

Jurisdiction, Deviations from Absolute Priority, and their Impact on the Valuation of Defaulted Securities

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Contents

List of Tables	VII
List of Figures	IX
Symbols and Abbreviations.....	XI
1 Introduction.....	1
2 Bankruptcy Codes and Recovery Risk	5
2.1 Default, Bankruptcy, and Resolution Procedures.....	5
2.1.1 Bargaining and Restructuring in Financial Distress.....	6
2.1.2 Distressed Exchanges	8
2.1.3 Bankruptcy Procedures in the United States	11
2.1.4 Bankruptcy Costs.....	14
2.1.5 Creditor Rights and Equity Holders' Bargaining Power.....	18
2.2 Comparison of U.S. and U.K. Bankruptcy Codes	21
2.3 Previous Empirical Studies.....	26
3 Credit Risk Model and Hypotheses.....	37
3.1 Overview of Structural Models	37
3.2 Fan and Sundaresan (2000) Model	47
3.3 Hypotheses.....	50
3.4 Sensitivity Analysis	53
4 Empirical Study of U.K. and U.S. Recovery Rates.....	57
4.1 Data Sources and Sample Selection	57
4.2 Choice and Definition of Variables	62
4.3 Recovery Rates in Distressed Exchanges	68
4.3.1 Descriptive Statistics	69
4.3.2 Regression Analysis	74
4.3.3 Regression Results.....	76
4.4 Recovery Rates in Bankruptcies	83
4.4.1 Descriptive Statistics	83
4.4.2 Regression Analysis	86
4.4.3 Regression Results.....	87
4.5 Recovery Rates on an Instrument Level.....	92
4.5.1 Descriptive Statistics	92
4.5.2 Regression Analysis	93
4.5.3 Regression Results.....	95
4.6 Recovery Rates and Prices at Default.....	97
4.6.1 Return Characteristics of Defaulted Debt	97

4.6.2	Efficiency of Debt Markets in Predicting Bankruptcy Settlements	103
4.7	Hypotheses Testing and Interpretation	106
4.8	Limitations and Alternative Explanations	107
4.8.1	Model Assumptions.....	107
4.8.2	Data Restrictions	110
4.8.3	Unobserved Factors	111
5	Conclusion	115
	Appendix	119
	Bibliography	129
	Legislation	141

List of Tables

Table 2.1:	Empirical studies of bankruptcy costs.....	16
Table 2.2:	Bankruptcy codes in the United States and the United Kingdom	23
Table 2.3:	Empirical studies documenting determinants of recovery rates and deviations from absolute priority	31
Table 3.1:	Structural models with endogenous default	44
Table 3.2:	Sensitivity of recovery rates to model factors	56
Table 4.1:	Number of defaults by default type	60
Table 4.2:	Bond default rates in the United States	67
Table 4.3:	Description of variables.....	68
Table 4.4:	Recovery rates by industry (distressed exchanges).....	70
Table 4.5:	Recovery rates by year of default (distressed exchanges).....	71
Table 4.6:	Summary statistics of dependent variables (distressed exchanges) ..	72
Table 4.7:	Summary statistics of firm characteristics (distressed exchanges) ..	73
Table 4.8:	Impact of country factor on recovery rates in distressed exchanges	77
Table 4.9:	Determinants of recovery rates in distressed exchanges.....	79
Table 4.10:	Pearson's correlation matrix and variance inflation factor (distressed exchanges)	82
Table 4.11:	Recovery rates by industry (bankruptcies).....	83
Table 4.12:	Recovery rates by year of default (bankruptcies).....	84
Table 4.13:	Summary statistics of dependent variables (bankruptcies)	85
Table 4.14:	Summary statistics of firm characteristics (bankruptcies)	86
Table 4.15:	Impact of country factor on recovery rates in bankruptcies.....	87
Table 4.16:	Determinants of recovery rates in bankruptcies	89
Table 4.17:	Pearson's correlation matrix and variance inflation factor (bankruptcies)	92
Table 4.18:	Recovery rates in the U.S and the U.K. by instrument type	93
Table 4.19:	Determinants of instrument recovery rates	96
Table 4.20:	Instrument recovery and bankruptcy period returns in the U.S.	98
Table A.1:	Defaulted issuers in data sample	129

List of Figures

Fig. 2.1: Bargaining phases of defaulted companies	7
Fig. 3.1: Sensitivity of recovery rates to bargaining power	55
Fig. 4.1: Overview of data types in the database	61
Fig. 4.2: Recovery distributions by instrument type	100
Fig. 4.3: Regression of default debt recovery on ultimate debt recovery	104
Fig. 4.4: Regression of default equity recovery on ultimate equity recovery ...	105
Fig. A.1: Database screenshot.....	127

Symbols and Abbreviations

Symbols

B	Face value of a bond
BC	Bankruptcy costs (all)
C	Dollar payout to all claimholders of the firm
D	Debt value
D_B	Debt value at the default boundary
E	Equity value
E_B	Equity value at the default boundary
F	F-test statistic
K	Bankruptcy costs – fixed portion
N	Number of observations
P_t	Trading price of debt at time t
P_D	Trading price of debt at default
R^2	Coefficient of determination
R_D	Recovery rate of debt
R_E	Recovery rate of equity
$R_{j,i}$	Recovery rate of debt instrument i issued by firm j
R_V	Recovery rate of the firm
RR_k	Recovery rate measure k
S	Debt service level
T	Maturity date of a bond
V	Firm value
V_B	Default barrier level for firm value
<i>Classes</i>	Number of creditor classes of the issuer with different seniority ranks
<i>DAPR</i>	Deviation from the absolute priority rule
<i>Default rate</i>	Default rate of corporate bonds in the United States in the event year
<i>Ebit</i>	Earnings before interest and taxation
<i>Energy & utility</i>	Dummy variable that equals one for issuers in the energy or utility sector
<i>Liquidated</i>	Dummy variable that equals one if issuer is liquidated
<i>Percent below</i>	Percentage of issuer's debt subordinated to this instrument
<i>Short maturity</i>	Dummy variable that equals one if issuer has a debt maturity in the next 12 months
<i>UK</i>	Dummy variable that equals one if issuer is located in the United Kingdom
c	Coupon of a bond

SYMBOLS AND ABBREVIATIONS

c_{avg}	Average coupon of the firm's debt instruments
dz	Increment of a standard Wiener process
i	Subscript indicating the instrument
j	Subscript indicating the firm
k	Subscript indicating the recovery rate measure
$\ln(x)$	Natural logarithm of x
op	Output price
q	Probability for failure of renegotiation
s	Skewness
t	Time to maturity of a bond
t_{def}	Time an issuer spends in bankruptcy (from default to resolution)
t_{score}	T-test statistic
x	Unspecified state variable
α	Bankruptcy costs – proportional factor
β_0	Constant term in regression
β_{1-9}	Regression coefficients
δ	Payout rate of the firm
ε	Error term
η	Bargaining power of equity holders
γ	Fixed liquidation cost
$E(\bullet)$	Expectation
$N(\bullet)$	Standard normal cumulative distribution function
σ	Asset volatility
τ	Tax rate

Abbreviations

ACAR	Average abnormal cumulative return
APR	Absolute priority rule
BRC	Bankruptcy Code of the United States
CUSIP	Committee on Uniform Security Identification Procedures
CVA	Company voluntary agreement
DAPR	Deviation from the absolute priority rule
DRSD	Moody's Default Risk Services Database
Ebit	Earnings before interest and taxation
E.U.	European Union
FYE	Financial year end
IRR	Internal rate of return
OLS	Ordinary least squares
SEDOL	Stock Exchange Daily Official List
SME	Small and medium sized enterprises
Std. dev.	Standard deviation
U.K.	United Kingdom
URD	Moody's Ultimate Recovery Database
U.S.	United States of America
USC	United States Code
VIF	Variance inflation factor

1 Introduction

“But the view that securities are inherently characterized by some intrinsic rights is incomplete as well. It ignores the fact that these rights depend on the legal rules of the jurisdictions where securities are issued.”

(La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998) p.3)

This work studies the effect that differences in creditor rights across jurisdictions have on the valuation of debt and equity securities of defaulted companies.

The financial crisis that started in 2007 has led to a sharp increase in corporate defaults worldwide, reaching record highs in 2009 in the United States and Western Europe.¹ Nevertheless, a large number of firms, particularly those that underwent a leveraged buyout in recent years, is still considered overleveraged and will have to undergo financial reorganization or risk insolvency as debt issues mature in the next 3-5 years.² This looming wave of recapitalization-needs heightens the general interest in how best to resolve these firms’ financial troubles, and whether financial reorganizations are better undertaken in formal insolvency proceedings or out-of-court in voluntary reorganizations.

They will also prove a test for the efficiency of different bankruptcy regimes around the world in facilitating reorganization and pursuing policy goals such as maximizing debt holder recoveries, speed of resolution and promoting the continuation of viable firms.³ Already since the telecom & internet crisis from 2001 to 2002, the debate on the optimal design of bankruptcy laws has intensified. Countries have adopted widely differing rules, for example in regard to the allocation of rights to creditors and equity holders, and in regard to bankruptcy resolution. Even within the European Union (E.U.), national bankruptcy codes differ widely and harmonization has so far largely been reduced to defining jurisdiction for cross-border insolvencies within the E.U.⁴ It is therefore a worthwhile exercise to study how different bankruptcy codes have

¹ See Credit Suisse (2010) p.243.

² See Credit Suisse (2010) p.23.

³ See Azar (2008a) p.382-388 for a comprehensive discussion on the goals and means of bankruptcy law.

⁴ A detailed discussion of the history and rather tedious process leading up to the European Insolvency Law 2000 can be found in Omar (2003).

affected debt and equity investors to date. In this context, it is particularly interesting to study the effect of bankruptcy laws on debt and equity recovery rates. Credit risk can be expressed as a combination of default probability and recovery rate risk. Studying the determinants of recovery rates is therefore crucial for the proper calibration of credit pricing models of academics, bond investors and rating agencies. Recovery rates are also an important parameter in the determination of banks regulatory capital requirements under Basel II.⁵ Differences in bankruptcy laws may affect the value of a firm's assets at default, as well as the distribution of the assets among claimants.

To address these questions, I apply the credit pricing model of Fan and Sundaresan (2000) to derive testable hypotheses for the effect of differences in creditor rights among countries on recovery rates. In a second step, the hypothesized model relationships are tested in an empirical study, comparing recovery data for defaulted companies in the United States (a relatively equity-friendly jurisdiction) and in the United Kingdom (a relatively creditor-friendly jurisdiction).

This work is structured into three main chapters. Chapter II introduces the legal and economic mechanisms of default, bankruptcy and financial reorganization. Reorganization procedures and the differences between formal bankruptcy and out-of-court reorganization are discussed. The absolute priority rule and bargaining mechanisms between claimant classes are introduced, and the effect of the bankruptcy code on equity holders' and debt holders' rights are discussed. The bankruptcy regimes of the United States (U.S.) and the United Kingdom (U.K.) are compared in detail. Not only do these two countries have the most developed equity and debt markets worldwide, but they are also characterized by widely differing bankruptcy regimes, making them an ideal object for a comparative study.

Chapter III reviews the literature on credit pricing models in order to identify an appropriate model to incorporate the effect of differing creditor rights across countries. Focusing on the Fan and Sundaresan (2000) model, I discuss the effect of differing creditor rights on the default boundary for the firm's asset value and recovery rates. Given these relationships, I derive hypotheses predicting that countries with stronger creditor rights have lower firm recovery rates, lower equity recovery rates, lower deviations from absolute priority but higher debt recovery rates. A sensitivity analysis illustrates these relationships and recovery rates predicted by the model.

⁵ Banks are required to estimate loss given default (1 minus recovery rate) on loans. See Basel Committee on Banking Supervision (2005).

Chapter IV describes the empirical test of the model with a unique, comprehensive dataset of 323 U.S. and U.K. companies that defaulted between 1998 and 2007, containing firm, debt and equity instrument specific characteristics, prices and recovery data. Regression analysis is conducted for the effect of creditor rights on recovery rates, controlling also for other factors including credit risk, proxies for bargaining power and for bankruptcy costs. The tests are conducted separately for sub-samples of distressed exchanges and bankruptcies, and on a firm and an instrument level. Finally, market prices for debt and equity securities at default are compared to recovery rates at emergence from bankruptcy. Statistical results are presented and critically evaluated.

Chapter V concludes with a summary of the thesis and the insights that can be derived from it, together with an outlook for future research.

This thesis is the first study to document the effect of creditor rights on the default boundary and deviations from absolute priority across countries with an international dataset. Three main findings emerge from the study: Firstly, I can confirm that the default boundary is at a significantly lower firm value in the creditor-friendly country, both for distressed exchanges and bankruptcies, consistent with theories of strategic default. Secondly, I confirm that deviations from absolute priority also exist in the creditor-friendly U.K. but at a much lower level. Thirdly, contrary to expectations, creditor recovery rates are significantly lower in the creditor-friendlier jurisdiction, as firm's delay financial reorganization more than implied by the equity holders' optimal reorganization decision.

