ZOMBIE STOCKS

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We examine a previously unstudied aspect of short selling: the risk that the shares a short seller has borrowed will be delisted and deregistered. We label such shares "zombie stocks" or "zombies," because they appear to be "dead," but nevertheless create financial horror for short sellers, exposing them to significant risks and costs even when the short seller has speculated correctly against a company's shares. The central problem occurs when short sellers are unable to purchase shares to satisfy their borrowing obligations and instead become stuck paying equity loan fees and posting collateral, potentially indefinitely.

We argue that these risks and costs are a significant limit to arbitrage that impedes the ability and willingness of short sellers to correct stock mispricing. We explain for the first time in the literature how the existing legal framework gives rise to these costs because of the way shares are held, loaned, and traded in public markets.

We also collect and analyze a unique dataset of thousands of stocks that were delisted from 2002–2019, and we examine the risks and costs of stocks becoming zombies. We demonstrate that these risks and costs are substantial: for more than 250 firms in our sample, we show that short sellers could have been trapped in a position for at least a month, and possibly much longer. We quantify the cost of equity loan fees and collateral requirements, which can be substantial.

Finally, we propose and assess several policies to address the existence of "zombie stocks." We contribute to the law and finance literature by providing the first evidence of zombie stocks as a barrier to short selling and by providing policy responses that could reduce the risks and costs associated with zombie stocks.

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INTRODUCTION

We address a previously unstudied aspect of short selling[1]: the delisting and deregistration of shares a short seller has borrowed and sold.[2] We label

[1] In a short sale, the seller borrows shares of stock that they do not yet own and sells those shares at current market prices; the short seller later "covers" this short position by purchasing the shares at a future date and then returns the borrowed shares. *See* Barbara A. Bliss, Peter Molk & Frank Partnoy, *Negative Activism*, 97 WASH. UNIV. L. REV. 1333, 1338–40 (2020) (describing mechanics of short selling). The short seller therefore profits when share prices decrease between the sale and subsequent purchase. *See* SEC. & EXCH. COMM'N, *Short Sales*, https://www.investor.gov/introduction-investing/investing-basics/glossary/short-sales-0 (last visited Feb. 12, 2022).

[2] Delisting and deregistration are distinct but conceptually related. Delisting involves removing a company's securities from the exchange on which they are listed, whereas deregistration involves terminating or suspending a company's reporting obligations under federal securities law. *See* Securities Exchange Act Release No. 34-52029, 17 C.F.R. 232, 240, 249 (July 14, 2005). Some scholars have long noted the importance of delisting and deregistration and their impact on data used for academic study, but they have not addressed the implications of these events for short sellers. *See, e.g.*, Tyler Shumway, *The Delisting Bias in CRSP Data*, 52 J. FIN. 327 (1997) (showing that surprise negative price reactions from delistings due to bankruptcy and other negative reasons are not reflected in commonly-used databases); Tyler Shumway & Vincent A. Warther, *The Delisting Bias in CRSP's Nasdaq Data and Its Implications for the Size Effect*, 54 J. FIN. 2361 (1999) (examining significant negative returns for delisted stocks).

such shares "zombie stocks" or "zombies," because they appear to be "dead,"[3] but nevertheless create financial horror for short sellers, exposing them to significant costs even when the short seller has bet correctly against a company's shares.[4] The central problem occurs when short sellers are unable to close out their positions because a stock no longer trades. To initiate a position, a short seller first borrows shares, through a broker, in the equity lending market and then sells them in the stock market.[5] They post collateral with their broker and pay a fee each day the position remains open.[6] To close a position, a short seller must purchase shares and return them to the lender. But when the shares no longer trade, a short seller may become stuck[7] in the position, paying fees and posting collateral, potentially indefinitely.[8]

As we describe below, stocks may be delisted for a number of reasons, only some of which lead to the stock actually becoming a "zombie stock." For example, a delisting from a stock exchange does not necessarily lead to deregistration; a delisting might occur merely because a stock switches exchanges

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[3] Delisted and deregistered shares are "dead" in ways that resemble zombies, the mythological undead revenants created by reanimating a corpse. For example, delisted and deregistered common shares of bankrupt companies frequently are canceled as part of the bankruptcy reorganization process, meaning that the shares no longer exist. Before such cancelation, shares of bankrupt companies can continue to trade over-the-counter (OTC), typically with the letter "Q" appended to the end of their stock symbols to denote the bankruptcy. *See* FIN. INDUS. REGUL. AUTH., *What a Corporate Bankruptcy Means for Shareholders*, https://www.finra.org/investors/insights/what-corporate-bankruptcy-means-shareholders (Nov. 16, 2021). Some shares of bankrupt companies nevertheless can have value, in part due to expectations that they will receive a stake in the reorganized company. *See* Andrew Bary, *Hertz Exits Bankruptcy. What Investors Can Expect.*, BARRON'S (June 30, 2021), https://www.barrons.com/articles/hertz-shares-rise-as-bankruptcy-exit-approaches-51625078681 (describing Hertz shares, HTZGQ, which traded at a positive price, given that shareholders expected to receive a stake in the reorganized company).

[4] One publicized example involved Rich Gates, a fund manager who had shorted some U.S.-listed Chinese companies that were subsequently delisted. See Bill Alpert, Even Short-Sellers Burned by Chinese Shares, Barron's (June 18, 2011), https://www.barrons.com/amp/articles/SB50001424053111904113704576383892664177456; see also Bill Alpert, Getting *Caught Short*, BARRON'S (Apr. 6, 2018, 9:44 PM), https://www.barrons.com/articles/getting-caught-short-1523065469 (describing one of Gates's mutual funds as being stuck short and paying fees margin requirements related to China-Biotics shares for five years, since 2013). Gates joined a Securities Industry and Financial Markets Association committee known as the Worthless Securities Working Group, which sought reform but ultimately disbanded. *See id.*

[5] *See generally* Gene D'Avolio, *The Market for Borrowing Stock*, J. FIN. ECON. 66, 271 (2002) (discussing the securities lending market).

[6] *See* Statement of Claim, IsZo Capital LP v. Jefferies LLC, Financial Industry Regulatory Authority (FINRA) Dispute Resolution Services, FINRA Case No. 21-02848, Exhibit 2, at 2, (on file with author) (letter from counsel for IsZo stating "there is no market for these securities); *see also id.*, Exhibit 4, at 1 (letter from counsel for Jefferies noting that "FINRA Rule 4210(c) states that the Firm shall maintain '$2.50 per share or 100% of current market value, whichever is greater' of securities that are short in an account").

[7] Stocks can continue to trade in OTC markets after they are delisted. *See* U.S. SEC. & EXCH. COMM'N, *Over-the-Counter Market,* https://www.sec.gov/divisions/marketreg/mrotc.shtml (visited Feb."chills" and "freezes" on trading of particular securities that are on deposit at DTC. *See* U.S. SEC. & EXCH. COMM'N, *DTC Chills and Freezes*, https://www.sec.gov/oiea/investor-alerts-bulletins/ib_dtcfreezes.html (visited Feb. 12, 2022).

[8] *See id.*; *see also* FINRA Rule 4210(c). We discuss this rule in greater detail in Part I.

or has been converted as part of a merger. Similarly, some scenarios will lead to the "death" of the stock with high probability, but not with certainty. One of our unique contributions here is to develop a framework for thinking about complex issues related to "zombie stocks," and to suggest how policymakers might address this morass.

Consider as an example IsZo Capital Management, a hedge fund that had a short position in several companies that had become "zombie stocks."[9] Table 1 provides details about IsZo's zombie positions, including the quantities of shares and margin requirements.[10] Note that IsZo's brokerage statement listed a price of zero for these positions, but nevertheless, included a significant margin requirement. Table 2 provides additional trading information about the stocks before they became "zombies."

TABLE 1: ISZO CAPITAL MANAGEMENT'S "ZOMBIE STOCKS" AS OF AUG. 9, 2021

Company	Quantity	Price	Market Value	PMC req %	Margin Requirement
Capital Corp of the West	(1,792)	0.000	0.00	100.00	2,240.00
Franklin Credit MGMT Corp	(44,990)	0.000	0.00	100.00	56,237.50
CPI Corp	(84,191)	0.000	0.00	100.00	105,238.75
Orleans Homebuilders Inc	(9,947)	0.000	0.00	100.00	12,433.75

Consider Orleans Homebuilders Inc. as an example. Orleans was a successful home builder for decades but faced serious financial difficulties after the 2007-08 financial crisis, including declining revenues and significant debt.[11] IsZo bet, correctly, that the price of Orleans stock would decline.

On Monday, March 1, 2010, Orleans filed for bankruptcy protection and the stock recorded a closing price of approximately $0.70 per share the previous Friday (February 26, 2010). The stock was delisted from New York Stock Exchange (NYSE) Amex Index but continued to trade, in limited volume, over-the-counter (OTC). As of June 1, 2010, the closing price of its common

[9] *See* Statement of Claim, IsZo Capital LP v. Jefferies LLC, *supra* note 6, at 27, 71, Exhibit 2 (describing IsZo's short position in Orleans shares). As described below, IsZo also held other short positions as well.

[10] *See* Statement of Claim, IsZo Capital LP v. Jefferies LLC, *supra* note 6, Exhibit 1. A broker requires that a customer provide "margin" when there is risk of fluctuation in the price of a security that would expose the broker to potential nonpayment from the borrower. Suppose a customer buys $100 of shares in a brokerage "margin" account by paying just $50. The additional $50 of "margin" is essentially a loan from the broker. If the price of the shares declines, the broker will require that the customer provide additional funds, to manage the broker's exposure to the risk of loss in the event of the customer's default. See Part III for a more complete discussion of the relationship between brokerage margin requirements and "zombie stocks."

[11] *See* Alan J. Heavens, *Orleans Homebuilders' Reorganization Plan Confirmed*, PHILA. INQUIRER, Dec. 2, 2010, at C01.

shares was just $0.18 per share,[12] and on June 4, 2010, Orleans shares were deregistered under federal securities laws.[13]

IsZo, and any investor with a short position in Orleans, should have rejoiced at these events. In theory, they could have closed out their position during the first two months of 2010 at a profit. Moreover, it should have been possible for IsZo to purchase Orleans shares even after it was delisted; the stock traded in OTC markets until it was deregistered in June, though such trading can be illiquid and restricted (which could have discouraged IsZo from trading).[14] As late as June 1, 2010, it should have been possible to cover a short position in Orleans by purchasing shares in the OTC market for just $0.18 per share. In this scenario, the "death" of Orleans shares was likely but had not yet actually happened. But three days later, when the stock was deregistered, Orleans shares were no longer traded *anywhere*, because deregistered securities can no longer be legally traded on exchanges in public securities markets.[15]

TABLE 2: DELISTING TIMELINE FOR ISZO CAPITAL MANAGEMENT'S "ZOMBIE STOCKS"

This Table reports trading information about IsZo Capital Management's zombie stocks. The data collected from the Center for Research in Security Prices (CRSP) reports the last date and price, as well as the delisting price of the four zombie stocks when the stocks were delisted. We also report the last trading records of the IsZo Capital Management's zombie stocks in the OTC market including the last trading date and the last reported short interest amount. Records in OTC market indicate that three companies, excluding Orleans Homebuilders Inc., were traded in the OTC market for a while after they were delisted.

	CRSP			**OTC**	
Company	**Last trading date**	**Last trading day closing price**	**Delisting price**	**Last trading date**	**Last short interest in OTC**
Capital Corp of the West	02/10/2009	0.085	0.035	09/28/2011	86,513
Franklin Credit MGMT Corp	10/31/2008	0.40	0.35	01/21/2015	44,990
CPI Corp	02/08/2012	1.19	1.19	Still exist	130,805
Orleans Homebuilders Inc	03/01/2010	0.715	0.119	N/A	N/A

[12] *See* Orleans Homebuilders, Inc., Notification of Removal from Listing and/or Registration under Section 12(b) of the Securities Exchange Act of 1934 (Form 25) (June 4, 2010) (describing closing price of $0.18 for Orleans common stock as of June 1, 2010).

[13] *See id.*

[14] *See, e.g.*, Gregory B. Kadlec & John J. McConnell, *The Effect of Market Segmentation and Illiquidity on Asset Prices: Evidence from Exchange Listings* 49 J. FIN. 611, 623–24 (1994) (finding that stocks have improved liquidity after they transition from OTC to being listed on an exchange).

[15] Section 12(b) of the Securities Exchange Act of 1934 requires the registration of any security that trades on a national securities exchange. *See* Keir D. Gumbs, Brian K. Rosenzweig, Ciarra Chavarria & David Dunn, *Going Dark: A Step-by-Step Planning Guide for Exiting the Public Company Reporting System*, 27 INSIGHTS 16, 16 (2013).

By late 2010, Orleans shares were officially worthless—the shares that were deregistered in June were then canceled when a judge approved the Orleans bankruptcy reorganization.[16] After that time, no one, including IsZo or any short seller, would have been able to purchase Orleans shares to satisfy their obligation for one simple reason: they no longer existed.

In such a situation, one might assume that all obligations related to IsZo's borrowed shares would cease. Yet they did not. Instead, these shares became "zombie stocks": even after the shares were canceled, they continued to be a source of risk and cost.

More than ten years later, on November 15, 2021, IsZo sued its broker Jefferies LLC, alleging in a Financial Industry Regulatory Authority (FINRA) arbitration that Jefferies had overcharged IsZo more than $28 million in fees during a five-year period, including fees related to IsZo's short position in Orleans and other securities.[17] IsZo alleged that when it attempted to transfer the short positions from Jefferies to a different broker, Jefferies replied that the delisted positions were "not eligible to be transferred and will remain open."[18]

Even though the Orleans shares that IsZo had shorted no longer existed, as Table 1 shows, Jefferies continued to report in IsZo's brokerage statement that there was a short position of 9,947 shares in Orleans. Jefferies imposed a margin requirement of $12,433.75, even though the market price per share was "0.0000."[19] Jefferies wrote that it was obligated by FINRA rules to impose a margin requirement of at least $2.50 per share for short positions with a market price of less than $5.[20] Jefferies contended that Orleans shares, which were not traded and had been valued at zero *for more than a decade*, fell into the FINRA category of shares with a market price of less than $5.[21]

On paper, IsZo's short positions had reflected significant gains. IsZo had correctly predicted that Orleans shares would decline in value. But the mechanics of establishing the short positions required IsZo to borrow shares. Once the Orleans shares were near worthless, it should have been inexpensive for IsZo to satisfy its obligation by purchasing the stocks for just pennies. But after trading was halted, neither IsZo nor Jefferies could purchase shares to

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[16] *See* Heavens, *supra* note 11, at C01.

[17] IsZo held its short positions at Jefferies for approximately five years, after they were transferred from a different broker. *See* Statement of Claim, IsZo Capital LP v. Jefferies LLC, *supra* note 6, at 16. IsZo also shorted shares of Capital Corp. of the West, Franklin Credit Management Corp., and CPI Corp., each of which subsequently plummeted in value. Three of the companies IsZo shorted (Capital, CPI, and Orleans) had filed SEC Form 12b-25 "Notification of Late Filing" (Form NTs), indicating they were unable to meet their reporting obligations in a timely matter, and trading in those stocks was immediately halted. *See id.*, Exhibit 2.

[18] *Id.* at ¶ 25.

[19] *See id.*, Exhibit 5 (Jefferies brokerage statements).

[20] *See id.*, Exhibit 4 (letter from Jefferies dated Oct. 18, 2021).

