The Disposition Effect in CEOs' Decisions to File Chapter 11[*]

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This Draft: November 16th, 2024

Abstract

Investors are known to exhibit disposition effects in trading, characterized by a higher propensity to realize gains than losses. Prior research highlights that both individual investors and corporate insiders tend to hold losing positions while selling winning ones. Similarly, filing for bankruptcy can, in many cases, be viewed as a CEO's acknowledgment of financial losses after prolonged struggles. Using a hand-collected sample of 300 U.S. Chapter 11 bankruptcy cases spanning 1984 to 2017, we demonstrate that CEOs delay bankruptcy filings by an average of 3.1 months for every one standard deviation increase in their disposition effect. Our analysis reveals a strong positive relationship between the delay in filing and the disposition effect among CEOs who exhibit this bias, while no such relationship is observed for CEOs without it. These findings remain robust across a series of robustness checks.

Keywords: Bankruptcy; Disposition effect; CEO; Delay; Behavioral bias

JEL Classification: G4, G33, G320

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1. Introduction

The conventional view of bankruptcy envisions a struggling individual or company reaching the realization that circumstances are unlikely to improve sufficiently to resolve the ongoing financial crisis. After consulting with experts, the individual or company files a petition for relief from the bankruptcy court. This straightforward description, as outlined by Platt et al. (2013), suggests that a rational decision-maker should file for bankruptcy protection as soon as it becomes evident that the value of filing exceeds the value of continuing operations (or defaulting). However, Platt et al. (2013) empirically demonstrate that the timing of a CEO's decision to file for bankruptcy is far more nuanced and complex than merely assessing the firm's immediate financial situation. Despite this insight, there is little empirical evidence to elucidate the underlying decision-making process. In this project, we aim to address this gap by providing novel evidence on how CEO behavioral biases influence the timing of bankruptcy filings.

"*We probably did take longer (to file for Chapter 11) than we should have because you never want to have that feeling of failure, and you always want to fight it out*," said Joseph Vicens, Chief Operating Officer of 1800mattress.com, a now-bankrupt retailer selling bedding via phone, Internet, and stores. A 2009 Reuters article highlighted the phenomenon of CEOs delaying bankruptcy filings, particularly during the 2008 financial crisis. The article attributed these delays to factors such as "shame, pride, or hubris," which often prevented executives from filing for

Chapter 11 in a timely manner, even when such delays risked derailing turnaround efforts or leading to total collapse. The article also quoted bankruptcy turnaround experts, many of whom observed that CEOs are generally reluctant to admit failure, which often results in delays. These experts emphasized that companies could improve their chances of recovery if executives overcame their reluctance and filed for protection with a well-thought-out reorganization plan, underscoring the significant costs of delayed filings.

This anecdotal evidence raises several critical questions: Is the timing of Chapter 11 filings rational? If not, what other factors influence the decision-making process? Specifically, do CEO behavioral biases play a role? This study aims to shed light on these questions by investigating how behavioral biases, particularly the disposition effect, influence bankruptcy timing. Delayed bankruptcy filings can impose significant costs on firms, as they often lead to greater value erosion and reduce the likelihood of a successful turnaround. First, a firm's financial situation may deteriorate further if cash flows fail to improve during the delay period. Second, executives may engage in riskier behavior while postponing bankruptcy. For example, they might take out high-interest loans, attempt private debt restructurings, or invest in high-risk projects in the hope of generating cash flows. These actions can further destabilize the firm, leading to additional losses and complicating the subsequent bankruptcy process. For these reasons, understanding what motivates CEOs to delay bankruptcy filings and identifying ways to mitigate these delays is essential.

The timing of bankruptcy decisions remains ambiguous. Researchers have incorporated several rational predictors into bankruptcy models, such as accounting health, equity performance, industry characteristics, and tax considerations. While these factors are generally correlated with actual bankruptcy rates, a notable gap often exists between predicted and observed outcomes. For example, Campbell, Hilscher, and Szilagyi (2008) demonstrate that their model's predicted failure rates closely follow the trend of actual failure rates but with a persistent discrepancy. Furthermore, these models predominantly focus on firm-specific factors when predicting bankruptcy. However, since bankruptcy decisions ultimately rest with top executives, CEO-specific characteristics are also likely to influence the timing of these filings.

On one hand, manager-shareholder conflicts can contribute to delays in bankruptcy filings. For instance, CEOs of bankrupt firms often face lower future compensation and reputational damage

(Eckbo, Thorburn, and Wang 2016). To maximize their own utility, CEOs may be reluctant to file for bankruptcy, even when doing so would maximize shareholder value. This behavior aligns with agency theory, as documented by Jensen and Meckling (1976), which we account for as control variables in our cross-sectional analyses. On the other hand, a less obvious but potentially significant factor influencing bankruptcy timing is CEOs' behavioral biases. The disposition effect, for example, describes a tendency among traders to hold on to losing assets for too long while liquidating winners prematurely (see Section 2 for supporting literature). Filing for bankruptcy can be seen as an act of realizing losses, making it plausible that CEOs who exhibit the disposition effect in their stock trading are also prone to irrationally delaying bankruptcy filings.

In this paper, we investigate whether the CEO disposition effect irrationally delays bankruptcy filings. Our analysis begins by identifying the optimal filing date, defined as the first instance when a firm is in deep financial distress. The difference between this optimal filing date and the actual bankruptcy filing date serves as our measure of delay. We limit our analysis to the six years preceding the bankruptcy year (a maximum of 84 months before the bankruptcy month) for two key reasons. First, firms typically exhaust all possible options to avoid bankruptcy, often struggling for years before filing. For instance, in the sample studied by Davydenko (2012), 25% of firms with *negative net worth* managed to avoid default for five years, indicating that setting a shorter window could underestimate the length of the delay. Second, Gilson and Vetsuypens (1993) show that firms generally experience significant unprofitability in the six years leading up to bankruptcy, reinforcing the relevance of this timeframe for our analysis. The results indicate that, on average, bankrupt firms postpone filing for Chapter 11 by approximately 3.5 years.

Next, we use insider trading data to demonstrate the prevalence of the disposition effect among CEOs, finding that it exists in the majority of cases (9,750 out of 10,967 CEOs). Specifically, we observe that CEOs' proportion of gains realized is three times higher than their proportion of losses realized. To further investigate, we combine a bankruptcy dataset comprising 300 Chapter 11 cases from 1984 to 2017, where we hand-collect most of the CEO information, with the disposition effect dataset and conduct a cross-sectional analysis. After controlling for basic firm characteristics, firm equity performance, manager-shareholder conflicts, CEO traits, macroeconomic factors, and fixed effects, we provide robust evidence that the disposition effect significantly delays bankruptcy filings. A one standard deviation increase in the disposition effect prolongs bankruptcy delays by

an average of 3.12 months. Notably, this positive relationship between the disposition effect and bankruptcy delay is observed only among CEOs who exhibit the disposition effect in their trading behaviors and is absent for those who do not. A series of robustness tests further confirm the validity of our findings.

To our knowledge, this is the first study to investigate how CEO behavioral biases influence firm bankruptcy decisions. Our work bridges traditional bankruptcy literature and behavioral finance by showing that CEOs' behavioral biases affect not only firm investments (e.g., Azouzi and Anis 2012) and financial policies (e.g., Shefrin 2002; Baker and Nofsinger 2010) but also the timing of bankruptcy filings. Additionally, our findings emphasize the importance of the CEO disposition effect in understanding firm outcomes, complementing well-studied behavioral traits like overconfidence (e.g., Goel and Thakor 2008), myopia (e.g., Laux 2012), and over-optimism (e.g., Campbell et al. 2011).

This paper also relates to the findings of Statman and Sepe (1989), who demonstrate that project terminations, a form of loss realization, are often followed by positive stock returns, as investors perceive these decisions by behaviorally biased CEOs as positive signals. While stock return analysis is less relevant in the context of bankruptcy filings due to delisting, we instead focus on the length of the delay itself as a meaningful measure.

Furthermore, this paper provides valuable insights into bankruptcy prediction models. Current micro-level models predominantly rely on structural frameworks incorporating either financial or market values but neglect CEO-specific factors. Incorporating CEO behavioral characteristics and trading activities could enhance the accuracy and specificity of bankruptcy predictions. Additionally, this study proposes an approach for corporate insiders, such as newly appointed independent directors, to more effectively monitor CEOs' bankruptcy decisions. By ensuring that executives make optimal exit decisions for firms in financial distress, board members could improve a firm's chances of survival.

The remainder of this paper is organized as follows. Section 2 reviews related literature. Section 3 outlines the sample and variable construction. Section 4 demonstrates the empirical design, and baseline analyses. Section 5 presents a series of robustness tests, and Section 6 concludes.

2. Literature Review

The disposition effect, first identified by Shefrin and Statman (1985), refers to investors' tendency to hold losing positions for too long while selling winning positions too soon. This behavioral bias has been widely documented among both individual investors and corporate insiders in the context of asset management. For instance, Odean (1998) examines trading records from 10,000 accounts at a large discount brokerage and finds that investors exhibit a strong preference for realizing gains over losses. This behavior cannot be fully explained by portfolio rebalancing needs or by efforts to avoid the higher trading costs of low-priced stocks. Similarly, Dhar and Zhu (2006) analyze data from a large brokerage firm and report substantial variation in the disposition effect among investors based on demographic and behavioral factors, such as trading frequency, income, and age, which proxy for financial knowledge. Dooren and Galema (2018) extend this analysis, showing that socially responsible investors exhibit a stronger disposition effect compared to conventional investors.

