



# Hedge funds as liquidity providers: Evidence from the Lehman bankruptcy<sup>☆</sup>

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## ABSTRACT

Hedge funds using Lehman as prime broker faced a decline in funding liquidity after the September 15, 2008 bankruptcy. We find that stocks held by these Lehman-connected funds experienced greater declines in market liquidity following the bankruptcy than other stocks; the effect was larger for ex ante illiquid stocks and persisted into the beginning of 2009. We find no similar effects surrounding the Bear Stearns failure, suggesting that disruptions surrounding bankruptcy explain the liquidity effects. We conclude that shocks to traders' funding liquidity reduce the market liquidity of the assets that they trade.

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## 1. Introduction

How does trading by hedge funds and their access to funding liquidity affect market liquidity and the dynamics of asset prices? This question has been difficult to answer because hedge funds enter markets where profit opportunities are likely to be greatest. Thus, they may be more likely to trade in relatively illiquid markets, where temporary deviations of prices from fundamentals are larger and more persistent, and they may enter and exit trades as liquidity and pricing dynamics shift. Long-Term Capital Management (LTCM), for example, famously traded on strategies related to changes in liquidity, such as those that occur in the U.S. Treasury market, where yields predictably rise as bonds move from the 'on-the-run'

classification (where they trade actively) to the 'off-the-run' classification (where they tend to be purchased by buy-and-hold investors).

This paper sidesteps the endogeneity of trading strategies by exploiting a 'natural' experiment, the Lehman Brothers bankruptcy, which constituted a plausibly exogenous adverse shock to some hedge funds' access to funding liquidity. Lehman Brothers acted as one of the major prime brokers prior to its bankruptcy on September 15, 2008. Prime brokers provide custodial services, securities lending services, and financing to their hedge fund customers. Prior to bankruptcy, Lehman had rehypothecated many of its hedge-fund clients' assets. When Lehman failed, many of these assets could not be returned, making it impossible for the funds to trade or to switch to a competing broker. As we document, the relative hazard rate of Lehman's hedge-fund clients more than *doubled* after the bankruptcy, relative to Lehman funds before the crisis. Lehman's demise hampered the ability of some hedge funds to trade their positions, leading to an increase in their failure rate.

In our main analysis, we show that stocks held by Lehman's hedge-fund clients prior to the bankruptcy

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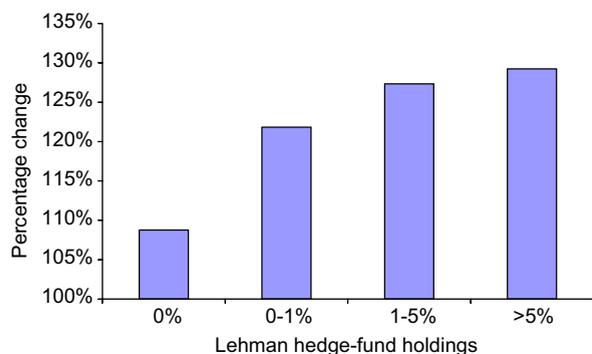
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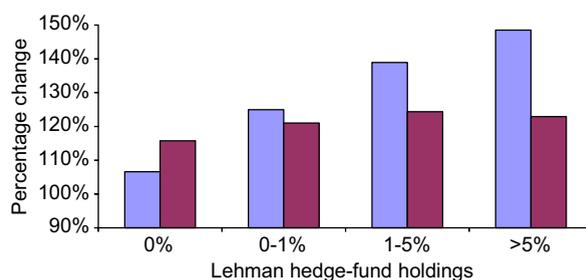
experienced unexpectedly large declines in market liquidity after the bankruptcy, compared to otherwise similar stocks not held by hedge funds exposed to Lehman Brothers. The overall price impact of trades on these stocks rose (i.e., the Amihud illiquidity index, equal to the ratio of absolute returns to dollar volume), as did their bid-ask spreads. Liquidity overall dropped sharply for all stocks; our cross-sectional result implies that stocks held by Lehman-connected hedge funds experienced larger declines in liquidity than other stocks. We also find strong evidence that prices of stocks held by the Lehman-connected funds fell during the first few weeks after the bankruptcy, and somewhat weaker evidence that they then had higher average returns for the subsequent months, suggesting higher liquidity risk required higher expected returns going forward.