[21] *See* Part III.A (discussing applicable FINRA rules).

close out IsZo's short positions.[22] Instead, IsZo was forced to continue maintaining those positions in its margin account, and to pay borrowing costs and post margin to maintain those positions. Every day, the apparent gains from IsZo's short positions declined, eaten away by these costs, and this zombie position continued to cause horror for years.

IsZo's story is far from unique. As our paper unveils, short sellers frequently encounter the risk that the shares they have borrowed will be delisted, deregistered, or both, making it difficult or impossible for them to purchase shares to satisfy their obligation to return borrowed shares. The costs of maintaining such "zombie stock" positions can be substantial and therefore act as a deterrent to short selling. Given the evidence that short sellers are important contributors to price efficiency[23] and liquidity,[24] these risks may thus adversely impact market quality.

The process by which a stock becomes a "zombie stock" is complex and involves not only short sellers and their brokers but also transfer agents and the Depository Trust & Clearing Corporation (DTC).[25] Transfer agents play an especially important role: they are responsible for recording changes of share ownership, maintaining shareholder records, canceling and issuing stock certificates, and distributing dividends.[26] As the Securities and Exchange Commission (SEC) has noted:

> Because transfer agents stand between issuing companies and security holders, efficient transfer agent operations are critical to the successful completion of secondary trades. SEC rules and regulations are intended to facilitate the prompt and accurate clearance and settlement of securities transactions and that assure the safeguarding of securities and funds.[27]

As we demonstrate below, many of the challenges that arise for "zombie stocks" are due to the relationship among transfer agents, brokers, and the DTC. Particularly, transfer agents and brokers can lack the incentive or ability to close out short positions of delisted or deregistered stocks. Also, transfer agents and brokers often do not necessarily communicate adequately with the DTC.

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[22] To the extent Jefferies had clients who were long Orleans shares at this time, they could have offset those positions with IsZo's positions, effectively transferring "shares" to IsZo to then be returned to satisfy the borrowing obligation.

[23] *See, e.g.*, Pedro A. C. Saffi & Kari Sigurdsson, *Price Efficiency and Short Selling*, 24 REV. FIN. STUD. 821, 835–45 (2011).

[24] *See, e.g.*, Ekkehart Boehmer, Charles M. Jones & Xiaoyan Zhang, *Shackling Short Sellers: The 2008 Shorting Ban*, 26 REV. FIN. STUD. 1363, 1373–94 (2013).

[25] We describe DTC's role in detail in Part I.C.

[26] *See Transfer Agents*, SEC. & EXCH. COMM'N, https://www.sec.gov/divisions/marketreg/mrtransfer.shtml (last modified Apr. 28, 2016).

[27] *Id.*

As we describe in Part I, short selling has been shown to generate substantial benefits in financial markets, and restrictions on short selling threaten and reduce those benefits. We describe the various rules applicable to short sellers and survey the literature on short selling. We situate the risks and costs associated with "zombie stocks" as yet another restriction on short selling that leads markets to be less efficient.[28] We also describe the challenges of share borrowing and lending, and the complexities associated with delisting and deregistration, each of which contributes to the difficulties short sellers face from "zombie stocks." As we show, the institutional and regulatory environment creates the potential for stocks to become "zombies," thereby imposing risks and costs on short sellers, and potentially deterring short sellers from borrowing stocks.

In Part II, we provide extensive empirical evidence of the risks and costs to short sellers. Our main takeaway is that the IsZo example above is far from unique. There are many similar examples where short sellers of "zombie stocks" become trapped, paying significant equity lending fees and posting margin for weeks, months, or even years. Both lending fees and margin requirements represent risks and costs that erode potential gains from a short position and may serve as a deterrent to short sellers. We show that these situations often arise after shares are delisted from a major exchange. As we demonstrate, in some cases delisted shares eventually trade OTC (usually after a delay of a few weeks). In such cases, "zombie stocks" effectively come back to life and the horror can end. However, in other cases, the stock is later deregistered, which prevents the shares from trading on any venue. We show that equity lending fees remain high for such stocks, and often persist for months, sometimes even years.

Finally, in Part III we discuss several implications and policy recommendations that could lower the risks and costs associated with "zombie stocks." Our proposals fall into three categories: (1) eliminating outdated and ill-advised margin requirements, (2) facilitating the closeout of short positions, and (3) applying rules of best execution and good faith and fair dealing to clients with "zombie stock" positions. Throughout the article, we also suggest some changes to academic researchers' approach to short selling and some areas of future study.

Overall, we contribute to the academic literature by demonstrating that the "zombie stock" problem is widespread and by showing how the problem generates significant costs for short sellers. Our findings are consistent with other research on short-selling restrictions, which shows that such restrictions harm investors by making markets less efficient.[29]

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[28] Boehmer, Jones & Zhang, *supra* note 24 (showing that restrictions placed on short sales in 2008 led to wider spreads, increased volatility, and price impacts).

[29] *See generally* Don M. Autore, Randall S. Billingsley & Tunde Kovacs, *The 2008 Short Sale Ban: Liquidity, Dispersion of Opinion, and the Cross-Section of Returns of US Financial*

I. Background on Short Selling, Share Lending, and Delisting

To provide context for assessing the expected risks and costs to short sellers from the possibility that their targets will become "zombie stocks," we begin by discussing three important background issues.

First, we describe the academic literature on the benefits of short selling, including price discovery and informational efficiency.

Second, we describe the literature on the risks and costs of short selling apart from the risks associated with "zombie stocks." These risks and costs can be significant, so much so that many market participants now view short selling as unprofitable and have abandoned the practice.

Third, we describe some important, often poorly understood, details about the legal framework and challenges related to short selling and share lending. We address the way shares are held, loaned, and traded in public markets. We frame these challenges in ways that are relevant to "zombie stocks," and have not previously been described in the literature.

Fourth, we discuss delisting and deregistration. We show how the complexities and uncertainty of these two phenomena contribute to the risks of shorting stocks that might become "zombies."

A. Short Selling Benefits

At the outset, we note that there is a large body of academic research on short selling with over 250 academic articles and over 40,000 citations.[30] This literature overwhelmingly shows that short selling can generate significant benefits, particularly regarding price discovery and informational efficiency.[31] Numerous studies show that short-sellers are informed traders[32] and that by

Stocks, 35 J. Banking & Fin. 2252 (2011) (addressing the negative impact of post-financial crisis regulation on short selling).

[30] *See* Table A.1 for a more detailed listing of the papers in that literature.

[31] *See, e.g.*, Peter Molk & Frank Partnoy, *Institutional Investors as Short Sellers?*, 99 B.U. L. Rev. 837, 859–67 (2019) (describing the academic literature on positive effects of short selling); *see generally* Wolfgang Bessler & Marco Vendrasco, *The 2020 European Short-Selling Ban and the Effects on Market Quality*, 42 Fin. Res. Letters 1 (2020) (examining European restrictions on short selling); Pedro A. C. Saffi & Kari Sigurdsson, *Price Efficiency and Short Selling*, 24 Rev. Fin. Stud. 821 (2011) (suggesting that short selling leads to better price efficiency); Paul Asquith, Parag A. Pathak & Jay R. Ritter, *Short Interest, Institutional Ownership, and Stock Returns*, 78 J. Fin. Econ. 243 (2005) (suggesting that binding short-sale constraints reduce price accuracy).

[32] *See generally* Joseph E. Engelberg, Adam V. Reed & Matthew C. Ringgenberg, *How Are Shorts Informed? Short Sellers, News, and Information Processing*, 105 J. Fin. Econ. 260 (2012) (showing that the negative relation between short sales and future returns more than doubles on news days); Michael S. Drake, Lynn Rees & Edward P. Swanson, *Should Investors Follow the Prophets or the Bears? Evidence on the Use of Public Information by Analysts and Short Sellers*, 86 Acct. Rev. 101 (2011) (showing that short interest is significantly associated with eleven variables thought to predict future returns); Stephen E. Christophe, Michael G. Ferri & Jim Hsieh, *Informed Trading before Analyst Downgrades: Evidence from Short Sellers*, 95 J.

trading they improve market quality.[33] These views have long been standard in the literature. For example, one study in 1977 stated, "a market with a large number of well-informed investors may not have any grossly undervalued securities, but if these investors are unwilling to sell short (as they often are) their presence is consistent with a few investments being overvalued."[34] This claim has been supported by data in a number of different subsequent studies in recent decades.[35] Most studies addressing measures of short selling activity, such as short interest and short volume, have found them to be negatively correlated with future returns, suggesting that short-sellers have valuable information.[36] Overall, the academic literature shows that short selling improves

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FIN. ECON. 85 (2010) (documenting abnormal levels of short selling for three days prior to the release of analyst downgrades); Ekkehart Boehmer, Charles M. Jones & Xiaoyan Zhang, *Which Shorts Are Informed?*, 63 J. FIN. 491 (2008) (showing that heavily shorted stocks significantly underperform lightly shorted stocks); Stephen E. Christophe, Michael G. Ferri & James J. Angel, *Short-Selling Prior to Earnings Announcements*, 59 J. FIN. 1845 (2004) (documenting a negative relationship between short sales prior to an earnings announcement and future returns); A. J. Senchack, Jr. & Laura T. Starks, *Short-Sale Restrictions and Market Reaction to Short-Interest Announcements*, 28 J. FIN. QUANTITATIVE ANALYSIS 177 (1993) (showing that the announcement of short interest is associated with a small and weakly statistically significant drop in returns).

[33] *See, e.g.*, Veljko Fotak, Vikas Raman & Pradeep K. Yadav, *Fails-to-Deliver, Short Selling, and Market Quality*, 114 J. FIN. ECON. 493 (2014) (showing that naked shorting leads to a significant reduction in absolute pricing errors, intraday volatility, and relative bid-ask spreads); *see generally* DON M. AUTORE, RANDALL S. BILLINGSLEY & TUNDE KOVACS, SEC. & EXCH. COMM'N, *Short Sale Constraints, Dispersion of Opinion, and Market Quality: Evidence from the Short Sale Ban on U.S. Financial Stocks* (2009) (providing evidence that the short sale ban in 2008 was associated with relative increases in share valuation); Anchada Charoenrook & Hazem Daouk, *A Study of Market-Wide Short-Selling Restrictions* (Dep't of Applied Econ. and Mgmt. Cornell Univ., Working Paper No. 2009-21, 2005) (suggesting that allowing short sales improves market quality).

[34] Edward M. Miller , *Risk, Uncertainty, and Divergence of Opinion*, 32 J. FIN. 1151, 1160 (1977).

[35] *See, e.g.*, Arturo Bris, William N. Goetzmann & Ning Zhu, *Efficiency and the Bear: Short Sales and Markets Around the World*, 62 J. FIN. 1029, 1032 (2007) (discussing that their "data support the view that short selling facilitates efficient price discovery").

[36] *See, e.g.*, Asquith, Pathak & Ritter, *supra* note 31, at 258–67 (reporting that short-sale constrained stocks significantly underperform unconstrained stocks); David E. Rapach, Matthew C. Ringgenberg & Guofu Zhou, *Short Interest and Aggregate Stock Returns*, 121 J. FIN. ECON. 46, 55–63 (2016) (showing that short selling predicts market returns in the time series data); Michael J. Aitken, Alex Frino, Michael S. McCorry & Peter L. Swan, *Short Sales Are Almost Instantaneously Bad News: Evidence from the Australian Stock Exchange*, 53 J. FIN. 2205, 2213–21 (1998) (examining the intraday price movement to short sales in the Australian market, where short trades are transparent); Hemang Desai, K. Ramesh, S. Ramu Thiagarajan & Bala V. Balachandran, *An Investigation of the Informational Role of Short Interest in the Nasdaq Market*, 57 J. FIN. 2263, 2270–77 (2002) (documenting that heavily shorted firms in the Nasdaq market have significantly negative abnormal returns after controlling for Fama-French three factors and momentum); Andrea S. Au, John A. Doukas & Zhan Onayev, *Daily Short Interest, Idiosyncratic Risk, and Stock Returns*, 12 J. FIN. MKT. 290, 297–308 (2009) (showing that stocks with low short interest in the UK market experience significant positive returns); Joseph J. Seneca, *Short Interest: Bearish Or Bullish?*, 22 J. FIN. 67, 67–70 (1967) (showing that short interest is significantly negatively related to future prices, even after controlling for autocorrelation); Engelberg, Reed & Ringgenberg, *supra* note 32, at 269–75 (suggesting that short sellers have a superior ability to process publicly available information); Ekkehart Boehmer, Charles M. Jones & Xiaoyan Zhang, *What Do Short Sellers Know?* (N.Y. Fed. Rsrv. Working

stock price accuracy and generates informative signals that may help the efficient allocation of capital.[37]

Short selling is particularly important in markets where there are asymmetric incentives that favor the production of positive versus negative information. Scholars have long understood that managers of public firms often have incentives to publicize positive information about their operations, to make it easier and cheaper to raise capital and increase manager compensation that depends on the company's stock price.[38] In contrast, managers have less of an incentive to disclose negative information, except to the extent required by securities law,[39] and can even target the short-sellers that produce this information.[40] Accordingly, incentives are often skewed in favor of positive information over negative information which can lead to an upward bias in price.[41] This asymmetry is one reason why short selling can be so valuable and why studies have shown that short-sellers improve market efficiency.[42]

Paper 2010), https://www.newyorkfed.org/medialibrary/media/research/conference/2010/cb/Boehmer_Jones_Zhang1.pdf (suggesting that short sellers are informed about future earnings).

[37] *See, e.g.*, Marcel Kahan, *Securities Laws and the Social Costs of "Inaccurate" Stock Prices*, 41 DUKE L.J. 977, 1005–08 (1992) (noting how "accurate stock prices further an efficient allocation of capital"); Jonathan Brogaard, Matthew C. Ringgenberg & David Sovich, *The Economic Impact of Index Investing*, 32 REV. FIN. STUD. 3461 (2019) (showing that noise in security prices "impedes firms' ability to make production decisions").

[38] *See* Molk & Partnoy, *supra* note 31, at 859–61.

[39] For example, some studies have found that managers vary how information is disseminated in order to reduce litigation risk. For a description of this literature, *see* Barbara Bliss, Frank Partnoy & Michael Furchtgott, *Information Bundling and Securities Litigation*, 65 J. ACC'TING & ECON. 61, 62 (2018).

[40] *See, e.g.*, Owen A. Lamont, *Go Down Fighting: Short Sellers vs. Firms*, 2 REV. OF ASSET PRICING STUD. 1, 15–16 (2012) (providing evidence that firms take anti-shorting actions).

[41] *See, e.g.*, Miller, *supra* note 34, at 1160–66 (suggesting that prices reflect the valuations of more optimistic investors when short sales constraints exist and investors have heterogeneous beliefs).