Among corporate insiders (e.g., executives, board members, blockholders, and officers), Kelly (2018) provides evidence of the disposition effect and identifies its implications for stock returns. Specifically, the study finds that insider sales of losing positions are predictive of poor future stock performance. Kelly also introduces a novel measure of the disposition effect based on stock returns following realized losses. Favreau and Garvey (2020) examine repurchase decisions by insiders after realizing losses and confirm the existence of the disposition effect among corporate insiders. Their study evaluates various theories to explain this behavior-including prospect theory (Kahneman and Tversky 1979), realization utility (Brown et al. 2006), and belief hypothesis (Weber and Camerer 1998)-and concludes that belief revisions drive the disposition effect for insiders. Further, Markink (2021) finds that blockholders exhibit the strongest disposition effect among subgroups of insiders, outperforming officers, directors, and executives.

In addition to insiders, evidence of the disposition effect has been documented in other sophisticated traders. Frazzini (2006) identifies this bias among mutual fund managers, while Calvet et al. (2009) observe it in the trading behavior of Swedish insiders. At a broader level, Ferris et al. (1988) and Heath et al. (1999) highlight the presence of the disposition effect in aggregated market data. Additionally, a significant body of research has explored whether trading activity by corporate insiders predicts future stock returns (e.g., Lorie and Niederhoffer 1968; Rozeff and

Zaman 1988; Lin and Howe 1990; Bettis et al. 1997), consistently finding predictive power in insider trades.

In addition to the disposition effect, Barberis, Huang, and Thaler (2006) demonstrate that narrow framing, a cognitive bias in which decisions are evaluated in isolation rather than as part of a broader context, is a critical feature of decision-making under risk.[1] This bias often leads agents to make irrational decisions when faced with uncertainty. This concept is relevant to CEOs' bankruptcy decisions, where the CEO (agent) must decide whether to file for bankruptcy under conditions of financial risk. Kyle, Ou-Yang, and Xiong (2006) present a formal framework to address the asset liquidation problem for agents with preferences aligned with prospect theory, a common explanation for the disposition effect. Their model suggests that an agent is inclined to hold on to a risky project with a relatively inferior Sharpe ratio if the project is currently incurring losses but is likely to liquidate the asset once it breaks even. Conversely, the agent tends to liquidate a project with a superior Sharpe ratio if its profits either increase or drop to the break-even point. This model aligns closely with our study, where the CEO, as the decision-maker, exhibits preferences consistent with the disposition effect. Under the prospect theory framework, a CEO who is hesitant to realize losses on underperforming projects but readily liquidates profitable ones demonstrates a behavioral bias. Extending this logic, it is reasonable to infer that such a CEO would also delay filing for bankruptcy-a decision analogous to realizing losses on a failing project.

Since this study aims to examine whether the disposition effect influences CEOs' timing decisions regarding bankruptcy, understanding the factors that have already been shown to affect bankruptcy timing is essential. The closest related literature investigates the determinants of bankruptcy timing. A general consensus is that the timing of a bankruptcy filing is a critical decision made by the CEO, with significant implications for the effectiveness and timeliness of bankruptcy protection, as well as the subsequent turnaround potential.

Chatterjee (2014) highlights that companies often delay filing for Chapter 11 bankruptcy. This pattern is particularly evident in the surge of bankruptcy filings observed before the implementation of the 2005 Bankruptcy Abuse Prevention and Consumer Protection Act

[1] In their paper, an agent who is offered a new gamble evaluates that gamble in isolation, separately from other risks she already faces. This narrow framing phenomenon indicates that an investor may consider investments separately without the context of the overall portfolio.

(BAPCPA). The act increased both the pecuniary and non-pecuniary costs of filing for bankruptcy. As a result, there was a sharp increase in Chapter 11 filings just before the law took effect in mid-October 2005, followed by an equally sharp decline afterward. This surge suggests that financially distressed firms adjusted their filing dates to take advantage of the more debtor-friendly provisions of the pre-BAPCPA law, illustrating how changes in the legal environment can influence the optimal timing of bankruptcy filings. Platt et al. (2013) further argue that bankruptcy decisions are more complex than a straightforward cost-benefit analysis. Their findings suggest that factors such as real GDP, the passage of BAPCPA, and even the seasons of the year play a role in determining bankruptcy timing. However, their study focuses primarily on macro-level bankruptcy rates rather than the decision-making process of individual firms.

As discussed in Section 1, agency problems can also contribute to delays in bankruptcy filings. CEOs may be motivated to postpone filing due to concerns over their reputation and compensation. Eckbo, Thorburn, and Wang (2016) investigate career and compensation outcomes for CEOs of large firms that file for Chapter 11 and find significant financial consequences. CEOs leaving the executive labor market experience a median compensation loss, with a present value of $7 million until age 65-equivalent to five times their pre-departure compensation. Interestingly, the study finds no significant deterioration in reputation for bankrupt CEOs, as 29% of them go on to become CEOs of other companies after bankruptcy resolutions, compared to only 15% for CEOs who depart two years before bankruptcy. Additionally, Sundaram and Yermack (2007) document a positive relationship between CEOs' pension value and their risk-taking behavior. They suggest that CEOs with substantial pension value are more likely to delay bankruptcy filings, potentially to preserve personal financial benefits. Beyond individual motivations, corporate governance factors, such as board size and the presence of independent directors, likely influence bankruptcy timing as well, given their role in mitigating agency problems. In our cross-sectional analyses, we incorporate the percentage of independent directors and CEO age as control variables to account for their impact on bankruptcy timing.[2]

Furthermore, research shows that CEO behavioral biases significantly influence firm decisions and policies. First, CEOs do not always make optimal decisions that maximize shareholder wealth. Jensen and Meckling (1976) highlight that agency problems permeate all aspects of a firm,

[2] We do not include board size as it is highly correlated with firm size, another control variable.

affecting decision-making. Second, studies demonstrate that CEOs' personal biases can distort firm policies. For example, Stein (1989) argues that CEOs often behave myopically, such as by forsaking valuable long-term investments, to manipulate market perceptions and inflate current earnings. Bertrand and Schoar (2003) show that managerial fixed effects play a significant role in corporate decisions, including investments, financial strategies, and organizational practices. Their findings suggest that managerial style influences decision-making patterns, with older managers exhibiting more conservative strategies and MBA-trained managers adopting more aggressive approaches. Similarly, Hayward and Hambrick (1997) establish a link between CEO hubris and acquisition decisions, including premiums paid.

Additional evidence suggests that CEOs imprint their personal preferences on corporate policies. Cronqvist et al. (2011) find a strong correlation between CEOs' personal leverage choices and the capital structures of their firms, contradicting rational capital structure theories (e.g., Modigliani and Miller 1958). Jenter and Lewellen (2015) show that retirement-age CEOs are more likely to accept takeover bids due to career and retirement considerations, even when such decisions may not align with the best interests of the target firm's shareholders.

Recent studies further explore the influence of CEO behavioral biases on decision-making. Pan, Siegel, and Wang (2020) conclude that cultural heritage affects CEOs' acquisition tendencies, with those from uncertainty-avoiding cultures being less likely to pursue mergers and acquisitions (M&As). Duchin, Simutin, and Sosyura (2021) demonstrate that gender dynamics also shape investment decisions, as male CEOs allocate more investment capital to male division managers than to female managers. Building on these insights, our study investigates whether the CEO's disposition effect influences the timing of bankruptcy decisions. Specifically, we aim to understand how this behavioral bias affects a CEO's willingness to file for bankruptcy, a decision with critical implications for the firm and its stakeholders.

3. Sample and Variable Construction

The original bankruptcy filing dataset comprises 3,089 bankruptcy filings from 1964 to 2017.[3] For our analyses, we focus on Chapter 11 filings starting in 1984, as this marks the earliest

[3] We thank Sudheer Chava for providing this bankruptcy dataset.

availability of CEO insider trading dataset, which are sourced from the Thomson/Refinitiv database. Board director information is obtained from BoardEx, while firms' financial and stock data are retrieved from COMPUSTAT and CRSP, respectively. Detailed data sources can be found in Appendix A.1.

As detailed in Appendix A.2, we impose several conditions to construct our final sample of Chapter 11 cases. First, a bankruptcy case must be present in the bankruptcy probability dataset, and the latest probability data must be within three years prior to the bankruptcy date. These criteria yield 1,924 cases. Next, we require that each case have a non-missing "*delay*" variable, defined as reaching the top three bankruptcy probability deciles within six years before bankruptcy. This step eliminates 65 cases. Since most firms in our sample are small public companies, CEO information is not available from EXECUCOMP or Incentive Lab. To address this, we hand-collect CEO information for two critical years: the optimal year and the bankruptcy year. Cases with missing CEO information are excluded, resulting in the elimination of 350 additional cases. Lastly, we merge the bankruptcy dataset with the CEO disposition effect dataset. This step results in a significant reduction in observations, as we require that the same CEO remain in place from the onset of the delay period to the actual bankruptcy filing. After applying all criteria, our final sample consists of 300 Chapter 11 cases.

