



# Market fragility and the paradox of the recent stock-bond dissonance<sup>☆</sup>

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## HIGHLIGHTS

- Real US stock prices have exceeded their pre-financial-crisis level by about 36%.
- This rise hints that markets may have been demanding more stocks instead of bonds.
- Paradoxically, post-crisis government bond prices have reached record highs.
- Higher post-crisis disaster risk in a model matches all pre/post-crisis asset prices.
- The coincidence of having no disasters after the crisis justifies high stock prices.

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## ABSTRACT

After the Lehman-Brothers collapse, the stock index has exceeded its pre-Lehman-Brothers peak by 36% in real terms. Seemingly, markets have been demanding more stocks instead of bonds. Yet, instead of observing higher bond rates, paradoxically, bond rates have been persistently negative after the Lehman-Brothers collapse. To explain this paradox, we suggest that, in the post-Lehman-Brothers period, investors changed their perceptions on disasters, thinking that disasters occur once every 30 years on average, instead of disasters occurring once every 60 years. In our asset-pricing calibration exercise, this rise in perceived market fragility alone can explain the drop in both bond rates and price-dividend ratios observed after the Lehman-Brothers collapse, which indicates that markets mostly demanded bonds instead of stocks.

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## 1. Introduction

Since the first oil crisis of 1973, the US stock exchange has been marked by two major setback episodes of its *aggregate dividend index*: the dot-com bust and the Lehman-Brothers collapse (see Fig. 1).

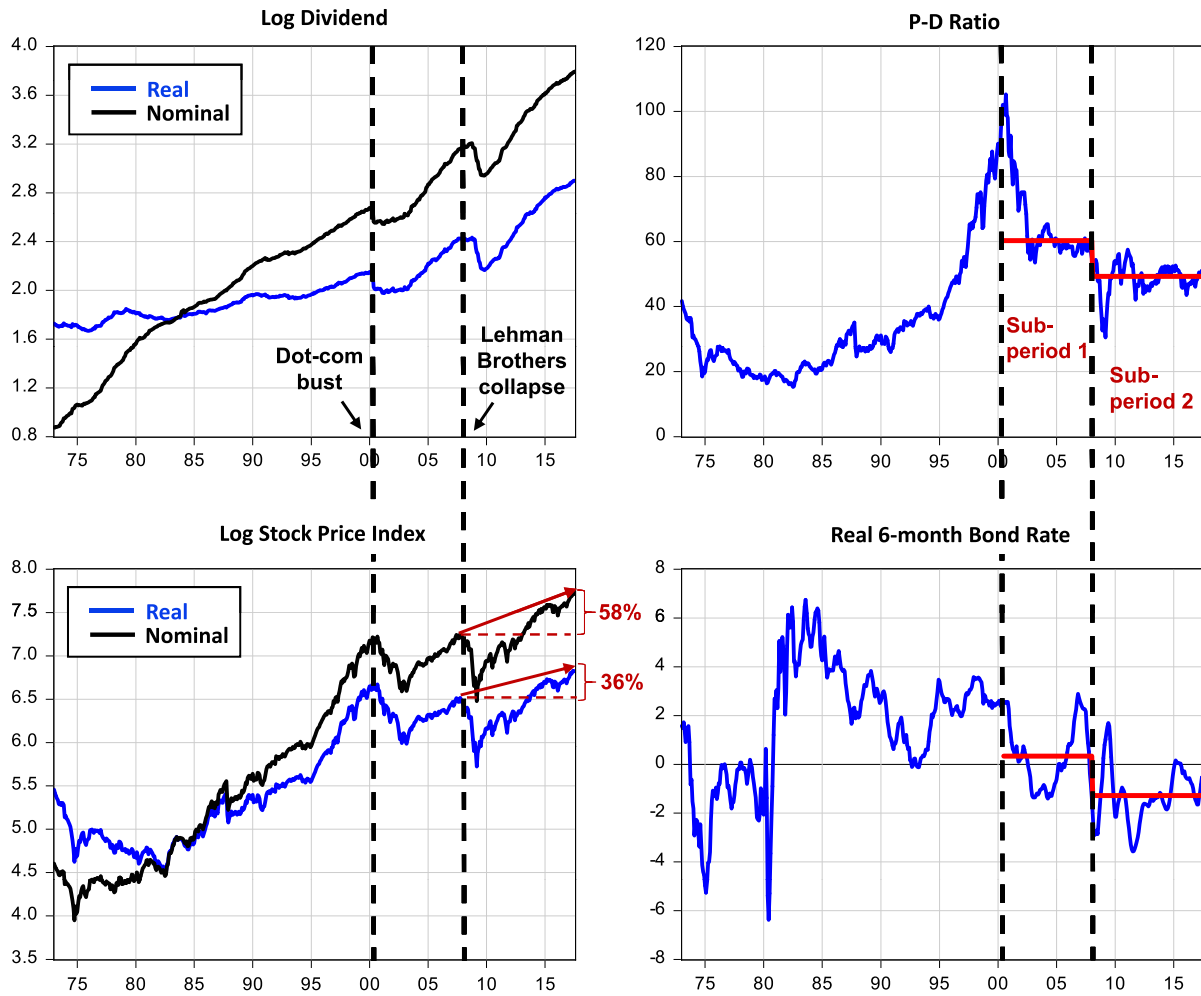
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These two disaster episodes mark two subperiods, as depicted by Fig. 1: the pre- and post-Lehman-Brothers regimes.<sup>1</sup> In the post-Lehman-Brothers period (subperiod 2), by the end of July 2017, the stock market has grown above and beyond its pre-Lehman-Brothers peak by more than 36% in real terms (58% in nominal terms – see Fig. 1). According to standard asset-pricing theory, it is reasonable to think that investors have rebalanced their portfolios, demanding more stocks instead of bonds. If this was true, then the bond price would have fallen, leading to an increase in the bond rate. However, in subperiod 2, the bond rate has significantly decreased and persistently stayed in a negative regime (see Fig. 1 and Table 1). *This stock-bond dissonance, (a) the persistent drop in bond rates, and (b) the persistent growth of stock prices, is a paradox.*