[42] *See, e.g.*, Ekkehart Boehmer & Juan (Julie) Wu, *Short Selling and the Price Discovery Process*, 26 REV. OF FIN. STUD. 287, 295–303 (2013) (documenting that increased shorting flow reduces the deviations in prices from a random walk); Engelberg, Reed, & Ringgenberg, *supra* note 32, at 269–75 (suggesting that short sellers are skilled information processors and are important to market efficiency); David Hirshleifer, Siew Hong Teoh & Jeff Jiewei Yu, *Short Arbitrage, Return Asymmetry, and the Accrual Anomaly*, 24 REV. OF FIN. STUD. 2429, 2444–57 (2011) (examining whether short sellers try to arbitrage accounting anomalies like accrual and net operating asset (NOA) anomalies and whether short selling can help limit mispricing); Pedro A. C. Saffi & Kari Sigurdsson, *Price Efficiency and Short Selling*, 24 REV. OF FIN. STUD. 821, 835–44 (2011) (showing that stocks with a low lending supply and/or high loan fees are associated with worse price efficiency); Amiyatosh Purnanandam & Nejat Seyhun, *Do short sellers trade on private information or false information?*, 53 J. FIN. & QUANT. ANALYSIS 997, 1021 (examining whether short sellers contribute to the informational efficiency of prices by trading on private information); Jonathan M. Karpoff & Xiaoxia Lou, *Short sellers and Financial Misconduct*, 65 J. FIN. 1879, 1879–1913 (2010) (showing that short selling tend to be good at uncovering financial fraud); Arturo Bris, William N. Goetzmann & Ning Zhu, *Efficiency and the Bear: Short Sales and Markets Around the World*, 62 J. OF FIN. 1029, 1046–70 (2007) (providing evidence of increased market efficiency in countries where short sales are allowed).

B. Short Selling Risks and Costs

Scholars also have shown that restrictions on short selling—including increases in the risk faced by short sellers—may reduce liquidity, increase volatility, and skew available information, ultimately leading to less accurate stock prices.[43] A considerable body of research shows that regulations restricting or constraining short selling leads to mispricing and less informationally efficient markets.[44]

Notwithstanding these widespread findings, short investors face significant risks and costs, often more so than long investors. First, the mechanics of short selling leave short investors exposed to several unique risks and costs. To short a stock, a short seller must first borrow shares in the equity lending market, and they must post collateral and pay a borrow fee each day the position remains open. These borrow fees can change over time and the lender of the shares retains the right to terminate the loan at will.[45] Moreover, short sellers also face substantial risks from regulatory scrutiny and litigation[46] following

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[43] *See, e.g.*, Joseph E. Engelberg, Adam V. Reed & Matthew C. Ringgenberg, *Short-Selling Risk*, 73 J. FIN. 755, 756 (2018) (finding that stocks with more short selling risk have lower returns, less price efficiency, and less short selling); *see also* SEC. & EXCH. COMM'N, SHORT SALE POSITION AND TRANSACTION REPORTING 135 (2014), https://www.sec.gov/files/short-sale-position-and-transaction-reporting%2C0.pdf [hereinafter *SEC Short Sale Position*] ("The academic literature provides ample theoretical support for, and empirical evidence of, the importance of short selling for liquidity."); *SEC Short Sale Position* at 134 ("Theoretical studies support the notion that short sellers promote price efficiency, finding that restrictions on short selling should lead to less accurate prices, higher volatility, and should hinder price discovery.").

[44] *See, e.g.*, Boehmer & Wu, *supra* note 42, at 317–18 ("We find that the total effect of shorting on efficiency is lower when shorting is more constrained."); Engelberg et al., *supra* note 32, at 278 (arguing that negative information is not accurately reflected in stock prices as informed traders capitalize on superior information processing, rather than on superior access to information); Karl B. Diether, Kuan-Hui Lee & Ingrid M. Werner, *It's SHO Time! Short-Sale Price Tests and Market Quality*, 64 J. FIN. 37, 38 (2009) ("[S]horting restrictions had no effect on the volatility of returns."); Owen A. Lamont & Jeremy C. Stein, *Aggregate Short Interest and Market Valuations*, 94 AM. ECON. REV. 29, 32 (2004) (arguing that problems arise in markets from insufficient short selling, rather than excessive); Douglas W. Diamond & Robert E. Verrecchia, *Constraints on Short-Selling and Asset Price Adjustment to Private Information*, 18 J. FIN. ECON. 277, 302–3 (1987) (arguing that short sale constraints reduce the "rate at which private information is revealed to the public"); Harrison Hong & Jeremy Stein, *Differences of Opinion, Short-Sales Constraints, and Market Crashes*, 16 REV. FIN. STUD. 487, 489–91 (2003) (arguing that some investors do not trade due to constraints on short selling, thereby preventing accurate information from being revealed to markets); Miller, *supra* note 34, at 1166 ("In a market with little or no short selling the demand for a particular security will come from the minority who hold the most optimistic expectations about it.").

[45] *See* Gene D'Avolio, *The Market for Borrowing Stock*, 66 J. FIN. ECON. 271, 271–306 (2002) (discussing the securities lending market); Engelberg et al., *supra* note 43, at 755 (showing that stocks with higher short selling risk have less trading by short sellers and lower price efficiency).

[46] *See, e.g.*, Ian Appel, Jordan Bulka & Vyacheslav Fos, *Active Short Selling by Hedge Funds*, (CEPR Press Discussion Paper No. 13788, 2019) (describing regulatory scrutiny and litigation arising from short selling); Lamont, *supra* note 40, at 1 (noting that firms can take diverse legal and regulatory actions against short sellers).

significant price declines.[47] The "meme" stock phenomena of 2021[48] further increased these risks, leading some short sellers to exit the business and leaving others to defend themselves against a criminal investigation of short selling by the Department of Justice.[49] Short sellers also frequently face pressure from commentators[50] and corporate managers[51] who favor imposing additional restrictions on short selling; regulators periodically give into these pressures, imposing additional costs on short sellers.[52]

Recent scholarly efforts have examined the market reaction around announcements made by activist short sellers who claim to have documented problems at targeted companies. For example, several recent studies independently find that activist short-selling campaigns are associated with abnormal returns of approximately negative 7% around the announcement date.[53] Although one controversial study examining a set of anonymous announcements argues that short sellers have incentives to profit from false or misleading announcements to the extent markets overreact to the publication of salient negative news,[54] a more recent study found that activist short selling is associated with long-term negative returns and results, as well as increased regulatory scrutiny and litigation against targeted companies.[55] In sum, the academic literature shows that short sellers provide significant benefits to markets, but the activity of short sellers can be constrained by the risks and costs associated with shorting.

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[47] *See* Tom Matthews et al., *Short Selling Bans and Market Restrictions*, WHITE & CASE (Feb. 15, 2021), https://www.whitecase.com/insight-alert/short-selling-bans-and-market-restrictions-considerations-investors.

[48] *See* Owen Lamont & Richard Thaler, *'Dumb Money' Exposes the Baffling Allure of Bad Investment Advice*, N.Y. TIMES (Oct. 1, 2023), https://www.nytimes.com/2023/10/01/opinion/dumb-money-movie-gamestop-stock.html.

[49] *See* Michelle Celarier, *Are Activist Short Sellers Misunderstood?*, N.Y. TIMES (Feb. 12, 2022), https://www.nytimes.com/2022/02/12/business/dealbook/are-activist-short-sellers-misunderstood.html (describing pressures from the public, companies, and regulators on short sellers).

[50] *See, e.g.*, Larry Kudlow, *What Was the SEC Thinking?*, NAT'L REV. (Aug. 13, 2007), https://www.nationalreview.com/kudlows-money-politics/what-was-sec-thinking-larry-kudlow (asserting that restrictions on short selling help reduce market volatility and prevent "bear raids," and that the SEC's removing the uptick rule was "an unbelievably lousy idea").

[51] *See* Jonathan Garber, *Elon Musk: 'Short Selling Should Be Illegal'*, FOX BUS. (Dec. 3, 2019), https://www.yahoo.com/entertainment/elon-musk-apos-short-selling-163709050.html.

[52] *See, e.g.*, MANAGED FUNDS ASS'N, *An Introduction to Short Selling*, 7–12 (2018) (describing various costs associated with short selling); Asquith, Pathak & Ritter, *supra* note 31, at 258–67 (reporting that short-sale constrained stocks significantly underperform unconstrained stocks).

[53] *See* Ian Appel et al., *Active Short Selling by Hedge Funds* 2 (European Corp. Governance Inst., Working Paper No. 609, 2019), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3401875; *see generally* Barbara A. Bliss et al., *Negative Activism*, 97 WASH. L. REV. 1333 (2020).

[54] *See* Joshua Mitts, *Short and Distort*, 49 J. LEGAL STUD. 287 (2020) (finding that pseudonymous attacks on public companies are followed by sharp stock price reversals).

[55] *See* Molk & Partnoy, *supra* note 53, at 30–45.

C. Share Borrowing and Lending

We next describe some important institutional details that matter to the study of "zombie stocks" but have not been described extensively in the academic literature. The key issues involve legal encumbrances that arise from the peculiar way shares are held, borrowed, and traded in modern financial markets.[56]

As noted in Part I.B, to establish a short position, the short seller must borrow shares and then sell them. But actually borrowing a share is impossible for most short sellers, because the DTC is the holder of record (with the nominee name Cede & Co.) for most securities.[57]

Instead, a complex daisy-chain process enables a short seller to indirectly borrow and sell the share through their broker, provided that the broker is a member of DTC.[58] DTC, through a subsidiary, the National Securities Clearing Corporation (NSCC), provides to its member brokers an automated book-entry accounting system that centralizes the settlement of securities transactions. NSCC acts as the central counterparty to clear and settle virtually every transaction in equity securities in the U.S., including short sales.[59]

Brokers use a Continuous Net Settlement (CNS) system to settle their transactions with NSCC and keep a record of their securities and money balances. CNS short positions represent shares owed by brokers to NSCC, and if shares are available they are delivered from a broker's account at DTC to NSCC's account at DTC to cover the broker's obligation to CNS.[60] The main change related to short selling that occurs each day is not the actual borrowing and selling of shares by short sellers, but instead is a book entry that enables a member broker to "lend" any excess securities in their DTC account to ensure that short sale delivery obligations are satisfied.[61] Throughout this process, the shares themselves remain at DTC, in the name of Cede & Co. Thus, while the mechanics of short selling suggest shares are lent from an existing long investor to a short seller who then sells them to another long investor, in reality the shares do not move.

From the short seller's perspective, both the borrowing and sale of shares are executed by the broker based on a "margin" agreement between the short

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[56] *For a complete description of the legal encumbrances associated with short selling, which we rely on here, see* Shaun Martin & Frank Partnoy, *Encumbered Shares*, 2005 U. ILL. L. REV. 775, 794–801 (2005); *see also* Marcel Kahan & Edward B. Rock, *The Hanging Chads of Corporate Voting*, 96 GEO. L.J. 1227 (2008).

[57] *See* Martin & Partnoy, *supra* note 56, at 796 (explaining the DTCC process); *see also* DTCC EQUITIES CLEARING SERVS.,

[58] This process has remained largely unchanged since DTCC was established. *See* Martin & Partnoy, *supra* note 56, at 796–97.

[59] *See* DTCC EQUITIES CLEARING SERVS., https://www.dtcc.com/clearing-services/equities-clearing-services/cns (visited Feb. 14, 2022).

[60] *Id.*

[61] *See* Martin & Partnoy, *supra* note 56, at 797.

seller and broker permitting such activities, including the extension of credit to the short seller.[62] Short sellers "borrow" shares from their broker and are then required to post margin with the broker.[63] Again, no actual shares are moved; instead, the broker delivers confirmations and statements to the short seller reflecting the transactions, and then enters into net transactions as described above to mirror the overall exposure of its clients.

These processes are relevant to "zombie stocks" because a short position generates an obligation to redeliver shares. The short seller has that obligation to the broker, and the broker also has an obligation as part of the CNS transactions described above. The ways in which these obligations interact have been largely hidden from view and poorly understood, but they can have important implications.

These peculiar aspects of share borrowing and lending create problems when shares are delisted and deregistered. Most importantly, it can become difficult or impossible to satisfy an obligation to return a borrowed share, and therefore difficult or impossible to satisfy the obligations of either short sellers or brokers following a delisting or deregistration. Brokers owe duties to their clients, including a duty of best execution,[64] suggesting that they should be responsible for arranging share purchases at the best available price for clients who seek to cover short positions. If securities are no longer available to cover a short obligation, the broker arguably has a responsibility to offset a short seller client's borrowing against the countervailing lending of another client of the broker. However, it is less clear what brokers should do when their net position is short, so that they also face an inability to satisfy a borrowing obligation within the CNS system.

While securities lending occurs OTC in current United States equity markets, some stock exchanges (including Brazil, Japan, and the NYSE circa the 1920s) conducted securities lending on an exchange.[65] This likely helps al-

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[62] *Id.* at 779.

[63] Both the initial and maintenance margin requirements are described in FINRA Rule 4210. The important subset of the rule for purposes of understanding "zombie stocks" is FINRA Rule 4210(c), which provides for maintenance margin. Maintenance margin requirements are along a sliding scale, depending on the price of the stock shorted. For stocks that are "selling" at a price of $5.00 per share or more, the requirement is $5.00 per share or 30% of the current market value, whichever is greater. *See* FINRA 4210(c)(3). For stocks "selling" at a price of less than $5.00 per share, the requirement is $2.50 per share or 100% of the current market value, whichever is greater. *See* FINRA 4210(c)(2). In other words, the short margin requirement for low-priced stocks has a floor of $2.50 per share, even if the price of the stock falls below $2.50; whether the stock is still deemed to be "selling" under FINRA Rule 4210(c) appears to be an open legal issue that has not yet been addressed by regulators or in disputed cases. We address this legal issue in Part III *infra*.

[64] *See* U.S. SEC. & EXCH. COMM'N, *FACT SHEET Regulation Best Execution*, https://www.sec.gov/files/34-96496-fact-sheet.pdf.

[65] *See* Fábio Cereda, Fernando Chague, Rodrigo De-Losso & Alan Genaro, *Price Transparency in OTC Equity Lending Markets: Evidence from a Loan Fee Benchmark*, 143 J. FIN. ECON. 569 (2022) (examining the equity lending market in Brazil); Zsuzsa R. Huszar & Melissa Porras Prado, *An Analysis of Over-the-Counter and Centralized Stock Lending Markets*, 43 J. FIN.

leviate some of the negative consequences arising from the securities lending market.[66] However, if a stock is delisted from its exchange then it is likely the "zombie stock" issues we discuss would still occur.

We next turn to the current process by which a company delists from a national securities exchange and then terminates its registration and reporting obligations under the Securities Exchange Act of 1934. As we describe, the first step in the process is delisting, whereby a stock is removed from its listing exchange. This is often followed by deregistration by the SEC. In many voluntary situations, company officials will complete each step of the process we describe below. But in other cases, particularly when a delisting is involuntary, the process may be initiated by the exchange and the company will not be involved at all.

D. Delisting and Deregistration

Delisting and deregistration present additional complications for understanding "zombie stocks." The process begins with delisting, which can be involuntary or voluntary. Voluntary delistings are initiated by the issuer of stock, often due to events like a merger. Occasionally, some firms choose to "go dark," which means they voluntarily delist and deregister the firm's traded securities to take the company private.[67] Involuntary delistings can occur when a company ceases operations or fails to meet listing requirements, often due to poor financial performance.

Typically, there is advance notice prior to the delisting of a stock. For example, Nasdaq publishes a daily list of securities that are pending suspension or delisting.[68] According to Nasdaq, securities appear on the list on the first trading day after a company sends Nasdaq notification of a voluntary delisting, and also when the securities have been suspended for failure to meet listing requirements.[69] The securities remain on this list until the first business day after the securities are delisted.[70]

In a typical voluntary delisting, a company's board of directors begins by approving resolutions authorizing the company to proceed with delisting and

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MKT. 31–53 (2019) (examining the equity lending market in Japan); Charles M. Jones & Owen A. Lamont, *Short-Sale Constraints and Stock Returns*, 66 J. FIN. ECON. 207–39 (2002) (examining lending on the NYSE from 1926 to 1933).