Not requiring CEOs to remain in place throughout the entire delay period would introduce significant bias into the results. First, it would create substantial selection bias, as firms may replace the CEO during financial distress, appointing a new leader to either expedite the bankruptcy filing and lead a successful turnaround or adopt strategies to further postpone the financial struggle. The former scenario could accelerate bankruptcy, while the latter could prolong the filing, thereby distorting the analysis. Second, if the delay period involves multiple CEOs, it becomes challenging to attribute the observed delay to any one CEO's disposition effect, complicating the interpretation of results and undermining the robustness of the study.

Measuring the length of delay. A key question in this study is how to empirically determine whether a bankruptcy filing is early or late. We posit that the best approach to estimate the "optimal timing" of bankruptcy is the model developed by Campbell, Hilscher, and Szilagyi (2008), hereafter referred to as the "CHS model." This model integrates both accounting and stock market information to estimate the probability of bankruptcy in the following period and has demonstrated

greater predictive accuracy compared to earlier models, such as the KMV distance-to-default model.[4]

We begin by calculating monthly bankruptcy probabilities for all firms with non-missing variables based on the CHS model. Next, we divide the entire CHS sample into ten deciles each month according to the bankruptcy probabilities of individual firms, with higher deciles indicating a greater likelihood of bankruptcy. We then identify the first year a company enters the top three deciles (eighth, ninth, and tenth) within the six years preceding its bankruptcy date. This focus on the top three deciles is supported by Table 1, which shows that 95.46% of bankrupt firms fall into these categories. As a robustness test, we further narrow this window to the top two deciles. Within the identified year, we select the month with the highest CHS probability as the "optimal month" for filing for Chapter 11. This month represents the point at which the firm is deemed to have fallen into deep financial distress. Finally, we define and calculate the "delay" variable as follows:

$$Delay_i = (12 * BankruptcyYear_i + BankruptcyMonth_i) - (12 * OptimalFilingYear_i + OptimalFilingMonth_i) \quad (1)$$

where *i* represents a bankrupt firm. Since we examine a maximum of six years prior to the bankruptcy year, the delay variable ($Delay_i$) is defined within the range [0, 84] months.

Measuring CEO disposition effect. We follow Odean (1998) and several other papers in the literature (e.g. Favreau and Garvey 2020) that model disposition effect as the disparity between proportion of gains realized (PGR) and the proportion of losses realized (PLR). We use the following equations to calculate monthly PGR and PLR for all CEOs.

$$\text{Proportion of Gains Realized } (PGR) = \frac{Realized\ Gains}{Realized\ Gains + Paper\ Gains} \quad (2)$$

$$Proportion\ of\ Losses\ Realized\ (PLR) = \frac{Realized\ Losses}{Realized\ Losses + Paper\ Losses} \quad (3)$$

where realized gains (losses) stand for the monthly realized dollar amount of gains (losses) realized by comparing the selling price of assets in a given month with their cost basis at the beginning of the month. Conversely, paper losses refer to the monthly unrealized dollar amount of gains (losses),

[4] We calculate bankruptcy probabilities following the methodology outlined in Campbell et al. (2008). For detailed information on the calculation process, please refer to their paper.

calculated by comparing the stock price with the cost basis at the beginning of the month. We repeat this for a CEO across months and assets. Lastly, we compute the disposition effect for CEO *i* using the following equation:[5]

$$Disposition\ Effect_i = \overline{PGR_i} - \overline{PLR_i} \quad (4)$$

We include a comprehensive set of control variables in our baseline model. Column three of Appendix A.1 provides detailed descriptions of the calculation methods for each control variable. The first group controls for basic firm characteristics, including firm size, book-to-market ratio, leverage, growth opportunities, liquidity (quick ratio), payout ratio (dividends and interest payments scaled by total assets), firm age, and firm risk (stock volatility). Additionally, we account for CEO age, following Yermack (2007), as discussed earlier. To address potential agency-related explanations, we control for the percentage of independent directors, noting that board size is highly correlated with firm size in our sample. Furthermore, Platt et al. (2013) highlight the influence of macroeconomic factors, such as GDP growth and credit spreads, on bankruptcy timing. Consequently, we include the annual growth rate of gross domestic product as a control. This variable captures the tendency for bankruptcy filings to accelerate during recessions, such as those in 2000 and 2008, which are associated with shorter delays in filing.

Our sample is not structured as panel data; rather, it consists of distinct bankruptcy cases. For control variables, we use data from the optimal year-the year when the bankrupt firm first enters deep financial distress-instead of the bankruptcy year. This approach ensures that the variables reflect the causes of delays rather than the consequences. It is important to note that missing values exist for many firm-related control variables. Given the already small sample size, we manually collect the missing data to maintain the robustness of our analysis.

4. Baseline Analysis

This section presents the results of the baseline analyses. We begin by examining the validity of the CHS model, which is expected to show an increasing probability of bankruptcy as the filing

[5] As a robustness check, we also use alternative measure for the disposition effect according to Chang, Solomon, and Westerfield (2016).

date approaches. Figure 1A illustrates the average CHS bankruptcy probability for each month prior to the bankruptcy date. The graph reveals a gradual upward trend from the 84th month to the 30th month before bankruptcy, followed by a sharp increase thereafter. As previously noted, approximately one-quarter of firms begin this period with negative net worth, during which they exhaust all possible options to remain operational. On average, these firms experience a slow deterioration in financial health until the 30th month before bankruptcy, at which point a significant financial decline often occurs, rendering a Chapter 11 filing unavoidable.

Figure 1B presents the persistence of struggling firms after their estimated optimal filing date, as determined by the CHS model. On average, firms that start at the 8th CHS decile experience a slight improvement, declining to the 7.7th decile, before reversing course and deteriorating steadily until bankruptcy. Firms that begin at the 9th or 10th deciles show modest improvements to the 8.2nd and 8.4th deciles, respectively, before their financial situations worsen. By the time of bankruptcy, all three trajectories converge at the 10th decile. The graph provides evidence that firms generally remain in very poor financial health after their estimated optimal filing date.

Table 1 presents details of all ten CHS deciles from the bankruptcy year to three years prior. To ensure consistency across years, we include only cases with non-missing CHS probabilities throughout this period, resulting in a sample of 948 cases. In the bankruptcy year, the top three deciles account for 95.46% of all bankrupt firms. The percentage of firms in the top three deciles decreases monotonically as we move further from the bankruptcy year. Additionally, nearly 90% of the firms reached the 10th decile at least once during the three years prior to the bankruptcy year. These results provide evidence that firms tend to struggle for an extended period after their optimal filing date, with financial conditions progressively worsening over time.

Figure 2A depicts the distribution of bankruptcy filing delays. Approximately 21% of bankrupt firms delay filing for a period of 18 to 30 months, while 69% delay for a period of 0 to 60 months. Additionally, Row 1 in Table 3 indicates that the average delay is 46 months, equivalent to nearly four years. Figure 2B displays the annual average length of bankruptcy delays from 1984 to 2017, alongside the annual GDP growth rates. The graph suggests that delays tend to be longer during periods of higher GDP growth but shorter during economic recessions, such as in 2008. As an exogenous shock, macroeconomic conditions can influence bankruptcy timing. For instance, during periods of higher credit spreads and restricted borrowing, firms may be forced to file sooner.

Conversely, in a favorable economy with easier access to financing at lower costs, delays may be prolonged as firms explore alternative methods to address financial distress. Figure 2C illustrates the distribution of bankruptcy delay across industries. The utility and finance industries exhibit the shortest delays, while the oil industry shows the longest. This finding aligns with expectations, as both the utility and finance sectors are characterized by high debt ratios and are subject to stricter regulatory oversight compared to other industries. In these sectors, regulators and creditors exert significant influence over bankruptcy timing, often expediting filings to mitigate broader risks. The rapid bankruptcies of Lehman Brothers in 2008 and Pacific Gas and Electric Company (PG&E) in 2019 exemplify how external pressures can lead to quicker resolutions in these industries.[6] In contrast, capital-intensive industries such as oil and manufacturing experience longer delays. This can be attributed, in part, to their reliance on long-term projects and substantial fixed assets, which provide opportunities to restructure or secure alternative financing before filing for bankruptcy.

As for the CEO disposition effect sample, Table 2 indicates that 9,750 out of 10,967 CEOs exhibit the disposition effect. Specifically, CEOs realize gains at a rate three times higher than losses. This finding aligns with Favreau and Garvey (2020), who report a PGR/PLR ratio of 2.91 among officers, including CEOs. The prevalence of the disposition effect among CEOs provides a strong empirical foundation for addressing our main research question.

To conduct the baseline analysis, we merge the disposition effect sample to the distress sample by CEO first name, middle name, and last name. Our baseline model is specified as follows:

$$Delay_i = \alpha + \beta' CEODispositionEffect_i + \boldsymbol{\gamma' CONTROLS} + Fixed\ Effects + \varepsilon_i \qquad (5)$$

where *i* denotes the firm, and ε represents the error term. In addition to the aforementioned control variables, we include year and industry fixed effects to account for time-specific and industry-specific factors that could influence the results.