2 Bankruptcy Codes and Recovery Risk

“Distressed investing is a marriage of law and credit.”⁶

Investors in defaultable debt securities are confronted with several risks, including interest rate risk, default timing risk and recovery risk.⁷ As an issuer defaults, the value of the security is largely determined by its expected recovery. Recovery mechanics, however, are defined by the applicable bankruptcy code of the jurisdiction the firm is located in. Only with a thorough understanding of the legal regime can one therefore accurately describe and value defaultable securities. The first section of this chapter discusses default resolution and bankruptcy procedures, with a focus on the U.S. The second section highlights international differences specifically between the U.S. and the U.K. bankruptcy codes. The last section provides a brief overview on previous empirical studies on recovery rates.

2.1 Default, Bankruptcy, and Resolution Procedures

“The policy issues regarding the bankruptcy code and its bearing on APR violations warrant further research.” (Eberhart and Senbet (1993) p.114).

In a generalized framework, the recovery rate (percent of face value recovered) of a debt instrument in a bankruptcy depends upon the value of the bankrupt firm and how this firm value is distributed among the different claimant classes, including debt and equity holders, in a plan of reorganization or in liquidation. In the United States and most European countries the bankruptcy code contains an ‘absolute priority rule’, stating that claims need to be fully satisfied in order of seniority before more junior claims (including equity) can receive any recovery.

However, deviations from absolute priority (i.e. recoveries received by junior claimants in excess of what they would receive under absolute priority) are

⁶ Alistar Hay (Managing Director, Head of Distressed Products Group Sourcing at Deutsche Bank) speaking at the 5th Distressed Debt and Restructuring Conference 2010 in Frankfurt, Germany.

⁷ Chapter 3 discusses these risks in more detail in the derivation of credit pricing models.

frequent and well documented in the United States (see also the empirical evidence to be discussed in section 2.3). As Meckling (1977) p.32 states “*The courts, the Congress, and the Securities and Exchange Commission refuse to relegate stockholders to the status of purely residual claimants.*” Senior claimants frequently agree to smaller deviations from absolute priority in bankruptcy in order to avoid lengthy proceedings and possible litigation by junior claimants. Similarly, it may be in the interest of all parties to avoid a costly bankruptcy altogether by reorganizing privately out-of-court before. The allocation to claimants in such financial reorganizations – and thus more generally the value of defaultable debt instruments – therefore depends on the relative bargaining power of debt and equity holders.

This section describes default resolution via bankruptcy or out-of-court procedures, bankruptcy costs, bargaining among claimants and their impact on recovery rates.

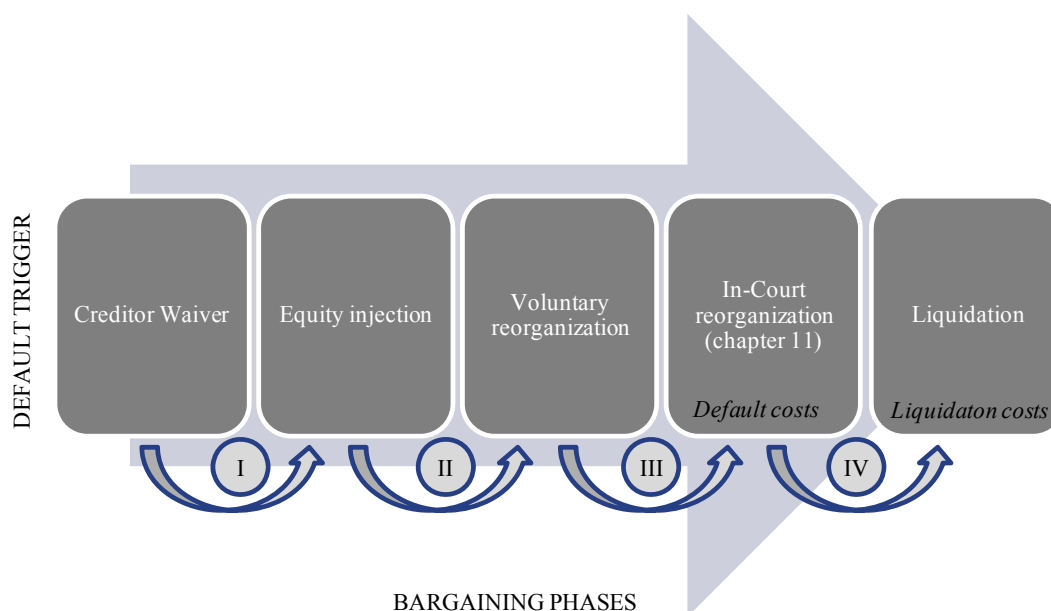
2.1.1 Bargaining and Restructuring in Financial Distress

A company can be considered financially distressed when there is a high likelihood of insolvency unless the situation improves.⁸ However, companies can be distressed for a long time without having to take financial action. Restructuring becomes urgent when the company defaults one of its debt contracts or payment obligations. This triggers a series of possible interactions or negotiations between the debtor and debt holders to remedy the default and avoid liquidation. Fig. 2.1 depicts the sequence of such negotiations:

⁸ A more precise, widely used definition for distress is proposed by Altman and Hotchkiss (2006) p.185 who describe a bond as distressed when it is trading at a “yield-to-maturity at least 1000 basis points over 10-years treasuries” and bank loans when trading at “below 90 cents on the dollar”.

2.1 DEFAULT, BANKRUPTCY, AND RESOLUTION PROCEDURES

Fig. 2.1: Bargaining phases of defaulted companies



Note: The figure shows the phases of bargaining between claimants of a defaulted firm.
Source: Own representation.

A debt default is generally either a payment default (not paying debts when due) or a covenant default (breach of a contractual covenant such as a financial covenant or general undertaking). A technical default can still be cured within the applicable grace period (usually 30 days), or formally waived by creditors.⁹ In negotiating for a waiver (bargaining phase I), creditors will usually ask for a fee and improvements of debt covenants in addition to feasible financial forecasts.

If the financial situation of the debtor has deteriorated too much to continue the debt service in the foreseeable future, lenders may not agree to grant a waiver. The second bargaining phase (II) then sees equity holders deciding on whether to inject additional equity into the firm to cover the payment obligation or as a concession to obtain the necessary waiver. Equity holders may decide not to inject additional equity into the firm if the value of their equity claim is lower than the required payment, they may decide to default strategically in order to renegotiate debt contracts, or because of own liquidity constraints.

⁹ For multilateral debt, majority consent is generally required for amendments or waivers. Loan Market Association standard loan documentation requires majority approval for waivers of covenants and 100% approval for payment waivers. Market standard bond documentation requires majority consent for waivers of covenants, and usually also 100% consent for waivers of payment defaults (some of the bonds issued at the height of the credit bubble from 2006 to 2008 have seen lower thresholds though).

Lacking the required equity injection, the debt instrument is in legal default after the grace period. Due to standard cross-default clauses, this will usually also lead to a default of all of the borrowers other indebtedness.¹⁰ If the borrower is unable to repay the defaulted obligations, he becomes ‘technically insolvent’. Creditors are now able to take possession of any collateral granted to them. The debtor has two ways to proceed. He can either attempt a consensual restructuring of the firm’s indebtedness (bargaining phase III), or file for bankruptcy (bargaining phase IV).

2.1.2 Distressed Exchanges

“In effect, bankruptcy will be taken out of the courts and “privatized.” This institutional innovation will take place to recognize the large economic value that can be preserved by privately resolving the conflicts of interest among claimants to the firm.” Jensen (1989) p.43.

In reaction to a debt default or to gain additional financial flexibility ahead of an imminent default, a borrower may attempt a consensual, out-of-court restructuring of his indebtedness.¹¹ The borrower tries to convince creditors (bargaining game III) to either improve the current lending terms by reducing the principal amount to be repaid, lowering interest rates or extending maturity (a ‘debt service reduction’), or he can exchange existing debt securities for equity, cash, new debt securities or a combination of those (a ‘distressed exchange’) to reduce the overall indebtedness.

Asquith, Gertner and Scharfstein (1994) find that a debt service reduction will generally only be possible for private (bank) debt, and only if substantial value remains in the firm and the default or distress arises from temporary cash-flow problems – raising prospects for future recovery – rather than fundamental overindebtedness or operational weakness. While a loosening of covenants may be acceptable to banks, a debt principal reduction is rarely agreed to in practice. In the presence of public debt holders (bonds) – that are typically numerous, widely dispersed, and unknown to the issuer (bearer bonds) – a debt service reduction may not be possible given the requirement to obtain approval by 100% of bond holders for material amendments.

In more fundamental distress situation, a distressed exchange will be required to substantially deleverage. In a distressed exchange, the issuer offers existing

¹⁰ I.e. Loan Market Association standard loan documentation foresees 30 days grace period and cross-default clauses.

¹¹ See Asquith, Gertner and Scharfstein (1994) p.636 for an empirical overview of the types of default and methods used in restructuring.

2.1 DEFAULT, BANKRUPTCY, AND RESOLUTION PROCEDURES

lenders cash, new bonds or equity in exchange for existing indebtedness. When cash or bonds are offered, these usually represent a sizeable discount to the face value of existing debt. A successful exchange would thus result in a substantial deleveraging. Similarly, an exchange of debt for equity (a ‘debt-for-equity-swap’) would deleverage the issuer. In a typical distressed exchange, senior lenders will be offered cash or secured debt, whereas unsecured and junior bond holders might also be offered an equity portion.¹² Altman and Karlin (2009) report the “re-emergence” of distressed exchanges in the recent financial crisis, with more such transactions completed in 2009 in the U.S. than any previous year.

Gilson, John and Lang (1990) explain that the success of a private reorganization depends mainly on two factors – first the size of the cost savings from avoiding bankruptcy and second, an agreement on how to share these cost savings among the claimants. Regarding costs, in the majority of cases, a distressed exchange is attractive as the costs are low compared to bankruptcy costs.¹³ In some cases though, a distressed exchange may be more costly. For example, it may have prohibitively high transactions costs linked to complex and lengthy negotiations for firms with very dispersed creditor groups and complex capital structures – or where information asymmetries between management and creditors are large – that may be easier to resolve under formal bankruptcy rules and court supervision.¹⁴ There may also be some liabilities that can only be effectively resolved in bankruptcy (e.g. large leases, uncertain contingent liabilities relating

¹² See Franks and Torous (1994) p.356 for empirical evidence on the payments offered to each creditor class. The payment types reflect both the relative seniority position of the claimants and their risk preference, i.e. typical senior lenders such as banks prefer cash or riskless securities whereas junior bond holders such as hedge funds are often willing to take a risky equity position.

¹³ For example, Franks and Torous (1994) and Altman and Karlin (2009) report substantially higher recovery rates in distressed exchanges than bankruptcies. Gilson, John and Lang (1990) p.337 report relatively low direct costs of distressed exchanges of 0.65% of book asset values, Betker (1997) p.62 reports 2.51%. Additionally, indirect costs are likely substantially higher in bankruptcies. Franks and Torous (1994) study differences in deviations from absolute priority to estimate implied costs of reorganization, which are 4.5% higher in bankruptcies than in distressed exchanges. See also section 2.1.4 for a discussion of bankruptcy costs.

¹⁴ See for example Giammarino (1989).

to environment pollution such as asbestos or oil spills,¹⁵ or unfunded pension obligations).¹⁶

An agreement on how to share the cost savings among claimants is not straightforward. Equity holders have the initiative and will aim to retain as much value as possible themselves. Individual creditors may also want to hold out for better terms, because the amount and structure of securities offered in exchange do not fit their individual preference, or to free ride of the expected deleveraging of the firm (see Gertner and Scharfstein (1991)). However, a high participation rate in the tender offer is required in order to maximize financial impact for the firm and share the costs among the creditors. Therefore, exchange offers are typically proposed conditional on a minimum acceptance rate.¹⁷ Chatterjee, Dhillon and Ramirez (1995) describe how moral or structural coercion may be used to increase participation rates, including combining consents with provisions to strip untendered bonds of covenant protections or a prepackaged Chapter 11 filing. James (1996) shows how concessions by senior bank lenders also help to mitigate hold-out problems. However, Helwege (1999), as well as Brunner and Krahnen (2008), find that having a large number of lending banks can also impede restructuring solutions for a firm, as secured banks are generally more reluctant to make concessions than bondholders. Gilson (1997) describes how, given the difficulties of obtaining creditor consents out-of-court, firms executing a distressed exchange deleverage much less than in a bankruptcy process and are more likely to fail again in the future. Overall, firms with a simple debt structure and little public debt outstanding seem to be more successful at restructuring privately out-of-court.

As bargaining in distressed exchanges happens mainly to avoid the formal bankruptcy process and associated costs, the resultant terms of the exchange will partially reflect the expected outcome from bargaining within the bankruptcy. As Gilson, John and Lang (1990) p.317 state: *“If bankruptcy is the alternative to private renegotiation, then firms’ incentives to settle with creditors out-of-court, and the settlement terms, will reflect the legal and institutional constraints of the bankruptcy process”*.¹⁸ Rights accorded to debt holders and equity holders in bankruptcy proceedings will thus also benefit them in bargaining outside of

¹⁵ At the time of writing, there is for example an ongoing discussion on whether British Petroleum should file for bankruptcy given the uncertainty of legal liabilities related to the oil spill in the Gulf of Mexico.