[66] Cereda et al., *supra* note 64, at 570.

[67] For example, one study documents a spike in "going dark" transactions after the passage of the Sarbanes-Oxley Act, which increased compliance costs for some public firms. *See* Christian Leuz, Alexander Triantis & Tracy Yue Wang, *Why Do Firms Go Dark? Causes and Economic Consequences of Voluntary SEC Deregistrations*, 45 J. ACCT'G & ECON. 181, 182. (2008) (attributing a spike in deregistrations to the Sarbanes-Oxley Act).

[68] *See, e.g.*, Nasdaq, *Issues Pending Suspension or Delisting*, NASDAQ LISTING CTR. https://listingcenter.nasdaq.com/IssuersPendingSuspensionDelisting.aspx (last visited Feb. 14, 2022).

[69] *See id.*

[70] *See id.*

deregistration.[71] Once the company has undertaken the first definitive action to delist, it must file a Form 8-K under Item 3.01(d) within four business days.[72] The company is also required to notify the exchange that it is delisting.[73] After the Form 8-K is filed, the company must publicize its plans to delist and file a Form 25; the content and timing of these filings can be complicated.[74] The timing of these requirements is designed to avoid time pressure, a problem that can be addressed in a voluntary delisting, but typically cannot be addressed in an involuntary delisting.

A typical involuntary delisting is initiated by the listing exchange, often due to poor financial performance, violations, or both, of listing requirements. Each stock exchange maintains a set of continuing listing requirements. For example, Nasdaq's continuing listing requirements include minimum stock price and volume conditions.[75] If a firm violates any of these conditions, the exchange will send a warning of non-compliance, and the warning will typically include a deadline by which the firm must remedy the violation to remain listed. If the firm fails to achieve compliance, the exchange will then file Form 25, which is the precursor to delisting.

Form 25 governs the delisting, deregistration, or both, of securities under Rule 12d2-2 of the Securities Exchange Act of 1934.[76] The securities listed on Form 25 are typically delisted by operation of law ten days after the filing of the form.[77] That ends the first step (delisting). As noted above, securities can continue to trade in OTC markets after they are delisted, though the liquidity of the firm's shares may be limited[78] and OTC trading may not necessarily start immediately.

After delisting, the firm may face the second step (deregistration). While delisting is specific to a *security*, deregistration is specific to a *firm* and relates to a firm's obligations to file reports with the SEC under Rule 15(d).[79] A firm may delist without deregistering, but if a firm deregisters it *must* delist. Deregistration can also be voluntary or involuntary. In a voluntary deregistration, the company will typically withdraw any registration statements that

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[71] The audit committee also can be involved in this approval process. *See* Gumbs et al., *supra* note 15, at 17 (issuer's guide for delisting and suspending).

[72] *See id.*

[73] See Gumbs et al., *supra* note 15, at 17.

[74] For example, the notice of plans to delist, including reasons for the withdrawal, must be published via a press release on the company's website at least ten days in advance of filing the Form 25, which must be filed at least ten days in advance of the filing deadline for the next periodic reporting requirement. *See* Gumbs et al., *supra* note 15, at 17.

[75] *See* NASDAQ, *Continued Listing Guide*, January 2022.

[76] 17 CFR 240.12d2-2 (2005).

[77] *See* Gumbs et al., *supra* note 15, at 17.

[78] *See* Gregory B. Kadlec and John J. McConnell, *The Effect of Market Segmentation and Illiquidity on Asset Prices: Evidence from Exchange Listings*, 49 J. FIN. 611–36 (1994) (finding improved liquidity of securities trading on exchanges compared to those trading on OTC markets).

[79] 15 U.S.C. § 78 (2022).

have been filed but not used to sell securities, and file post-effective amendments to any outstanding registration statements.[80] The path to deregistration then varies depending on the source of the company's reporting obligations. If the company's only source of a reporting obligation is under the Section 12(b) registration provision covered by Form 25, its reporting obligations under Section 13(a) are suspended immediately.[81] If the company also has reporting obligations under Section 12(g) or Section 15(d), it should file a Form 15 within ten days after filing its Form 25.[82] Section 12(b) deregistration then becomes effective 90 days after the filing of Form 25, and Section 12(g) registration is terminated and Section 15(d) reporting obligations are suspended 90 days after the filing of Form 15.[83] Needless to say, voluntary deregistration is complicated.

Involuntary deregistration typically occurs after the stock exchange files Form 25 with the SEC. While a firm can trade OTC after a delisting event, if it is deregistered it will not trade anywhere (including OTC). When a firm is deregistered, it typically leads to a broker "kick-out." As discussed above, most U.S. equities are held in street name at the DTC, usually under the name of Cede & Co. In a broker kick-out, the shares are no longer held in street name and instead, the beneficial owner is listed as the actual shareholder of record. At this point, the shares become incredibly illiquid, as brokers will no longer facilitate trading in them on exchanges or OTC.

While it may seem that this should be the official death of the stock, the stock does not actually cease to exist until the DTC declares it "non-transferable." In order for a stock to be deposited at DTC, it must be an "eligible security," meaning a security that is freely tradeable pursuant to U.S. securities laws and is qualified under DTC's Operational Agreements.[84] DTC relies on issuers (that is, the firm) and the firm's transfer agents to provide information about eligibility.[85] However, in the case of a company that is delisted and kicked-out due to poor financial performance, the firm typically has no incentive to notify the DTC of a change in its status. Also, it is not uncommon for the firm to stop paying its transfer agents, so the transfer agent no longer has an incentive to do work on behalf of the firm.[86] If neither the firm nor the

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[80] *See* Gumbs et al., *supra* note 15, at 17.

[81] *Id.*

[82] *Id.*

[83] *Id.* at 18.

[84] *See The Depository Trust Company, Operational Arrangements (Necessary for Securities to Become and Remain Eligible for DTC Services)* DEPOSITORY TR. CO. 7–8 (2023), https://www.dtcc.com/~/media/Files/Downloads/legal/issue-eligibility/eligibility/operational-arrangements.pdf.

[85] *See Operational Arrangements (Necessary for Securities to Become and Remain Eligible for DTC Services)*, DEPOSITORY TR. CO., ii (2023), https://www.dtcc.com/~/media/Files/Downloads/legal/issue-eligibility/eligibility/operational-arrangements.pdf (describing reliance on issuers, agents, and participants).

[86] *See id.*

transfer agent notify the DTC that a stock is non-transferable, then the stock continues to exist even though it cannot be traded. As a result, securities lending obligations may persist even after a kick-out, leaving a short seller trapped in a position indefinitely.

Obviously, the delisting and deregistration process can be confusing, particularly as to the likelihood and timing of delisting. It often can be unclear precisely when or whether a stock will be delisted, or deregistered. Given this lack of clarity, it can be difficult for short sellers to determine when they should exit a position that appears likely to be delisted in the future. Securities that are slated for delisting are not necessarily delisted. Other delistings are true surprises that cannot be predicted. Accordingly, short sellers face risks associated with both the timing and determination of delisting.

To the extent "zombie stocks" generate additional expected risks and costs for short sellers for any of the above reasons, that can be an important part of the overall assessment of short selling. Unfortunately, as noted above, the academic literature has not addressed the "zombie stock" phenomenon, and there are no empirical studies of its risks and costs. In the next section, we examine the properties of zombie stocks to help fill that gap.

II. Empirical Findings

In this section, we empirically examine the antecedents and impact of zombie stocks. We show that many zombie stocks occur after firms are delisted as a result of poor financial performance, and when stocks become zombies, short sellers may be stuck paying equity lending fees and posting collateral for weeks, months, or in some cases, even years.

A. Data

To study zombie stocks, we combine data from several sources. To measure financial market characteristics for listed stocks, we use data from the Center for Research in Securities Prices (CRSP) for the period 2000–2020. We filter the sample to include ordinary common stocks and American Depository Receipts (CRSP share codes 10, 11, 30, and 31). We use the Compustat Supplemental Short Interest file to calculate short interest as a percentage of shares outstanding for each firm, and we merge the data with CRSP using the CRSP-Compustat merge table. As of September 2007, short interest data is released twice a month for each firm (based on mid-month and end-of-month settlement dates). Prior to September 2007, data was released once a month.

In many cases, zombie stocks are delisted from major stock exchanges and their shares may then trade via a broker-dealer network (that is, trading OTC). To examine the financial market characteristics of OTC stocks, we use

data from OTC Markets. The OTC Markets data starts in September of 2011 and our sample runs through 2020.

To measure conditions in the securities lending market, we use Securities Finance data from Markit. The data contains information on the quantity of shares lent out and borrowed, as well as a measure of the cost of borrowing shares called the daily cost of borrow score (DCBS). The DCBS variable contains a score for each stock and trading date that ranges from 1 (cheap to borrow) to 10 (most expensive to borrow). We also use loan fee tenure, which measures how long the typical securities loan has been open (in number of days).

Finally, we collect deregistration data from the SEC website for the years 2002–2019. The SEC posts several documents during the deregistration process for a company. While the process varies from company to company, most deregistered companies involve the following four documents: (1) Order of Suspension, (2) Notice of Hearing, (3) Initial Order of Deregistration, and (4) Final Order of Deregistration.

B. Example Zombie Stock: China-Biotics

As previously discussed, zombie stocks are typically delisted from their exchange, deregistered, or both, before becoming zombies. Figure 1 provides an example timeline of the delisting and deregistration process for one well-known zombie stock, China-Biotics. The CRSP database records a delisting on June 15, 2011; however, while this date corresponds to the last trading date on Nasdaq,[87] other documentation suggests that in real-time, traders would not have known about the delisting event until several weeks later.

On June 24, 2011, the company announced it received a warning notice from Nasdaq, dated June 20, 2011, indicating the company was in violation of listing requirements because it had not filed its 10-K for the fiscal year ending March 31, 2011. The notice indicated the company had until July 5, 2011, to respond.[88] On June 29, 2011, the company announced its "intent to voluntarily delist" from Nasdaq, with a stated intention of filing Form 25 with the SEC "around July 11, 2011" and the official delisting becoming effective ten days after on July 21.[89]

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[87] *See* GLOBE NEWSWIRE, *NASDAQ Halts China-Biotics Inc,* NBC NEWS (June 15, 2011, 6:18 PM), https://www.nbcnews.com/id/wbna43417046.

[88] *See* Press Release, China-Biotics, China-Biotics, Inc. Receives NASDAQ Delisting Notification (June 24, 2011).

[89] *See* Press Release, China-Biotics, China-Biotics, Inc. Elects to Voluntarily Delist From the NASDAQ Stock Market (June 29, 2011), https://www.prnewswire.com/news-releases/china-biotics-inc-elects-to-voluntarily-delist-from-the-nasdaq-stock-market-124727108.html.

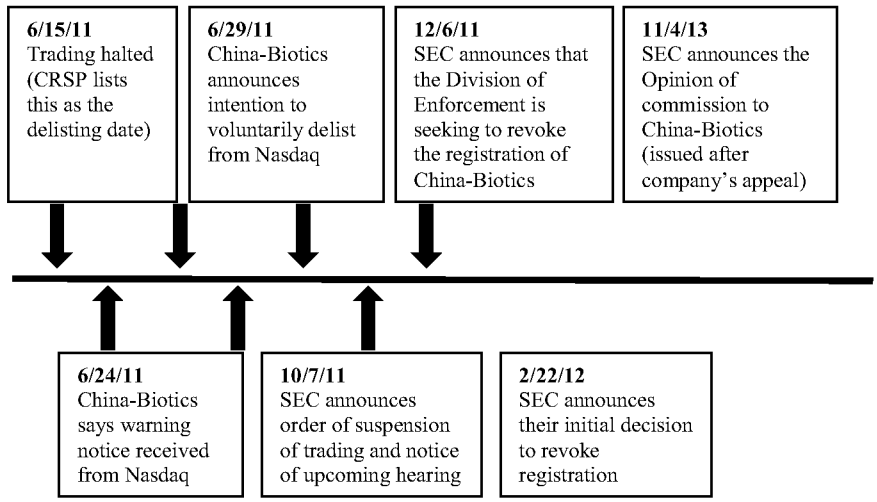


FIGURE 1: EXAMPLE ZOMBIE STOCK: TIMELINE OF KEY EVENTS FOR CHINA-BIOTICS

On October 7, 2011, the SEC announced a suspension of trading in China-Biotics and stated: "Further, brokers and dealers should be alert to the fact that, pursuant to Rule 15c2-11 under the Exchange Act, at the termination of the trading suspension, no quotation may be entered unless and until they have strictly complied with all of the provisions of the rule."[90] Finally, on December 6, 2011, the SEC announced they were seeking to revoke China-Biotics registration and on February 22, 2012, the registration was revoked. An appeal of the deregistration was denied on November 4, 2013.

In this example, short sellers would have to notice the company's missing 10-K filing, and anticipate that this would lead to the delisting of the firm prior to the trading halt that occurred on June 15, 2011. Once the trading halt occurred, there was no way to buy shares to cover and close out a short position. As such, any short seller with an open position on June 15, 2011, would have been trapped in their position. In fact, at least one short seller did get trapped in China-Biotics—fund manager Rich Gates says his fund was forced to pay equity loan fees and post collateral for five years after China-Biotics stopped trading.[91]

[90] Press Release, SEC, Trading Suspension: China Biotics, Inc. (Oct. 7, 2011), Release No. 65509, https://www.sec.gov/litigation/suspensions/2011/34-65509.pdf.

[91] *See* Bill Alpert, *Even Short-Sellers Burned by Chinese Shares*, BARRON'S (June 18, 2011); *see also* Bill Alpert, *Getting Caught Short*, BARRON'S (Apr. 6, 2018, 9:44 PM), https://www.barrons.com/articles/getting-caught-short-1523065469 (describing one of Gates's mutual funds as being stuck short and paying fees margin requirements related to China-Biotics shares for five years, since 2013).

C. The Process of Becoming a "Zombie Stock"

Next, we examine how prevalent such issues are, in general. Table 3 presents an overview of all the companies that were delisted (Panel A) and deregistered (Panel B) over our sample period. Over 8,000 companies were delisted in our sample, but the majority (approximately 5,000 of them) were delisted due to a merger. In such cases, the acquired stock is typically canceled upon the merger close date (eliminating all lending obligations) so it is rare for such stocks to become zombies.[92] However, as shown in the second, third, and fourth row of Panel A, stocks may be delisted for several other reasons.[93] In particular, as noted in Panel A, stocks are delisted for violating the listing requirements of their exchange (approximately 170), the liquidation of a company's assets in bankruptcy (approximately 70), or for financial performance-related issues (approximately 3,200).

We then examine short interest data, securities lending data, and OTC data to examine what happens to stocks around delisting events. The results are shown in the last four columns of Panel A. Not surprisingly, stocks involved in a merger often have significant short interest and securities lending activity around the merger close date; however, in the last column we see that almost none of them appear in the OTC data within 30 days after delisting, consistent with the shares being canceled after the merger close date. For liquidations, we see no evidence of OTC trading within thirty days after delisting – again, this is not surprising, since the liquidation of these companies typically leads to the shares being canceled after the firm completes the Chapter 7 bankruptcy process. Because the liquidation process can take months, or even years,[94] the lack of OTC trading may be problematic for traders who shorted the stock prior to delisting. However, short sellers appear to anticipate this risk, as short interest is abnormally low (just 0.70% of shares outstanding) for these firms at delisting.