Table 3 presents the summary statistics for our primary sample, which comprises 300 Chapter 11 bankruptcy cases from 1984 to 2017. All continuous variables are winsorized at the 1% and 99% levels to mitigate the influence of extreme values. The average bankruptcy filing delay is 46.39 months, with a standard deviation of 21.35 months, indicating substantial variation in filing times

[6] This underscores the critical role of corporate governance, which is accounted for in our baseline regression model.

across firms. For the disposition effect, the mean value is 0.008, while the median is 0.002, suggesting that most CEOs in the sample exhibit this behavioral bias in their trading activities.

The firm-level characteristics suggest that the sample primarily consists of smaller and younger firms compared to typical S&P 500 companies. Although the sample firms show seemingly healthy leverage (mean of 0.319) and quick ratios (mean of 4.391), their high average book-to-market ratio (mean of 0.809) may reflect low market valuations caused by their distressed financial conditions. Additionally, the annual cumulative stock return in the optimal year averages -26.4%, further highlighting the severe financial and market challenges these firms face. Finally, the GDP growth rate has a mean of 5.2% (0.052) with low variability (standard deviation of 0.017), indicating relatively stable macroeconomic conditions over the sample period.

Table 4 presents the correlation matrix for the independent variables included in Equation (5). The results show that none of the variables are highly correlated, with the highest correlation being -0.332 between firm size and stock volatility. Note that board size is strongly correlated with firm size, with a correlation coefficient of approximately 0.6. Additionally, the credit spread (measured as the difference between BAA and AAA corporate bond yields) exhibits a high correlation with the GDP growth rate. Due to these high correlations, we exclude board size and credit spread from Equation (5) to avoid multicollinearity issues.

We explore the relationship between delay and the CEO disposition effect using multiple approaches. Figure 3 illustrates this relationship with a fitted line, accompanied by 95% confidence intervals. The graph clearly shows a significantly positive relationship between the two variables, indicating that higher CEO disposition effects are associated with longer delays in bankruptcy filings.

Table 5 Panel A presents the regression results based on Equation (5), with each column incorporating a different set of control variables. Firm and industry fixed effects are included in all columns except for Column (5), where year fixed effects are omitted to avoid absorbing the impacts of macroeconomic factors (GDP growth rate). In Column (1), the regression controls for basic firm characteristics. The results indicate that smaller and older firms tend to experience longer delays in filing for bankruptcy. Additionally, companies with higher investment in research and development (R&D) are associated with prolonged delays. Firms that distribute fewer dividends and interest payments also delay bankruptcy filings more, as do firms with lower equity

risk. Column (2) introduces stock performance as an additional control variable. While most of the previously included controls remain statistically significant, stock volatility becomes insignificant. However, stock return is positive and significant, indicating that firms are more likely to prolong delays when their stock return is higher in the optimal year. In Column (3), we add CEO age as a control variable. Although positively correlated with delay, CEO age does not have a statistically significant impact on the length of delay. Column (4) incorporates the percentage of independent directors as a proxy for corporate governance and to account for agency problems. While this variable is negatively correlated with the length of delay-suggesting that better governance is associated with shorter delays-the relationship is not statistically significant. Columns (5) and (6) include GDP growth rate as a macroeconomic control. In Column (5), GDP growth rate is negatively and significantly related to delay when year fixed effects are excluded. However, this relationship becomes statistically insignificant in Column (6) after accounting for year fixed effects, as anticipated. These results suggest that a higher GDP growth rate in the optimal year is associated with shorter delays, potentially because periods of high GDP growth are often followed by economic contractions, which may expedite bankruptcy filings.

The coefficient on the CEO disposition effect is positive and statistically significant at the 1% level across all columns, indicating a robust positive relationship between the CEO disposition effect and the length of bankruptcy delay. This relationship is also economically significant. As shown in Column (6) of Table 5 Panel A, a one standard deviation increase in the CEO disposition effect corresponds to an additional 3.12 months of delay in filing for bankruptcy.

Table 5, Panel B divides the full sample into two sub-samples based on whether a CEO exhibits the disposition effect. We apply Equation (5) as the regression model and use the same set of controls as in Column (6) of Panel A. Among the 300 CEOs in our sample, 252 exhibit this behavioral bias in their trading activities, while 48 do not. Column (1) of Panel B reveals an even stronger economic significance for CEOs with a disposition effect compared to the full sample results in Panel A, Column (6). Specifically, a one standard deviation increase in the disposition effect is associated with an additional delay of 3.39 months in filing for bankruptcy. In contrast, the sub-sample of CEOs who do not exhibit the disposition effect shows a positive but statistically insignificant relationship with bankruptcy delay. These findings consistently support the hypothesis that the CEO disposition effect significantly influences the length of bankruptcy delay.

Overall, our baseline results provide robust evidence of a strong positive relationship between the CEO disposition effect and the length of bankruptcy filing delays. To ensure the validity of these findings, we perform several robustness tests, detailed in Section 5.

5. Robustness

5.1. Alternative Measure for CEO Disposition Effect

Chang, Solomon, and Westerfield (2016) introduce a regression-based method to calculate the disposition effect. This approach is analogous to the one used by Odean (1998), but it leverages regressions to allow for clustering of standard errors and adding control variables, thereby accounting for potential dependencies in asset sales and avoiding the assumption that each sale is independent. Following Chang et. al (2016), the regression model used to estimate the disposition effect is as follows:

$$Sale_{ijt} = b_0 + b_1 Gain_{ijt} + \varepsilon_{ijt} \quad (6)$$

where observations are at the CEO (*i*), asset (*j*), and date (*t*) level. Standard errors are clustered by month. At the beginning of each month, we calculate a volume-weighted average cost basis for each CEO-stock pair, which is then compared with the stock price at the end of the first trading day of the month. Based on this comparison, a dummy variable (*Gain*) is assigned a value of one if the stock has a paper gain at the beginning of the month, and zero otherwise. The dependent variable, *Sale*, is equal to one if the CEO sells the stock during the month. The regression coefficient, b_1, captures the CEO's disposition effect.

Table 6 presents the regression results based on Equation (5), where the CEO disposition effect is measured using the method proposed by Chang, Solomon, and Westerfield (2016). We lose 63 bankruptcy cases due to the limited number of trading activities for their CEOs that can produce a b_1. The results in Panel A show that all coefficients on the CEO disposition effect are positive and statistically significant at the 5% level, consistent with the findings in Table 5, Panel A. A one standard deviation increase in the disposition effect corresponds to an additional delay of 2.95 months in filing for bankruptcy. Panel B extends this analysis through sub-sample regressions, revealing that only CEOs with a disposition effect have a significant impact on

bankruptcy delay. The sub-sample of CEOs exhibiting the disposition effect demonstrates greater economic significance, with an additional delay of 3.14 months, compared to the full sample in Panel A (2.95 months). These findings with an alternative measure for CEO disposition effect align closely with the baseline regression results, reinforcing the robustness of the relationship between the CEO disposition effect and the length of bankruptcy delays.

5.2. Entropy Balancing Model

To ensure the robustness of our findings, we utilize entropy balancing as an additional approach in our analysis. Entropy balancing reweights observations to achieve balance in the covariate distributions between CEOs with and without the disposition effect. This method is particularly advantageous because it addresses potential selection bias and ensures that any observed differences in bankruptcy delay are attributable to the disposition effect rather than confounding variables. Unlike traditional matching methods, entropy balancing does not require dropping observations, preserving the full sample size and maintaining statistical power, which is crucial for our small sample. Furthermore, it allows for the simultaneous balancing of multiple covariates, such as firm size, CEO age, and percentage of independent directors, ensuring comparability across groups. By mitigating biases and improving causal interpretability, entropy balancing strengthens the validity and reliability of our results.

To further test the robustness of our hypothesis, we convert the variable of interest, CEO disposition effect, into a dummy variable that equals one if the CEO exhibits the disposition effect and zero otherwise. This dummy variable is used in the first stage of entropy balancing to obtain weights, with all control variables from Table 5, Panel A, Column (6) included, but without fixed effects. In the second stage, we estimate Equation (5) using the weighted sample and the disposition effect dummy as the primary independent variable. Table 7 presents the regression results with different sets of controls, incorporating fixed effects in all columns. The coefficients on the disposition effect dummy are consistently positive and statistically significant at the 1% level across all five columns, aligning closely with the results from our baseline model. Notably, the percentage of independent directors becomes negative and statistically significant, indicating that stronger corporate governance can shorten bankruptcy delays. These findings confirm the

robustness of our hypothesis, demonstrating that the relationship between CEO disposition effect and bankruptcy delay holds even under the entropy balancing framework.

6. Conclusions

This paper examines whether CEOs' bankruptcy decisions are irrational and influenced by the disposition effect, a behavioral bias. Traditional literature assumes a rational process for bankruptcy timing, where factors impacting this process are also deemed rational. We challenge this assumption by integrating behavioral finance into the study of bankruptcy decisions, bridging two distinct strands of literature.

Our contributions are threefold. First, we extend the application of behavioral finance to CEOs' exit strategies, complementing existing research on firm-level decisions such as investment and capital structure. Second, we identify a potential factor that could enhance the accuracy of bankruptcy prediction models. Finally, our study offers practical insights into improving a firm's survivability. Recognizing and addressing behavioral biases in the decision-making process can help optimize the timing of bankruptcy filings, mitigating the adverse effects of these biases on firm outcomes.

