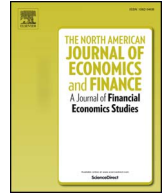


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The impact of funding liquidity on market quality

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ABSTRACT

This study analyzes market quality during the 2007–2008 credit crunch, by examining the impact of funding liquidity on market liquidity and price discovery of S&P 500 exchange-traded funds (i.e., S&P 500 depositary receipts [SPYs]) and index futures (E-minis). The empirical results show that funding liquidity affects market liquidity, and that the impact of illiquidity contagion between SPYs and E-minis was significant during the subprime mortgage crisis. In particular, the contagion effects between the two markets mediate the impact of funding illiquidity on market liquidity during the credit crunch. Considering the influences of other market factors on price discovery, we suggest that E-mini index futures made less contributions to price discovery during the credit crunch compared to normal periods. The empirical finding emphasizes the importance of the contagion effect between ETF and E-mini futures markets, when they suffer from external shocks.

1. Introduction

The financial crisis that resulted from the subprime mortgage crisis of 2007 was associated with several shocks that underscored the importance of funding liquidity for market quality. During the financial crisis, especially with specific bankruptcy events, the liquidating and hedging needs of short positions emerged because of concerns relating to unscheduled trading halts and uncertainties with clearinghouse integrity. Market professionals recognize their short strategies for reducing equity exposure, thereby exacerbating market fluctuations. The amplification of volatility therefore results in incomplete protection to meet the considerable needs of insurance and liquidation spirals, and this leads to increased capital and margin requirements of investors. As mentioned in Brunnermeier and Pedersen (2009), market liquidity and funding liquidity are mutually reinforcing, and further leading to liquidity spirals.

This study analyzes changes in market quality during the 2007–2008 credit crunch by examining the impact of funding illiquidity on market liquidity and the price discovery of S&P 500 exchange-traded funds ([ETFs]; i.e., S&P 500 depositary receipts [SPYs]) and E-mini index futures (E-minis). As noted in O'Hara (2003), two of the most important functions of the financial markets are price discovery and liquidity. Much of the available empirical literature has examined funding liquidity during the 2008 financial crisis by focusing on equity liquidity, volatility, and resiliency. However, to date no relevant study has considered the impact of funding liquidity on price discovery and the influence of spillovers on market liquidity. To fill this gap, we examine the impact of funding liquidity on changes in market quality in the SPY and E-minis markets that have the characteristics of high liquidity, and discuss the liquidity linkage and illiquidity contagion between the two markets.

Stressed markets produce more cash/futures arbitrage opportunities compared to non-stressed markets (Cheng & White, 2003).

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Margin requirements increase in illiquidity when margin-setting financiers are unsure whether price changes are triggered by fundamentals news or liquidity shocks (Brunnermeier, 2009). Grossman and Miller (1988) argue that both spot and futures stock markets were highly illiquid on October 19, 1987 (i.e., the day of the crash). Such uncertainty occurs particularly when liquidation pressure leads to price volatility, which in turn raises a financier's expectations regarding future volatility, thus resulting in increased margins. During the market disruptions of 2007, broker-dealer financing and liquidity arrangements drew increasing attention from analysts. Credit ratings agencies recognized these market pressures, noting that major U.S. broker-dealers were liquidity-challenged in the third quarter of 2007, when disruptions in the U.S. subprime period and the spillover into other markets contributed to an overall and widespread market correction.¹

The issues of liquidity comovement and spillover have received considerable attention and discussion through the development of theoretical models (Brunnermeier & Pedersen, 2009; Cespa & Foucault, 2014; Goldstein, Li, & Yang, 2014).² In addition to theoretical works, empirical studies have found that market declines cause asset illiquidity, and binding capital constraints leads to sudden liquidity dry-ups. Hameed, Kang, and Viswanathan (2010) report that negative market returns reduce stock liquidity, especially during periods of tightness in the funding market. Goyenko and Ukhov (2009) note that bond illiquidity acts as an important channel for the transmission of monetary shocks into the stock market, and show that a change in the illiquidity of one market affects illiquidity conditions in the other. Chiu, Chung, Ho, and Wang (2012) demonstrate that a higher degree of funding illiquidity leads to a decline in market liquidity in the ETF market, especially for financial ETFs compared to index ETFs. However, the funding of traders dramatically affects—and is also markedly affected by—market liquidity. Based on the associations between funding and market liquidity, Brunnermeier and Pedersen (2009) develop a theoretical model to link an asset's market illiquidity and risk premium to its funding use and the general shadow cost of funding by analyzing the characteristics of market liquidity.³ Therefore, the contagion effect between ETFs and index futures could influence the impact of market illiquidity on the market quality of the two markets.