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[92] In a merger, shares of the target are delisted upon closing and shares of the target are typically converted into the right to receive the merger consideration. *See* Keir D. Gumbs, Brian K. Rosenzweig, Ciarra Chavarria & David Dunn, *Going Dark: A Step-by-Step Planning Guide for Exiting the Public Company Reporting System*, 27 INSIGHTS 16, 18–22 (2013).

[93] As shown in Table A.3 Appendix, CRSP delisting codes classify companies based on the reason for delisting. We narrow the CRSP classifications to five different types of delisting, consistent with Tyler Shumway, *The Delisting Bias in CRSP Data*, 52 J. FIN. 327 (1997) (showing that delistings due to bankruptcy and other negative reasons are usually surprises and are not reflected in commonly-used databases); and Tyler Shumway & Vincent A. Warther, *The Delisting Bias in CRSP's Nasdaq Data and Its Implications for the Size Effect*, 54 J. FIN. 2361 (1999) (examining significant negative returns for delisted stocks).

[94] Arturo Bris, Ivo Welch & Ning Zhu, *The Costs of Bankruptcy: Chapter 7 Liquidation versus Chapter 11 Reorganization*, 61 J. FIN. 1253, 1266, 1270 (2006) (finding that "the typical Chapter 7 case takes 2 years to unwind.").

Finally, for delistings due to poor financial performance, we see that approximately 63% of companies start trading on OTC markets within thirty days of delisting. However, this implies that over 250 firms in our sample were delisted for performance reasons yet did not trade OTC for at least one month following delisting. Moreover, on average, these firms had relatively high short interest at delisting – the average short interest as a percentage of shares outstanding was 3.66%. In other words, for 255 firms in our sample, a significant number of short sellers could have been trapped in a position for at least one month, and possibly much longer, following delisting.

Because performance-related delistings appear to be high risk for short sellers, we next examine them in further detail. Figure 2 plots the number of performance-related delistings, by year, over our 2000–2020 sample period. While a typical year has approximately 100 such delistings, they tend to increase significantly during economic downturns. The maximum number of delistings in our sample occurs in 2001, following the dot-com boom, and there is another increase in 2009, following the global financial crisis. The results suggest that "zombie stock" risk is higher around economic downturns.

Finally, we examine deregistration events. As previously discussed, if the SEC deregisters a stock, brokers no longer facilitate trading in the security. As such, any short seller with an open position at deregistration would be unable to close it, by any means, and would remain in the position until the DTC officially deems the security "non-transferable." In Table 3, Panel B, we report the number of companies that received documents related to the deregistration process.[95] In our sample, approximately 5,400 securities are deregistered by the SEC, and in many cases (approximately 4,200 of them) a security is suspended from trading first. As such, any short seller who did not exit a position prior to the suspension of trading may have been trapped in a position until the DTC deemed the security "non-transferable."

[95] For most of the deregistrations in our sample, the SEC files a "Notice of Hearing" in advance of the final decision. However, in our sample there are relatively fewer "Initial Order of Deregistration" documents because the SEC added this step in 2012.

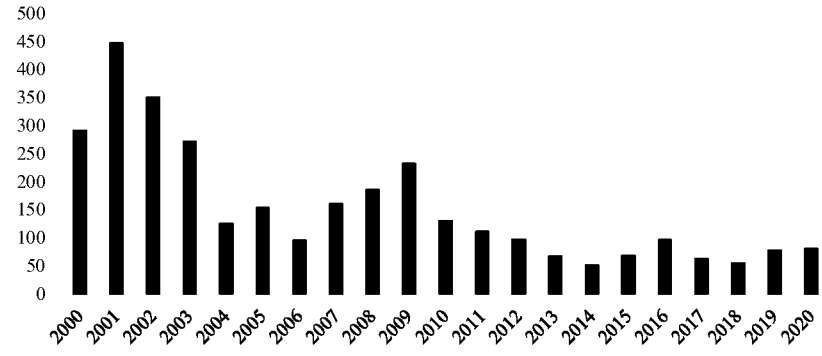


FIGURE 2: NUMBER OF COMPANIES DELISTED FOR PERFORMANCE RELATED REASONS BY YEAR FROM 2000–2020

TABLE 3: DELISTING AND DEREGISTRATION DATA SUMMARY

Panel A: Delisting data, 2000-2020 (CRSP, Compustat, Markit, OTC)							
Reason for delisting	**Number of delisted companies**	**CRSP code**	**% companies merged with Compustat data**	**% companies with short interest[1]**	**Average short ratio**	**% companies merged with Markit data[3]**	**% companies merged with OTC data[4]**
Merger	4,918	200-290	43.03%	40.95%	3.28%	84.72%	0.12%
Exchange	174	300, 304-390	26.44%	18.97%	3.19%	61.31%	2.50%
Liquidation	72	400-490	38.89%	37.50%	0.70%	88.14%	0.00%
Performance-related	**3,202**	500, 520-591	**34.13%**	**29.51%**	**3.67%**[2]	**75.37%**	**63.10%**
Total	8,366		39.24%	36.09%	3.38%	80.79%	18.48%

[1] data available within 100 days of delisting
[2] the result excludes one outlier in our sample (that is, National bank of Greece with a short ratio of 6117%)
[3] Markit data time frame: 06/2002–12/2019
[4] data show up in OTC market within 30 days after delisting, OTC time frame: 09/2011–12/2021

Panel B: Deregistration data, 2002-2019		
Type of Document	**Number of deregistration**	**Document description**
Order of Suspension	4,185	Lists recent SEC trading suspensions
Notice of Hearing	5,804	Provides links to notices and orders concerning the institution, settlement, or both, of administrative proceedings
Initial order of deregistration	1,801	Announces the initial decisions from administrative law judges
Final order of deregistration	5,424	Announces the final decisions from administrative law judges

D. The Costs of Shorting a "Zombie Stock"

The evidence in the previous section suggests that a significant number of stocks with high short interest may have become zombies, especially those that were delisted due to poor financial performance. Accordingly, we next examine the financial consequences of shorting such stocks.

Figure 3 provides additional evidence that stocks delisted due to poor financial performance are often costly and risky for short sellers. Panel A examines the average number of days that securities loans have been outstanding after a stock is delisted (securities loan tenure). The figure shows loan tenure in event time for two groups of stocks: (1) those that delisted due to poor financial performance (solid black line) and (2) those that delisted for non-performance reasons (dotted line). Approximately ten days prior to delisting, the average securities loan in stocks that delisted due to poor financial performance has a tenure of approximately eighty days. The loan tenure decreases slightly as the stock approaches delisting (event date = 0), and then starts steadily increasing after delisting. By 200 days after delisting, the loan tenure is nearly 120 days—the high average tenure suggests some short sellers have had positions open since before the delisting event. In contrast, the line for stocks that are delisted for non-performance reasons remains relatively flat from ten days before delisting to 200 days after delisting, suggesting there is no change in loan tenure after delisting for these stocks. In sum, the results suggest that in stocks delisted for performance reasons, some short sellers are getting stuck in their positions (so the length of time the average position is open increases after the delisting date).

To study this further, we next examine the cost of borrowing shares, in event time around delisting, for the same two groups of firms. The results are shown in Panel B of Figure 3. The results plot the daily cost to borrow score (DCBS) from Markit. The DCBS takes the value 1 for most stocks, which are easy and inexpensive to borrow, and greater than 1 for stocks that are

expensive to borrow (with a maximum score of 10). For both groups of stocks, the DCBS is relatively stable before versus after delisting, suggesting the cost to borrow shares did not change significantly after delisting. However, for companies delisted for non-performance reasons, the score is approximately 1.5, suggesting the average cost of borrowing shares in these firms is low. In contrast, for companies delisted due to poor finance performance, the average DCBS score is much higher, at nearly 3.5. Combined, the results in Panel A and Panel B suggest that some short sellers appear to be trapped in stocks that are delisted for poor financial performance, and these short sellers must pay relatively high loan fees as long as their positions remain open.

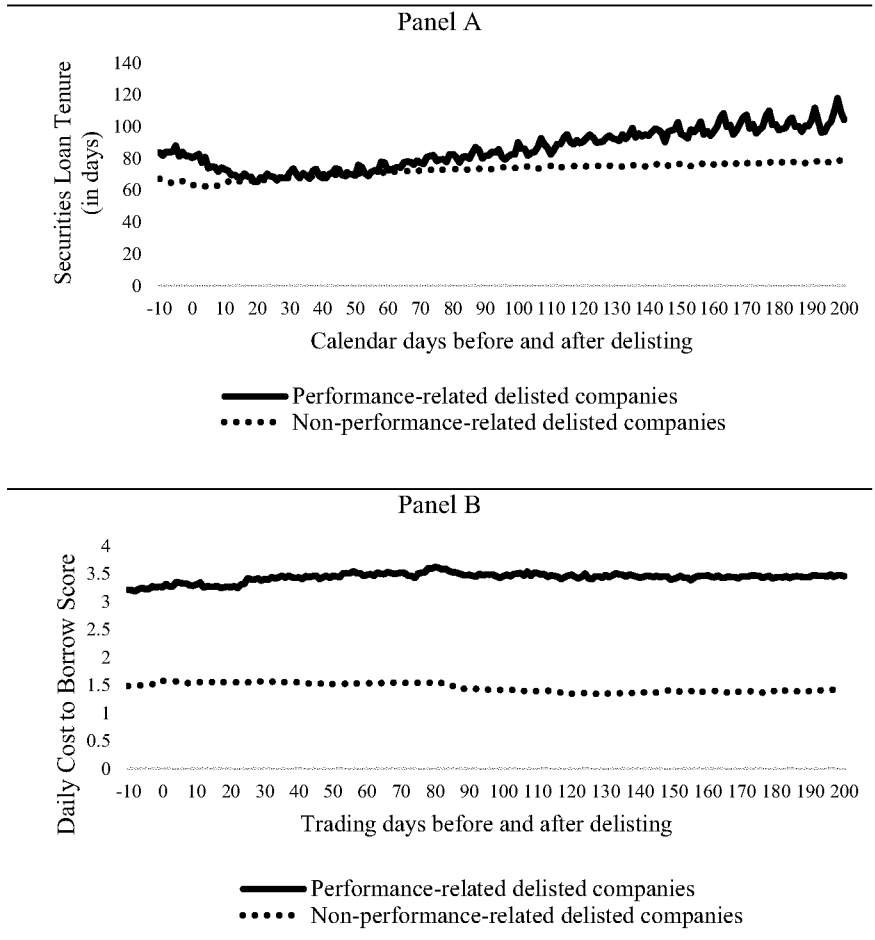


FIGURE 3: DAILY SECURITIES LOAN TENURE, IN DAYS (PANEL A) AND DAILY COST TO BORROW SCORE (PANEL B)

Finally, to quantify the total impact zombie stocks, we estimate the amount that short sellers paid in equity lending fees on zombie stocks, as well as the amount of money that short sellers had tied up in collateral positions for such stocks. To do this, we first derive a conservative estimate of the number of zombie stocks over our sample period. We define a stock as a zombie if it is delisted for performance related reasons, it has outstanding equity loans, and there is either no trading volume OTC or existing OTC volume is below the outstanding quantity of shares on loan to short sellers (so that short sellers could not buy enough shares in one day to close their position).[96] We document approximately 1,100 zombie stocks over our sample.

We then calculate the collateral requirements on these zombie stocks. - For a short sale with a stock price at or above $5, the collateral is calculated as the sum of 102% of the position value and 50% of the position value in additional margin. From then on, the maintenance margin is 30% of the position value, or $5, whichever is greater. For a short sale with a stock price below $5, FINRA Rule 4210(c) applies different maintenance margin requirements. The maintenance margin is 100% of the position value, or $2.50, whichever is greater. Thus, as a percentage, maintenance margins get much higher when the stock is below $5. We find that short sellers, on average, had more than $11.6 million in collateral tied up *per day for each company* over our sample period because of zombie stocks.

The table below shows how we calculate the total amount of collateral tied up in a short position. Because the collateral requirements vary by stock price, the table shows the calculation for five different example stock prices. For our sample of zombie stocks, we estimate the daily total collateral tied up by short sellers by adding up the collateral across stocks each day and then we estimate the aggregate for all zombie stocks in our sample by adding up this value across days. In our sample, we had approximately 271,648 observations across approximately 1,100 zombie stocks. We estimate that short sellers had an average of $876.8 million in daily aggregated collateral tied up.

[96] If OTC volume on a given date is less than the quantity of shares on loan, we define a stock as a zombie for the next month (in such a case, it is likely it would take many trading sessions to close out a position). Using this definition, a stock might be a zombie for only one month if OTC volume is initially low but eventually gets high enough to allow short sellers to close out all positions, or it could be a zombie for many years if there is never enough OTC trading to allow short sellers to cover all outstanding equity loans.

TABLE 4: CALCULATION OF TOTAL COLLATERAL TIED UP FOR DIFFERENT EXAMPLE STOCK PRICES

Example	Stock Price	Collateral %	Collateral $ [a]	Initial Margin %	Maintenance Margin	Minimum Margin $ [b]	Total Collateral Tied Up [c]
1	$20.00	102%	**$20.40**	50%	30%	**$6.00**	**$26.40**
2	$5.50	102%	**$5.61**	50%	30%	**$5.00**	**$10.61**
3	$4.00	102%	**$4.08**	50%	100%	**$4.00**	**$8.08**
4	$2.50	102%	**$2.55**	50%	100%	**$2.50**	**$5.05**
5	$0.50	102%	**$0.51**	50%	100%	**$2.50**	**$3.01**

[a] Collateral $ = Loan balance (number of shares × stock price) × Collateral %. The table assumes 1 share in each example.
[b] Minimum margin (if the stock price is greater than or equal to $5) = MAX ($5, (stock price × maintenance margin)) × Number of shares
Minimum margin (if the stock price is less than $5) = MAX ($2.5, (stock price × maintenance margin)) × Number of shares
[c] Total Collateral Tied Up = Collateral + Minimum Margin

Finally, we calculate the loan fees short sellers were forced to pay on positions they could not close. To do this, we take the daily cost of borrow score (DCBS) from the Markit database and translate it to basis points.[97] This provides an annualized loan fee, in basis points. We then compute the daily loan fee, in dollars, as the annual loan fee in basis points, multiplied by the collateral requirement, divided by 360 trading days per year. The table below shows how we calculate total daily lending costs. We calculate total lending costs as the daily lending fee multiplied by the posted collateral, and then we aggregate this across stocks and dates to compute the total equity loan costs on zombie stocks over our sample period. Similar to how we handled the collateral calculation, our dataset has more than 271,000 observations, which includes roughly 1,100 zombie stocks. We find that short sellers paid approximately $383 million dollars in equity loan fees on zombie stocks over the period 2002–2019. In other words, the costs we discuss are significant: short sellers may be forced to post millions in collateral for days, weeks, or even months, as a result of "zombie stocks," and they may end up paying millions more in equity loan fees.

[97] *See* Jesse Blocher & Robert E. Whaley, *Passive Investing: The Role of Securities Lending*, (Van. U. Working Paper 2474904, 2015), https://acfr.aut.ac.nz/__data/assets/pdf_file/0010/29917/WhaleyPassive-Investing.pdf (showing mean lending fee for each DCBS category in Table III).

