run. Specifically, they document significant declines in quarterly inflation, real GDP growth, and industrial production growth up to four quarters forward. We show that FTS clusters also affect real estate corporate cash flows. We estimate that the occurrence of an FTS cluster increases the odds of lower revenue for REITs in the following quarter by 15 percent, *ceteris paribus*.

This REIT revenue decline following an FTS cluster persists for some time. We find that the likelihood of revenue declines remains significantly elevated two, three, and four quarters forward. Interestingly, however, we find that revenue declines are only associated with clusters of FTS days, not the occurrence of an individual FTS day in a quarter. Our results confirm that a higher concentration of FTS days in a quarter signals an economic downturn in real estate. This evidence on the real consequences of FTS in the REIT sector goes beyond the contemporaneous micro-structure channel documented in the literature to date.

It appears that market participants anticipate lower corporate revenues following a cluster of FTS days and reprice REIT shares appropriately. We find very little evidence of negative momentum in REIT share prices beyond price changes during an actual FTS episode: REIT industry total return premiums are largely unaffected up to four quarters forward. Our finding suggests that information signaled by FTS about declining fundamentals is priced quickly and fully, with no further implications for REIT stock returns.

Lower corporate revenues suggest a decline in the underlying real estate market fundamentals following FTS clusters. This decline is economically substantial: we find that the occurrence of an FTS cluster in a quarter almost completely wipes out any appreciation in property prices that would otherwise have followed up to four quarters forward. We estimate that, absent an FTS cluster, commercial property values would increase by 6.28 percent over four quarters. Following a quarter with an FTS cluster, however, price appreciation over the subsequent four quarters is 6.08 percent lower, leading to net appreciation of close to zero over that period. Our finding represents novel evidence on the long-term value effects of FTS episodes in the market for real property.

Finally, to confirm that we appropriately identify the effects of FTS episodes, we use a counter-factual analysis around the main individual conditions that indicate an FTS episode, i.e. strongly negative equity returns and strongly positive bond returns. We find that neither a bear market in equities alone, nor a bond market rally alone, produce any of our main results, suggesting our results are indeed uniquely related to FTS episodes.

We contribute to the existing literature as follows. Baele, Bekaert, Inghelbrecht, and Wei (2014) document the effects of FTS on the performance of a broad range of global risky assets. Others focus on the response in measures of volatility or liquidity (Anand, Irvine, Puckett, and Venkataraman, 2013; Greenwood and Thesmar, 2011; Hameed, Kang, and Viswanathan, 2010). We provide novel evidence on the contemporaneous, short-term effects of FTS on the total return performance and liquidity measures of listed real estate securities. We believe this to be the first evidence on how real estate markets are affected by FTS episodes.

The existing literature largely focuses on the short-term effects of FTS on performance and liquidity. Some explore the cross-sectional distribution of firm-level responses to FTS (Bansal, Connolly, and Stivers, 2014; Cella, Ellul, and Giannetti, 2013; Greenwood and Thesmar, 2011) but also remain focused on short-run effects. There is evidence that a cluster of FTS days signals a decline in future economic fundamentals (Allen, Bali, and Tang, 2012; Baele, Bekaert, Inghelbrecht, and Wei, 2014), but the implications for firms and their assets are, to date, unexplored. We are, to our knowledge, the first to document long-run implications for corporate cash flows, future stock returns, and real asset values in private property markets.

We proceed as follows. Section 2 outlines our empirical method. Section 3 presents the data. Section 4 discusses the results. Section 5 presents counter-factual tests. Section 6 concludes.

2 Methodology

2.1 Empirical identification of FTS episodes

To identify FTS episodes, we broadly follow Baele, Bekaert, Inghelbrecht, and Wei (2014). They define FTS as the simultaneous occurrence of unusually high bond and low equity returns. We define the indicator for high bond and low equity returns as

$$FTS_t = I\left\{r_t^b > z_b\right\} + I\left\{r_t^s < z_s\right\} \tag{1}$$

where I is the indicator function, r_t^b and r_t^s are bond and stock market returns on day t, and z_i are threshold values defined as

$$z_b = \kappa \cdot \sigma_{b,t} \qquad\qquad z_b = -\kappa \cdot \sigma_{s,t} \tag{2}$$

where $\sigma_{b,t}$ and $\sigma_{s,t}$ are time-varying volatilities for bond and stock returns at time t and z_i is the threshold parameter. This requires equity (bond) returns to be κ standard deviations below (above) zero to identify an FTS day. To avoid look-ahead bias problems, we use a one-sided kernel to measure return volatility over the past 22 trading days and set $\kappa = 1.5$.[3] We then construct an indicator that takes the value of 1 during FTS days and 0 otherwise.

2.2 Aggregate response of REITs to FTS episodes

We characterize the aggregate unconditional response of REITs returns and liquidity to FTS and compare it to other industries. We measure the industry-level return response by comparing daily portfolio returns on FTS days with those on non-FTS days. For REITs and other industries, we test the hypothesis that the mean return on FTS days is equal to that on non-FTS days. Alternatively, we measure the industry-level return response by regressing daily portfolio returns on the FTS indicator and a set of pricing factors as follows

$$R_{i,t} = \gamma_0 + \gamma_1 FTS_t + \gamma_2 \mathbf{X}_t + u_{i,t} \tag{3}$$

where $R_{i,t}$ is the value-weighted return on industry portfolio i on day t, γ_0 is a constant, FTS_t is the FTS indicator variable we have constructed, and $\mathbf{X}$ contains other relevant daily pricing factors. In different versions of this regression, we establish the robustness of our estimates to the addition of the return on the market portfolio, the Fama and French value and size

[3] Baele, Bekaert, Inghelbrecht, and Wei (2014) define an FTS episode as a day with unusually high (low) bond (equity) returns, with high equity volatility and strong negative high-frequency correlations between bond and equity prices. They also use a two-sided kernel to measure return volatility. We explored different approaches and found that our method of relying on strongly negative (positive) equity (bond) returns generates a distribution of FTS days that is very similar to the one described in Baele, Bekaert, Inghelbrecht, and Wei (2014). We also explored another method where we generate a return volatility using the average of backward-looking volatility and forward-looking VIX volatility. This avoids potential difficulties with using future data, since the VIX value that pertains to the next 22 trading days is observable today. We found little difference using this alternative method.

factors (Fama and French, 1993), the momentum factor (Carhart, 1997), and a liquidity pricing factor constructed from the Amihud (2002) measure as asset pricing factors. In this step of our analysis, we are primarily interested in the value of the estimated coefficient on the FTS indicator, γ_1, for each industry.