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Figure 1A: Average CHS Probability for Bankrupt Firms from the 84th Month before Bankruptcy to the Bankruptcy Month

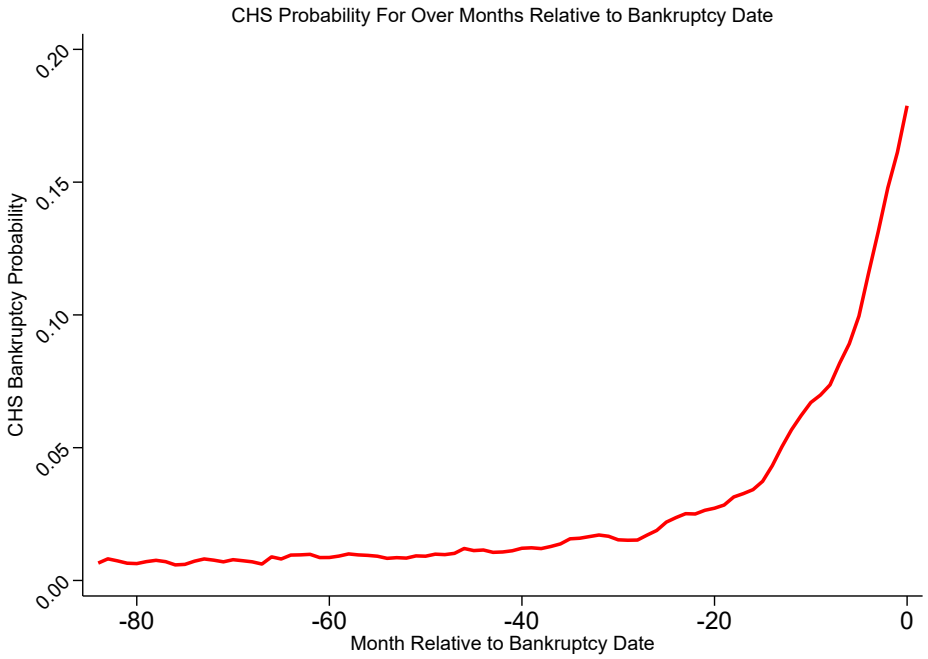


Figure 1B: Average CHS Decile Over Years Prior to Bankruptcy Year for Firms that Start at 8th, 9th, and 10th Deciles in their Optimal Year

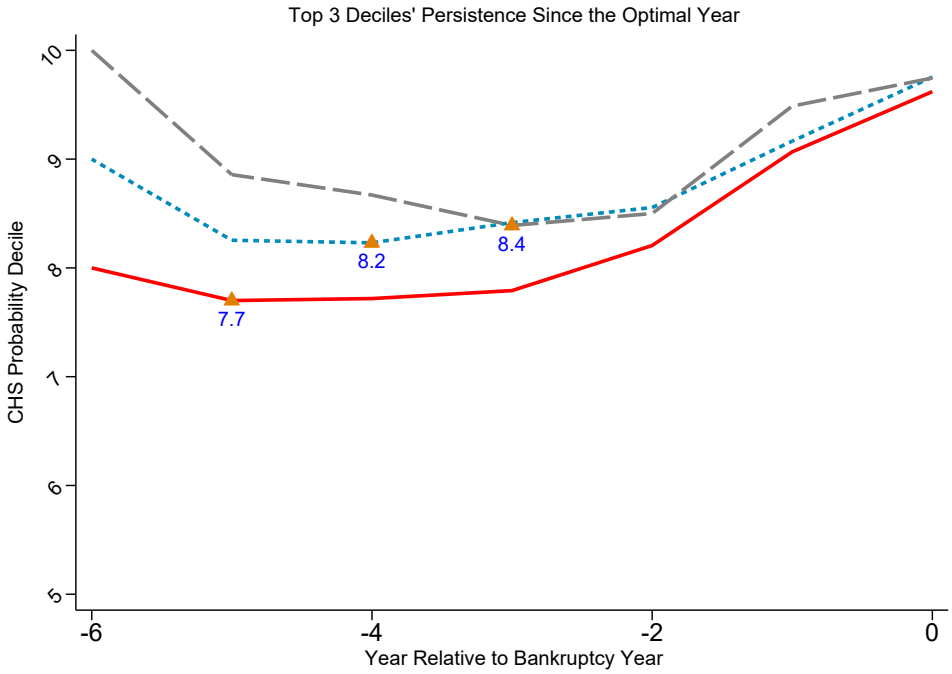


Figure 2A:

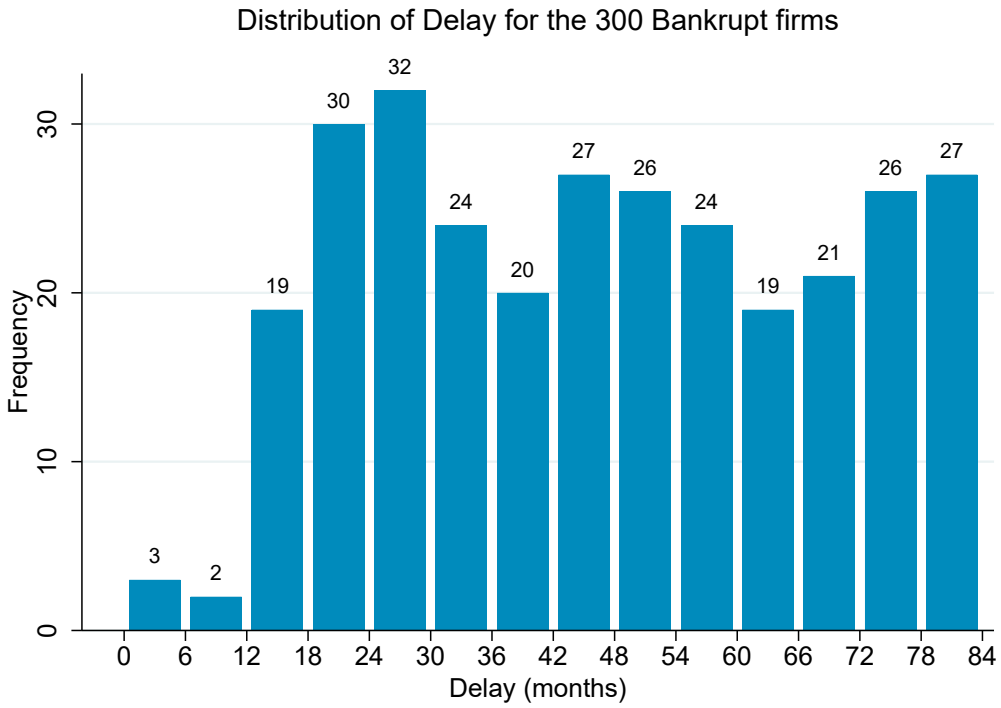


Figure 2B:

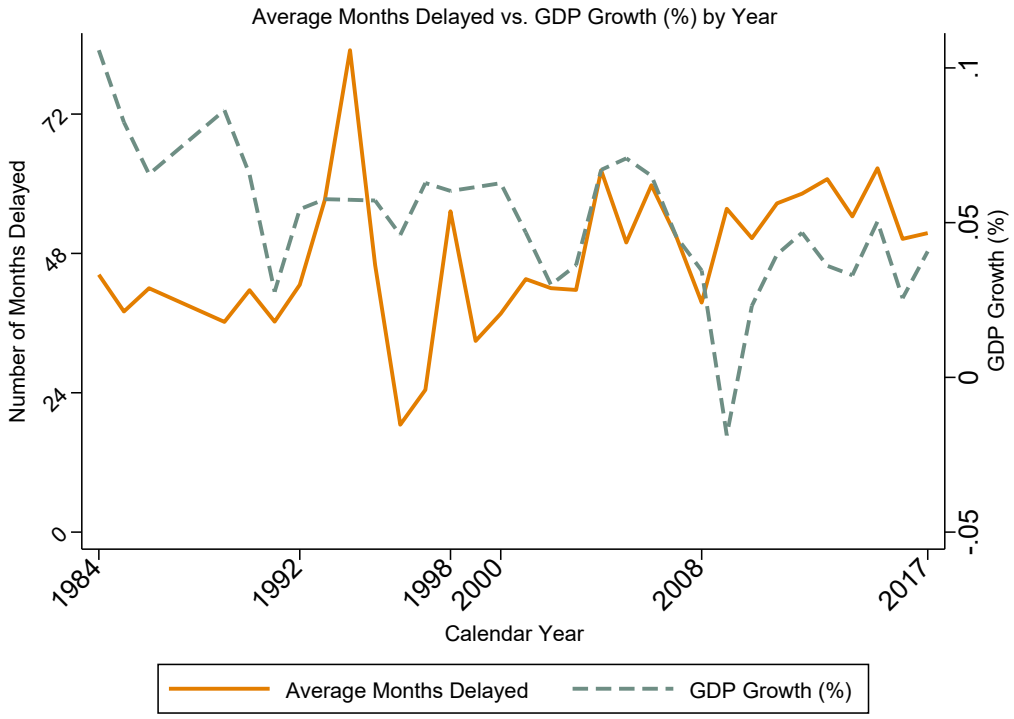


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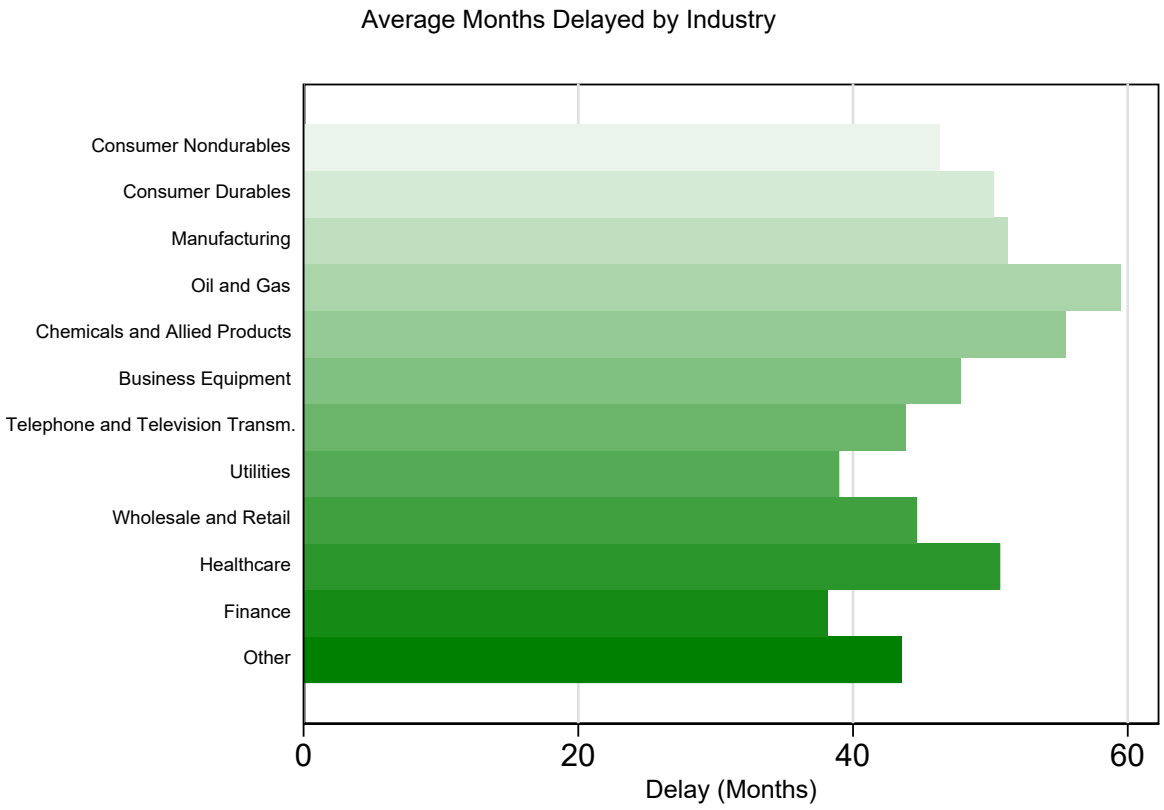

Average Months Delayed by Industry
Consumer Nondurables
Consumer Durables
Manufacturing
Oil and Gas
Chemicals and Allied Products
Business Equipment
Telephone and Television Transm.
Utilities
Wholesale and Retail
Healthcare
Finance
Other
0
20
40
60
Delay (Months)

Figure 3:

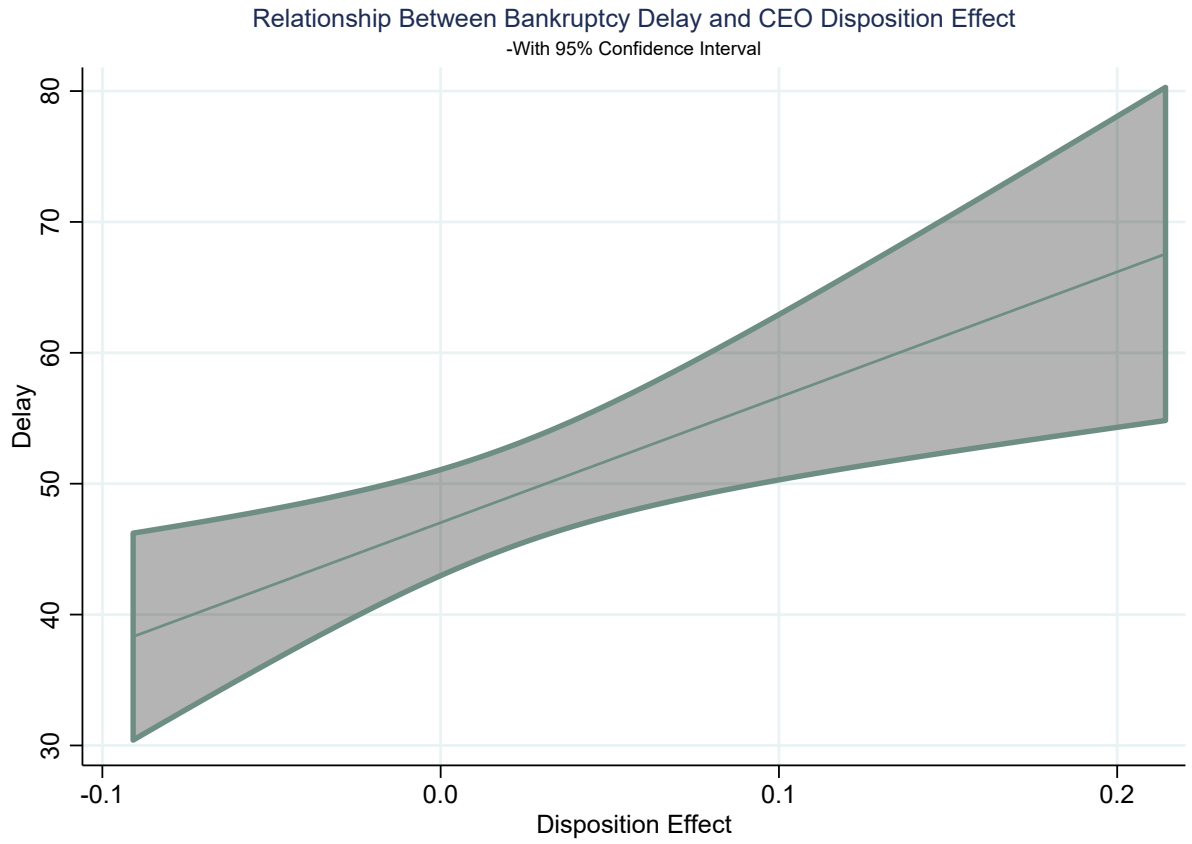

Relationship Between Bankruptcy Delay and CEO Disposition Effect
-With 95% Confidence Interval
Delay
30
40
50
60
70
80
-0.1
0.0
0.1
0.2
Disposition Effect

Table 1: Validity of CHS Model

This table presents the detailed distribution of 948 bankruptcy cases across ten deciles based on each firm's annual average CHS probability from three years prior to bankruptcy (t-3) to the bankruptcy year (t). Column (1) reports the percentage of firms that reached each decile as their maximum decile during this period. To ensure consistency, we include only firms with non-missing CHS values for all years between t-3 and t, resulting in a final sample of 948 cases. The sample period is from 1984 to 2017.

CHS DECILES	(1) *Max Decile within 84 Months before Bankruptcy (%)*	(2) *Bankruptcy Year (%)*	(3) *One Year before Bankruptcy (%)*	(4) *Two Years before Bankruptcy (%)*	(5) *Three Years before Bankruptcy (%)*
DECILE1	0.00	0.63	0.42	1.37	2.53
DECILE2	0.00	0.74	0.53	1.27	2.74
DECILE3	0.00	0.53	0.84	2.85	4.54
DECILE4	0.11	0.32	1.48	2.53	5.17
DECILE5	0.32	0.42	1.9	5.7	7.49
DECILE6	0.53	1.05	3.16	6.22	11.39
DECILE7	0.63	0.84	5.06	13.82	13.19
DECILE8	1.69	4.01	13.08	19.51	17.41
DECILE9	6.96	12.34	24.58	24.89	22.57
DECILE10	89.77	79.11	48.95	21.84	12.97
Cumulative % of Top 3 Deciles	98.42	95.46	86.61	66.24	52.95
Total Count	948	948	948	948	948
Total Pct.	100%	100%	100%	100%	100%

Table 2: Summary of CEO Disposition Effect According to Insider Trading

This table summarizes the insider trading activities of CEOs, which form the basis for calculating the CEO disposition effect. The dataset includes 10,967 CEOs. Panel A provides a comparison of insider trading activities between CEOs with and without the disposition effect. Panel B presents the summary statistics for the proportion of gains and losses realized, calculated following the methodology of Odean (1998). The results in Panel B indicate that the proportion of gains realized is three times higher than the proportion of losses realized. Statistical significance is denoted by *, **, and *** at the 10%, 5%, and 1% levels, respectively.