¹⁶ See Helwege (1999) p.348.

¹⁷ While Chatterjee, Dhillon and Ramirez (1995) p.340 report average threshold acceptance rates of 74%, Moyer (2005) p.70 mentions “typical” thresholds of 90-95%.

¹⁸ Similarly, see also Stiglitz (2001) p.6.

2.1 DEFAULT, BANKRUPTCY, AND RESOLUTION PROCEDURES

bankruptcy in anticipation of the alternative outcome. Debt holders will be willing to make concessions to equity holders knowing that a private reorganization will preserve firm value and that deviations from absolute priority may also occur in bankruptcy proceedings.

However, when transaction costs are too high or the free rider problem too burdensome, claimants may be unable to agree to a consensual restructuring and the firm may have to file for bankruptcy. As Jackson (1982) p.860 describes in his seminal paper, bankruptcy laws here act as a substitute for private negotiation in case of market failure and *“as a system designed to mirror the agreement one would expect the creditors to form among themselves were they able to negotiate such an agreement from an ex ante position”*.

2.1.3 Bankruptcy Procedures in the United States

Bankruptcy procedures in the United States are regulated by Title 11 of the United States Code (11 USC), as enacted by the Bankruptcy Reform Act of 1978 and amended, among other, by the Bankruptcy Reform Act of 1994 and the Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA) of 2005.¹⁹ Under U.S. federal law, either the debtor or creditors can file for bankruptcy, but it is usually the debtor who files voluntarily under bankruptcy code (BRC) 301, which he can do without specific requirements or conditions precedent.²⁰ Creditors can also file for involuntary bankruptcy under BRC 303 if the debtor is in legal default. In either case, the petition can be for proceedings under Chapter 11 of the Bankruptcy Code that allows for a reorganization of the firm in bankruptcy, or Chapter 7 that foresees appointment of a trustee to liquidate the firm's assets. The majority of large corporate cases in the U.S. are filed under Chapter 11, as it allows for management to stay in place and provides for more flexibility in disposing of assets, whereas Chapter 7 is more often chosen for small or very contentious cases to accelerate proceedings.²¹ Therefore, the following discussion will focus in more detail on the mechanics of Chapter 11.²²

¹⁹ See for example Mallon (2008) p.308ff. for a detailed description of the current U.S. bankruptcy rules.

²⁰ Formally, management can file if it foresees a “likelihood” of insolvency. The bankruptcy judge can reject the filing if he deems it unnecessary.

²¹ See for example Bris, Welch and Ning (2006) p.1258-1262 or Moyer (2005), p73.

²² A very detailed chart by Lynn M. LoPucki, illustrating the procedure under Chapter 11 and Chapter 7 in more legal detail, can be found at www.bankruptcyvisuals.com.

The aim of Chapter 11 proceedings is to agree a reorganization plan that allows to feasibly operate the business as a going concern.²³ Such a reorganization plan generally consists of a financial and an operational restructuring plan. After the bankruptcy filing, the debtor management has an exclusivity period of 120 days to file a plan of reorganization, and another 180 days after that to obtain the required consents for the plan.²⁴ Only after the exclusivity period has ended can creditors propose their own plans. The financial restructuring plan intends to restructure and reduce the firm's indebtedness and consists of two steps. The first one identifies all claimants and divides them into different classes considered *pari-passu* (of equal seniority). The second step assigns each class the recovery it will receive in the reorganization in the form of cash, new debt securities or equity. A plan may divert from absolute priority if all claimant classes agree to it. For a plan to be approved, all impaired claimant classes need to accept it with 2/3 of the amount and 50% of the number of claims.²⁵ Claimants will decide on acceptance of the plan based on the size and form of their recovery, or reject it in the hope of achieving a higher recovery with another plan (bargaining phase IV).²⁶ If the plan is accepted by all claimant classes and has received confirmation by the court (the 'plan confirmation'), the firm can emerge from bankruptcy once all the plan requirements are met and the reorganization effected (the 'emergence'). As an alternative to reorganization, the plan may also foresee liquidation of the firm (by selling the assets individually or as a whole). Creditors may favor this option after management's exclusivity period ends and if a consensual agreement on a reorganization plan is unlikely.²⁷

A filing under Chapter 11 also has several immediate effects, including:

²³ The plan has to demonstrate, among other, sufficient financial flexibility to avoid becoming insolvent again in the near future. Nevertheless, several studies including those by LoPucki and Whitford (1993) and Gilson (1997) have documented repeated failures of distressed firms.

²⁴ The exclusivity period can be extended by the court, though since the BAPCPA 2005 reform only by up to another 18 months.

²⁵ Unimpaired classes are deemed to agree to the plan automatically and do not vote.

²⁶ Under USC 11 section 1129 (b) a "cram-down" on the dissenting classes can be requested of the court if the plan is "fair and equitable", complies with the bankruptcy code and does not deviate from absolute priority. In practice however, a cram-down is rarely used, given the extensive valuation efforts required for a cram-down and risk of litigation. See Klee (1979) for a detailed discussion of the cram-down mechanism.

²⁷ Several jurisdictions around the world have also established an auction bankruptcy system, which mandatorily prescribe auctioning the assets and distributing the proceeds to creditors. See for example Thorburn (2000) or Eckbo and Thorburn (2003) for a discussion of the Swedish auction system.

2.1 DEFAULT, BANKRUPTCY, AND RESOLUTION PROCEDURES

- *Automatic stay*: pre-petition claims are frozen, and claimants cannot pursue any actions on their claims or any collateral granted to them.
- *Interest frozen* on unsecured claims.
- *Debtor-in-possession (DIP)* financing can be obtained with court approval, that ranks super senior and can be attached extra collateral.²⁸ This allows the firm to keep operating and pursuing profitable projects.²⁹
- *Voidable preferences*: payments to creditors up to 90 days before the bankruptcy filing can be voided.
- *Right to reject executory contracts*: The bankrupt firm can reject existing contracts such as rental leases. Damages for breach of contract can be sought but rank *pari-passu* to unsecured claims.
- In Chapter 11, the debtor management usually stays in place and continues to operate the business. However, as of the filing date, the management assumes a *fiduciary duty towards creditors* in addition to equity holders.³⁰
- The court appoints an *official committee of unsecured creditors* to represent creditors' interests in the proceeding. Typically the seven largest claims in a class are chosen as representatives. Additional committees may be appointed for other debt classes as well as equity holders.³¹

A Chapter 11 filing thus also has some beneficial effects for the firm. In fact, it helps to protect the firm from creditors, allows to renegotiate burdensome executory contracts, and can facilitate an operational restructuring by forcing stakeholders such as unions and suppliers to cooperate.

A special case of Chapter 11 is the prepackaged bankruptcy, where a plan of reorganization is negotiated with claimants prior to filing for bankruptcy and submitted together with the bankruptcy petition. An advantage of this procedure is a highly accelerated timetable and positive signal to stakeholders of the firm, while benefitting from bankruptcy procedures to circumvent holdout problems.³²

²⁸ See Dahiya, John, Puri and Ramirez (2003) for empirical evidence on the use and structure of DIP financing.

²⁹ Myers (1977) highlights the benefits for creditors of agreeing to additional investments even in bankruptcy.

³⁰ See for example Lin (1993) or Chaver and Fried (2002) for a detailed discussion of fiduciary duty in bankruptcy proceedings.

³¹ 11 USC Section 1103. See DeNatale (1981) for a detailed discussion of creditor committees.

³² See for example Tashjian, Lease and McConnell (1996) on the empirical usage and attributes of prepacked bankruptcies in the U.S.

2.1.4 Bankruptcy Costs

Incurring or expected bankruptcy costs play an important role for claimant recoveries, both by reducing firm value and by being the object for bargaining among claimants as described above. Bankruptcy costs are typically classified into direct and indirect costs.³³ Direct costs of bankruptcy include legal (court, lawyer) and advisor (accountant, investment banker) fees to run the bankruptcy process. In addition to the debtor, the creditors' committees and (where relevant) equity holders' committee may have separate advisors payable by the firm. Indirect costs relate to deterioration in the firm's value due to a wide range of negative effects of bankruptcy, such as loss of reputation, key employees, clients and suppliers, management distraction, strategic uncertainty and investment freezes. If assets are sold to delever, or the firm is liquidated, there can also be substantial write-downs from fire-sales of assets: Shleifer and Vishny (1992) demonstrate that asset sales of a distressed firm will often be below value, as its industry peers are likely to be experiencing problems themselves.³⁴

On the other hand, as described in the previous section, bankruptcy can also have some legal and commercial benefits for the firm.³⁵ It can also be beneficial by disciplining managers and forcing them to take difficult decisions they would otherwise avoid.³⁶ In general though, bankruptcies are costly to the firm.

Table 2.1 lists empirical studies of bankruptcy costs and their main findings. As can be seen, there is far more evidence on direct costs of bankruptcy than on the indirect costs, which are difficult to measure. Nevertheless, even estimates of direct costs vary widely depending on the sample composition (in particular firm size) and measure used. For example, Ang, Chua and McConnell (1982) report average direct costs of 7.5% for a sample of small firm liquidations, whereas LoPucki and Doherty (2004) report only 1.4% for a sample of large firm Chapter 11 cases. An excellent overview of the components and determinants of bankruptcy costs is provided by Bris, Welch and Ning (2006). They find that bankruptcy costs vary widely by firm type and measuring methodology, and consider a range of 2% to 20%. The authors note that while indirect costs

³³ See for example Altman (1984) or Bris, Welch and Ning (2006) for a broad discussion of the different types of bankruptcy costs. Ang, Chua and McConnell (1982) mention the loss of tax credits from loss-carry forwards as a third category of bankruptcy costs. Here I treat them as an indirect cost.

³⁴ See also Acharya, Bharath and Srinivasan (2007) for empirical evidence.

³⁵ See for example Kalay, Singhal and Tashjian (2007), who find that firms often experience a significant operational improvement during Chapter 11 as a result of determined restructuring.

³⁶ See for example Jensen and Meckling (1976) and Jensen (1989).

2.1 DEFAULT, BANKRUPTCY, AND RESOLUTION PROCEDURES

(expressed as a percentage of firm value) seem unrelated to firm size, marginal direct costs do decrease significantly for larger firms (advisors may charge their clients fixed fees or a decreasing percentage of the estate for larger firms³⁷). Both types of bankruptcy costs seem to be strongly dependent on the time spent in bankruptcy (longer bankruptcies see increasing advisor fees as well as continuing operational deterioration).³⁸

If a consensual reorganization in bankruptcy is not achievable, the firm will have to be liquidated. Bris, Welch and Ning (2006) find that while Chapter 7 proceedings may have slightly smaller direct costs, they generally incur substantially higher indirect costs than Chapter 11 (as intangible firm value gets lost). Similarly, liquidation under Chapter 11 probably also incurs higher indirect costs compared to reorganization in Chapter 11. However, liquidation may be preferable where operational weaknesses or complex capital structures complicate reorganization, or for small firms that cannot afford the direct costs of longer reorganization procedures.

³⁷ For more detail see also LoPucki and Doherty (2006).

³⁸ Weiss and Wruck (1998) illustrate this in an interesting case study of the Chapter 11 process of Eastern Airlines. Failure to agree on a plan of reorganization or liquidation saw protracted bankruptcy for the airline and eventually most of the firm value was lost.