To test whether the FTS sensitivity of REITs differs from that of other industries, we estimate Equation (3) in a system of regressions for all industry portfolios using SUR (Zellner, 1962). On that basis, we compute the χ^2 statistic and the associated probability that a given industry coefficient, $\gamma_{1,i}$, is equal to the beta coefficient for REITs, $\gamma_{1,REITs}$.

To assess the aggregate response in liquidity, we compute an industry portfolio-level version of Amihud's (2002) illiquidity measure as the ratio of the daily absolute industry return to the industry-level (dollar) trading volume on that day as follows

$$ILLIQ_{i,t} = \frac{|R_{i,t}|}{VOL_{i,t}} \tag{4}$$

where $|R_{i,t}|$ is the absolute return of industry portfolio i on day t and $VOL_{i,t}$ is the respective daily trading volume in dollars. This ratio gives the percentage price change per dollar of daily trading volume, or the daily price impact of order flow. Given that the pricing of Amihud's (2002) illiquidity measure is largely driven by the trading volume component (Lou and Shu, 2017), we also compute the inverse of daily dollar trading volume alone. We then employ these measures to assess differences in the liquidity response to FTS in REITs versus other industries following the same method as described for the unconditional return response.

2.3 The impact of FTS episodes on corporate cash flows

Baele, Bekaert, Inghelbrecht, and Wei (2014) show that a larger concentration of FTS days in a quarter predicts significant declines in inflation, real GDP growth, and industrial production growth up to four quarters into the future. We extend their work to include the implications of FTS for future REIT revenues.

To do so, we first define an indicator signaling the occurrence of more than one FTS day in a quarter, what we refer to hereafter as a 'cluster' of FTS days. This indicator stands in contrast to the regular FTS indicator signaling whether a quarter had any FTS day at all. We then estimate a logit model where the dependent variable is an indicator measuring whether a given REIT experiences a decline in revenue from quarter $t-1$ to quarter t, $RevDrop_{i,t}$. The main predictor of interest is the FTS cluster indicator in quarter $t-1$. We estimate the following logistic regression, in an unbalanced panel of firm-quarter observations, using maximum likelihood methods

$$logit(RevDrop_{i,t}) = \gamma_0 + \gamma_1 FTS_{t-1} + \gamma_2 \mathbf{X}_{i,t-1} + u_{i,t} \tag{5}$$

where γ_0 is a constant, FTS_t is the FTS cluster indicator, $\mathbf{X}$ contains other observable firm characteristics at time $t-1$, and u is the residual. We include an extensive set of control variables as follows. Size is the natural log of the firm's equity market capitalization at the end of the previous quarter. Leverage is total liabilities plus preferred stock divided by market equity plus total liabilities and preferred stock at the end of the previous quarter. Total Institutional Ownership is the percentage of shares held by all institutional owners.

Market to Book is the firm's equity market capitalization at the end of the previous quarter divided by the book value of equity. Rated is a dummy variable equal to one if the firm has an investment grade credit rating with S&P or Moodys. Residential, Office, Industrial, Retail, Other, Hotel, Diversified, and Healthcare are property type dummy variables. S&P 500, S&P 400, and S&P 600 are dummy variables equal to one if the firm was a constituent of those indexes during the quarter. Recession is a dummy variable equal to one if the quarter falls during an NBER recession. Standard errors are clustered by firm.

2.4 The impact of FTS episodes on future returns

Finding lower REIT revenues following a cluster of FTS days within a quarter raises the question, do REIT investors fully price future cash flow changes, or is there further repricing that occurs. To address this question, we estimate cumulative total return premiums for the REIT industry over the risk-free rate (proxied by the one-month Treasury Bill) one, two, three, and four quarters into the future following FTS. We measure FTS in two ways, first as an indicator for any FTS days in the previous quarter and then as an indicator for an FTS cluster in the previous quarter. We estimate the following time series regressions

$$Ret_t = \gamma_0 + \gamma_1 FTS_{t-1} + u_t \tag{6}$$

where Ret_t measures the cumulative return premium t quarters into the future where $t = 1, 2, 3,$ or 4 quarters after an FTS cluster or individual FTS day. If the information about declining fundamentals signaled by a cluster of FTS days is efficiently priced into the stock market as it becomes available during the FTS episode, then we expect the coefficient γ_1 to be zero.

The potential for lower REIT revenues also implies there may be an FTS-based deterioration in underlying property prices. That is, FTS episodes may lead to a decline in the underlying real estate market. To assess this potential FTS-related impact, we estimate the effect of FTS clusters on an index of U.S. commercial property prices as follows

$$CPPI_t = \gamma_0 + \gamma_1 FTS_{t-1} + u_t \tag{7}$$

where $CPPI$ measures the cumulative appreciation in U.S. commercial real estate prices t quarters into the future where $t = 1, 2, 3$, or 4 quarters after a quarter with an FTS cluster or individual FTS day. If a cluster of FTS days signals an economic downturn and is followed by declining real estate market fundamentals, then we expect lower price appreciation in the quarters to come, thus we expect the coefficient γ_1 to be significantly negative.

3 Data

We draw data from a number of sources. We study a sample of U.S. equity REITs from 1993, the inception of the modern REIT era, through the end of 2016. We identify FTS days using daily stock returns on the S&P500 index and bond returns on the benchmark 10-year Treasury, both downloaded from DataStream.

For the industry-level analysis, we construct value-weighted industry portfolios from CRSP daily return data using only firms with share code 10 or 11 (common stock). We classify firms according to the SIC code-based industry classification scheme of Fama and French.[4]

[4]For details, see `http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_12_ind_port.html`.

We construct the REIT portfolio from the firms in the FTSE NAREIT universe. The market portfolio is the universe of firms in the industry portfolios.

For the analysis of firm-level revenue declines, we obtain balance sheet and income statement data by firm-quarter from S&P Global (formerly SNL Financial). To construct the ownership variables, we rely on institutional filings of security holdings (SEC Form 13f). For the analysis of price appreciation in the U.S. commercial real estate markets, we use the Real Capital Analytics (RCA) Commercial Property Price Index (CPPI). The index is available on a quarterly basis from 2001 to 2017. The number of daily observations in the final sample for the identification of FTS days and the industry-level analysis is 6,042 between 1993 and 2016, split into 5,949 non-FTS days and 93 FTS days. The number of firm-quarters in the sample for the analysis of firm-level revenue declines is 9,230, also covering the period 1993 to 2016.