Panel A: CEO Insider Trading Summary

	N	Num. of Realized Gains	Num. of Paper Gains	Num. of Realized Losses	Num. of Paper Losses
CEOs with Disposition Effect	9,750	7,096	280,240	511	90,977
CEOs without Disposition Effect	1,217	227	29,920	1,891	23,189
All CEOs	10,967	7,323	310,160	2,402	114,166

Panel B: CEO Disposition Effect Summary

	PGR	PLR	PGR-PLR	T Statistic	PGR/PLR
CEOs with Disposition Effect	0.0179	0.0013	0.0166***	76.5400	13.7700
CEOs without Disposition Effect	0.0034	0.0326	-0.0292***	-38.1100	0.1000
All CEOs	0.0161	0.0053	0.0108***	50.2300	3.0400

Table 3: Summary Statistics of Variables in the Final Sample

This table presents the summary statistics for all intendent variables in the optimal year used in the cross-sectional analyses. For each variable, the table reports the number of observations, mean, standard deviation, minimum value, 25th percentile, median, 75th percentile, and maximum value. The full sample consists of 300 unique Chapter 11 cases from 1984 to 2017. All continuous control variables are winsorized at the 1% and 99% levels to mitigate the influence of outliers.

	N	Mean	Std. Dev.	min	p25	Median	p75	max
Delay	300	46.385	21.354	5.5	28	45.5	65	83
Disposition Effect	300	0.008	0.041	-0.091	0	0.002	0.006	0.214
Firm Size	300	5.716	1.961	1.153	4.256	5.804	7.097	10.284
Book-to-Market	300	0.809	1.326	-5.882	0.25	0.632	1.315	5.754
Leverage	300	0.319	0.253	0	0.067	0.32	0.506	0.934
Growth Opp.	300	0.428	2.283	0	0	0	0.012	18.917
Quick Ratio	300	4.391	14.032	0.057	0.726	1.122	2.173	114.146
Payout Ratio	300	0.049	0.077	0	0.012	0.036	0.057	0.588
Stock Volatility	300	0.821	0.372	0.197	0.564	0.73	1.027	1.897
Firm Age	300	9.732	9.529	2	3	6	13	39
Stock Return	300	-0.268	0.81	-2.651	-0.756	-0.275	0.154	2.191
CEO Age	300	54.657	9.609	32	48	55	61	78.5
%Independent Dir.	300	0.364	0.21	0	0.25	0.333	0.467	1
GDP Growth Rate	300	0.052	0.017	-0.019	0.045	0.059	0.063	0.084

Table 4: Correlation Matrix

This table exhibits the correlation between each pair of independent variables. P-values are reported in parentheses.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Disposition Effect	-											
(2) Firm Size	0.015											
	(0.791)											
(3) Book-to-Market	-0.041	0.108										
	(0.484)	(0.062)										
(4) Leverage	-0.107	0.300	-0.128									
	(0.065)	(0.000)	(0.027)									
(5) Growth Opportunity	0.097	-0.237	-0.085	-0.102								
	(0.093)	(0.000)	(0.141)	(0.078)								
(6) Quick Ratio	0.000	0.070	0.033	-0.091	0.014							
	(0.995)	(0.227)	(0.574)	(0.115)	(0.805)							
(7) Payout Ratio	-0.057	-0.132	-0.159	0.202	0.100	-0.021						
	(0.328)	(0.023)	(0.006)	(0.000)	(0.083)	(0.722)						
(8) Stock Volatility	-0.056	-0.332	0.055	-0.156	0.148	0.013	0.170					
	(0.331)	(0.000)	(0.343)	(0.007)	(0.010)	(0.829)	(0.003)					
(9) Firm Age	0.101	0.257	0.058	0.050	0.013	-0.081	-0.077	-0.261				
	(0.079)	(0.000)	(0.319)	(0.389)	(0.820)	(0.160)	(0.185)	(0.000)				
(10) Stock Return	0.089	-0.258	-0.167	-0.137	0.215	0.015	-0.071	-0.042	0.031			
	(0.123)	(0.000)	(0.004)	(0.018)	(0.000)	(0.798)	(0.223)	(0.465)	(0.592)			
(11) CEO Age	-0.005	0.149	0.080	0.125	0.014	-0.044	0.006	-0.154	0.208	0.089		
	(0.926)	(0.010)	(0.169)	(0.031)	(0.805)	(0.446)	(0.912)	(0.008)	(0.000)	(0.124)		
(12) %Independent Director	-0.012	-0.090	0.169	-0.140	0.010	0.083	-0.026	0.094	0.043	-0.084	-0.143	
	(0.838)	(0.118)	(0.003)	(0.015)	(0.857)	(0.152)	(0.655)	(0.104)	(0.456)	(0.146)	(0.013)	
(13) GDP Growth Rate	-0.039	-0.152	0.027	0.005	0.000	-0.141	0.014	-0.102	-0.140	-0.173	-0.208	0.036
	(0.502)	(0.009)	(0.646)	(0.924)	(0.997)	(0.014)	(0.804)	(0.076)	(0.015)	(0.003)	(0.000)	(0.531)

Table 5: Baseline Regressions

This table presents the baseline regression coefficients using Equation (5). All columns, except for Column (5), include both industry and year fixed effects. Column (5) incorporates only industry fixed effects. Column (1) includes basic firm characteristics, while Columns (2) through (5) sequentially add one additional category of control variables. Column (6) represents the full regression model, incorporating all control variables and both fixed effects. The t-statistics are reported in parentheses, with standard errors clustered at the company level. Statistical significance is indicated by *, **, and *** at the 10%, 5%, and 1% levels, respectively.

Panel A: Full Sample Regressions

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	*Delay*	*Delay*	*Delay*	*Delay*	*Delay*	*Delay*
Disposition Effect	82.88***	77.49***	77.58***	77.16***	74.41***	76.17***
	(3.613)	(3.345)	(3.290)	(3.205)	(3.195)	(3.164)
Firm Size	-5.075***	-4.401***	-4.358***	-4.256***	-3.543***	-4.400***
	(-6.800)	(-5.774)	(-5.712)	(-4.978)	(-4.896)	(-5.834)
Book-to-Market	0.322	0.767	0.654	0.827	0.899	0.826
	(0.441)	(1.073)	(0.887)	(1.090)	(1.122)	(1.093)
Leverage	-0.441	-0.0373	-0.392	-1.116	-3.045	-1.175
	(-0.0825)	(-0.00713)	(-0.0743)	(-0.210)	(-0.569)	(-0.220)
Growth Opportunity	0.659*	0.412	0.396	0.359	0.332	0.411
	(1.698)	(1.051)	(1.036)	(0.931)	(1.091)	(1.068)
Quick Ratio	-0.0264	-0.0367	-0.0343	-0.0283	-0.0206	-0.0443
	(-0.245)	(-0.355)	(-0.332)	(-0.272)	(-0.159)	(-0.395)
Payout Ratio	-35.78**	-31.59**	-32.60**	-32.86**	-36.16***	-33.16**
	(-2.076)	(-2.154)	(-2.299)	(-2.375)	(-3.079)	(-2.362)
Stock Volatility	-7.825*	-6.386	-5.757	-5.458	-5.810	-6.472
	(-1.889)	(-1.517)	(-1.335)	(-1.256)	(-1.519)	(-1.434)
Firm Age	3.888***	3.662**	3.472**	3.756**	4.636***	3.398**
	(2.606)	(2.494)	(2.382)	(2.569)	(3.270)	(2.307)

Stock Return		4.568***	4.447***	4.331***	4.422***	4.130***
		(2.836)	(2.789)	(2.707)	(3.006)	(2.608)
CEO Age			0.136	0.121	0.203*	0.124
			(1.088)	(0.964)	(1.800)	(0.995)
%Independent Director				-6.551	-7.330	-6.418
				(-1.087)	(-1.309)	(-1.101)
GDP Growth Rate					-203.2***	-112.0
					(-2.642)	(-1.024)
Year Fixed Effect	Yes	Yes	Yes	Yes	No	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	300	300	300	300	300	300
R-squared	0.402	0.422	0.424	0.427	0.310	0.430
Months Delayed Per One Std.Dev Increase in Disposition Effect	3.40	3.18	3.18	3.16	3.05	3.12

Panel B: Subsample Regressions

	(1)	(2)
VARIABLES	*Delay (DE=Yes)*	*Delay (DE=No)*
Disposition Effect	90.04***	3.067
	(2.876)	(0.0147)
Firm Size	-4.438***	-4.629
	(-5.343)	(-1.411)
Book-to-Market	0.608	2.175
	(0.583)	(0.864)
Leverage	-1.281	45.31*
	(-0.213)	(1.932)
Growth Opportunity	0.180	0.751
	(0.365)	(0.673)
Quick Ratio	-0.0440	1.222
	(-0.345)	(0.268)
Payout Ratio	-29.87**	-453.0
	(-1.993)	(-1.482)
Stock Volatility	-6.082	5.779
	(-1.386)	(0.201)
Firm Age	3.976**	13.57
	(2.543)	(1.111)
Stock Return	5.359***	4.286
	(3.100)	(0.580)
CEO Age	0.109	-0.104
	(0.758)	(-0.189)
%Independent Director	-5.059	8.712
	(-0.776)	(0.227)
GDP Growth Rate	-124.3	-96.12
	(-1.101)	(-0.0674)
Year Fixed Effect	Yes	Yes
Industry Fixed Effect	Yes	Yes
Observations	252	48
R-squared	0.422	0.959
Months Delayed Per One Std.Dev Increase in Disposition Effect	3.39	0.09

Table 6: Regressions Based on an Alternative Measure for CEO Disposition Effect

This table presents the regression results based on Equation (5), utilizing an alternative measure for the disposition effect as proposed by Chang et al. (2016). Column (1) includes basic firm characteristics, while Columns (2) through (5) sequentially incorporate one additional category of control variables. The t-statistics are shown in parentheses, with standard errors clustered at the company level. Statistical significance is denoted by *, **, and *** at the 10%, 5%, and 1% levels, respectively.