TABLE 5: EXAMPLE OF CALCULATION FOR TOTAL DAILY LENDING COSTS

Daily Cost of Borrow Score (DCBS)	**Daily Lending Fee**	**Total Collateral Tied Up**	**Total Daily Lending Costs**
1	0.000010 (= 36 × 0.0001 / 360)	$10,000	$0.10
2	0.000051 (= 183 × 0.0001 / 360)	$10,000	$0.51
3	0.000088 (= 318 × 0.0001 / 360)	$10,000	$0.88
4	0.000136 (= 488 × 0.0001 / 360)	$10,000	$1.36
5	0.000206 (= 741 × 0.0001 / 360)	$10,000	$2.06
6	0.000268 (= 964 × 0.0001 / 360)	$10,000	$2.68
7	0.000380 (= 1367 × 0.0001 / 360)	$10,000	$3.80
8	0.000567 (= 2040 × 0.0001 / 360)	$10,000	$5.67
9	0.000668 (= 2403 × 0.0001 / 360)	$10,000	$6.68
10	0.001466 (= 5278 × 0.0001 / 360)	$10,000	$14.66

III. IMPLICATIONS

The significant risks and costs that Part II demonstrates are associated with shorting "zombie stocks" have important implications. We discuss three areas where both regulatory policies and private ordering might provide solutions to address these implications. Specifically, we focus on (1) new margin rules, (2) mechanisms to facilitate the closeout of short positions, and (3) the potential application of contract principles, including the duty of good faith and fair dealing. In each area, we recommend specific policy solutions.

As noted in the Introduction, the possible scenarios involving "zombie stocks" include securities that have been delisted, deregistered, no longer exist for reasons of performance, are not traded, or for other reasons have a market value of zero. These scenarios can be complex and do not necessarily lead to the "death" of a stock. Accordingly, as we describe below, regulation should be designed to account for the complexity of the scenarios involving "zombie stocks."

A. New Margin Rules

We begin with margin rules.[98] As suggested above in Part II.D, one obvious problem with "zombie stocks" is the application of FINRA Rule 4210(c).

[98] Initial margin requirements are governed by FINRA Rule 4210(b) and involve a complex analysis that references Regulation T, Rules 400 through 406 of SEC Customer Margin Requirements for Security Futures, Rules 41.42 through 41.49 under the Commodity Exchange Act, as well as other amounts specified by FINRA or minimum requirements, including minimum requirements for a "pattern day trader." *See* FINRA Rule 4210(b).

We note initially that, as with many rules, maintenance margin requirements are asymmetric for long versus short positions. For long positions, the maintenance margin for stocks is simply 25% of the "current market value."[99] As the value of stocks approaches zero, the maintenance margin for long positions also approaches zero. There is no minimum maintenance margin requirement for stocks with a low per share value.

In contrast, the maintenance margin for short positions is more complex and includes a significant minimum maintenance requirement. As was the case in the IsZo litigation, brokers can and do assert that Rule 4210(c) requires a minimum maintenance margin requirement of $2.50 per share.[100] As a result, short sellers who are unable to close out their positions can become stuck paying relatively significant fees for required maintenance margin (in contrast to the countervailing long position, which in the same scenario would have a maintenance margin requirement approaching zero).

One straightforward improvement would be for FINRA to amend Rule 4210(c) to provide that the maintenance margin requirement should be zero or that the rule should not apply for short sellers of securities in certain "zombie stock" scenarios. Specifically, FINRA could add a new exception to Rule 4210(e), which currently provides that the margin rules do not apply to certain securities in situations where there does not appear to be a substantial need for required initial or maintenance margin.[101] For example, Rule 4210(e)(1) exempts offsetting "long" and "short" positions from the relevant margin requirements.[102] Rules 4210(e)(2)-(8) exempt certain other securities and accounts, where there appear to be reasons that margin requirements are not necessary (or where margin requirements should differ).[103] Rule 4210(e)(9) provides for different margin requirements for security-based swaps.[104]

A new Rule 4210(e)(10) could provide that margin requirements shall be zero for short positions with a market value of zero.[105] For example, in the IsZo case cited in the Introduction, Jefferies had determined that the market value of

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[99] *See* FINRA Rule 4210(c)(1).

[100] These margin requirements are asymmetric for long and short positions: maintenance margin for long positions is simply 25% of the market value of the position. *See* FINRA Rule 4210(c).

[101] *See* FINRA Rule 4210(e).

[102] *See* FINRA Rule 4210(e)(1).

[103] *See* FINRA Rule 4210(e)(2)–(8).

[104] *See* FINRA Rule 4210(e)(9).

[105] The determination of whether a market price is zero could be based on objective or subjective criteria. The rule could distinguish between situations where the stock has a price of zero because it no longer exists and therefore obviously is worth zero, contrasted to situations where the stock merely has a low price and still has potential upside. The margin requirements for low-priced stocks (for example one penny) could be determined based on a percentage of the price of the stock when the stock has not traded recently and there is no basis for determining that the stock is likely to trade in the future, whereas the margin requirement could be a fixed amount (as currently provided in Rule 4210) if there is a reasonable basis for determining that the stock is likely to trade in the future. The broker would be required to make this determination, and then such determinations could be adjudicated; currently, there is no such mechanism for a short seller to argue that she should not be required to post margin because the security is worthless.

the securities was zero and listed the market value as zero on IsZo's brokerage statements. A new exception to Rule 4210(c) could provide for a period (for example, one month) during which the price must have been listed as zero before the exemption would be triggered. In such cases, there arguably should be no margin requirement. The new rule also could provide that margin requirements would be zero in additional scenarios, including delisting, deregistration, and securities that no longer exist for any reason or are not traded. This exemption likewise could apply after a specified period or could be limited to deregistration.

We note that under one plausible interpretation of Rule 4210(c), this exemption is already implicit in the rule. This interpretation involves the following argument: the language in Rule 4210(c) requires that securities be "selling at less than $5.00 per share," but deregistered securities are not "selling at" any price. Nor are delisted securities "selling at" any price if they have not traded for a specified period. Accordingly, this argument goes, Rule 4210(c)'s maintenance requirement for short positions does not apply to "zombie stocks," at least in situations where the stocks are not trading.

Based on this interpretation, private litigation could seek to enjoin brokers from charging fees to clients with short positions in securities that are not "selling at less than $5.00 per share," or relatedly to seek damages from excessive fees. The argument would be that under FINRA Rule 4210(c) the term "selling at" must mean that the securities are actively trading. If they are not trading at all, then "selling at" doesn't apply. This interpretation would reject the brokers' argument, used by Jefferies in the IsZo dispute, that they were required to have IsZo post-maintenance margin of $2.50 per share. The justification for a new rule in this area would be to clarify the meaning of "selling at," particularly given the possibility (which brokers presumably would argue) that the term "selling at" does not require the existence of trading.

To examine the implications of this proposed change to short sale margin requirements, Table 6 and Figures 4 and 5 examine stock prices after a stock enters distress. Table 6 shows that 691 firms in our sample were delisted due to poor financial performance, and of these, 517 (75%) ended up trading OTC after delisting. Approximately half the delisted firms (395) had a stock price that fell below $2.50 after delisting, and many of these (356) had stock prices that fell below $0.50.

For a short seller, a position loses money when the stock increases in value. Thus, margin requirements are set to protect the lender of shares when the price of a stock increases. Accordingly, we next consider the likelihood that the price of a stock significantly increases after a delisting event. Figure 4 shows the probability that a stock price rebounds above $2.50 after falling below a series of thresholds, ranging from $0.50–$2.50. In all cases, we find that it is extremely rare for a stock price to increase above $2.50. Once the price falls below $2.50, there is only a 6.58% chance the price rises above $2.50 again, and for stocks with a price below $0.50, that probability falls to 1.12%. Moreover, in Figure 5, we plot the distribution of maximum possible

stock prices after a stock price falls below a series of thresholds, ranging from $0.50–$2.50. The figure shows that across our entire sample, it is extremely rare for a stock price to ever exceed $5.00 per share after falling below $2.50. Overall, these results suggest that a minimum maintenance margin requirement of $2.50 per share is too conservative, as stock prices very rarely rebound above this level after a significant price drop.

Alternatively, one reform to margin requirements could be that as of a delisting or deregistration event, all lending transactions of shares would be automatically canceled. This cancelation could be based on either a new rule or based on new provisions in broker agreements. Either a regulatory or private ordering approach could specify the terms that would govern settlement of short positions after delisting or deregistration and the cancelation of lending agreements.

TABLE 6: NUMBER OF COMPANIES REACHING A PRICE BELOW $0.50–$2.50

Description	Number of cases
• Number of performance-related delisting stocks (09/2011–2020)	691
• Number of performance-related delisted companies that showed up in OTC data	517
• Number of companies with OTC data starting within 30 days after the delisting date	436
• Number of companies with a minimum price below $2.50 after the delisting date	395
• Number of companies with a minimum price below $2.00 after the delisting date	393
• Number of companies with a minimum price below $1.50 after the delisting date	386
• Number of companies with a minimum price below $1.00 after the delisting date	377
• Number of companies with a minimum price below $0.50 after the delisting date	356



FIGURE 4: PROBABILITY OF A STOCK PRICE REBOUNDING ABOVE $2.50 AFTER FALLING BELOW $0.50–$2.50

However, although this alternative reform could resolve the margin requirement problem, it would likely raise issues about ownership that could be problematic, given that it would force involuntary transactions. One way of accommodating such issues could be to have the cancelation simply alter the default rule that applies to stock lending after a delisting or deregistration, and then permit parties to reestablish new lending transactions under certain circumstances, such as when shares begin trading on an OTC platform with sufficient volume. Then the parties could apply new margin requirements to renewed lending transactions. Such a "cancel-and-restart" approach could enable short sellers to exit their positions if they wished, but we are concerned that this approach could create more problems than it might solve.

Moreover, we are sympathetic to the argument from brokers that shares that appear to be worthless could nevertheless end up having value. Hertz and various "meme" stocks are examples of where such risks might arise. Nevertheless, there is no plausible argument that stock in some "zombie" situations, such as the close of bankruptcy proceedings, might somehow be resuscitated and then have value. A new rule might usefully distinguish between situations where the probability that securities have a positive value in the future is zero versus a speculative potentially non-zero probability. In the IsZo case, although Jefferies cited a potential risk associated with "meme" stocks, this risk is arguably zero when the stock no longer exists. One interesting question is whether the broker has a client with a countervailing "long" position in a stock even though that stock no longer exists, but the presence of such a client does not justify charging margin for illusory positions.

Finally, an alternative approach to the margin requirement problem would be the creation of synthetic derivative shares, which could be traded as substitutes to satisfy any short seller's borrowing obligation. Then, existing FINRA rule exceptions would apply to any short positions that also were paired with countervailing synthetic long positions (that is, maintenance margin requirements would not apply and arguably would be zero). We simply note the possibility of this solution, along with several questions that might prevent its viability. What would the price of these derivatives be, and how would it be set? What would qualify as a synthetic substitute? How could a market in "when issued" shares work if (unlike other such markets) there was no possibility of the existence of actual shares in the future? Who would create these instruments, and would it require the involvement of DTC or even regulators?

Overall, we suggest that the simplest solution to the margin requirement aspects of the "zombie stock" problem would be to amend FINRA 4210 in the ways suggested in this section. These amendments could work in tandem with changes that would facilitate the closeout of short positions, a topic we turn to next.

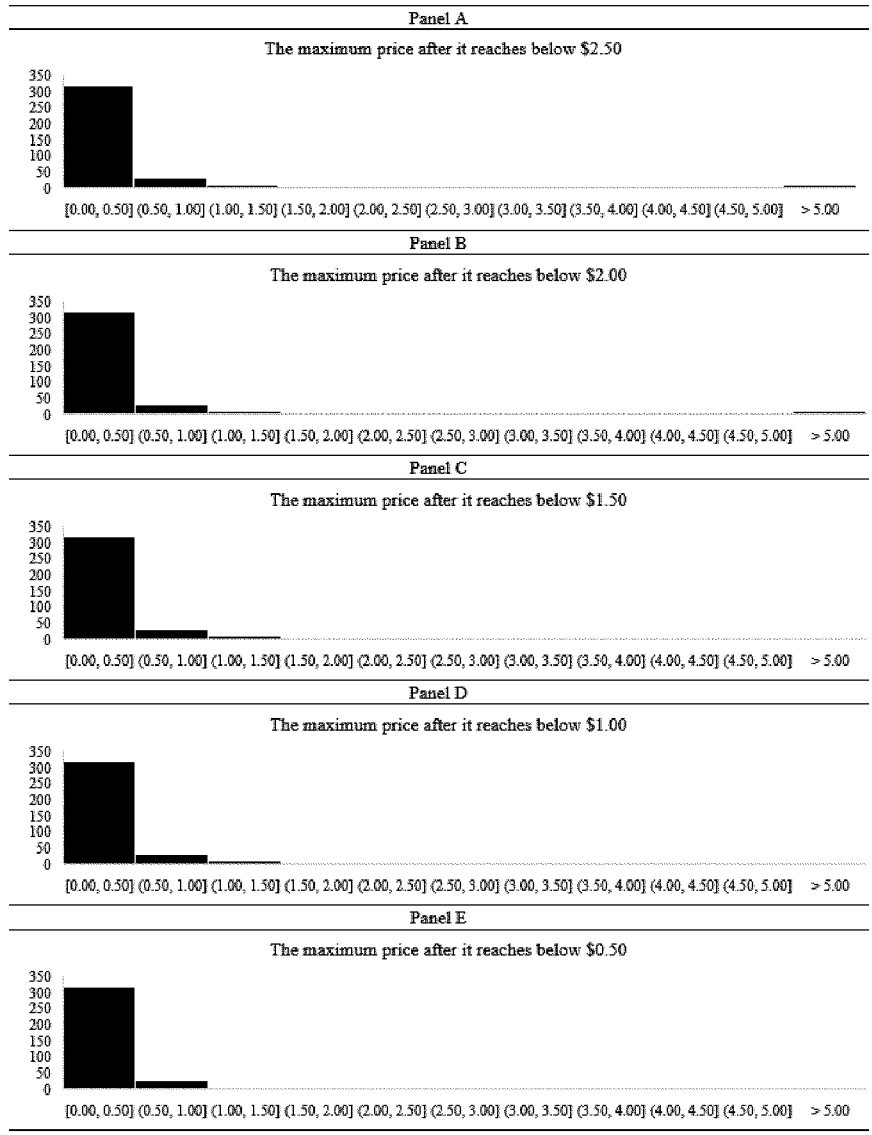


FIGURE 5: DISTRIBUTION OF MAXIMUM STOCK PRICE AFTER THE STOCK PRICE REACHES A MINIMUM VALUE BELOW $0.50–$2.50

B. Facilitating Closeouts

Although new margin requirements could improve "zombie stock" scenarios by reducing costs to short sellers, they likely would not resolve the market failures of high information and search costs that make it difficult or

impossible for parties to close out short positions after a delisting. Accordingly, we next discuss several mechanisms that could facilitate the closeout of short positions.

We note two possible scenarios for a failing company. In the first scenario, which is the typical case, delisting is a temporary stop on the way to cancelation of all shares: short positions are often ultimately closed, supply and demand are matched in sufficiently liquid markets, and there is no market failure that leads to a "zombie stock" scenario.

However, in the second scenario, the one we address for "zombie stocks," even when there is a high probability that a stock will soon become worthless, the market fails to match supply and demand. Some people might want to buy stock to cover their positions, and others might want to sell their stocks at some low non-zero price, but unfortunately, these buyers and sellers might not find each other. Moreover, some buyers and sellers are not even aware of "zombie stock" events, and some market participants, including brokers, have incentives not to close out positions, because they will continue to collect lending fees. At the end of this path, when shares ultimately are deregistered, brokers are prohibited from trading shares and therefore the market cannot clear. Accordingly, our proposals are aimed at ameliorating these market failures.