Table 1 presents descriptive statistics on the time series distribution of FTS days and quarterly clusters of FTS days (more than one FTS day in a given quarter). The Table suggests that FTS days are a relatively rare event. We identify a total of 93 FTS days in 6,042 days in our sample period. However, the occurrence of FTS days varies significantly from year to year. The year with the highest number of FTS days was 2014, with 12 FTS days in that year. On the other hand, several years (1994–1996) did not experience any FTS days at all. The average likelihood of an FTS episode occurring on a given day was 1.5 percent, which is broadly consistent with the estimates in Baele, Bekaert, Inghelbrecht, and Wei (2014). The Table further suggests that the likelihood of FTS days occurring varies substantially through time, with the likelihood of an FTS day reaching a maximum of 4.76 percent in 2014.

Baele, Bekaert, Inghelbrecht, and Wei (2014) note that FTS days sometimes occur in clusters, and we confirm this observation in our data. We count 23 quarters with a cluster of FTS days. On this basis, the likelihood of a quarter experiencing a cluster of FTS days is 24 percent.

The occurrence of FTS coincides with events that produce uncertainty in equity markets. For instance, 1998, the year of the Russia crisis, saw 4 FTS days. The years 2000 and 2001, influenced by the burst of the dot-com bubble, saw 5 and 7 FTS days, respectively. The most obvious cluster of large numbers of FTS days spans the period of the Global Financial Crisis 2007 and the subsequent recovery from the Great Recession.

[Table 1 about here.]

4 Results

4.1 Industry-level FTS responses in aggregate

Table 2 presents the results from measuring daily industry portfolio responses to FTS days. The rows show the various industries. The panels represent the industry-level average response in daily total returns to FTS days, in the Amihud price impact of trade measure, and in the inverse of dollar trading volume, the denominator of the Amihud measure. Each set of columns measures the difference in the outcome variable across FTS and non-FTS days, and reports the t-statistic from a means comparison test.

[Table 2 about here.]

Panel A of Table 2 shows that portfolio total returns on FTS days are significantly negative for all industries. We find that returns on the overall market portfolio are on average 2.69

percent lower on FTS days than on non-FTS days. We find that REIT returns are also negative on FTS days. However, the difference to non-FTS days at 2.49 percent is numerically smaller for REITs than for many other industries.

We find that the strongest negative return response is in Financials (excluding REITs), where returns are 3.28 percent lower than on non-FTS days, while the least-affected industry by this measure is Utilities, where returns are 1.66 percent lower than on non-FTS days.

Panel B of Table 2 shows that the price impact of trade in REITs is reduced by 1.64 percent per dollar of trading volume on FTS days as compared to non-FTS days. According to our estimates, the price impact of trade is reduced the most in the Other portfolio with -3.58 percent per dollar of trading volume.[5] In contrast, we find that the price impact of trade increases the most on FTS days in the Financials portfolio, with a coefficient of 2.38. Our results suggest that measures of REIT liquidity actually show relative improvement during FTS episodes.

Panel C in Table 2 shows the response to FTS days in the inverse of dollar trading volume. We consider this measure as Lou and Shu (2017) suggest that the Amihud illiquidity measure is priced largely due to the effect of trading volume. We find that the inverse of trading volume in REITs declines during FTS days, suggesting that trading volume itself increases substantially at those times as compared to non-FTS days. According to our estimates, REITs experience the largest increase in trading volume of all industries. One important finding here is that the REIT sector is not immune to FTS episodes.

[5]Other is a category that includes mines, construction, building materials, transportation, hotels, business services, and entertainment.

Table 3 presents the return response to FTS days after controlling for common asset pricing factors. Our results suggest that the response to FTS in the REIT industry is statistically different from the majority of other industry portfolios at the 5 percent level.

[Table 3 about here.]

The Table further shows that the magnitude of the estimated FTS response across industries changes as we add additional pricing factors. Recall that for REITs, the effect of FTS on raw returns is -2.49 percent. When controlling for the return on the market, we find that the FTS response of REIT returns is zero. When controlling for the size and value factors, momentum and liquidity, we find small but significantly positive return responses between 0.25 and 0.28 percent on FTS days. Our analysis thus suggests that the FTS effect on total returns is related to firm characteristic-based pricing factors. When considering these pricing factors, we find that REITs have smaller FTS betas than many other stocks. In fact, our results suggest that the REIT industry responds positively to FTS episodes, all else equal.

Bansal, Connolly, and Stivers (2014) find that large-cap stocks are most affected by FTS, suggesting that REITs, many of which are small- to mid-cap stocks, have lower FTS sensitivity. However, the 32 REITs currently in the S&P 500 index account for 58.7 percent of the total equity market capitalization of the FTSE Nareit All REITs Index. We interpret the outperformance of REITs on FTS days as a consequence of their investments in 'hard' assets.

In sum, we find a smaller reduction in REIT raw returns on FTS days than in many other industries, suggesting that REITs are somewhat shielded from FTS-related portfolio rebalancing. The trading volume analysis suggests this is not because REITs are being

ignored by investors seeking to rebalance risky equity portfolios toward safer bonds. We also find that the response in REIT returns to FTS is significantly positive after controlling for common asset pricing factors. Further, we find evidence that the liquidity of REIT stocks improves during FTS episodes, a finding in stark contrast with what we see in other sectors. Overall, our results thus far suggest that REITs provide at least a partial hedge against the consequences of FTS for other equities.[6]

4.2 FTS and future REIT revenues

Baele, Bekaert, Inghelbrecht, and Wei (2014) show that a larger concentration of FTS days in a quarter predicts significant declines in economic fundamentals. Table 4 presents the results from estimating Equation (5), the likelihood of a drop in revenue for REITs following a quarter with an individual FTS day (Panel A) versus a cluster of FTS days (Panel B). Appendix Table A1 shows descriptive statistics for the variables in these regressions.

[Table 4 about here.]

Panel A of Table 4 shows that the occurrence of an FTS day by itself has no significant impact on the odds of REIT experiencing a decline in revenue in the subsequent quarter. However, Panel B of Table 4 shows that the likelihood of a drop in revenues for REITs increases significantly after a quarter that experienced a cluster of FTS days. The economic magnitude of the effect is significant. Our estimates suggest that the odds of lower revenues increase by over 15 percent after a quarter with a cluster of FTS days. We find similar results for two, three, and four quarters into the future. Results are in Appendix Table A2.

[6] Whether FTS is a state variable that generates a risk premium in an intertemporal CAPM world is beyond our scope here.

FTS are typically short-term episodes lasting up to three days. In some models, FTS is driven by non-fundamental shocks to the liquidity needs of liquidity-supplying intermediaries and investors (Nagel, 2012).[7] However, FTS may be followed by declines in real economic fundamentals (Allen, Bali, and Tang, 2012; Baele, Bekaert, Inghelbrecht, and Wei, 2014). To the extent that FTS forecast poor economic conditions, they may in the long run lead to significant changes in expected cash flows for real estate companies.