Table 2.1: Empirical studies of bankruptcy costs

Authors	Dataset	Time period	Estimated costs
Direct costs			
Warner (1977)	11 bankrupt railroads; estimated mean market value \$50m at filing	1933-1955	Mean 4% of market value of firm one year prior to default
Ang, Chua and McConnell (1982)	86 liquidations, Western District of Oklahoma, estimated mean prebankruptcy assets of \$615,516	1963-1979	Mean 7.5%, median 1.7% of total liquidating value of assets
Altman (1984)	19 Chapter 11 cases, mean assets \$110 million before filing	1974-1978	For 12 retailers: mean 4%, median 1.7% of firm value. For 7 industrials mean 9.8%, median 6.4%
Gilson, John and Lang (1990)	18 exchange offers	1978-1987	0.65% average offer costs as a percentage of book value of assets (max. 3.4%)
Weiss (1990)	37 Chapter 11 cases from 7 bankruptcy courts; average total assets before filing \$230 million	1980-1986	Mean 3.1%, median 2.6% of firm value prior to filing
Betker (1995)	75 traditional Chapter 11 cases; 48 prepackaged Chapter 11 cases; 29 exchange offers; mean assets FYE before restructuring \$675m	1986-1993	Traditional Chapter 11: mean 3.93%, median 3.37% of prebankruptcy assets ; Prepackaged Chapter 11: mean 2.85%, median 2.38%; Distressed exchanges: mean 2.51%, median 1.98%
Tashjian, Lease and McConnell (1996)	39 prepackaged Chapter 11 cases; mean book value assets FYE before filing \$570 million	1986-1993	Mean 1.85%, median 1.45% of book value of assets FYE preceding filing
Lawless and Ferris (1997)	98 Chapter 7 cases from 6 bankruptcy courts; median assets \$107,603	1991-1995	Mean 6.1%, median 1.1% of assets at filing
Lubben (2000)	22 Chapter 11 cases, median assets \$50 million	1994	Mean 1.8%, median 0.9% of total assets at filing (mean 2.5% excluding prepacks)
LoPucki and Doherty (2004)	48 Delaware & SDNY Chapter 11 cases, mean assets at filing \$480m	1998-2002	Mean 1.4% of assets at filing
Bris, Welch and Ning (2006)	Over 300 cases filed in Arizona and Southern District of New York. Chapter 11 (mean prebankruptcy assets \$19.8 million) and Chapter 7 (mean \$501,866)	1995-2001	Chapter 7: mean 8.1%, median 2.5% of prebankruptcy assets Chapter 11: mean 9.5%, median 2.5%
Indirect costs			
Altman (1984)	19 Chapter 11 cases	1974-1978	10.5% of firm value measured just prior to bankruptcy
Opler and Titman (1994)	Distressed industries	1974-1990	Financial distress costs are positive and significant

2.1 DEFAULT, BANKRUPTCY, AND RESOLUTION PROCEDURES

Authors	Dataset	Time period	Estimated costs
Andrade and Kaplan (1998)	31 highly leveraged transactions that subsequently became distressed	1987-1992	10% to 20% of firm value
Maksimovic and Phillips (1998)	302 Chapter 11 cases (owing 1,195 plants)	1978-1989	Indirect costs of bankruptcy are negligible
Pulvino (1999)	27 U.S. airlines, 8 of which in Chapter 7 or 11	1978-1992	Sale prices of used aircraft by bankrupt airlines are lower than by distressed non-bankrupt firms
Acharya, Bharath and Srinivasan (2007)	279 bankrupt U.S. firms from S&P CreditPro database	1982-1999	Indirect costs are substantial due to fire-sales effect

Source: Adapted from Altman and Hotchkiss (2006) p.95 and expanded

2.1.5 Creditor Rights and Equity Holders' Bargaining Power

The bankruptcy code grants equity holders considerable bargaining power and the ability to impose costs on creditors in bankruptcy proceedings. Betker (1995) describes that equity holders can exercise bargaining power two-fold: via their control of the firm's management and as a junior claimant organized in the equity committee.

While management formally assumes a fiduciary duty towards creditors as well as equity holders in bankruptcy, in practice, management's interests remain more aligned with equity holders than creditors. For instance, as managers frequently hold equity stakes, are relying on equity holders for current and future compensation, and are incentivized to delay bankruptcy in order to retain private benefits of control. Management has the ability to initiate bankruptcy proceedings and thus choose the optimal time for a bankruptcy filing. Management typically stays in place in the U.S. during Chapter 11 bankruptcy, and it has the initial exclusivity period to propose a plan of reorganization, allowing it to significantly protract the bankruptcy proceedings.

The equity committee can further delay creditor plans by contesting, by proposing own plans of reorganization or by litigation, possibly blocking a reorganization altogether and forcing the bankrupt firm into liquidation. Both delay and liquidation are generally costly to the firm – as described in the previous section, direct and indirect bankruptcy costs increase strongly with time spent in bankruptcy.

At the same time, equity holders also have a clear incentive to strategically delay reorganization, as such delay increases the value of their option-like equity claim on the firm – with more time, the value of the firm may rise again above the face value of debt. As Miller (1977) p.45 states: *“Permitting stockholders to claim court protection and thereby retain control of a corporation in default would amount to giving them a call option at the expense of the creditors.”*

Creditors thus have an interest to bargain and offer concessions to equity holders in order to expedite their agreement to the plan of reorganization. They may also try to avoid a bankruptcy filing altogether and achieve a consensual out-of-court restructuring by sharing part of the cost savings with the junior claimants.

In bargaining over a plan of reorganization, each claimant class aims to maximize its recovery. The main item of disagreement – besides plan distribution per se – is usually the valuation of the firm, which determines how much would

formally be available for distribution to junior claimants. Even under the absolute priority rule valuation can be highly contentious, as some classes may be paid a combination of debt and equity for which a theoretical valuation must be made. There is however significant leeway in the valuation of distressed firms,³⁹ whether using discounted cash flow, comparable transaction multiples or liquidation value methods. Such ambiguity provides substantial scope for litigation by dissenting creditors or equity holders. For a firm whose asset value is significantly below its nominal indebtedness, equity holders are automatically considered to have no residual claim on the firm. The closer the firm value is to solvency though, the higher the valuation ambiguity and potential for an equity recovery.⁴⁰ The valuation ambiguity thus creates another incentive for the claimants to agree on a reorganization plan.

The bargaining power of creditors is influenced by their own ability to coordinate among each other. Concentrated creditor claims facilitate coordination, whereas a large number of creditors with different seniority and collateral rights may have diverse interests, and have difficulty coordinating among each other to bargain effectively with borrowers. Bank lenders are generally better at coordinating and forming bank pools to negotiate with borrowers,⁴¹ whereas dispersed bondholders have difficulty coordinating and have a higher risk of holdouts.⁴² Bank lenders also have different preferences than bond investors, being reluctant to realize write-downs or accept risky securities as payment.⁴³ Junior (subordinated) debt holders' interests may be more aligned with equity holders than with senior debt holders, if their claims are significantly impaired.⁴⁴ The relative experience of creditors with distressed situations plays an important role as well. Specialized distressed investors (so called "vulture investors") are able to negotiate better than for example trade creditors, given their experience with distress situations and bankruptcy procedures.⁴⁵ Similarly, Jensen (1991) describes the pivotal role of Drexel in the 1980's in coordinating debt reorganizations.

³⁹ See Gilson, Hotchkiss and Ruback (2000) for a detailed discussion of valuation of distressed firms.

⁴⁰ See Betker (1995) p.167.

⁴¹ See for example Brunner and Krahnen (2008).

⁴² See for example Hege and Mella-Barral (2005).

⁴³ See for example Helwege (1999) p.355-356.

⁴⁴ See for example Moyer (2005) p.338.

⁴⁵ See Hotchkiss and Mooradian (1997).

The BAPCPA 2005 introduced a number of changes to the U.S. bankruptcy code that generally strengthened the rights of creditors in proceedings, including:⁴⁶

- Limit rights of insiders (reduce use of key employee retention plans)
- Appointment of Chapter 11 trustee in cases of suspected fraud, dishonesty or criminal conduct
- Expedite cases (maximum exclusivity period limited to 18+2 months)
- Strengthen minority creditor rights (creditor committee must provide access to information for all creditors it represents)
- A two-year fraudulent conveyance look back period⁴⁷
- Limitations on time to assume or reject leases

Adler, Capkun and Weiss (2007) and Bharath, Panchapegesan and Werner (2008) describe how even before the changes in the code, the bankruptcy code in the U.S. has become gradually more creditor-friendly over the last twenty year, and note how this has induced firms to delay default – possibly destroying firm value and resulting in lower firm recoveries.

Nevertheless, the bankruptcy code in the U.S. remains one of the equity-friendliest in the industrialized world (see Djankov, McLiesh and Shleifer (2007)).

Internationally, White (1996) compares the U.S. and European bankruptcy laws and provides a discussion of their effect on bankruptcy resolution of individual firms, as well as the long-term efficiency of a country's economy. She argues that *"Once firms are in financial distress, a harsh bankruptcy policy gives managers a strong incentive to delay filing for bankruptcy, so that the delay effect per firm rises."*⁴⁸ Comparing an expert-run creditor-friendly system such as the U.K. to the U.S. debtor-in-control system, White (1996) argues that the former could result in delayed bankruptcy filings and risky investments, whereas the latter tends to be too lenient on underperforming firms and management.

In order to capture differences in creditor rights across countries, La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998) construct a well-known creditor rights index (henceforth "LSSV") that consists of four binary dimensions measuring how bankruptcy codes internationally grant creditors' rights in bankruptcy proceedings. The four measures are:

⁴⁶ See for example Altman and Hotchkiss (2006) p.47-55.

⁴⁷ Fraudulent conveyance refers to transactions closed shortly before bankruptcy. If these precipitate the bankruptcy or were closed in the knowledge of imminent bankruptcy, these transactions can be voided.

⁴⁸ White (1996) p.18.

- 1) Is there no automatic stay on assets?
- 2) Are secured creditors paid first?
- 3) Are there specific rules for when the firm has to file for bankruptcy?
- 4) Is the old management replaced?

It is worthwhile noting that the LSSV score reflects primarily the rights of secured creditors.⁴⁹ The first two dimensions in particular, while protecting secured creditors, may well disadvantage unsecured creditors. An automatic stay on assets restricts secured creditors from realizing their collateral, which weakens their relative seniority position but allows the firm to continue operating with the assets granted as collateral. If secured creditors are not paid first, this clearly weakens their seniority position, though it may benefit unsecured creditors if these get to share the collateral pool. The lack of rules governing the criteria for filing for bankruptcy significantly strengthens equity holders position, as it allows the debtor to threaten to default strategically or, if the opposite, to strategically delay a bankruptcy filing. As discussed above, in the U.S. the management has wide discretion in the decision of when to file for bankruptcy. In other countries – for example in Germany under the Insolvenzordnung of 1994 – management has to file based on a strict overindebtedness test. In the U.K., management can only file for bankruptcy in an actual event of default or technical insolvency. Finally, the replacement of management (usually through a court or creditor appointed trustee) can resolve the agency conflicts between creditors and managers (whether acting on their own or for equity holders).

2.2 Comparison of U.S. and U.K. Bankruptcy Codes

The discussion in this chapter so far has focused on the bankruptcy regime in the U.S., a relatively debtor-friendly system designed to promote consensual reorganization of the firm, which allocates significant power over the firm and reorganization plan to management and equity holders during the bankruptcy process. In this section, I compare the bankruptcy system in the U.S. to the system in the U.K.⁵⁰ The two countries are ideally suited for a study comparing differences in creditor rights, as the two jurisdictions have similar cultures, the

⁴⁹ See La Porta, Lopez-de-Silanes and Shleifer (2008) p.20.

⁵⁰ Note that the principal procedures discussed here apply to England and Wales. Scotland and Northern Ireland have their own, though similar, rules. Nevertheless, the literature generally refers to the U.K. meaning England and Wales, given that most U.K. companies are incorporated in that jurisdiction.

same legal tradition, common law and highly developed financial markets, but distinctly different bankruptcy codes.⁵¹

The U.K. has a very creditor-friendly regime, focused on protecting the rights of creditors, and particularly grants significant rights to secured creditors to enforce their collateral and take control of the firm.⁵² LSSV scores the United States as “1” (only meets the second requirement) and the United Kingdom as “4” (meets all requirements) for creditor rights. Table 2.2 shows how the U.S. and the U.K. differ in these measures, as well as additional characteristics of both countries bankruptcy codes.

⁵¹ A detailed discussion of legal and institutional differences can be found in Azar (2008a).

⁵² A comparison of the bankruptcy codes (at the time) can also be found in Kaiser (1996) and Franks, Nyborg and Torous (1996).

2.2 COMPARISON OF U.S. AND U.K. BANKRUPTCY CODES

Table 2.2: Bankruptcy codes in the United States and the United Kingdom

	United States	United Kingdom
Principal procedure	Chapter 11 (Reorganization) Chapter 7 (Liquidation)	Administration (Reorganization) Administrative Receivership (Liquidation)
Main legislation	A) Bankruptcy Reform Act 1978 B) BAPCPA 2005	A) Insolvency Act 1986 B) Enterprise Act 2002
LLSV creditor rights score	1	4
I) Automatic stay on assets	Yes	A) No B) Yes
II) Secured creditors paid first	Yes (but after administrative and certain other claims)	Yes
III) Bankruptcy trigger/restrictions for filing	Voluntary filing by management. Involuntary filing only in case of insolvency	Payment or technical default. No voluntary filing
IV) Management stays	Yes	No
Additional characteristics		
Control rights	Management (Debtor in Possession)	Secured creditors or court-appointed administrator
Focus of procedure	Maintain firm as going concern. Restructure balance sheet and preserve value for both debt and equity	A) Focus on protecting secured creditors B) Focus on protecting all creditors and preserving the firm as a going concern
Reorganization plan	120 day exclusivity period for debtor, extendable	Receiver/Administrator
Required voting majority	2/3 in amount and 50% in number of claims for each class	50% in amount of claims (75% for voluntary arrangement)
Supra-priority financing available	Yes	No
Reject contracts	Yes	Limited (onerous contracts)

Source: Own representation. The table list the main procedures and characteristics of the bankruptcy code in the U.S. and the U.K. LSSV is the creditor rights score reported by La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998).