The relative drop in liquidity is large both statistically and economically, and persists and even grows through the fourth quarter of 2008. We find no similar liquidity effects surrounding the Bear Stearns failure, suggesting that our results flow from disruptions surrounding bankruptcy rather than just the failure of a large broker-dealer. Institutional investors seemed to have supplied liquidity—or at least reduced the increase in demand for liquidity—during the post-Lehman stock market collapse. Lehman Brothers' hedge-fund customers were unable to fulfill this stabilizing role because they were constrained in their ability to trade their positions.

Figs. 1 and 2 illustrate our key result graphically. We report the average percentage change in the Amihud (2002) illiquidity index from the three months before to the three months after Lehman's bankruptcy. The index increased across the whole stock market as liquidity dried up across the board. Said slightly differently, stock-return volatility increased much more than trading volume due to greater price impact of trades in the less liquid environment that prevailed after September. But, as the figure shows, the decline in liquidity was larger for stocks held by hedge funds that used Lehman as their prime broker (Fig. 1). For stocks with illiquidity above the median during the pre-crisis months, the increase was



**Fig. 1.** Percentage change in Amihud's price impact measure. This figure graphs the percentage change in the Amihud illiquidity index from the pre-Lehman (July 1–August 31, 2008) to the post-Lehman (September 15, 2008–December, 2008) bankruptcy periods. The stocks are separated into four groups based on the fraction owned by Lehman-connected funds as of June 30, 2008 from 13F filings.



**Fig. 2.** Percentage change in Amihud's price impact measure by ex ante liquidity level. This figure graphs the percentage change in the Amihud illiquidity index from the pre-Lehman (July 1–August 31, 2008) to the post-Lehman (September 15, 2008–December, 2008) bankruptcy periods. The stocks are separated into eight groups: first based on the fraction owned by Lehman-connected funds as of June 30, 2008 from 13F filings, and second based on whether the stock was above or below the median Amihud index during the pre-crisis regime. The bars on the left represent stocks with an Amihud index above the sample median.

much more pronounced (Fig. 2). For example, illiquid stocks not held by Lehman-connected funds experienced an increase in illiquidity of about 105%, compared to an increase of almost 150% for stocks with more than 5% of their shares owned by these funds.

Our empirical strategy boils down to using the Lehman bankruptcy as an instrument for a funding shock. This raises the broader question: Does market liquidity fall when hedge funds fail generally? While we do report results consistent with this notion, testing how failure affects liquidity runs into several problems. In contrast to the Lehman bankruptcy, we cannot pinpoint the exact timing of failure, which we measure based on funds dropping out of our Lipper TASS hedge-fund database (TASS). Returns enter TASS with a lag, and funds sometimes report their last return several months before failure. For example, the Bear Stearns High-Grade Structured Credit Fund and the High-Grade Structured Credit Enhanced Leveraged Funds both failed in July of 2007 but reported their last return to TASS in April of that year. Hedge fund failures (based on TASS-defined failure) are also preceded by below-average returns and above-average outflows, suggesting two kinds of endogeneity. First, funds may sell their more-liquid stocks prior to failure to meet investor redemptions. Second, poor performance of assets held by hedge funds may be correlated with changes in the liquidity of those stocks. Our approach avoids these problems because Lehman's demise occurred suddenly, because we know exactly when to search for liquidity and pricing effects, and because subprime lending explains the failure, rather than problems associated with the hedge-fund brokerage business.

Our results provide support for models linking the funding liquidity of traders to the market liquidity of the assets that they trade. Finding a causal link from funding to market liquidity is difficult empirically because there is a two-way feedback between them. Comerton-Forde, Hendershott, Jones, Moulton, and Seasholes (2010) show that shocks to market-makers' balance sheets can affect market liquidity. In our case, shocks to funding liquidity of traders occurred through their links to Lehman

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