The existing literature focuses on documenting the short-run, contemporaneous effects of FTS days on the performance of different markets, see e.g. Baele, Bekaert, Inghelbrecht, and Wei (2014), or the determinants of the cross-section of responses to FTS-related periods of market turmoil. Bansal, Connolly, and Stivers (2014) show that large-cap, liquid stocks show a stronger return response to volatility spikes.[8] Cella, Ellul, and Giannetti (2013) document that stocks with a larger share of short-horizon institutional owners experience a stronger return response to volatility shocks. Greenwood and Thesmar (2011) show that stocks with more concentrated or homogeneous ownership experience larger price drops after a liquidity shock. The literature thus focuses on short-term impacts surrounding FTS events, but it largely ignores potential long-run effects of FTS. Our results expand on the existing evidence on contemporaneous effects of FTS by documenting the long-run impact on corporate cash flows up to four quarters following a cluster of FTS days in a quarter.

[7] FTS occurs for different reasons. When equity market volatility is high, investment managers fear redemptions and become increasingly risk-averse, leading to a preference for safe, high-quality assets (Vayanos, 2004). When aggregate liquidity is low, Knightian uncertainty leads investors to favor assets with those characteristics (Caballero and Krishnamurthy, 2008). When volatility is high, speculators may stop providing liquidity for high-risk assets, reducing aggregate liquidity (Brunnermeier and Pedersen, 2009). Aggregate liquidity may also decline when asset price shocks reduce the net worth of intermediaries (Adrian and Shin, 2010), or regulation restricts growth in intermediary balance sheets (Adrian, Boyarchenko, and Shachar, 2017; Adrian, Fleming, Shachar, and Vogt, 2017). Caballero and Simsek (2016) show how global capital flows regulate liquidity. FTS may also occur as a result of dynamic adverse selection (Guerrieri and Shimer, 2014).

[8] Spikes in option-implied equity market volatility, especially when the level of implied volatility is already high, are treated as a marker for the onset of FTS in some papers (Chung and Chuwonganant, 2014).

4.3 FTS and future returns

To the extent that clusters of FTS days signal a decline in future economic fundamentals, this raises the possibility of adjustments to expected returns in the stock market. If REIT investors price this decline into share prices correctly, we expect that there should be no future repricing related to these revenue declines. To find otherwise would suggest a departure from efficient market pricing of REITs. Table 5 presents the results pertaining to this hypothesis.

[Table 5 about here.]

We find that little evidence that individual FTS days (Panel A) or a clusters of FTS days in a quarter (Panel B) have any predictive power for future REIT industry returns one, two, three or four quarters beyond the actual FTS event. Our finding suggests that any information signaled by FTS clusters relating to an impending economic downturn is priced quickly and fully into the stock market during the FTS episode. We find no evidence for a lasting impact or renewed correction in stock returns following an FTS episode.

Table 6 shows that commercial property price appreciation in the U.S. is unchanged after the occurrence of an individual FTS day in a quarter (Panel A). However, we find a significantly negative effect on property price appreciation after the occurrence of an FTS cluster in a quarter (Panel B). Our finding is consistent with the evidence on a higher likelihood of revenue reductions for REITs. REIT revenues are largely comprised of rental revenues from the properties the firms own and operate. If these cash flows decline, then the underlying property assets are less productive, and property values should, as a result, decline. Our finding supports this rationale.

In economic terms, the effect is significant. We find that, absent any FTS-related effects, property price appreciation over four quarters is 6.28 percent on average. The marginal effect of an FTS cluster occurring prior to the four quarters over which price appreciation is measured is -6.08 percent. As a result, net price appreciation over the year following a quarter with an FTS cluster is approximately zero. These results represent novel evidence on the long-term effects of FTS outside of trades that occur on the days of an FTS episode.

5 Identification tests

A possible criticism is that our findings may really be a by-product of a bear market in equities or a bond market rally. In order to identify the effect of FTS more precisely, we run a set of counter-factual tests. FTS requires two conditions to hold simultaneously, namely, strongly negative equity returns and strongly positive bond returns. Here, we replicate our main analysis but replace the FTS indicator variables with counter-factual indicators that take the value of one if a quarter experienced a cluster of strongly negative equity returns alone or strongly positive bond returns alone. This analysis allows us to distinguish between the effects of FTS and those of a bear market in stocks or a bond market rally.

[Table 7 about here.]

Table 7 presents the results from the logit model of the likelihood of lower REIT revenues following a quarter with a cluster of strongly positive bond returns alone (Panel A) or strongly negative equity returns alone (Panel B). The Table shows that neither a bond market rally alone nor a bear market in equities alone predict revenue declines going forward.

[Table 8 about here.]

Table 8 presents the results from the regression model of quarterly U.S. CPPI appreciation following a quarter with a cluster of days that experienced strongly positive bond returns alone (Panel A) or strongly negative equity returns alone (Panel B). The Table shows that neither a bond market rally alone nor a bear market in equities alone have any predictive power for future CPPI appreciation.

6 Conclusion

In this study, we explore the effects of FTS episodes in real estate markets. Our work is motivated by the observation that, in contrast to many other asset classes, there is little evidence on how real estate investments behave during FTS.

Empirically, we find that REITs provide at least a partial hedge against FTS in comparison to many other industry stock portfolios, with lower declines in total returns and smaller effects on liquidity measures on FTS days. We also find evidence that clusters of FTS days signal an impending downturn in economic fundamentals with significant implications for REIT revenue growth up to four quarters forward. Lower revenues imply a decline in the productivity of the underlying real estate assets, which results in significant repricing, wiping out capital appreciation up to four quarters into the future, as per our estimates. Counter-factual tests show that these long-term effects are indeed specific to FTS episodes, and not just a by-product of a bond market rally or a bear market in stocks.

The effect of FTS in real estate markets is of particular interest due to the economic significance of this asset class in the U.S., and because real estate is fundamentally thought

of as a diversifier in mixed-asset portfolios under normal market conditions. Our findings suggest that real estate may also be valuable to investors seeking to protect portfolio values from the adverse consequences of FTS episodes. The results of our study may have further practical implications for investors and managers who are able to act on the information content of FTS clusters about future economic fundamentals and property values.