Interestingly, both countries' codes have changed during the observation period of 1998 to 2007 chosen for the empirical study in chapter 4. However, while the changes have somewhat aligned both codes on a number of measures, the fundamental differences in the treatment of creditors remain. Djankov, McLiesh and Shleifer (2007) update the LSSV index for 129 countries, leaving the score

for the United States and the United Kingdom unchanged at 4 and 1, respectively.⁵³

In section 2.1.3, I already described the mechanics of the bankruptcy code in the U.S. To summarize briefly, firms can file for bankruptcy under Chapter 7 (for liquidation), or Chapter 11 (to work out a plan of reorganization). Management can file for Chapter 11 at its discretion without objective requirements, and will generally stay in place to manage the firm as debtor-in-possession. On filing, an automatic stay on assets prohibits creditors from taking action against the debtor or seizing collateral. Management then has an exclusivity period of 120 days (extendible) to propose a plan of reorganization. All claimant classes have to agree on a plan of reorganization, and a court ‘cram-down’ on dissenting creditors is rarely used. Consequently, Chapter 11 proceedings can take several years to resolve. BAPCPA 2005 did introduce more rights to creditors and provides for a greater role of turnaround managers. As a result of the changes in the code and more frequent use of DIP financing by senior lenders (giving them additional control rights), the debt holders’ position has been strengthened somewhat in the U.S.⁵⁴ Nevertheless, the equity holders’ position remains substantially stronger than in most other countries.

The U.K. regime on the other hand, regulated by the Insolvency Act of 1986, has evolved with the primary aim of protecting secured creditors’ rights. There are strict rules for when management can and has to file for bankruptcy in case of payment default. Secured creditors’ interests are protected with no automatic stay on assets, routine replacement of management and limitations on new senior financing during bankruptcy.

Prior to the reforms of the Enterprise Act of 2002 (effective 15. September 2003), the principal U.K. procedure was Administrative Receivership. When a company defaults on its debt obligations, creditors secured with a floating charge⁵⁵ can appoint a Receiver with wide powers to manage the firm and liquidate assets in the best interests of the secured creditors. This system in effect

⁵³ Azar (2008b) constructs a more detailed pro-creditor index composed of seven sub-indices (some of which composed of several other indicators). The difference between the jurisdictions is less pronounced, with the U.K. scored 74 and the U.S. 60. The U.S. fares relatively better than in the LSSV score, as the interests of unsecured creditors are considered in addition to the interest of secured creditors, whereas the LSSV score focuses on the rights of secured creditors.

⁵⁴ See for example Bharath, Panchapegesan and Werner (2008).

⁵⁵ In the U.K. there are two types of collateral charges. A fixed charge is given over a specific asset, a floating charge is given over all of a company’s assets except those already encumbered by a fixed charge. In practice, a fixed charge is often supplemented with a floating charge.

puts the decision to liquidate or reorganize the firm into the hands of secured creditors. These however have few incentives to reorganize the firm as long as the liquidation value is high enough to fully satisfy their claims, particularly as liquidation will generally be quicker.⁵⁶ Franks and Sussman (2005a) p.73 note that “*Litigation is an infrequent event in U.K. bankruptcy*”, with courts reluctant to restrict the flexibility of receivers to act as they see fit. However, there has been repeated criticisms that the U.K. regime thus allowed secured creditors to ruthlessly pursue their collateral realization, was leading to too many liquidations of viable firms, and that the Receiver was insufficiently accountable to unsecured creditors.⁵⁷ Evidence is provided among other by Couwenberg (2001) who compares the efficiency of four countries’ bankruptcy regimes in preserving firms as going concerns, and reports that – particularly for very small firms – liquidation is the predominant way to resolve default in the U.K.

The Insolvency Act of 1986 had already introduced the Administration scheme, under which a court-appointed Administrator takes control of the company to draw up a plan of reorganization in the interest of all creditors. The Administrator must, within 8-10 weeks of his appointment, put the reorganization plan for a vote to the creditors committee of unsecured creditors, who have to accept it with a simple majority.⁵⁸ However, prior to the Enterprise Act of 2002, his appointment could be blocked by floating charge holders who could appoint a Receiver instead, making the procedure ineffective and little used.

In response, the Enterprise Act of 2002 introduced a number of changes to enhance the effectiveness of the Administration procedure and reduce the number of liquidations. Use of Administrative Receivership is much restricted (mainly to legacy floating charges), and Administration introduced as the main procedure. While the Administrator can still be chosen and appointed by the floating charge holders, his fiduciary duty is further extended seeking to a) rescue the company as a going concern; b) secure the best result for all creditors and only lastly c) liquidate assets to pay out secured creditors. The Act also introduced a limited stay on assets.

Armour, Hsu and Walters (2007) study the effect of changes in the code for a sample of 384 U.K. bankruptcies commencing in the two years prior to and after the Enterprise Act. They find that while gross debt recovery rates have increased,

⁵⁶ See Aghion, Hart and Moore (1992) for a discussion of the relative merits of different insolvency regimes.

⁵⁷ See Webb (1991).

⁵⁸ In cases where unsecured creditors are expected to have no recovery, only the secured creditors vote as residual claimants.

so have direct costs of proceedings with no overall change in net recovery rates to creditors. The number of reorganizations compared to liquidation has also remained unchanged, leading them to query the assumed superiority of the new regime.

A frequently used alternative to bankruptcy in the U.K. for firms financed only with private debt is the so-called “London Approach”, basically an out-of-court strategic debt reduction agreed to by the debtor’s banks.⁵⁹ Armour, Cheffins and Skeel Jr (2002) argue that it is the concentrated debt structure of U.K. borrowers – with a loan market largely split between the four major lending banks⁶⁰ – that has facilitated lender coordination and allowed for the London Approach to work so well.

However, as discussed in chapter 2.1.2, a strategic debt reduction with its unanimous consent requirement is difficult to agree when public debt holders are involved. Flood (2001) discusses how, with the growth of the corporate bond market in the U.K. and increasing involvement of bond investors and vulture funds in corporate workouts, the need arose for broader forms of reorganization. A distressed exchange can be conducted in the U.K. via a Company Voluntary Arrangement (CVA), a semi-formal procedure introduced by the Insolvency Act of 1986 and supplemented in the Enterprise Act of 2002.⁶¹ Interestingly, a CVA can be used both within Administration and out-of-court to agree on claim amounts, distribution and company restructuring between the claimants. One of the main advantages of the CVA procedure compared to other out-of-court restructuring alternatives is that it allows making agreements binding on all creditors (including dissenters) even outside bankruptcy, with a 75% majority vote of claims amount and number.⁶²

2.3 Previous Empirical Studies

A number of studies have analyzed the determinants and effects of deviations from absolute priority in the United States. Other studies have looked to firm-

⁵⁹ See Armour and Deakin (2001) for a detailed discussion of the London Approach.

⁶⁰ HSBC, Barclays, RBS and Lloyds TSB.

⁶¹ A detailed description of the mechanics and history of Company Voluntary Arrangements can be found in Tribe (2009).

⁶² The ability to bind dissenting creditors is an important reason for the popularity of the U.K. CVA procedure to conduct distressed exchanges. For example, Schefenacker cited this as a major reason for the transformation and migration of the parent company to the U.K. from Germany prior to effecting a distressed exchange.

2.3 PREVIOUS EMPIRICAL STUDIES

and instrument specific determinants of debt recovery rates. However, as noted by Hotchkiss, John and Thorburn (2008) p.63 “*evidence on bankruptcy reorganization outside the US is sparse*”.

Table 2.3 lists the most important empirical studies analyzing recovery rates and deviations from absolute priority (DAPR). Warner (1977) and Franks and Torous (1989) – for a later sample following the establishment of the 1978 bankruptcy code – are among the first to document significant deviations from absolute priority in practice in Chapter 11 bankruptcies.

Several authors study whether such deviations from absolute priority and recovery rates at emergence from bankruptcy (ultimate recovery rates) are reflected in security prices at default. Eberhart, Moore and Roenfeldt (1990) find that equity markets are largely efficient at anticipating deviations from absolute priority already at default of the issuer. Similarly, Eberhart and Sweeney (1992) show that bond markets also anticipate final bankruptcy settlements including deviations from absolute priority. This view is supported in the following study by Altman and Eberhart (1994), who find bond prices broadly efficient regarding recovery rates, both at default and at issuance of the bond. On the other hand, Hubbard and Stephenson (1997) find that investors grossly overpay for defaulted equity. Analyzing the performance of bankrupt firms post-emergence, Eberhart, Altman and Aggarwal (1999) find that these stocks outperform the market (in the following 200 days), linked to an undervaluation at emergence.

Other authors have studied the determinants of recovery rates and deviations from absolute priority. LoPucki and Whitford (1990) find that the size of deviations from absolute priority is positively related to creditor recovery rates. Franks and Torous (1994) are the first to relate recovery rates and deviations from absolute priority to multiple factors such as firm size, leverage and creditor concentration in a multivariate regression mode. Importantly, they also compare recovery rates of Chapter 11 with those of distressed exchanges and find the latter to have significantly higher recovery rates and deviations from absolute priority. Betker (1995) relates the deviations to a range of proxies for the bargaining power of equity and debt holders. James (1996) analyzes recovery rates for bond holders in distressed exchanges and finds a significant relationship between bond holders’ willingness to agree to an exchange at low recovery rates and the concessions made by bank lenders. However, it remains unclear whether – as suggested by the author – it is only these concessions facilitating bondholder participation, or whether both are related to the severity of financial distress the firm is suffering. Bris, Welch and Ning (2006) relate recovery rates to bankruptcy costs and find Chapter 11 to be more attractive for creditors given lower indirect bankruptcy costs, notwithstanding higher deviations from absolute priority. Davydenko and Strebulaev (2007) instead analyze credit spreads of non-defaulted bonds. Interpreting these credit spreads as indicators for default and recovery risk, they link them to several proxies for bargaining power and bankruptcy costs. Dieckmann, Martin and Strickland (2006) analyze a historic sample from the 1920’ and find time spent in bankruptcy to be a major

determinant of bankruptcy costs and recoveries. Eraslan (2008) empirically tests a model for bargaining between equity, unsecured and secured creditors and finds that bargaining to avoid liquidation is beneficial given liquidation costs. Davydenko (2009) studies determinants of firm value at default and finds that default may be triggered either by low asset values or by liquidity constraints.

The focus of a recent stream of literature has been to link recovery rates to the overall market conditions. Altman, Brady, Resti and Sironi (2005) show that recovery rates are linked to default rates in the economy, as prices of defaulted bond are affected by the overall demand and supply of this asset class. Acharya, Bharath and Srinivasan (2007) provide empirical evidence in support of the fire-sale hypothesis of Shleifer and Vishny (1992).

The most comprehensive model for estimating recovery rates is proposed by Gupton and Stein (2005). Their study of over 1,400 defaulted firms is used to calibrate Moody's 9-factor LossCalc model, incorporating macroeconomic, firm and instrument specific factors.

All of these studies are however based on U.S. data only. La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998) describe how shareholder and creditor rights differ among jurisdictions and their impact on the development of financial markets in these countries. One would also expect recovery rates to vary significantly between jurisdictions. Even *within* the United States, application of the U.S. bankruptcy code varies among states. Weiss (1990) and later Capkun and Weiss (2008) find significantly higher deviations from absolute priority in Delaware and the Southern District of New York than in other U.S. states, partially due to extensive granting of supra-priority debtor-in-possession financing by the courts.

Internationally, Franks, Nyborg and Torous (1996) are the first to discuss the effect of different bankruptcy codes on creditor recovery rates and compare the U.S., the U.K. and the German bankruptcy regimes qualitatively. Unfortunately, they did not conduct an empirical study but only reference results presented by Franks and Torous (1994) for a U.S. sample and Olsen (1996) for a U.K. sample. The comparison shows that the U.S. Chapter 11 exhibits higher recovery rates but longer resolution times than the U.K. regime. Ravid and Sundgren (1998) present evidence on the creditor-friendly Finnish bankruptcy system and find a similar number of liquidations but lower recovery rates than in comparable U.S. studies. The authors speculate that this could be due to Finnish firms filing for bankruptcy later. Thorburn (2000) studies the bankruptcy system in Sweden that auctions bankrupt firms as going concern entities and finds that it results in lower bankruptcy costs, lower deviations from absolute priority and faster resolution than U.S. Chapter 11. Stromberg (2000) for a similar sample of Swedish bankruptcies however finds that in practice, there are many similarities between cash auctions and formal reorganization procedures and that auctions often result in sale-backs to incumbent owners at fire-sale prices. Grunert and Weber (2007) report recovery rates of a sample of bank loans to German small and medium

2.3 PREVIOUS EMPIRICAL STUDIES

enterprises and confirm the importance of collateral for loan recovery rates. Franks and Sussman (2005a) analyze a sample of distressed bank loans to small and medium sized enterprises in the U.K. and find lending practices, collateral requirements and contracts have adapted to the local bankruptcy law. Armour, Hsu and Walters (2007) compare U.K. receiverships before the Enterprise Act of 2002 with Administration cases post the Act and find no statistical difference in recovery rates, as slightly higher asset values in Administration get eaten up by higher bankruptcy costs.

The study by Davydenko and Franks (2008) is the only one to date to analyze debt recovery rates across countries.⁶³ For a sample of small bank loans in Germany, France and the U.K., the authors analyze the effect of differences in creditor rights across these countries on loan recovery rates, controlling for firm and loan characteristics in a multivariate regression. They find that, notwithstanding adaptation of lending practices to local creditor rights, substantial differences in recovery rates in formal bankruptcies remain across countries, with the U.K part of their sample exhibiting higher loan recovery rates and fewer liquidations than Germany or France. However, the dataset of small bank loans studied by Davydenko and Franks restricts their cross-country analysis in three ways: lacking equity recovery data, they do not analyze deviations from absolute priority. Combined with limited information on debt structure, their data does not allow studying firm recovery rates and the default boundary.⁶⁴ Finally, as small bank loans are rarely traded, they have no information on default prices compared to ultimate recoveries.