Previous studies that have analyzed the relationship between funding liquidity and market liquidity have also offered recommendations for future research. First, Hameed et al. (2010) indicate that future researchers could investigate the effects of funding constraints by using high-frequency data, because their own evidence is indirect.⁴ Second, Cespa and Foucault (2014) recommend that future researchers examine the strength and influence of liquidity spillovers across asset classes. Third, Goldstein et al. (2014) provide an example using index futures markets to show that individual traders are more likely to concentrate on stock index trading, whereas hedge fund trading is more likely to involve index arbitrage, with trading in both equity and index futures markets. Integrating these research recommendations, the current study investigates the impact of funding illiquidity on changes to market quality in SPY and E-mini index futures markets.

Although many studies (Brunnermeier & Pedersen, 2009; Kyle & Xiong, 2001) argue that funding liquidity (i.e., capital constraints) shocks and wealth effects for liquidity supplier are the possible sources of covariation in liquidity supply. Theories of liquidity comovements due to dealers' capital constraints assume that marginal liquidity providers are identical across assets. Cespa and Foucault (2014) argue that this assumption is less tenable across heterogeneous asset classes, suggesting that liquidity providers in one asset class (e.g., ETFs) often learn information from other asset price (e.g., from the underlying assets of ETFs).

Ben-David, Franzoni, and Moussawi (2012, 2014) argue that ETFs impact the liquidity of underlying portfolio, especially during events of market stress. Since the E-mini futures play an important role on hedge trading in the financial markets during the high volatility period. In addition, Ben-David, Franzoni, and Moussawi (2012) indicate that ETFs contributed to shock propagation between the futures market and the equity market during the Flash Crash on May 6, 2010. Based on the concept provided by Cespa and Foucault (2014), authorized participants (APs) and arbitrageurs maybe refer to the information of the index futures to keep ETF prices in line with those of the basket that they aim to track. Furthermore, market makers (or liquidity providers) of the index futures learn the information from the prices of those underlying securities. Illiquidity spillover and contagion between ETFs and index futures are important for market participants, especially during event of market stress such as the 2007–2008 credit crunch. Ben-David, Franzoni, and Moussawi (2017) suggest that ETFs could potentially improve price discovery at the index level. They argue that trading activity from authorized participants (APs) and arbitrageurs helps transmit systematic information from the ETF to the underlying securities and provides liquidity to the underlying securities. APs and arbitrageurs play an important role in the improvement in price discovery and the additional liquidity that ETFs add can enhance price discovery.

Consistent with Brunnermeier and Pedersen (2009) and Chiu et al. (2012), we show that funding liquidity has a significant effect

¹ Furthermore, the “Flash Crash” of May 6, 2010, represents one of the most dramatic events in the history of financial markets. A report from the Commodities Future Trading Commission and the Securities and Exchange Commission identifies one source of the flash crash as index arbitrageurs who opportunistically buy E-minis and simultaneously sell products such as SPYs or individual equities in the S&P 500, which transferred the selling pressure in the futures market to equities markets.

² Brunnermeier and Pedersen (2009) provide a model that links an asset's market liquidity and traders' funding liquidity, thereby showing that margins are destabilizing and market liquidity and funding liquidity are mutually reinforcing, and leading to liquidity spirals. Cespa and Foucault (2014) show how liquidity spillovers occur in a dual-asset framework when dealers specialized in different assets learn from others' prices. They report a self-reinforcing, positive relationship between the illiquidity of the two assets. Furthermore, Goldstein et al. (2014) use a similar setting to Cespa and Foucault (2014) to analyze a model in which traders have different trading opportunities and learn information from prices, thereby showing that the diversity of trading motives (speculation or hedging) may reduce price informativeness and increase capital cost.

³ Brunnermeier and Pedersen (2009) devise a model to demonstrate that market liquidity (a) can suddenly dry up; (b) has commonality across securities; (c) is related to volatility; (d) is subject to “flight to quality”; and (e) co-moves with the market.

⁴ Hameed et al. (2010) investigate the impact of market declines on various dimensions of liquidity, including (a) time-series as well as cross-sectional variations in liquidity; (b) commonality in liquidity; and (c) the cost of liquidity provision. Consistent with the results of the previous theoretical model, their results suggest that market liquidity drops after large negative market returns, because the aggregate collateral of financial intermediaries falls and many asset holders are forced to liquidity, making it difficult to provide liquidity precisely when the market requires it.

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