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Figures and Tables

Descriptive statistics on the distribution of FTS episodes, 1993–2016

Year	FTS Days	Likelihood	Quarters with FTS Clusters	Likelihood
1993	1.0000	0.0040	0.0000	0.0000
1994	0.0000	0.0000	0.0000	0.0000
1995	0.0000	0.0000	0.0000	0.0000
1996	0.0000	0.0000	0.0000	0.0000
1997	2.0000	0.0079	1.0000	0.2500
1998	4.0000	0.0159	1.0000	0.2500
1999	2.0000	0.0079	0.0000	0.0000
2000	5.0000	0.0198	2.0000	0.5000
2001	7.0000	0.0278	2.0000	0.5000
2002	2.0000	0.0079	0.0000	0.0000
2003	1.0000	0.0040	0.0000	0.0000
2004	2.0000	0.0079	0.0000	0.0000
2005	2.0000	0.0079	0.0000	0.0000
2006	1.0000	0.0040	0.0000	0.0000
2007	8.0000	0.0317	2.0000	0.5000
2008	7.0000	0.0278	2.0000	0.5000
2009	6.0000	0.0238	2.0000	0.5000
2010	9.0000	0.0357	2.0000	0.5000
2011	9.0000	0.0357	3.0000	0.7500
2012	6.0000	0.0238	2.0000	0.5000
2013	1.0000	0.0040	0.0000	0.0000
2014	12.0000	0.0476	3.0000	0.7500
2015	3.0000	0.0119	0.0000	0.0000
2016	3.0000	0.0119	1.0000	0.2500
Total	93.0000		23.0000	
Mean		0.0154		0.2396

Table 1: *FTS Days are defined following Baele, Bekaert, Inghelbrecht, and Wei (2014). We define a quarter as having a cluster of FTS events if it has more than one FTS day during the quarter.*

Industry-level response to FTS days, 1993–2016

	Panel A: Returns				Panel B: Amihud				Panel C: Inverse Dollar Volume			
	Non-FTS	FTS	Difference	t-Statistic	Non-FTS	FTS	Difference	t-Statistic	Non-FTS	FTS	Difference	t-Statistic
Observations	5949	93			5949	93			5949	93		
Non-Durables	0.0007	-0.0171	0.0178	13.2400	0.0296	0.0339	-0.0043	-0.4400	1.2107	1.2037	0.0069	0.0200
Durables	0.0010	-0.0315	0.0325	16.1900	0.0302	0.0501	-0.0199	-0.9100	1.1157	1.1214	-0.0057	-0.0200
Manufacturing	0.0009	-0.0283	0.0292	16.0100	0.0310	0.0225	0.0086	1.2800	1.2497	0.7234	0.5263	5.8700
Energy	0.0010	-0.0277	0.0286	11.8900	0.0235	0.0077	0.0158	9.2000	0.6261	0.2234	0.4027	11.8200
Chemicals	0.0008	-0.0220	0.0228	14.8700	0.0119	0.0077	0.0041	3.2500	0.4743	0.3555	0.1188	1.0600
Business Eq.	0.0010	-0.0291	0.0301	15.8600	0.0405	0.0227	0.0178	4.3000	1.0543	0.6502	0.4041	4.1200
Telecom	0.0008	-0.0240	0.0248	13.7900	0.0256	0.0341	-0.0085	-1.2600	1.1545	1.7490	-0.5945	-1.1700
Utilities	0.0006	-0.0159	0.0166	10.1400	0.0052	0.0026	0.0026	6.0500	0.4146	0.1578	0.2568	11.5000
Retail	0.0008	-0.0215	0.0223	14.4800	0.0412	0.0278	0.0134	3.7700	1.3884	0.9015	0.4870	4.7100
Healthcare	0.0008	-0.0202	0.0210	13.0800	0.0324	0.0149	0.0175	8.6300	0.9818	0.5295	0.4524	4.8500
Financials	0.0010	-0.0318	0.0328	12.3400	0.0631	0.0870	-0.0238	-1.4500	3.1605	3.3736	-0.2130	-0.5400
Other	0.0008	-0.0276	0.0284	17.0700	0.0965	0.0607	0.0358	3.9900	2.9997	2.1351	0.8646	3.2700
REITs	0.0009	-0.0240	0.0249	9.0100	0.0275	0.0111	0.0164	8.3200	1.8932	0.6964	1.1967	9.3500
Market	0.0008	-0.0260	0.0269	16.1700	0.0383	0.0327	0.0055	1.5000	1.4745	1.2147	0.2598	2.7000

Table 2: *The Table reports daily industry-level returns, industry-level Amihud illiquidity measure, and industry-level inverse dollar volume on FTS and non-FTS days. Both the Amihud and inverse dollar volume are multiplied by 1,000,000. Industry portfolios are constructed from CRSP data using only firms with share code 10 or 11, and firms are classified by the industry classification scheme of Fama and French. The REITs portfolio is constructed from firms in the FTSE NAREIT universe. Market is the universe of firms in the industry portfolios. Data cover the period 1993 to 2016. FTS Days are defined following Baele, Bekaert, Inghelbrecht, and Wei (2014).*

Industry-level total return response to FTS days controlling for asset pricing factors, 1993–2016

	Panel A: Raw Return			Panel B: CAPM			Panel C: Fama French (FF)			Panel D: FF+Momentum			Panel E: FF+Momentum+Liquidity		
	Beta	t-Statistic	$p(\chi^2)$	Beta	t-Statistic	$p(\chi^2)$	Beta	t-Statistic	$p(\chi^2)$	Beta	t-Statistic	$p(\chi^2)$	Beta	t-Statistic	$p(\chi^2)$
Non-Durables	-0.0178	-19.04	0.0000	-0.0014	-2.23	0.2467	-0.0012	-1.96	0.0002	-0.0010	-1.61	0.0012	-0.0010	-1.62	0.0009
Durables	-0.0325	-20.43	0.0000	-0.0008	-0.93	0.5336	0.0001	0.16	0.0307	-0.0003	-0.36	0.0244	-0.0003	-0.42	0.0189
Manufacturing	-0.0292	-22.78	0.0000	-0.0018	-3.41	0.0962	-0.0009	-1.84	0.0003	-0.0010	-2.05	0.0007	-0.0010	-2.04	0.0005
Energy	-0.0286	-18.09	0.0175	-0.0046	-3.67	0.0047	-0.0034	-2.76	0.0001	-0.0031	-2.55	0.0004	-0.0031	-2.55	0.0003
Chemicals	-0.0228	-20.21	0.0959	-0.0025	-3.31	0.0542	-0.0020	-2.80	0.0000	-0.0019	-2.60	0.0002	-0.0019	-2.60	0.0001
Business Eq.	-0.0301	-17.74	0.0013	0.0037	4.09	0.0225	0.0015	2.01	0.3206	0.0011	1.50	0.2879	0.0012	1.54	0.2797
Telecom	-0.0248	-18.68	0.9403	0.0013	1.68	0.3646	0.0010	1.41	0.1503	0.0009	1.21	0.1922	0.0009	1.21	0.1764
Utilities	-0.0166	-15.07	0.0000	-0.0004	-0.47	0.7452	0.0004	0.46	0.0500	0.0007	0.87	0.1504	0.0008	0.90	0.1439
Retail	-0.0223	-18.90	0.0295	0.0007	1.04	0.5820	0.0007	1.07	0.0637	0.0008	1.12	0.1227	0.0007	1.03	0.0929
Healthcare	-0.0210	-18.07	0.0052	-0.0004	-0.51	0.7751	-0.0012	-1.50	0.0012	-0.0009	-1.17	0.0053	-0.0009	-1.22	0.0039
Financials (ex-REITs)	-0.0328	-21.01	0.0000	-0.0013	-1.65	0.2131	0.0012	2.15	0.1356	0.0009	1.63	0.1371	0.0009	1.64	0.1238
Other	-0.0284	-22.01	0.0011	-0.0005	-1.00	0.6486	-0.0002	-0.42	0.0027	-0.0002	-0.49	0.0066	-0.0002	-0.53	0.0050
REITs	-0.0249	-16.50	n/a	0.0000	0.01	n/a	0.0028	2.97	n/a	0.0025	2.64	n/a	0.0025	2.71	n/a
Market	-0.0269	-23.30	0.0623	0.0000	-2.28	0.9786	0.0000	-2.22	0.0028	0.0000	-2.12	0.0077	0.0000	-2.13	0.0062