While the effect of creditor rights on recovery rates internationally has been little studied, there have been a number of recent studies analyzing the impact of creditor rights on other aspects of corporate finance. Raghuram and Zingales (1995) find that lower bankruptcy costs in creditor-friendly countries such as Germany and the UK are associated with lower leverage. Acharya, Sundaram and John (2010) similarly relate lower leverage of U.K. firms compared to U.S. firms to creditor rights as well as other determinants of firm's liquidation costs. Claessens and Klapper (2005) relate stronger creditor rights to more frequent use of bankruptcy. Acharya, Amihud and Litov (2010) find that firms in creditor-friendly countries such as the U.K. are more inclined to pursue diversifying acquisitions than in the U.S., which result in lower cash flow risk and lower value. Djankov, McLiesh and Shleifer (2007) and Qian and Strahan (2007) study how stronger creditor rights encourage greater availability of private credit.

⁶³ Note that the dataset and initial results of their study were already previously reported in a detailed report by Franks, Servigny and Davydenko (2004).

⁶⁴ Data from the individual banks may not encompass debt data on loans from other banks and market debt for the defaulted issuers.

Finally, Acharya and Subramanian (2009) show that stronger creditor rights are associated with lower innovation and economic growth.

As discussed above, there has been a wide body of literature in the U.S. during the last twenty years studying the importance of creditor rights in defining bargaining among claimants and the impact on deviations from absolute priority and on recovery rates. However, to my knowledge no study to date has looked at documenting the effect of strategic bargaining and deviations from absolute priority across countries. This thesis intends to address this research gap, using a similar empirical approach as Davydenko and Franks (2008), but for a data sample including firm and equity recovery rates, trading prices and settlement recoveries.

2.3 PREVIOUS EMPIRICAL STUDIES

Table 2.3: Empirical studies documenting determinants of recovery rates and deviations from absolute priority

Authors	Dependent variable	Independent variables	Main theory	Test method	Dataset	Main Findings
Warner (1977)	Ultimate recovery (trading price): bond	Default recovery, DAPR	Efficient markets	Market model regression	1930–1955. 20 bankrupt railroads	Markets are efficient at anticipating DAPR
Franks and Torous (1989)	Ultimate recovery (settlement): DAPR	n.a.	Equity's option to delay leads to DAPR.	Descriptive	1970–1984. 30 Chapter 11 cases	Bargaining and DAPR are common in Chapter 11
Eberhart, Moore and Roenfeldt (1990)	Ultimate recovery (trading price): equity	Default recovery of equity, DAPR	Efficient markets	OLS regression	1979–1986. 30 Chapter 11 cases	Average DAPR of 7.6%. Equity markets efficiently price DAPR at default
LoPucki and Whitford (1990)	Ultimate recovery (Settlement): DAPR, senior, unsecured	Total debt recovery	Presence of DAPR	Descriptive	1979–1988. 43 Chapter 11 cases	Bargaining and DAPR are common in Chapter 11
Weiss (1990)	Ultimate recovery (settlement): DAPR, senior, unsecured	Size, court venue	Presence of DAPR	Descriptive	1979–1986. 37 U.S. bankruptcies	DAPR are present in 29 of 37 cases. Secured creditors are nevertheless largely repaid in full. Direct costs of bankruptcy are 3.1% on average
Eberhart and Sweeney (1992)	Ultimate recovery (trading price): bond	Default recovery: bond	Efficient markets	ACAR test	1980–1990. 67 Chapter 11 cases	DAPR often benefits (junior) bondholders. Bond market is fairly efficient at default in pricing ultimate departures from APR
Altman and Eberhart (1994)	Ultimate recovery (trading price): bond	Default recovery: bond	Efficient markets	ACAR test	1980–1992. 91 Chapter 11 cases	Bond market is fairly efficient both at default and at issuance in pricing ultimate recoveries

Table 2.3: Empirical studies documenting determinants of recovery rates and deviations from absolute priority

Authors	Dependent variable	Independent variables	Main theory	Test method	Dataset	Main Findings
Franks and Torous (1994)	Ultimate recovery (settlement): DAPR	Leverage, size, accounts payable, debt concentration, management turnover	Creditors bargain with equity holders to execute distressed exchanges	OLS regression	1983–1990. 37 Chapter 11 cases and 45 distressed exchanges	DAPR and creditor recoveries are higher in distressed exchanges than in bankruptcies
Betker (1995)	Ultimate recovery (settlement): DAPR	Leverage, size, solvency, creditor concentration, court venue, measures of equity and management power	Agency theory	Tobit regression	1982–1990. 75 Chapter 11 cases	DAPR is influenced by management's incentives, in addition to other measures such as firm solvency and the proportion of creditors that are secured
James (1996)	Ultimate recovery (settlement): bonds	Bank concessions, debt structure, leverage	Information and holdout problems of public debt	OLS and Tobit regressions	1980–1990. 68 distressed exchanges	Concessions by bank lenders important to mitigate problems in public distressed exchanges
Hubbard and Stephenson (1997)	Ultimate recovery (trading price): equity	Default recovery of equity	Efficient markets	Descriptive	1988–1993. 68 Chapter 11 cases	Defaulted equity is systematically overpriced
Ravid and Sundgren (1998)	Ultimate recovery - (settlement): debt		Efficiency of creditor-friendly bankruptcy code	Descriptive	1982–1992. 72 Finnish bankruptcies.	Finnish system has lower recovery rates but no more liquidations than U.S.
Thorburn (2000)	Ultimate recovery (settlement): debt	Cash flow, collateral, creditor concentration, industry, resolution type	Auction bankruptcies	OLS regression	1988–1991. 263 Swedish auction bankruptcies	Auction system has lower costs, lower DAPR and quicker resolution than Chapter 11
Stromberg (2000)	Ultimate recovery (settlement): debt	Time, size, industry, outside buyer	Auction bankruptcies	Probit regression	1988–1991. 205 Swedish auction bankruptcies	Sale back to incumbent owners is a common outcome of auctions, making them comparable to reorganization schemes

2.3 PREVIOUS EMPIRICAL STUDIES

Table 2.3: Empirical studies documenting determinants of recovery rates and deviations from absolute priority

Authors	Dependent variable	Independent variables	Main theory	Test method	Dataset	Main Findings
Altman, Brady, Resti and Sironi (2005)	Default recovery (market average): bonds	Default rate, supply, GDP growth	Supply-demand	OLS regression	1982–2001. 1300 defaulted bonds from NYU Salomon database	Significant influence of the overall market supply of defaulted bonds on default recovery
Franks and Sussman (2005a)	Ultimate recovery (settlement): loans	Lender type, procedure, collateral	U.K. contractualist bankruptcy system	Descriptive	1997–1998. 542 distressed U.K. SME firms	Concentration of collateral and liquidation rights in main bank avoids creditor coordination failures in contractualist system. Reliance on strong collateral
Gupton and Stein (2005)	Ultimate recovery (settlement or trading price): debt	Collateral, seniority, leverage, industry, region	Moody's LossCalc & KMV models	OLS regression	1982–2005. 1,400 defaulted firms worldwide from Moody's recovery database	Significant explanatory value of LossCalc 9-factor model
Bris, Welch and Ning (2006)	Ultimate recovery (settlement): DAPR, senior, unsecured	Time, type of filing, creditor concentration, management stake, secured stake, size	Differences between Chapter 11 and Chapter 7	Logit regression	1995–2001. 225 Chapter 11 and 61 Chapter 7 cases	Chapter 7 has similar direct costs and higher indirect costs compared to Chapter 11, making the latter generally more attractive for creditors
Dieckmann, Martin and Strickland (2006)	Ultimate recovery (trading price): bonds	Time, issue size, industry, macro-economy	Bankruptcy costs	Logit regression	1919–1928. 340 U.S. bankruptcies	Recoveries are influenced by time in default and industry conditions
Acharya, Bharath and Srinivasan (2007)	Ultimate recovery (trading price): bonds	Industry concentration and distress, assets, asset tangibility, profitability, leverage, debt structure, seniority and collateral	Fire sales effect (Shleifer and Vishny (1992))	OLS regression	1982–1999. 279 U.S. bankruptcies	Industry distress is relevant factor for debt recoveries

Table 2.3: Empirical studies documenting determinants of recovery rates and deviations from absolute priority

Authors	Dependent variable	Independent variables	Main theory	Test method	Dataset	Main Findings
Armour, Hsu and Walters (2007)	Ultimate recovery (settlement): debt	Industry, time, size, resolution	Concentrated creditor governance in bankruptcy	OLS regression	2001–2004. U.K. SME. 153 receiverships and 195 administrations	The new Administration regime has higher gross recoveries but also higher cost with no net effect for creditors
Davydenko and Strebulaev (2007)	Credit spreads: bonds	Proxies for credit risk, liquidation costs, bargaining power and renegotiation frictions.	Strategic default (Fan and Sundaresan (2000))	Fama-MacBeth regression	1994–1999. Bond spreads from 523 U.S. non-defaulted issuers	Most proxies are statistically significant but little explanatory value for investment grade credit spreads. Strategic default does not explain poor empirical performance of traditional models
Grunert and Weber (2007)	Ultimate recovery (settlement): loans	Collateral, size, bank relationship, industry, macro factors	Firm-specific determinants of recovery rates	OLS regression	1992–2003. 128 Defaulted SME loans of one German bank	German loan recovery rates are in line with U.S. Collateral and a close bank relationship increase recovery rates.
Capkun and Weiss (2008)	Ultimate recovery (settlement): DAPR	Industry, size, leverage, collateral, U.S. jurisdiction, resolution	Determinants of DAPR	Bivariate probit regression	1993–2004. 169 U.S. large public firm bankruptcies	DAPR in Chapter 11 has decreased in recent years. DAPR are larger in Delaware and SDNY. Presence of DAPR allows for faster resolution
Davydenko and Franks (2008)	Ultimate recovery (settlement): loans	Country, age, size, collateral, GDP, industry	Creditor rights across countries	OLS regression	1984–2003. Loans of 920 SME's from 10 banks in France, UK and Germany	Lending contracts are adjusted to local bankruptcy law. Country effects remain significant in bankruptcies. Surprisingly, little country differences in workouts
Eraslan (2008)	Ultimate recovery (settlement): senior, unsecured and equity	Leverage, asset specificity, interest rates, reorganization type, court venue	Influence of liquidation costs on DAPR	Max. likelihood estimate of market implied liquidation values in 3-party model	1990–1997. 128 Chapter 11 cases (large, publicly held U.S. firms from Lynn LoPucki's bankruptcy database)	Liquidation values are higher in favorable industry conditions and for high interest rates. Given liquidation costs, a mandatory liquidation regime

2.3 PREVIOUS EMPIRICAL STUDIES

Table 2.3: Empirical studies documenting determinants of recovery rates and deviations from absolute priority

Authors	Dependent variable	Independent variables	Main theory	Test method	Dataset	Main Findings
Davydenko (2009)	Default recovery: firm	Quick ratio, debt structure, volatility	Strategic vs. liquidity default	OLS regression	1997–2003. 797 defaulted U.S. issuers	Endogenous default boundary in credit risk model is good estimate of firm value, but actuals vary widely. Both liquidity and asset value can trigger default.

Source: Own formulation

3 Credit Risk Model and Hypotheses

This chapter intends to analyze the determinants of recovery rates. It starts with an overview of structural credit pricing models and highlights the different ways in which these treat default, reorganization and distribution of firm value among claimants. The Fan and Sundaresan (2000) model is reviewed in more detail to analyze the effect of differences in creditor rights on the default decision of the firm and bargaining among claimants, and is used to derive testable hypotheses. The impact of variations in input parameters is highlighted in a sensitivity analysis.

3.1 Overview of Structural Models

In a generalized framework, the value of a defaultable debt security depends on the interest rate risk, the default probability and the recovery risk of the security.⁶⁵ As the issuer becomes distressed and default imminent, the sensitivities to interest rate risk and to default risk become negligible, whereas the sensitivity to recovery risk becomes very high.⁶⁶ To value distressed debt securities, it is therefore useful to identify credit pricing models explicitly modeling the recovery rate.

Merton (1974) in his seminal paper applied the valuation insights of Black and Scholes (1973) and Merton (1973) to present the first rigorous framework for the valuation of defaultable debt. He considers a frictionless, arbitrage-free market with a single constant risk-free interest rate r and no transaction costs, bankruptcy costs or taxes. For a firm with a single zero-coupon bond with face value B and maturity T , the asset value V of the firm is stochastic and follows the log-normal diffusion process:

⁶⁵ See for example Uhrig-Homburg (2002) p.25ff, who provides a broad overview of credit risk models.