As our empirical analysis above shows, market mechanisms often do not lead to the matching of supply and demand after a stock is delisted. The failure to close out short positions during a "zombie stock" scenario arises in part due to the nature of the relationship among issuers, transfer agents, and DTC. We view the causes of these market failures as falling within two categories. First, we focus on the role of DTC in these relationships, and we suggest changes that could create information sharing and incentives that would more likely lead to the closeout of "zombie stock" positions. Second, apart from policy changes at the DTC level, we examine the relationships among transfer agents, brokers, and clients, and suggest changes in these relationships, including both regulatory and private solutions, which could facilitate closeout even if the difficult DTC problems cannot be resolved.

1. Flipping the Default Rule at DTC

The "zombie stock" problem arises in significant part because of the role that DTC plays in the markets. As noted in Part I.C above, DTC is the largest securities depository in the world[106] and, through Cede & Co., the holder of record for most of the world's securities.[107] For a stock to be deposited

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[106] *See DTC Eligibility Information*, SEC. TRANSFER CORP. https://stctransfer.com/dtc-eligibility-information/ (last visited Sept. 23, 2023).

[107] *See FAQs: How Issuers Work with DTC*, DEPOSITORY TR. & CLEARING CORP., https://www.dtcc.com/settlement-and-asset-services/issuer-services/how-issuers-work-with-dtc

at DTC, it must be an "eligible security," meaning a security that is freely tradeable under U.S. securities laws and is qualified under DTC's Operational Agreements.[108] DTC's Operational Agreements provide for the methods that issuers and their transfer agents should use to deliver information to DTC, including maintaining eligibility; DTC relies on issuers and transfer agents to provide this information.[109]

No mechanism at DTC incentivizes the declaration of a stock as worthless or not transferable. As noted in Part I.D above, issuers with outstanding stock typically have incentives to encourage their transfer agents to work with DTC to maintain liquidity of their shares but failing firms often do not. In the extreme, defunct firms lack any resources or incentives to continue to engage with their transfer agents, and their transfer agents lack incentives to monitor or discover information about the health of the issuer or to notify DTC.

In the ideal scenario, when a stock is in danger of becoming a "zombie," the DTC "Corporate Action" area will receive a null and void letter from an issuer, transfer agent, or both, and will then "take down" the securities issue. For example, in some cases when securities become worthless, including because they have expired, an issuer, transfer agent, or both, informs the DTC that the rights represented by the securities have expired and that participant brokers should be notified that they should deem these positions worthless and remove these securities by using the Position Removal ("PREM") function with the DTC before a specified date, when DTC will delete them.[110]

However, this ideal scenario does not always occur. Some securities become "Non-Transferable Securities" (NTS), meaning that they no longer have the services of a registered transfer agent.[111] Specifically, SEC Rule 17Ad-16 is designed to address transfer delays due to unannounced transfer agent changes, including the termination of a transfer agent.[112] However, the problem in such scenarios is that there often is no properly incentivized person to send information to DTC after a delisting occurs, meaning that DTC does not necessarily receive a required NTS notification after delisting.

(last visited Sept. 23, 2023).

[108] *See Operational Agreements*, THE DEPOSITORY TR. CO. (2023), https://www.dtcc.com/~/media/Files/Downloads/legal/issue-eligibility/eligibility/operational-arrangements.pdf.

[109] *See id.* at 5–14 (describing reliance on issuers, agents, and participants).

[110] *See, e.g.*, *Important Notice from DTC Reorganization to All Participants*, DEPOSITORY TR. & CLEARING CORP. (2009), https://www.dtcc.com/-/media/Files/pdf/2009/4/24/5005-09.pdf.

[111] *See* Depository Trust Company Proposed Rule Change to Deposits Service Guide, Exchange Act Release No. 34-86897, 84 Fed. Reg. 48,187, 48,188 (Sept. 6, 2019) https://www.sec.gov/rules/sro/dtc/2019/34-86897.pdf (describing circumstances of NTS notification as including "the bankruptcy or insolvency of the issuer, the failure of the issuer to pay fees to a transfer agent, a final or complete liquidation of the issuer, the filing of a certificate of dissolution, the placement of the issuer in receivership and the revocation of the issuer's charter").

[112] *See* Notice of Assumption or Termination of Transfer Agent Services, Exchange Act Release No. 34-35039, 59 Fed. Reg. 63,656 (Dec. 1, 1994); *see also* Depository Trust Company Proposed Rule Change to Operational Arrangements, Exchange Act Release No. 34-86113, 84 Fed. Reg. 28,867, 28,868 (June 14, 2019), https://www.sec.gov/rules/sro/dtc/2019/34-86113.pdf.

Effectively, the current relationship among DTC and its issuers, transfer agents, and participant brokers establishes a default rule that once a stock becomes a DTC "eligible security," it continues to be deemed to be eligible until DTC receives information to the contrary. We view this default relationship as potentially problematic, particularly when a delisted stock is deregistered. When an issuer becomes defunct and the transfer agent either does nothing or resigns, the issuer's stock might not be deemed to be NTS; instead, it might simply sit in a kind of financial market purgatory, where it is still deemed to be an "eligible security" at DTC, even though it obviously should not be. In other words, the DTC might think the stock is alive, when in fact it is dead (hence our term "zombie stocks").

Accordingly, we propose that DTC should flip the default rule and instead presume that any stock that is delisted will automatically be NTS (even though delisted stocks do not necessarily become deregistered). A transfer agent could then overcome this presumption by making a filing, perhaps a new Form TA-3, representing that the stocks are still transferable. An issuer also could attempt to overcome this presumption by representing in a filing to DTC that it is undertaking efforts to retain a transfer agent who presumably would make a similar submission to DTC. The rule proposal for this change would include comments about the costs and benefits of these filings and how frequently they would be required.

DTC then could determine whether to grant temporary relief from NTS status, based on the degree of transferability that is evidenced in the filing. For example, either the transfer agent or the issuer could include information relevant to transferability, including data regarding liquidity, volume, or trading prices. The new default rule standard could be something like whether the security is "reasonably expected to have a price above zero and sufficient trading to enable holders of positions to exit within a reasonable amount of time." The use of a reasonableness standard would give DTC the flexibility to enable market participants to continue to trade in certain circumstances where there is some liquidity.

We also propose flipping the default rule for the PREM mechanism. The DTC could adopt a straightforward rule that if a stock becomes NTS, it is automatically scheduled to be removed from the DTC platform within a specified period (for example, one month). A participant broker then could respond to this presumption by making a filing describing the degree of liquidity and trading in the stock, the aggregate size of its clients' long and short positions in the stock, and representing reasons why the stock should not yet be removed. Again, a reasonableness standard might be appropriate: the participant broker could be required to represent that it reasonably expects the stock to eventually resume normal trading within one month. After one month, absent an additional representation, the stock again would default to presumed removal. One can imagine that in the IsZo case, Jefferies could have made representations

about the size of its clients' positions, and any need to continue to maintain eligibility of the stock. (Of course, such arguments would not likely be reasonable for stocks that already had been canceled post-bankruptcy.)

In other words, we propose that DTC's relationship with issuers, transfer agents, and participants be modernized to account for the "zombie stock" problem by creating incentives for the transmission of information to DTC. The flipped default rule concept would place appropriate incentives on any market participants who would benefit from continued trading of a particular stock after a delisting while ensuring that true "zombie stocks" would be ultimately removed from the DTC platform.

Our overarching idea to facilitate the closeout of positions with an automatic NTS/PREM presumption is consistent with the important role DTC plays for eligible securities. DTC developed the service for handling NTS stocks that are likely to become defunct, but it does not actually classify whether the stocks should be removed. Instead, DTC relies on third parties: first, it relies on the issuer and transfer agent for information about stocks that lose the services of a transfer agent; second, DTC relies on participants to advise DTC to perform a position removal. We argue that DTC should not wait for a response from third parties about delisted stocks, but instead should presume after delisting that a security will become defunct, and then rely on this default rule as an information-forcing mechanism to incentivize third parties, including issuers, transfer agents, and participant brokers, to provide information about stocks that are likely to continue trading. In other words, our idea is that DTC should presume that "zombie stocks" are already dead or are going to die soon, and then put the burden on third parties to resuscitate them or provide proof of life.

2. Broker-Client Solutions

The above DTC-focused approach would require DTC to propose new rules, with an appropriate process of notice-and-comment pursuant to the Administrative Procedure Act. We next propose some solutions that would not require the involvement of DTC. These solutions are focused on the relationship between brokers and their clients.

We begin by discussing the current incentives of brokers with clients who have margin accounts and positions in "zombie stocks." (Cash accounts do not involve borrowing.) We note that these incentives are asymmetric, depending on whether the client has a long versus short position. Consider the following example.

First, suppose a client buys a stock for $1.00 with an initial margin of $0.50. As the stock price declines, the client will be required to maintain margin of 25% of the stock price. As the stock price approaches zero, the broker will make margin calls, which the client will need to cover by repaying a

portion of the margin loan. As this occurs, the maintenance margin will approach zero (as the client will pay down the balance of the $0.50 initial margin loan). For example, if the stock price declines to $0.04, the minimum maintenance margin would be $0.01, meaning that the client had paid off $0.49 of the initial margin loan. Accordingly, the broker would have only a proportionately small incentive to maintain the client's long position to collect margin lending fees from the owner of the stock.

The story is very different for a short seller. A short seller who establishes a position when the stock price is $1.00 must borrow the stock, sell the stock, and post $2.50 margin. The short seller is then subject to the maintenance requirement of FINRA Rule 4210(c), which many brokers appear to interpret as requiring a minimum of $2.50 per share of margin. Even when the stock price declines significantly, to $0.04, a broker could require minimum margin of $2.50. In the case of a "zombie stock," the short seller could face this $2.50 margin requirement indefinitely.

Note the asymmetry in costs to long versus short positions when a stock becomes a "zombie stock." The client with the long position faces zero or no cost. Yet the client with the short position is stuck with a relatively high margin requirement.

Moreover, as we show in Part II above, long and short sellers face asymmetric costs concerning loan fees. In addition to the margin requirement, short sellers will likely have to pay relatively high equity lending fees the entire time their position remains open (as shown in Figure 2, Panel B). These costs are in addition to other potential asymmetries concerning liquidation of long and short positions. For example, short positions face higher potential capital gains taxes, and brokers also face greater back-office logistics for short sellers because of the requirement to locate counterparties for securities lending.

Given these asymmetries, our proposals are directed at equalizing the burden on short sellers. One potential broker-based solution would be to simply cancel any offsetting long and short positions. However, it would be difficult to do this through private ordering. The lending agreement would need to be amended to provide for mandatory cancelation under specified circumstances. It would be difficult to specify those situations. It is possible that a rule requires offsetting the positions, but we recognize that it would be undesirable to force clients to exit positions when they might not want to do so. We recognize here the asymmetry of the long and short positions: a long position in a "zombie stock" has virtually zero downside but potential upside, while a short position has potentially significant and ongoing downside but limited or zero upside. As long as a short sale requires borrowing and selling stock, this asymmetry is inevitable and will persist.

An alternative broker-based solution would be to limit the amount of the lending fee. To some extent, the margin rule amendment described above would accomplish this objective. In addition, a rule might further restrict a

broker's ability to charge high lending fees to short sellers of "zombie stocks." However, we recognize that such a rule would present similar difficulties to the cancelation of offsetting positions.

Other potentially less draconian ways to facilitate the closeout of short positions would simply involve brokers undertaking efforts to better match buyers and sellers. Unfortunately, brokers lack the incentive to do so, particularly given the relatively high profits from margin and lending fees. Inertia also might play a role: a broker might have clients who own a stock that has been delisted, and clients who are short the same stock, yet both sets of clients might simply be inactive or perhaps might not even notice the delisting.

We see two potential ways for brokers independently to facilitate the closeout of such long and short positions, one in which potential buyers, sellers, or both, are searching for ways to close out their positions but face high search costs, and another in which potential buyers, sellers, or both, are not engaged in any action related to, and potentially are unaware of the need to, close their positions.

First, among buyers and sellers who want to close their positions but face high search costs, one policy would be to facilitate both sides broadcasting their desire to trade. A broker might be made obligated (or arguably would be obligated based on their duty of best execution) to match positions of clients with positions by broadcasting these positions through a matching platform. Such a platform could resemble the NYSE auction process to broadcast order imbalances at the end of the day.[113]

Essentially, the NYSE approach is the broadcast near the end of the trading day—something like "more people want to buy than sell, so tell us if you want to sell," or vice versa. Then traders submit orders, which are then closed out at an end-of-day price. A similar process might work for delisted shares and could match potential buyers and sellers who currently find it difficult to find a match. Thus, the exchange could ameliorate this market failure. The organization could be either the NYSE, the DTC, or some new group, perhaps privately organized by DTC members, so that all members could see who is net short or net long, and by how much. This process could be focused on brokers, to reduce their search costs, and create incentives for them to close out their net positions.

Second, brokers could be (or arguably already are) obligated to close out internally matched positions. In other words, if a broker has a short-seller client who has borrowed a delisted or deregistered stock and an owner client of the same number of shares of stock, the broker could be required to match the two clients, or at least explicitly notify them of the potential to do so. A short-seller client who is paying margin requirements arguably would be better off

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[113] *See* Narasimhan Jegadeesh & Yanbin Wu, *Closing Auctions: Nasdaq v. NYSE*, 143 J. FIN. ECON. 1120–39 (2022).

paying some non-zero price to the owner client to settle its borrowing, and the owner arguably would be better off receiving some non-zero price for a worthless stock. A broker who owes a duty of best execution to both clients arguably should match them, as we discuss below in Part III.C.

Brokers could include in the brokerage agreements provisions that specifically address what they will do when securities are delisted and deregistered. For example, they could provide that if there is a delisting, the short position would immediately be cash settled at a price. There would need to be a mechanism for determining that price, either based on the most recent trade or a valuation mechanism like the one used in International Swaps and Derivatives Association (ISDA) agreements. The cost of appraisal likely would be too expensive and might generate further risks and opportunities for strategic behavior. For example, there might be difficulties arising if there is no price drop before a trading halt, or if a company voluntarily delists at a time when the price does not reflect negative information associated with the delisting.

Finally, brokers might attempt to resolve some of the problems associated with "zombie stocks" by facilitating the creation of synthetic shares, including cash-settled derivatives and contracts for differences, which could permit the "synthetic closeout" of short positions. For example, brokers might permit a client with a short position to zero out their position with an offsetting synthetic derivative, and thereby avoid any margin or lending fee. The use of synthetic closeout could be a temporary solution for stocks in situations of significant uncertainty. However, it is not clear whether funds regulated under the Investment Company Act of 1940 would be allowed to hold such synthetic shares.

C. Best Execution and the Implied Duty of Good Faith and Fair Dealing

Finally, we discuss potential solutions related to two aspects of existing law. First, brokers already owe clients a duty of best execution, including with respect to OTC trades.[114] Second, as a default rule, contracts, including broker-client agreements, include an implied duty of good faith and fair dealing.[115] Even if the above two sets of policy recommendations do not lead to formal changes, brokers arguably have obligations to (1) take reasonable steps to avoid charging excessive loan fees to clients with short positions in "zombie stocks," and (2) take reasonable good faith steps to close out clients' short

[114] *See, e.g.*, *Newton v. Merrill, Lynch, Pierce, Fenner & Smith*, 135 F.3d 266, 270 n.2 (3d Cir. 1998) (reversing summary judgment dismissing Rule 10b-5 claims that were based on violations of the duty of best execution trading OTC stocks and noting "the duty of best execution requires the defendants to execute the plaintiffs' trades at the best reasonably available price.").