Panel A: Full Sample Regressions

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	*Delay*	*Delay*	*Delay*	*Delay*	*Delay*	*Delay*
Disposition Effect	52.23**	52.43**	54.28**	54.23**	54.65**	55.08**
	(1.972)	(1.979)	(2.093)	(2.070)	(2.427)	(2.164)
Firm Size	-5.002***	-4.163***	-4.069***	-4.055***	-3.468***	-3.985***
	(-5.656)	(-4.812)	(-4.733)	(-4.703)	(-4.636)	(-4.656)
Book-to-Market	-0.501	0.235	-0.118	0.000121	-0.305	0.0242
	(-0.533)	(0.278)	(-0.132)	(0.000133)	(-0.326)	(0.0264)
Leverage	-1.783	-1.640	-2.336	-2.533	-3.914	-2.862
	(-0.295)	(-0.283)	(-0.403)	(-0.434)	(-0.694)	(-0.474)
Growth Opportunity	0.451	0.188	0.171	0.133	0.166	0.228
	(1.264)	(0.462)	(0.453)	(0.358)	(0.562)	(0.599)
Quick Ratio	-0.00987	-0.0176	-0.00329	-0.00217	-0.0185	-0.0658
	(-0.0599)	(-0.112)	(-0.0216)	(-0.0145)	(-0.0994)	(-0.361)
Payout Ratio	-43.29**	-36.38**	-38.46***	-37.79***	-38.65***	-37.49**
	(-2.459)	(-2.377)	(-2.688)	(-2.642)	(-3.191)	(-2.550)
Stock Volatility	-5.643	-5.208	-4.249	-4.063	-5.263	-5.898
	(-1.197)	(-1.148)	(-0.922)	(-0.879)	(-1.228)	(-1.187)
Firm Age	2.687	2.182	1.640	1.775	3.754**	1.213
	(1.394)	(1.167)	(0.881)	(0.948)	(2.321)	(0.644)

Stock Return		5.381***	5.100***	5.132***	5.146***	4.651***
		(3.118)	(3.007)	(3.019)	(3.413)	(2.770)
CEO Age			0.269**	0.261*	0.234*	0.261*
			(1.984)	(1.917)	(1.945)	(1.931)
%Independent Director				-5.503	-6.259	-6.169
				(-0.818)	(-1.026)	(-0.947)
GDP Growth Rate					-223.4**	-188.6
					(-2.520)	(-1.516)
Year Fixed Effect	Yes	Yes	Yes	Yes	No	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	237	237	237	237	237	237
R-squared	0.400	0.430	0.441	0.443	0.344	0.452
Months Delayed Per One Std.Dev Increase in Disposition Effect	2.80	2.81	2.91	2.90	2.93	2.95

Panel B: Subsample Regressions

	(1)	(2)
VARIABLES	*Delay (DE=Yes)*	*Delay (DE=No)*
Disposition Effect	90.62**	25.75
	(2.197)	(0.493)
Firm Size	-3.665***	-6.323***
	(-4.048)	(-2.743)
Book-to-Market	-0.0936	-0.843
	(-0.0872)	(-0.391)
Leverage	-5.163	3.827
	(-0.791)	(0.197)
Growth Opportunity	0.215	-0.434
	(0.443)	(-0.517)
Quick Ratio	-0.0913	-0.623
	(-0.558)	(-0.185)
Payout Ratio	-30.24**	-315.5***
	(-2.012)	(-3.040)
Stock Volatility	-4.189	-22.97
	(-0.818)	(-1.416)
Firm Age	1.623	-10.41
	(0.832)	(-1.422)
Stock Return	3.980**	5.243
	(2.148)	(1.128)
CEO Age	0.244	0.744
	(1.581)	(1.528)
%Independent Director	-5.320	19.04
	(-0.751)	(0.970)
GDP Growth Rate	-116.7	-535.7**
	(-0.908)	(-2.306)
Year Fixed Effect	Yes	Yes
Industry Fixed Effect	Yes	Yes
Observations	252	48
R-squared	0.417	0.913
Months Delayed Per One Std.Dev Increase in Disposition Effect	3.14	0.89

Table 7: Entropy Balancing Model

This table reports the regression results using the entropy balancing model. The variable of interest is a dummy variable that equals one if a CEO exhibits the disposition effect, and zero otherwise. The table format mirrors that of Table 6, Panel A. The t-statistics are reported in parentheses, with standard errors clustered at the company level. Statistical significance is indicated by *, **, and *** at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	*Delay*	*Delay*	*Delay*	*Delay*	*Delay*
DE Dummy (0/1)	7.559***	7.830***	8.039***	7.908***	8.193***
	(2.734)	(2.735)	(2.792)	(2.809)	(2.981)
Firm Size	-5.267***	-5.041***	-4.888***	-4.900***	-4.914***
	(-6.303)	(-5.321)	(-5.058)	(-5.406)	(-5.384)
Book-to-Market	0.438	0.661	0.621	0.922	0.989
	(0.692)	(0.794)	(0.726)	(1.058)	(1.106)
Leverage	2.586	2.419	1.195	0.0855	-2.037
	(0.467)	(0.429)	(0.209)	(0.0156)	(-0.375)
Growth Opportunity	0.926**	0.747*	0.711*	0.654	0.573
	(2.246)	(1.782)	(1.730)	(1.574)	(1.334)
Quick Ratio	-0.0894	-0.0767	-0.0768	-0.0511	-0.0499
	(-0.964)	(-0.807)	(-0.813)	(-0.577)	(-0.531)
Payout Ratio	-44.84**	-43.65**	-43.14***	-43.13***	-42.86***
	(-2.466)	(-2.576)	(-2.635)	(-2.827)	(-2.775)
Stock Volatility	-9.085**	-9.289*	-8.649*	-7.951*	-8.020
	(-1.971)	(-1.968)	(-1.789)	(-1.673)	(-1.633)
Firm Age	3.044*	3.141*	2.869*	3.006*	3.364**
	(1.858)	(1.931)	(1.758)	(1.847)	(2.032)
Stock Return		2.591	2.466	2.531	2.148
		(1.353)	(1.297)	(1.395)	(1.182)

CEO Age			0.163	0.132	0.121
			(1.211)	(0.975)	(0.890)
%Independent Director				-12.41*	-12.58**
				(-1.850)	(-1.981)
GDP Growth Rate					-9.875
					(-0.0873)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes
Observations	300	300	300	300	300
R-squared	0.521	0.550	0.550	0.558	0.562

Appendix A.1: Sources and Definitions of Variables

Variable	***Data Source***	***Definition***
Delay	COMPUSTAT; CRSP; Bankruptcy Dataset Provided by Sudheer Chava	The distance between the year and month of actual bankruptcy filing date and the year and month of the estimated optimal filing date.
Disposition Effect (*Primary*)	Thomson/Refinitiv	Proportion of Gains Realized (*PGR*) - Proportion of Loss Realized (*PLR*). *See Odean (1998); Favreau and Garvey (2020)*.
Disposition Effect (*Alternative*)	Thomson/Refinitiv	The regression coefficient (*b1*) from Equation (3) in this paper for CEO *i*, asset *j*, and date *t*.
Firm Size	COMPUSTAT	Natural log of a firm's total asset (*AT*) in the optimal filing year.
Book-to-Market	COMPUSTAT	*CEQ/ (PRCC_F * CSHO*) in the optimal filing year.
Leverage	COMPUSTAT	*DLTT/AT* in the optimal filing year.
Growth Opportunity	COMPUSTAT	*XRD/SALE* in the optimal year.
Quick Ratio	COMPUSTAT	*(ACT - INVT)/LCT* in the optimal filing year. If missing, then (CHE + RECT)/LCT.
Payout Ratio	COMPUSTAT	(*DVT + XINT)/AT* in the optimal filing year.
Stock Volatility	CRSP	Annualized standard deviation of daily stock returns for the optimal filing year.
Firm Age	COMPUSTAT	The distance between the optimal filing year and the first year with non-missing *PRCC_F*.
Stock Return	CRSP	Cumulative daily stock return in the optimal filing year.
CEO Age	COMPUSTAT	CEO age in the optimal filing year.
%Independent Director	BoardEx	The percentage of independent directors in a board of directors for the optimal filing year.
GDP Growth Rate	Federal Reserve Economic Data (FRED)	(January GDP in year *t* - January GDP in year *t*-1)/January GDP in year *t*-1. Sample uses this value for the optimal filing year.

Appendix A.2: Bankruptcy Sample Construction

	Number of Unique Bankruptcy Cases Remaining
Merge the bankruptcy dataset to the full CHS failure probability dataset	2,367
Require that a bankruptcy case has available CHS monthly data within 3 years before the bankruptcy date	1,924
Have non-missing *Delay* variable: reach the top 3 CHS deciles within 6 years before bankruptcy	1,859
Require that a bankruptcy case has non-missing CEO name in the optimal year	1,509
After merging with CEO disposition effect dataset, a CEO must have non-missing disposition effect value	453
Lastly, the CEO in the optimal year must be the same person as the CEO at the bankruptcy filing date	300