⁶⁶ Interest rate risk in default is negligible as coupon payments are usually suspended during bankruptcy proceedings, and the debt restructured or refinanced. Default risk approaches 1.

$$dV = (\mu V - C)dt + \sigma Vdz, \quad (3.1)$$

where μ is the instantaneous expected return on asset value V , C is the total dollar payout by the firm to all security holders (i.e. coupon and dividends), σ is the volatility of return on the asset value V and z is a geometric Brownian motion. Default occurs at maturity T if the asset value V of the firm is less than the firm's liabilities ($V(T) < B$). The asset value is then transferred to debt holders with a recovery rate $R_D = V/B$.⁶⁷

Under arbitrage-free pricing assumptions, Merton (1974) p.468 obtains the following differential equation for the price D of any derivative instrument on the firm value:⁶⁸

$$0 = \frac{1}{2} \sigma^2 V^2 D_{VV} + (rV - C)D_V - rD + D_T + C, \quad (3.2)$$

where subscripts denote partial derivatives. Defining the asset value to be equal to the value of debt and equity of the firm:

$$V = D + E, \quad (3.3)$$

the value of a risky discount bond can be expressed as a combination of a long position in an identical default-free bond with price P and a short position in a short European put on the assets of the firm:

$$D(V, t) = B \cdot P(t, T) - Put(V, t), \quad (3.4)$$

which allows to derive the value of the bond using the Black-Scholes option pricing formula.⁶⁹

A major assumption of the Merton (1974) model is that default can only occur at maturity of the bond. A range of papers seek to address this issue by modeling

⁶⁷ Recovery of face value. Alternatively, credit pricing models often use recovery of market value or recovery of treasury value instead to simplify calculations (see Duffie and Singleton (1999) p.688ff who coined the terms). However, the recovery of face value is the more intuitive measure when analyzing allocations in bankruptcy proceedings. See also Guha and Sbuelz (2005) for an in-depth discussion of the use of recovery of face value.

⁶⁸ This differential equation also applies to the price of risky coupon bonds, where Merton (1974) p.468 assumes no cash dividends, i.e. total cash payout $C = \text{coupon } c$.

⁶⁹ See Merton (1974) p.454.

3.1 OVERVIEW OF STRUCTURAL MODELS

the default event differently. The literature generally considers three different classes of credit pricing models following Merton (1974): structural models with exogenous default, structural models with endogenous default, and reduced form models.⁷⁰ Structural models with exogenous default event (such as Kim, Ramaswamy and Sundaresan (1993) or Longstaff and Schwartz (1995)) are first passage time models where default occurs when the specified trigger variable (i.e. the asset value of the firm) falls below a threshold level (the default barrier) that is exogenously determined (fixed or stochastic). On the other hand, structural models with endogenous default (such as in Black and Cox (1976) and in Leland (1994)) emphasize the determination of the default barrier level, modeled as a game theoretic decision of claimants that pre-considers the final outcome of the default decision. These models are frequently used for analysis of optimal capital structure and debt contract design.⁷¹ Another advantage is that they relate the default barrier to a payment default, rather than an overindebtedness state, as the later would not necessarily lead to an immediate default event.⁷² Reduced form models (such as Jarrow and Turnbull (1995) and Duffie and Singleton (1999)) abstract from assumptions on default barriers and asset values, instead they use a stochastic default intensity process to specify the default time and possibly a stochastic recovery rate process to specify the default magnitude. While empirically more efficient at pricing investment grade bonds, the input parameters and results of reduced form models are difficult to interpret economically.⁷³ The following discussion will focus on structural models with endogenous default event, which appear most useful for the purpose of this thesis in analyzing firm value, its distribution and bargaining among claimants.

Black and Cox (1976) approach the maturity issue of Merton (1974) by modeling the default event as “strategic debt service”, i.e. as a decision by equity holders not to inject additional equity into the firm to cover coupon payments. They consider a firm with a single console bond with a constant coupon rate c , no payout to equity holders and assume that debt service payments have to be covered by new equity issues. They show that it is optimal for equity holders to default when the firm value reaches the lower barrier value V_B that maximizes the value of equity and minimizes the value of debt:

$$V_B = \frac{c}{r + \frac{\sigma^2}{2}}, \quad (3.5)$$

⁷⁰ See Uhrig-Homburg (2002) p.25.

⁷¹ See for example Uhrig-Homburg (2002) p.37-38.

⁷² See Koziol (2007) p.40.

⁷³ See Bohn, Arora and Zhu (2005).

where r is the constant risk free interest rate and σ the volatility of return on the asset value of the firm. Note that the default barrier here increases with the cost of debt and decreases with the risk free rate and riskiness of the firm. Intuitively, equation (3.5) shows that it is optimal for equity holders to default when the cost of covering debt payments exceeds the expected return on the firm's assets for equity holders. For a riskless firm ($\sigma = 0$), equity holders will default when the riskless return on the firm's assets ($V_B * r$) is lower than the coupon c . For riskier firms, equity holders will wait longer to default, given the higher option value of their equity position.

Leland (1994) extends the model of Black and Cox (1976) to include a tax advantage of debt and bankruptcy costs. The tax rate t results in a tax shield of $c * t$ per period for a levered, solvent firm, thus increasing the value of the firm. Bankruptcy would however result in loss of the tax shield. Bankruptcy also creates additional bankruptcy costs (BC) in proportion α to the firm value at default: $BC = \alpha V_B$. Leland (1994) is thus able to derive the optimal capital structure as a trade-off between the tax shield and the costs of bankruptcy. He also derives a modified optimal default barrier for the equity holders' default decision:

$$V_B = \frac{(1 - \tau)c}{r + \frac{\sigma^2}{2}}. \quad (3.6)$$

The presence of the tax shield incentivizes the equity holders to delay default. Interestingly, the default barrier is independent of the proportional bankruptcy cost α , as the bankruptcy cost is fully born by debt holders and does not affect equity values. Leland (1994) still makes a number of critical assumptions – including infinite maturity debt, constant capital structure and costless equity issues – which are addressed by later papers.

Leland and Toft (1996) address the infinite maturity and instead assume a firm continuously issuing new finite maturity debt to maintain a constant debt structure.

Credit models so far generally assumed default to lead to immediate liquidation. Another stream of literature models bargaining among claimants to avoid costly bankruptcy. Anderson and Sundaresan (1996) use a similar setup as Leland (1994), but introduce the possibility of strategic debt renegotiation between debt and equity holders to avoid bankruptcy in the form of a take-it-or-leave-it offer by equity holders. The firm's asset value is modeled in a discrete time setting as a binomial process; the firm generates cash flow in proportion to its assets value. The basic framework for the default decision is an extensive form non-cooperative game in which the debtor decides which proportion of contractual coupon payments c to satisfy from the firm's cash flow. If this is less than the

3.1 OVERVIEW OF STRUCTURAL MODELS

contractual amount, the resulting covenant breach⁷⁴ allows the creditors to force the firm into bankruptcy. However, as Anderson and Sundaresan (1996) assume fixed bankruptcy costs K (these represent the costs of liquidation or sale), creditors may prefer to avoid bankruptcy if the value of the proposed debt service until maturity is more than the value of the firm minus applicable liquidation costs. The bankruptcy costs thus provide an incentive for both claimant classes to bargain. However, all bargaining power in this model lies with the equity holders, who can choose the debt service level they want to propose to the debt holders. Anderson and Sundaresan (1996) thus derive an equilibrium solution and default barrier. A lower than contractual debt service level here can be interpreted as a debt service reduction or distressed exchange, with resulting deviations from absolute priority. Anderson, Sundaresan and Tychond (1996) generalize this approach to a continuous time-setting.

Fan and Sundaresan (2000) formulate a continuous-time extension of Anderson and Sundaresan (1996) that allows to renegotiate debt contracts out-of-court via a distressed exchange or debt service reductions. Their framework accommodates varying bargaining powers of equity holders vs. debt holders.

Davydenko and Strebulaev (2007) extend the Fan and Sundaresan (2000) model to account for renegotiation frictions by adding a factor q that expresses the probability for bargaining to fail, resulting in costly liquidation instead.

Koziol (2006), in an extension of Leland (1994), derives the optimal default time for a firm with convertible debt.

Another challenge of structural models has been the use of the asset value as state variable, as it is difficult to observe directly. A number of studies therefore use cash flow measures such as earnings before interest and taxes (EBIT) instead. This has the added advantage of being independent of the firm's capital structure and taxes and thus better suited for the analysis of dynamic capital structure. Mella-Barral and Perraudin (1997) follow Mello and Parsons (1992) in using the output price (op) of a commodity as the state variable.⁷⁵ Goldstein, Ju and Leland (2001) assume an EBIT process and EBIT reducing bankruptcy to motivate debt renegotiation and a dynamic capital structure strategy. Similar to Leland (1994), they consider the influence of a tax advantage of debt on optimal capital structure choice. Mella-Barral (1999) extends Mella-Barral and Perraudin (1997) to consider the outcome of distressed exchanges in different scenarios where debt and equity holders have varying bargaining powers. He also considers the

⁷⁴ Failure to pay interest or principal is taken as the most basic covenant.

⁷⁵ The cash flow of the firm here is modeled as the stochastic product price op minus fixed production costs, which is similar to an EBIT measure.

possibility of asset sales to competitors and permanent coupon concessions. Christensen, Lando, Flor and Miltersen (2002) extend Goldstein, Ju and Leland (2001) to include the possibility of bargaining over the benefits of a debt restructuring, and the effect of call provisions on debt.

Francois and Morellec (2004) consider renegotiation within Chapter 11 bankruptcy proceedings rather than out-of-court. They modify the model of Fan and Sundaresan (2000) to incorporate lengthy and costly bargaining in-court as an alternative to liquidation or costless renegotiation out-of-court, and demonstrate the effect of renegotiation options and exclusivity provisions on credit spreads and optimal leverage. In a combination of both models, Ericsson and Renault (2006) allow for both out-of-court reorganization and in-court reorganization, and also account for the impact of randomly occurring liquidity shocks in bond markets. The latter in particular allows them to generate higher theoretical credit spreads for shorter maturities that are closer to observed credit spreads than in previous models. Broadie, Chernov and Sundaresan (2007) use a similar Chapter 11 reorganization framework as Francois and Morellec (2004), but follow Goldstein, Ju and Leland (2001) in using an EBIT process, and include an endogenous liquidity barrier to differentiate between economic and financial distress.

A stylized fact of most credit pricing models is that they only consider one debt issue or class of debt. This issue has been addressed in recent years in a number of multi-party bargaining models. Noe and Wang (2000) study the optimal negotiating sequence equity holders should choose when restructuring a distressed firm with two-creditors in a bargaining game with a discrete time setting, and highlight the benefits of obtaining a conditional restructuring agreement from one creditor before negotiating with the next. Along a similar line, Breccia (2004) proposes a credit pricing model that adapts Mella-Barral and Perraudin (1997) for sequential renegotiation of multiple debt classes in a Chapter 11 setting. Hege and Mella-Barral (2005) extend Mella-Barral (1999) to a setting with multiple creditors and tax advantage of debt. In a further extension, Hackbarth, Hennessy and Leland (2007) examine the optimal mixture of bank and bond debt where only the bank lender has the ability to conduct out-of-court renegotiations (as bond holders may be too dispersed to coordinate effectively). They also model the effect of differences in international bankruptcy laws (defined as soft vs. tough adherence to absolute priority) by including a variable splitting rule between debt and equity holders in the event of bankruptcy. Annabi, Breton and François (2008) extend Leland (1994): following the equity holders' decision to default, they bargain with senior and junior debt holders about the plan of reorganization in a multi-stage game within a Chapter 11 setting, with negotiation costs and random interference by the bankruptcy judge if negotiations take too long.

Among the discussed credit pricing models, the Fan and Sundaresan (2000) appears the best suited to analyze the effect of differences in creditor rights among countries on recovery rates. The variable bargaining power factor presents

3.1 OVERVIEW OF STRUCTURAL MODELS

an elegant solution to analyze the effect of variations (for example due to different insolvency regimes) on the default point and distribution among claimants, and explicitly considers deviations from absolute priority. By formulating the model as a voluntary, out-of-court bargaining model, the authors also provide a simple justification to abstract from the high complexity of specific legal procedures in formal bankruptcy proceedings. Finally, both the inclusion of bankruptcy costs (an important determinant of recovery rates) and the choice of the asset value as state variable (providing a direct link to recovery rates) are also useful. In the following section, I will discuss the Fan and Sundaresan (2000) model in more detail and derive testable hypotheses for the effect of variations in creditor rights on recovery rates from it.