Table 3: *The Table reports coefficients from a regression of daily portfolio returns on an FTS indicator variable and pricing factors. Beta is the coefficient on the FTS indicator variable. Portfolio returns are value-weight. Industry portfolios are constructed from CRSP data using only firms with share code 10 or 11, and firms are classified by the industry classification scheme of Fama and French. The REITs portfolio is constructed from firms in the FTSE NAREIT universe. Market is the universe of firms in the industry portfolios. Data cover the period 1993 to 2016. Beta is the industry-level sensitivity to FTS. The t-statistic refers to a test for the hypothesis that the estimated Beta is zero. $p(\chi^2)$ is the probability that a given industry's Beta is equal to the Beta in the REIT regression, where the system is estimated using SUR. FTS Days are defined following Baele, Bekaert, Inghelbrecht, and Wei (2014).*

FTS and declines in REIT revenue one quarter forward, 1993–2016

Panel A: Individual FTS Days							Panel B: FTS Clusters						
Variable	Coefficient	z-Statistic	p-Value	% Change Odds (unit change)	% Change Odds (SD change)	SD of X	Variable	Coefficient	z-Statistic	p-Value	% Change Odds (unit change)	% Change Odds (SD change)	SD of X
FTS Days	0.0592	1.2460	0.2130	6.1000			FTS Cluster	0.1418	2.8490	0.0040	15.2000		
Rated	0.0092	0.1130	0.9100	0.9000			Rated	0.0113	0.1390	0.8890	1.1000		
S&P 500	0.4599	2.9300	0.0030	58.4000			S&P 500	0.4490	2.8360	0.0050	56.7000		
S&P 400	0.4324	4.3930	0.0000	54.1000			S&P 400	0.4203	4.2620	0.0000	52.2000		
S&P 600	0.2836	3.0820	0.0020	32.8000			S&P 600	0.2744	2.9730	0.0030	31.6000		
Residential	-0.2686	-2.1650	0.0300	-23.6000			Residential	-0.2692	-2.1780	0.0290	-23.6000		
Other	-0.3256	-1.6140	0.1060	-27.8000			Other	-0.3278	-1.6280	0.1040	-27.9000		
Industrial	-0.0923	-0.7860	0.4320	-8.8000			Industrial	-0.0915	-0.7820	0.4340	-8.7000		
Retail	0.0028	0.0250	0.9800	0.3000			Retail	0.0020	0.0170	0.9860	0.2000		
Hotel	-0.1698	-1.1660	0.2440	-15.6000			Hotel	-0.1716	-1.1780	0.2390	-15.8000		
Diversified	0.1862	1.1710	0.2420	20.5000			Diversified	0.1840	1.1600	0.2460	20.2000		
Healthcare	-0.0204	-0.1110	0.9110	-2.0000			Healthcare	-0.0222	-0.1210	0.9040	-2.2000		
Recession Dummy	0.4174	5.9090	0.0000	51.8000			Recession	0.3746	5.1130	0.0000	45.4000		
Institutional Ownership	-0.1006	-0.6010	0.5480		-2.6000	0.2610	Institutional Ownership	-0.1040	-0.6210	0.5340		-2.7000	0.2610
Market to Book	-0.0574	-2.6700	0.0080		-8.7000	1.5890	Market to Book	-0.0562	-2.6310	0.0090		-8.5000	1.5890
Size	0.0436	0.9960	0.3190		7.0000	1.5610	Size	0.0446	1.0190	0.3080		7.2000	1.5610
Total Revenue/Total Assets	16.1864	8.4710	0.0000		39.0000	0.0200	Total Revenue/Total Assets	16.2293	8.4570	0.0000		39.2000	0.0200
Leverage	1.6571	5.4020	0.0000		32.1000	0.1680	Leverage	1.6486	5.3800	0.0000		31.9000	0.1680
Constant	-3.0939	-3.2910	0.0010	N/A	N/A	N/A	Constant	-3.1087	-3.3070	0.0010	N/A	N/A	N/A

Table 4: *The Table reports logit results for an estimation of the lower revenue on FTS day or FTS cluster indicator variables and controls. The sample consists of 9,230 firm-quarter observations and covers the period 1993 to 2016. The dependent variable is an indicator for Lower Revenue 1Q into the future. Variables are defined as in Table A1. P-values are calculated from firm-clustered standard errors. % Change Odds is the percentage change in the odds for the firm having lower revenue for a unit change (in the case of dummy variables) or one standard deviation change (for continuous variables) in the independent variable, respectively. SD of X reports the standard deviation of the continuous independent variable.*

FTS and REIT industry return premiums one to four quarters forward, 1993–2016

Panel A: FTS Day	Constant	SE	t-Statistic	FTS Coefficient	SE	t-Statistic
One Quarter Forward	0.0208	0.0062	3.3616	0.0080	0.0123	0.6463
Two Quarters Forward	0.0434	0.0094	4.6269	0.0185	0.0186	0.9946
Three Quarters Forward	0.0690	0.0118	5.8387	0.0187	0.0235	0.7969
Four Quarters Forward	0.0953	0.0139	6.8653	0.0110	0.0275	0.3997
Panel B: FTS Cluster	**Constant**	**SE**	**t-Statistic**	**FTS Coefficient**	**SE**	**t-Statistic**
One Quarter Forward	0.0229	0.0055	4.1646	-0.0018	0.0236	-0.0755
Two Quarters Forward	0.0478	0.0083	5.7283	0.0051	0.0358	0.1436
Three Quarters Forward	0.0725	0.0105	6.9060	0.0218	0.0450	0.4833
Four Quarters Forward	0.0981	0.0123	7.9597	-0.0018	0.0529	-0.0334