[115] *See e.g.*, Uniform Commercial Code § 1-304 ("every contract or duty with the UCC imposes an obligation of good faith in its performance and enforcement").

positions in "zombie stocks." Brokers who do not undertake a reasonable good faith attempt to satisfy these obligations arguably have breached these duties.

One implication of these existing legal standards is that brokers have a responsibility to ask clients if they would like to close out a short position, perhaps after a specified number of days of no trading. The broker could send notices reasonably calculated to inform the client of the risk of being charged loan fees on a stock that is delisted, deregistered, or both. Any lending fees might be deemed unreasonable after a certain period of time, or after a particular event occurs. For example, a court might conclude that a broker has violated its duties if it charged lending fees for a short position after the shares already had been canceled in bankruptcy. A court also might find that lending fees were not charged in good faith, or perhaps were unconscionable, once shares were deregistered or canceled.

The common law development of cases in these two areas could serve as a backstop for short sellers who are stuck paying large lending fees on "zombie stocks." Individuals or institutions could file lawsuits, like the suit by IsZo against Jefferies, and judges or arbitrators could find, based on appropriate factual findings, that brokers violated their duties of best execution, duties of good faith and fair dealing, or both. Of course, there are barriers to such litigation, including cost, and the outcome of these cases could also raise policy questions and concerns, depending on how they are decided. We mention these concepts for completeness, particularly given the IsZo litigation noted above.

IV. Conclusion

We document yet another in a long line of risks and costs to short selling: the risk that the shares will become "zombie stocks." We show that these risks and costs are significant and widespread, and we assess potential responses designed to reduce them. Our findings contribute to the literature on short selling and are consistent with the conclusion that markets would be fairer and more efficient if there were fewer restrictions on short selling.

We hope future academic research will address the presence of "zombie stocks" and that regulators will consider policy changes related to the risks and costs we discussed above. We also hope that regulators will address the dearth of data in the area and will consider improvements designed to provide more information. Specifically, we want to encourage great transparency with respect to lending and margin fees for short positions in delisted stocks.

APPENDIX

TABLE A.1

We report Google Scholar citation counts as of March 22, 2022 on a list of academic articles selected to be closely related to short selling. In some cases, there are multiple versions of the same paper (for example, a working paper version and a Dal version), and sometimes versions have slightly different names. Even though we think the versions match, we are not always able to conclusively determine a direct correspondence between them. If there are multiple versions of a paper, we include the sum of citations.

Paper	**Summary**	**# Cites**
Miller (1977)	This model demonstrates the effect of short sales on the relationship between investor beliefs and stock valuation.	4669
Diamond and Verrecchia (1987)	This model examines the impacts of short sales constraints and private info on informed versus uninformed investors.	2307
Diether et al. (2002)	Examines the relationship of analysts' earnings forecasts to stock price; finds that dispersion does not proxy for risk.	2263
Stambaugh et al. (2012)	Finds that anomalies relate more strongly to investor sentiment where short (versus other) selling occurs.	1610
Hong and Stein (2003)	This model relates short-sales constraints to crashes due to bullish investor exits, particularly with high volumes.	1479
D'Avolio (2002)	Relates equity market specials and recalls to investor divergence of opinion, firm size, institutional ownership.	1461
Chen et al (2002)	This model uses mutual fund holdings data to predict that reductions in breadth forecast lower future returns.	1436
Ofek and Richardson (2003)	This model relates Internet stock bubble and burst to short sales restrictions and subsequent lockup expirations.	1270
Nagel (2005)	Uses institutional ownership as a proxy for short sale constraints to explain cross-sectional return anomalies.	1201
Jones and Lamont (2002)	Uses 1926–33 NYSE data to support overpricing hypothesis; finds short selling expensive stocks remains profitable.	1168
Bris et al. (2007)	Examines 47 equity markets worldwide; findings support idea that short sales are associated with increased efficiency.	1094
Asquith et al. (2005)	Uses short interest ratios (institutional ownership) to proxy demand (supply); convertible arbitrage may drive short sales.	1028
Boehmer et al. (2008)	Finds that heavily shorted stocks underperform lightly shorted stocks; short sellers may have an information advantage.	1019

Lamont and Thaler (2003)	Examines violations of put-call parity; posits that short sale constraints prevent arbitrage of carve-out mispricing.	930
Dechow et al. (2001)	Short sellers target low fundamentals ratios, cover positions when ratios mean-revert, to minimize costs/ maximize profits.	906
Diether et al. (2009)	Using Reg SHO data, correlates short sales and volatility; contrarian short sellers may take opportunistic risks.	850
Boehmer and Wu (2013)	Using NYSE data, finds empirical evidence that short sellers increase informational efficiency and decrease drift of prices.	801
Desai et al. (2002)	Finds significant negative abnormal returns for heavily shorted Nasdaq firms; delisting more likely than matched controls.	777
Duffie et al (2002)	This model uses lending fees to establish that investors are risk-neutral and behave optimally given heterogeneous beliefs.	772
Saffi and Sigurdsson (2011)	Relates lending supply to price efficiency; associates short sale constraints with the magnitude of extreme price falls.	758
Total number of citations for remaining 268 papers		39146

TABLE A.2: DELISTING EXAMPLES BY TYPE

Delisting type	**Examples**	**Documents announcing the delisting event**
Mergers	Sun Microsystems was acquired by Oracle Corporation and was delisted from the market when the acquisition was completed in January 2010.	https://www.sec.gov/Archives/edgar/data/709519/000119312509216203/ddef14a.htm https://www.sec.gov/Archives/edgar/data/709519/000119312509216203/ddef14a.htm
	Health Management Associates, Inc was acquired by Community Health Systems, Inc and was delisted from the market when the acquisition was completed in January 2014.	https://www.sec.gov/Archives/edgar/data/792985/000119312514022279/d663049d8k.htm https://www.sec.gov/Archives/edgar/data/792985/000119312514022279/d663049d8k.htm
Voluntary Delisting	Adecco SA delisted its American Depositary Shares (ADS) from the New York Stock Exchange.	https://sec.report/Document/0001193125-07-078937/ https://sec.report/Document/0001193125-07-078937/
	Swedish Match terminated its ADR program and delisted from the NASDAQ.	https://www.sec.gov/Archives/edgar/data/0001011218/000119312507126504/d6k.htm https://www.sec.gov/Archives/edgar/data/0001011218/000119312507126504/d6k.htm

Liquidations	In December 2017, Sorrento Tech Inc. announced voluntary delisting from NASDAQ.	https://www.sec.gov/Archives/edgar/data/0001472343/000147234317000100/a8-kadelisting.htm https://www.sec.gov/Archives/edgar/data/0001472343/000147234317000100/a8-kadelisting.htm
	Maxygen Inc. shareholders agreed to liquidate and dissolve the company. They filed a certificate of dissolution with the Secretary of State of the State of Delaware and it became effective in August 2013.	https://www.sec.gov/Archives/edgar/data/1068796/000119312513353934/d591659d8k.htm https://www.sec.gov/Archives/edgar/data/1068796/000119312513353934/d591659d8k.htm
Moving to a Different Exchange	AT Plastics, Inc. withdrew its common stock from the American Stock Exchange and moved to the Toronto Stock Exchange.	https://www.federalregister.gov/documents/2002/05/03/02-10975/issuer-delisting-notice-of-application-to-withdraw-from-listing-and-registration-at-plastics-inc https://www.federalregister.gov/documents/2002/05/03/02-10975/issuer-delisting-notice-of-application-to-withdraw-from-listing-and-registration-at-plastics-inc
Performance-related	In June 2011, China-Biotics Inc. received NASDAQ delisting notification for not filing its annual report on Form 10-K on time.	https://www.sec.gov/Archives/edgar/data/0001271057/000114420411037264/v226823_ex99-1.htm https://www.sec.gov/Archives/edgar/data/0001271057/000114420411037264/v226823_ex99-1.htm
	Orleans homebuilders filed for Chapter 11 bankruptcy protection.	https://www.sec.gov/Archives/edgar/data/0000038570/000114420410011125/v176135_8k.htm https://www.sec.gov/Archives/edgar/data/0000038570/000114420410011125/v176135_8k.htm

TABLE A.3: CRSP DELISTING CODES

Active

Code	**Description**
100	Issue still trading NYSE/NYSE MKT, NASDAQ, Arca or Bats.
150*	Issue still active, but no prices in this version of file.
160*	Issue stopped trading, but no prices in file after 840831.
170*	Issue stopped trading, but not delisted from current exchange (suspended or inactive).

Mergers

Code	Description
200	Issue acquired in merger, payment details unknown.
201	Merged into or in order to form an issue trading on NYSE.
202	Merged into or in order to form an issue trading on NYSE MKT.
203	Merged into or in order to form an issue trading on NASDAQ.
205	When merged, shareholders primarily receive shares of mutual funds.
231	When merged, shareholders primarily receive common stock or ADRs. Replaces codes 201, 202 and 203. Codes 201-203 are no longer assigned.
232	When merged, shareholders primarily receive common stock or ADRs. (Merged stock is not maintained on the CRSP file.) Replaces codes 210-220. Codes 210-220 are no longer assigned.
233	When merged, shareholders receive cash payments.
234	When merged, shareholders primarily receive preferred stock, bundled units, warrants, or rights, or debentures, or notes, or bundled units.
235	When merged, shareholders primarily receive other property.
240*	Flags merger with missing final distribution information.
241	When merged, shareholders primarily receive common stock and cash, issue on CRSP file.
242	When merged, shareholders primarily receive common stock and preferred stock or warrants or rights or debentures or notes, issue on CRSP file.
243	When merged, shareholders primarily receive common stock, issue on CRSP file and other property, issue on CRSP file.
244	When merged, shareholders primarily receive common stock or ADR, and cash and preferred stock or warrants or rights or debentures or notes. Issue on CRSP file.
251	When merged, shareholders primarily receive common stock or ADRs and cash. (Merged stock is not maintained on the CRSP file.)
252	When merged, shareholders primarily receive common stock or ADRs and preferred stock, or warrants, or rights, or debentures, or notes.
253	When merged, shareholders primarily receive common stock or ADRs and other property.
261	When merged, shareholders primarily receive cash and preferred stock, or warrants, or rights, or debentures, or notes.
262	When merged, shareholders primarily receive cash and other property.
271	When merged, shareholders primarily receive preferred stock or warrants, or rights, or debentures, or notes and other property.

280	Issue delisted due to merger attempt, but merger attempt failed.
290	Flags a merger with missing final distribution information. Replaces code 240. Code 240 is no longer assigned.

Exchanges

Code	**Description**
300	Issue acquired by exchange of stock, details unknown.
301	Issue exchanged for issue trading on NYSE.
302	Issue exchanged for issue trading on NYSE MKT.
303	Issue exchanged for issue trading on NASDAQ.
320	Issue exchanged for stock trading OTC.
331	Issue exchanged, primarily for another class of common stock. Replaces codes 301, 302, and 303. Codes 301-303 are no longer assigned.
332	Issue exchanged, primarily for another class of common stock. (Other stock is not maintained on the CRSP file.)
333	Issue exchanged, primarily for cash.
334	Issue exchanged, primarily for preferred stock, or rights, or warrants, or debentures, or notes.
335	Issue exchanged, primarily for other property.
340*	Flags an exchange with missing final distribution information.
341	Flags an exchange, shareholders receive common stock and cash. Issue on CRSP file.
342	Flags an exchange, shareholders receive common stock and preferred stock or warrants or rights or debentures or notes. Issue on CRSP file.
343	Flags an exchange, shareholders receive common stock and other property. Issue on CRSP file.
350*	Flags an exchange attempt that was not sufficient to "kill" issue.
351	Flags an exchange, shareholders receive common stock and cash. Issue not on CRSP file.
352	Flags an exchange, shareholders receive common stock and preferred stock, or warrants, or rights, or debentures, or notes. Issue not on CRSP file.
353	Flags an exchange, shareholders receive common stock and other property. Issue not on CRSP file.
361	When exchanged, shareholders primarily receive cash and preferred stock or warrants or rights or debentures or notes.
362	When exchanged, shareholders primarily receive cash and other property.
371	When exchanged, shareholders primarily receive preferred stock or warrants or rights or debentures or notes and other property.
390*	Flags an unsuccessful exchange attempt with missing distribution information.

Liquidations

Code	Description
400	Issue stopped trading as result of company liquidation.
401	Issue liquidated, for issue trading on NYSE.
403	Issue liquidated for issue trading on NASDAQ.
450	Issue liquidated, final distribution verified, issue closed to further research.
460	Issue liquidated, no final distribution is verified, issue closed to further research.
470	Issue liquidated, no final distribution is verified, issue pending further research.
480	Issue liquidated, no distribution information is available, issue is pending further research.
490	Issue liquidated, no distributions are to be paid, issue closed to further research.

Dropped

Code	Description
500	Issue stopped trading on exchange - reason unavailable.
501	Issue stopped trading current exchange - to NYSE.
502	Issue stopped trading current exchange - to NYSE MKT.
503	Issue stopped trading current exchange - to NASDAQ.
505	Issue stopped trading current exchange - to Mutual Funds.
510	Issue stopped trading current exchange - to Boston Exchange.
513	Issue stopped trading current exchange - to Midwest Exchange.
514	Issue stopped trading current exchange - to Montreal Exchange.
516	Issue stopped trading current exchange - to Pacific Stock Exchange.
517	Issue stopped trading current exchange - to Philadelphia Stock Exchange.
519	Issue stopped trading current exchange - to Toronto Stock Exchange.
520	Issue stopped trading current exchange - trading OTC.
535	Delisted by current exchange - unlisted trading privileges.
550	Delisted by current exchange - insufficient number of market makers.
551	Delisted by current exchange - insufficient number of shareholders.
552	Delisted by current exchange - price fell below acceptable level.
560	Delisted by current exchange - insufficient capital, surplus, equity, or all.
561	Delisted by current exchange - insufficient (or non-compliance with rules of) float or assets.

570	Delisted by current exchange - company request (no reason given).
572*	Delisted by current exchange - company request, liquidation.
573	Delisted by current exchange - company request, deregistration (gone private).
574	Delisted by current exchange - bankruptcy, declared insolvent.
575	Delisted by current exchange - company request, offer rescinded, issue withdrawn by underwriter.
580	Delisted by current exchange - delinquent in filing, non-payment of fees.
581	Delisted by current exchange - failure to register under 12G of Securities Exchange Act.
582	Delisted by current exchange - failure to meet exception or equity requirements.
583	Delisted by current exchange - denied temporary exception requirement.
584	Delisted by current exchange - does not meet exchange's financial guidelines for continued listing.
585	Delisted by current exchange - protection of investors and the public interest.
586	Delisted by current exchange - composition of unit is not acceptable.
587	Delisted by current exchange - corporate governance violation.
588	Conversion of a closed-end investment company to an open-end investment company.
589	Delisted by current exchange - unlisted trading privileges
591	Delisted by current exchange - delist required by SEC

Expirations

Code	**Description**
600	Expired warrant or right
601	Warrants, rights, preferreds, or units called for redemption
610	Unit split into its component parts

Domestics that became Foreign

Code	**Description**
900	A domestic Security becomes foreign
901	A domestic Security becomes foreign, but continues to trade on NYSE
902	A domestic Security becomes foreign, but continues to trade on NYSE MKT
903	A domestic Security becomes foreign, but continues to trade on NASDAQ