<sup>1</sup> See Online Appendix A for the rationale behind the precise definition of subperiods 1 and 2.



**Fig. 1.** US Data. Flat lines are statistics reported in Table 1. Source: Datastream (TOTMKUS) and Board of Governors of the Federal Reserve System (US), 6-Month Treasury Bill: Secondary Market Rate (TB6MS).

**Table 1**  
Descriptive statistics. Interest rate, and P–D-ratio statistics appear in Fig. 1.

Subperiods	1	2
	2000/7–2008/1	2008/2–2017/7
Mean real interest rate	0.33% (1.32%)	–1.29% (1.12%) <sup>b</sup>
Median P–D ratio <sup>a</sup>	60.24 (3.05)	49.26 (2.31) <sup>c</sup>

<sup>a</sup> Medians are reported when normality tests fail. Standard errors are reported in parentheses for means and median absolute deviations for medians.

<sup>b</sup> Difference-of-means *t*-test for difference from previous subperiod’s statistic is 9.53 (*p*-value is 0).

<sup>c</sup> Wilcoxon signed-ranks test for difference from previous subperiod’s median is 12.13 (*p*-value is 0).

An interesting feature of the post-Lehman-Brothers stock prices is that the P–D ratio has fallen significantly (see Fig. 1 and Table 1). For explaining the persistent drop in the P–D ratio, it would be reasonable to focus on changes in fundamentals, thinking that the dividend growth rate has decreased or that its volatility has increased. Yet, in both subperiods 1 and 2, median real dividend growth was 6.32% and dividend volatility (excluding disaster times) was 11.91%.<sup>2</sup> Here we suggest that these additionally puzzling P–D

<sup>2</sup> See Online Appendix B for tests of differences in median growth and volatility of the real dividend index across these two subperiods.

ratio dynamics are the key to resolving the stock-bond dissonance paradox. We recommend that while slower dividend growth or higher non-disaster volatility have not been observed, after the Lehman-Brothers collapse, investors have changed their expectations: a perception of higher market fragility, i.e., higher disaster risk hitting the real economy (such as the sudden drops in dividends seen in Fig. 1), can explain the stock-bond dissonance paradox and the P–D ratio dynamics.

Our market-fragility explanation is in line with a number of studies focusing on rare disaster risks in asset pricing. First, an influential body of literature suggests that disaster risk is variable.<sup>3</sup> Another body of literature assumes imperfect information about rare disaster risk and argues that parameter learning implies more pessimistic disaster-risk beliefs after a rare disaster.<sup>4</sup> Such a pessimistic shift in rare-disaster beliefs after the Lehman-Brothers collapse is corroborated by an increase in the “SKEW” index that

<sup>3</sup> See Gabaix (2012), Gourio (2012), and Wachter (2013), who demonstrate that this variability can explain many asset-pricing puzzles. In addition, Marfe and Penasse (2017) find empirical evidence for disaster-risk variability.

<sup>4</sup> See Collin-Dufresne et al. (2016), Koulovatianos and Wieland (2017), and Koszowski et al. (2017). All these studies agree that after the Lehman-Brothers collapse, beliefs about rare disaster risk should be more pessimistic, backing up the working hypothesis examined in this paper. Yet, for the sake of simplicity, here we employ only rational expectations and an unexpected post-disaster structural break.

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