Table 5: *Table reports regression results for a regression of future quarterly REIT industry-level return premiums on FTS day and FTS cluster indicator variables. Panel A reports results for REIT industry-level return premiums after individual FTS Days. Panel B reports results for REIT industry-level return premiums after clusters of FTS Days. The REIT industry portfolio is constructed from firms in the FTSE NAREIT universe. Data cover the period 1993 to 2016. FTS Days are defined following Baele, Bekaert, Inghelbrecht, and Wei (2014).*

FTS and property price appreciation one to four quarters forward, 2001–2017

Panel A: FTS Day					Panel B: FTS Cluster				
One quarter forward									
Variable	Coefficient	SE	t-Statistic	p-Value	Variable	Coefficient	SE	t-Statistic	p-Value
Constant	0.0112	0.0044	2.5400	0.0136	Constant	0.0146	0.0030	4.8800	<0.0001
FTS Day	-0.0027	0.0063	-0.4300	0.6657	FTS Cluster	-0.0167	0.0081	-2.0700	0.0423
2 Quarters Forward									
Variable	Coefficient	SE	t-Statistic	p-Value	Variable	Coefficient	SE	t-Statistic	p-Value
Constant	0.0270	0.0084	3.2000	0.0022	Constant	0.0302	0.0058	5.2200	<0.0001
FTS Day	-0.0112	0.0121	-0.9200	0.3607	FTS Cluster	-0.0332	0.0157	-2.1100	0.0386
3 Quarters Forward									
Variable	Coefficient	SE	t-Statistic	p-Value	Variable	Coefficient	SE	t-Statistic	p-Value
Constant	0.0454	0.0122	3.7300	0.0004	Constant	0.0469	0.0086	5.4400	<0.0001
FTS Day	-0.0221	0.0175	-1.2600	0.2120	FTS Cluster	-0.0492	0.0224	-2.2000	0.0317
4 Quarters Forward									
Variable	Coefficient	SE	t-Statistic	p-Value	Variable	Coefficient	SE	t-Statistic	p-Value
Constant	0.0624	0.0162	3.8600	0.0003	Constant	0.0628	0.0117	5.3500	<0.0001
FTS Day	-0.0297	0.0229	-1.2900	0.2010	FTS Cluster	-0.0608	0.0285	-2.1300	0.0368

Table 6: *Table reports results for a regression of returns on the RCA CPPI All Property Index on the FTS or FTS cluster indicator variable one, two, three, and four quarters forward. Data cover the period 2001 to 2017. FTS Days are defined following Baele, Bekaert, Inghelbrecht, and Wei (2014).*

Counter-factual events and declines in REIT revenue one quarter forward, 1993–2016

Panel A: Positive Bond Returns Only							Panel B: Negative Equity Returns Only						
Variable	Coefficient	z-Statistic	p-Value	% Change Odds (unit change)	% Change Odds (SD change)	SD of X	Variable	Coefficient	z-Statistic	p-Value	% Change Odds (unit change)	% Change Odds (SD change)	SD of X
FTS Cluster	-0.1743	-4.0390	0.0000	-16.0000			FTS Cluster	-0.0717	-1.5150	0.1300	-6.9000		
Rated	0.0154	0.1900	0.8490	1.6000			Rated	0.0103	0.1270	0.8990	1.0000		
S&P 500	0.4533	2.8990	0.0040	57.3000			S&P 500	0.4541	2.8940	0.0040	57.5000		
S&P 400	0.4206	4.2860	0.0000	52.3000			S&P 400	0.4267	4.3330	0.0000	53.2000		
S&P 600	0.2724	2.9750	0.0030	31.3000			S&P 600	0.2796	3.0450	0.0020	32.3000		
Residential	-0.2670	-2.1570	0.0310	-23.4000			Residential	-0.2678	-2.1690	0.0300	-23.5000		
Other	-0.3290	-1.6350	0.1020	-28.0000			Other	-0.3257	-1.6210	0.1050	-27.8000		
Industrial	-0.0880	-0.7510	0.4530	-8.4000			Industrial	-0.0915	-0.7830	0.4340	-8.7000		
Retail	0.0056	0.0480	0.9610	0.6000			Retail	0.0032	0.0280	0.9780	0.3000		
Hotel	-0.1741	-1.1990	0.2310	-16.0000			Hotel	-0.1707	-1.1710	0.2420	-15.7000		
Diversified	0.1821	1.1490	0.2510	20.0000			Diversified	0.1837	1.1570	0.2470	20.2000		
Healthcare	-0.0197	-0.1070	0.9140	-2.0000			Healthcare	-0.0218	-0.1200	0.9050	-2.2000		
Recession	0.3646	5.1660	0.0000	44.0000			Recession	0.4369	6.1730	0.0000	54.8000		
Institutional Ownership	-0.1003	-0.6000	0.5490		-2.6000	0.2610	Institutional Ownership	-0.1128	-0.6700	0.5030		-2.9000	0.2610
Market to Book	-0.0580	-2.6630	0.0080		-8.8000	1.5890	Market to Book	-0.0579	-2.6810	0.0070		-8.8000	1.5890
Size	0.0400	0.9210	0.3570		6.4000	1.5610	Size	0.0446	1.0210	0.3070		7.2000	1.5610
Total Revenue/Total Assets	16.2139	8.5300	0.0000		39.1000	0.0200	Total Revenue/Total Assets	16.1852	8.4600	0.0000		39.0000	0.0200
Leverage	1.6748	5.4560	0.0000		32.5000	0.1680	Leverage	1.6593	5.4150	0.0000		32.1000	0.1680
Constant	-2.9073	-3.1100	0.0020	N/A	N/A	N/A	Constant	-3.0519	-3.2520	0.0010	N/A	N/A	N/A

Table 7: *The Table replicates the regression for Table 4, using the counter-factual FTS indicator variables. Panel A is for the Positive Bond Return Only sample, and Panel B is for the Negative Equity Returns Only sample.*

Counter-factual events and property price appreciation one, two, three, and four quarters forward, 2001–2017

	Panel A: Positive Bond Returns Only				Panel B: Negative Equity Returns Only				
One quarter forward									
Variable	Coefficient	SE	t-Statistic	p-Value	Variable	Coefficient	SE	t-Statistic	p-Value
Constant	0.0083	0.0037	2.2500	0.0279	Constant	0.0107	0.0032	3.3200	0.0015
FTS Cluster	0.0035	0.0070	0.5000	0.6156	FTS Cluster	-0.0046	0.0092	-0.5000	0.6193
Two Quarters Forward									
Variable	Coefficient	SE	t-Statistic	p-Value	Variable	Coefficient	SE	t-Statistic	p-Value
Constant	0.0176	0.0074	2.3700	0.0209	Constant	0.0216	0.0063	3.4200	0.0011
FTS Cluster	0.0073	0.0133	0.5500	0.5846	FTS Cluster	-0.0053	0.0179	-0.3000	0.7671
Three Quarters Forward									
Variable	Coefficient	SE	t-Statistic	p-Value	Variable	Coefficient	SE	t-Statistic	p-Value
Constant	0.0276	0.0113	2.4500	0.0169	Constant	0.0325	0.0096	3.4000	0.0012
FTS Cluster	0.0124	0.0188	0.6600	0.5116	FTS Cluster	-0.0009	0.0248	-0.0400	0.9716
Four Quarters Forward									
Variable	Coefficient	SE	t-Statistic	p-Value	Variable	Coefficient	SE	t-Statistic	p-Value
Constant	0.0359	0.0153	2.3500	0.0220	Constant	0.0425	0.0130	3.2700	0.0018
FTS Cluster	0.0225	0.0240	0.9400	0.3522	FTS Cluster	0.0082	0.0303	0.2700	0.7875

Table 8: *The Table replicates the regression for Table 6, using the counter-factual FTS indicator variables. Panel A is for the Positive Bond Return Only sample, and Panel B is for the Negative Equity Returns Only sample.*

Appendix: Firm-level descriptive statistics on U.S. equity REITs, 1993–2016

Variable	N	Mean	SD	Min	Max
Lower Revenue 1Q	9,230	0.3262	0.4689	0.0000	1.0000
Lower Revenue 2Q	9,230	0.2932	0.4552	0.0000	1.0000
Lower Revenue 2Q	9,230	0.2603	0.4388	0.0000	1.0000
Lower Revenue 4Q	9,230	0.2283	0.4197	0.0000	1.0000
% Change in Total Revenue 1Q	9,230	0.0404	0.1398	-0.3749	0.7254
% Change in Total Revenue 2Q	9,230	0.0834	0.2171	-0.4252	1.2232
% Change in Total Revenue 3Q	9,230	0.1252	0.2833	-0.4724	1.6285
% Change in Total Revenue 4Q	9,230	0.1652	0.3420	-0.5171	2.0214
FTS	9,230	0.5554	0.4970	0.0000	1.0000
FTS Cluster	9,230	0.2636	0.4406	0.0000	1.0000
Rated	9,230	0.3499	0.4770	0.0000	1.0000
Institutional Ownership	9,230	0.5454	0.2609	0.0001	0.9997
Total Revenue to Total Assets	9,230	0.0434	0.0204	0.0201	0.1393
S&P 500	9,230	0.0703	0.2557	0.0000	1.0000
S&P 400	9,230	0.1009	0.3012	0.0000	1.0000
S&P 600	9,230	0.1056	0.3074	0.0000	1.0000
Market to Book	9,230	1.8798	1.5889	0.2670	12.1407
Size	9,230	20.5174	1.5613	14.7218	24.8424
Market Leverage	9,230	0.4870	0.1679	0.0392	0.8955
Recession	9,230	0.1026	0.3035	0.0000	1.0000
Residential	9,230	0.1802	0.3844	0.0000	1.0000
Office	9,230	0.1033	0.3043	0.0000	1.0000
Industrial	9,230	0.1667	0.3728	0.0000	1.0000
Retail	9,230	0.1961	0.3971	0.0000	1.0000
Other	9,230	0.0822	0.2747	0.0000	1.0000
Hotel	9,230	0.0972	0.2962	0.0000	1.0000
Diversified	9,230	0.0914	0.2883	0.0000	1.0000
Healthcare	9,230	0.0829	0.2757	0.0000	1.0000

Table A1: *The Table reports descriptive statistics for the 9,230 firm-quarter observations in our final firm-level sample over the period 1993 to 2016. Variables are defined as follows: Lower Revenue 1Q, 2Q 3Q, and 4Q are indicator variables equal to one if the firm had negative total revenue growth over following 1, 2, 3, and 4 quarters respectively. % Change in Total Revenue 1Q, 2Q, 3Q, and 4Q are the percentage change in total revenue over the following 1, 2, 3, and 4 quarters respectively. Rated is a dummy variable equal to one if the firms has an investment grade credit rating with S&P or Moodys. Size is the natural log of the firm's equity market capitalization at the end of the quarter. Leverage is total liabilities plus preferred stock divided by market equity plus total liabilities and preferred stock at the end of the quarter. Total Institutional Ownership is the percentage of shares held by all institutional owners. Market to Book is the firm's equity market capitalization at the end of the quarter divided by the book value of equity. Residential, Office, Industrial, Retail, Other, Hotel Diversified, and Healthcare are property type dummy variables. S&P 500, S&P 400, and S&P 600 are dummy variables equal to one if the firm was a constituent of those indices during the quarter. Recession is a dummy variable equal to one if the quarter falls during an NBER recession. FTS is an indicator variable equal to one if there was an FTS event during the quarter, and FTS Cluster is an indicator variable equal to one if the was an FTS cluster event during the quarter. Underlying data for Leverage, and index dummy variable are from COMPUSTAT. SNL Financial provides data for total revenue and property type dummy variables, and Thomson ReuterâĂŹs 13(f) database for underlying ownership data. FTS Days are defined following Baele, Bekaert, Inghelbrecht, and Wei (2014).*

Appendix: FTS and declines in REIT revenue two, three, and four quarters forward, 1993–2016

Variable	Coefficient on FTS Cluster	z-Statistic	p-Value	% Change Odds (unit change)	Control Variables	Property Type Effects	Recession Effect
Lower Revenue 2Q	0.1688	3.0440	0.0020	18.4000	Y	Y	Y
Lower Revenue 3Q	0.1199	1.8820	0.0600	12.7000	Y	Y	Y
Lower Revenue 4Q	0.1168	1.8790	0.0600	12.4000	Y	Y	Y

Table A2: *The Table reports logit results for an estimation of the lower revenue on FTS day or FTS cluster indicator variables and controls. The sample consists of 9,230 firm-quarter observations and covers the period 1993 to 2016. The dependent variable is an indicator for Lower Revenue 2Q, 3Q and 4Q into the future. Variables are defined as in Table A1. P-values are calculated from firm-clustered standard errors. % Change Odds is the percentage change in the odds for the firm having lower revenue for a unit change (in the case of dummy variables) or one standard deviation change (for continuous variables) in the independent variable, respectively. SD of X reports the standard deviation of the continuous independent variable.*