Table 3.1 lists the principal structural models with endogenous default events and their main characteristics as discussed above:

Table 3.1: Structural models with endogenous default

Authors	State variable	Optimal default boundary	Bankruptcy costs	Strategic renegotiation	Multiple creditors	Taxes
Black and Cox (1976)	$dV/V = \mu dt + \sigma dz$	$V_B = c / (r + \sigma^2 / 2)$	No	No	No	No
Leland (1994)	$dV/V = \mu dt + \sigma dz$	$V_B = (1 - \tau)c / (r + \sigma^2 / 2)$	αV_B	No	No	Tax advantage of debt τc
Leland and Toft (1996)	$dV/V = (\mu - \delta)dt + \sigma dz$	$V_B = \arg \max E_B(V, V_B)$	αV_B	No	No	Tax advantage of debt τc
Anderson and Sundaresan (1996)	binomial process	$S_B = \min(c; \max(V - K, 0))$	αV_B	Equity holders have all power	No	No
Fan and Sundaresan (2000)	$dV/V = (\mu - \delta)dt + \sigma dz$	$V_B = [(1 - \tau)c / (r + \sigma^2 / 2) + \eta K / (1 + \sigma^2 / 2r)] * 1 / (1 - \eta \alpha)$	$\alpha V_B + K$	Equity holders' initiative, varying bargaining power	No	Tax advantage of debt τc
Davydenko and Strebulaev (2007)	$dV/V = (\mu - \delta)dt + \sigma dz$	$V_B = (1 - \tau)c / (r + \sigma^2 / 2) * 1 / [1 - (1 - q)\eta \alpha]$	αV_B	Equity holders' initiative, varying bargaining power	No	Tax advantage of debt τc
Koziol (2006)	$dV/V = (\mu - \delta)dt + \sigma dz$	$V_B = \arg \max E_B(V, V_B, V_C)$	αV_B	No (convertible debt)	No	Tax advantage of debt τc

3.1 OVERVIEW OF STRUCTURAL MODELS

Table 3.1: Structural models with endogenous default

Authors	State variable	Optimal default boundary	Bankruptcy costs	Strategic renegotiation	Multiple creditors	Taxes
Mella-Barral and Perraudin (1997)	$dop/op = \mu dt + \sigma dz$	$op_B = \arg \max E_B(op, op_B)$	Liquidation: $V_B - \gamma$ Reorganization: proportional to costs and income	Either debt or equity holders have all bargaining power	No	No
Mella-Barral (1999)	$dx/x = \mu dt + \sigma dz$	$x_B = \arg \max E_B(x, x_B)$	$V_B - V_B^L$	Either debt or equity holders have all bargaining power	No	No
Hege and Mella-Barral (2005)	$dx/x = \mu dt + \sigma dz$	$x_B = \arg \max E_B(x, x_B)$	$V_B - V_B^L$	Equity holders have all bargaining power	Dispersed creditors	Tax advantage of debt τc
Goldstein, Ju and Leland (2001)	$dEbit/Ebit = \mu dt + \sigma dz$	$V_B = \arg \max E_B(Ebit, Ebit_B)$	αV_B	No	No	Government claim on firm's revenues personal&corporate
Christensen, Lando, Flor and Miltersen (2002)	$dEbit/Ebit = \mu dt + \sigma dz$	$V_B = \arg \max E_B(Ebit, Ebit_B)$	αV_B	Equity holders' initiative, varying bargaining power	No	Government claim on firm's revenues personal&corporate
Francois and Morellec (2004)	$dV/V = (\mu - \delta)dt + \sigma dz$	$V_B = \arg \max E_B(V, V_B)$	αV_B	Equity holders' initiative, varying bargaining power	No	Tax advantage of debt τc
Ericsson and Renault (2006)	$dV/V = (\mu - \delta)dt + \sigma dz$	$V_B = \arg \max E_B(V, V_B)$	αV_B	Equity holders' initiative, varying bargaining power	No	No

Table 3.1: Structural models with endogenous default

Authors	State variable	Optimal default boundary	Bankruptcy costs	Strategic renegotiation	Multiple creditors	Taxes
Broadie, Chernov and Sundaresan (2007)	$dEbit/Ebit = \mu dt + \sigma dz$	$V_B = \arg \max E_B(Ebit, Ebit_B)$	αV_B	Equity holders choose No default, debt holders renegotiation time frame	No	Government claim on firm's revenues personal&corporate
Breccia (2004)	$dEbit/Ebit = \mu dt + \sigma dz$	$V_B = \arg \max E_B(Ebit, Ebit_B)$	$(1-\eta)*(V_B-\gamma)$	Equity holders' initiative, varying bargaining power	Senior and junior debt issue	No
Hackbarth, Hennessy and Leland (2007)	$dEbit/Ebit = \mu dt + \sigma dz$	$V_B = \arg \max E_B(Ebit, Ebit_B)$	αV_B	Equity holders have all power, bargain with bank debt only	Bank and bond debt	Government claim on firm's revenues personal&corporate
Annabi, Breton and François (2008)	$dV/V = (\mu - \delta)dt + \sigma dz$	$V_B = (1-\tau)c/(r+\sigma^2/2)$	Negotiation costs $\alpha_1 V_B t_{\text{def}} + K$ Liquidation costs $\alpha_2 V_B$	Equity holders initiative' then creditors', varying bargaining power, bankruptcy judge randomly interferes	Senior and junior debt issue	Tax advantage of debt τc

Source: Adapted and extended from Uhrig-Homburg (2002) p.44.

Note: μ is the expected return. δ is the payout rate. r is the risk-free interest rate. op is the output price. x is an unspecified state variable. α is the proportional bankruptcy cost. K is the fixed bankruptcy cost. γ is the fixed liquidation/scrap value of the firm. E is the equity value. S_B is the optimal debt service level. q is the probability for failure of renegotiations. η is the relative bargaining power of equity holders. t_{def} is the time spent in bankruptcy or negotiation (from default to resolution). V is the asset value. V_B is the optimal barrier for default. V_B^L is the (lower) asset value after a liquidation sale. V_C is the optimal barrier for conversion of convertible debt.

3.2 Fan and Sundaresan (2000) Model

This section reviews the strategic reorganization model of Fan and Sundaresan (2000) in more detail, in order to discuss the influence of equity holders' bargaining power in a stylized setting and derive relevant hypotheses for empirical testing. Fan and Sundaresan (2000) extend the credit pricing models of Leland (1994) and Anderson and Sundaresan (1996) to formulate a continuous-time credit pricing model, that allows for renegotiation of debt contracts out-of-court via a distressed exchange (or debt service reductions), with varying bargaining power of equity holders.

A basic assumption of the model is that in the presence of bankruptcy costs, a distressed exchange is always preferable to bankruptcy or liquidation. Regarding the terms of the distressed exchange, creditors and equity holders bargain over the division of the asset value of the firm, in particular the allocation of cost savings from avoiding bankruptcy. The bargaining power of equity holders vs. creditors determines the sharing rule between equity holders and creditors (the deviation from absolute priority) and the optimal reorganization point.

Fan and Sundaresan (2000) consider a firm with equity and a single perpetual debt instrument that pays a coupon c . Similar to Merton (1974), the asset value V of the firm follows the lognormal diffusion process:

$$dV = (\mu - \delta)Vdt + \sigma Vdz, \quad (3.7)$$

where μ is the instantaneous expected return on the asset value V , δ is the cash payout rate of the firm to all security holders, σ is the volatility of return on the asset value and z is a standard Brownian motion.

However, like Leland (1994), Fan and Sundaresan also consider a tax benefit τc of debt (where τ is the tax rate and c is the coupon of the debt instrument) and bankruptcy costs that are incurred when the firm defaults on its debt (there is no differentiation between liquidation or in-court restructuring in regards to bankruptcy costs). Bankruptcy costs are considered to have a component that is proportional to firm value (αV_B , where the bankruptcy cost factor α takes a value between 0 and 1), and a fixed component (K). The proportional costs here can be interpreted as indirect costs of bankruptcy as described in section 2.1.4, (i.e. loss of customers), the fixed bankruptcy costs can be interpreted as direct costs (i.e. court and advisor costs). The remaining asset value after bankruptcy costs is

distributed to claimholders according to strict absolute priority, with zero recovery for equity holders.⁷⁶

To avoid bankruptcy, equity holders can propose a distressed exchange to debt holders in which all debt is swapped for equity.⁷⁷ Equity holders and debt holders bargain over the part of equity retained by incumbent equity holders. Bargaining is assumed to be costless. In a Nash bargaining game, the optimal sharing rule gives equity holders a proportion η of the bankruptcy costs avoided through the distressed exchange (see Fan and Sundaresan (2000) p.1063). The parameter η for the sharing rule represents the bargaining power of equity holders vs. debt holders and is a factor between 0 and 1, with zero representing all power to debt holders and 1 representing all power to equity holders.

The equity value E_B of the firm at the reorganization triggering asset value V_B can therefore be written as follows:⁷⁸

$$E_B = \eta(\alpha V_B + K), \quad (3.8)$$

and the debt value as

$$D_B = V_B - \eta(\alpha V_B + K). \quad (3.9)$$

A distressed exchange is proposed by equity holders at an endogenously determined optimal reorganization boundary V_B that maximizes their equity value:

$$V_B = \arg \max_{V_B} E(V, V_B) \quad (3.10)$$

with the boundary conditions for equity

⁷⁶ Absolute priority in the asset value model implies zero recovery for equity holders, as it implicitly assumes that the asset value at default is always below the face value of debt. If the asset value was higher, there could be no default, as assets could be used to cover debt service payments. This assumption abstracts from liquidity induced defaults.

⁷⁷ In the following, I concentrate on distressed exchanges and do not detail the alternative model for debt service reductions. As discussed in section 2.1.2, debt service reductions in practice are difficult to achieve and rare in highly distressed situations.

⁷⁸ The presented solutions here assume the normal case that firm value is sufficient to cover the bankruptcy costs. Otherwise, values for equity and debt reduce accordingly, as the bargaining concerns only the remaining lower firm value (see Fan and Sundaresan (2000) p.1093). Empirically, this is quite rare, within the model framework it can only be the case for very large values of K , i.e. very small firms that cannot afford the fixed bankruptcy costs.

$$\lim_{V \rightarrow \infty} E_B(V, V_B) = V - \frac{c(1-\tau)}{r}, \quad (3.11)$$

$$\lim_{V \rightarrow V_B} E_B(V, V_B) = \eta(\alpha V_B + K). \quad (3.12)$$

The first boundary condition states that for very large asset values, the debt becomes riskless, thus the equity value equals the value of the assets minus the value of riskless debt. The second boundary condition states that when the asset value approaches the reorganization boundary, the value of equity reflects the bargaining game detailed above.

From these conditions follows the optimal reorganization boundary⁷⁹

$$V_B = \left[\frac{(1-\tau)c}{r + \frac{\sigma^2}{2}} + \frac{\eta K}{1 + \frac{\sigma^2}{2r}} \right] \frac{1}{1 - \eta\alpha}. \quad (3.13)$$

Note that the first fraction of equation (3.13) represents the optimal default boundary proposed by Leland (1994) (see equation (3.6)) where no reorganization is possible. The reorganization boundary in the Fan and Sundaresan (2000) model is higher, given positive bankruptcy costs and bargaining power of equity holders – as equity holders participate in gains from reorganization, they are willing to reorganize at a higher value than the default boundary. The second fraction of equation (3.13) can be interpreted as the equity holders' benefit from avoiding fixed bankruptcy costs, the third fraction is related to the benefit of avoiding proportional bankruptcy costs.

Given (3.8) and (3.13) we can solve for the equity value E_B and debt value D_B at the optimal reorganization point:

$$E_B = \eta(\alpha V_B + K) = \left[\frac{(1-\tau)c}{r + \frac{\sigma^2}{2}} + \frac{\eta K}{1 + \frac{\sigma^2}{2r}} \right] \frac{\eta\alpha}{1 - \eta\alpha} + \eta K, \quad (3.14)$$

and from (3.9) follows:

⁷⁹ See Fan and Sundaresan (2000) p.1091-1095 for the detailed derivation. Here, the presented solution is simplified by assuming (analog to Leland (1994)) a payout ratio $\delta = 0$, a realistic assumption for highly distressed firms.

$$D_B = V_B - E_B = \left[\frac{(1-\tau)c}{r + \frac{\sigma^2}{2}} + \frac{\eta K}{1 + \frac{\sigma^2}{2r}} \right] - \eta K = \frac{(1-\tau)c - 2\sigma^2\eta K}{r + \frac{\sigma^2}{2}}. \quad (3.15)$$

Here I define deviation from the absolute priority rule (“DAPR”) as E_B/V_B , i.e. the percentage of firm value accorded to equity holders in reorganization:⁸⁰

$$DAPR_B = \frac{E_B}{V_B} = \eta\alpha + \frac{\eta K(1 - \eta\alpha)}{\left[\frac{(1-\tau)c}{r + \frac{\sigma^2}{2}} + \frac{\eta K}{1 + \frac{\sigma^2}{2r}} \right]}. \quad (3.16)$$

The Fan and Sundaresan (2000) model does not differentiate between out-of-court reorganization or reorganization in bankruptcy. It is formulated as an informal (out-of-court), costless and instantaneous bargaining. However, the authors point out that bargaining *within* bankruptcy can be modeled in the same way. U.S. bankruptcy rules, as described in section 2.1.3, give U.S. management wide discretion in filing for bankruptcy, and anecdotal evidence suggests that they frequently choose to file at an early stage, with high firm values.

In the following, I therefore apply the insights from their model to both out-court reorganizations and bankruptcies. A simple adaptation would see the bargaining game located within Chapter 11 where claimants bargain over the terms of a plan of reorganization in order to avoid additional liquidation costs (including possible delay and litigation costs that the equity holders can impose on debt holders). The (lower) barrier value V_B in that model would represent the lower asset value at which the firm files for bankruptcy protection.⁸¹

3.3 Hypotheses

A major contribution of Fan and Sundaresan (2000) is the modeling of the influence of variable bargaining power of equity holders on the equilibrium reorganization outcomes for equity and debt values. As discussed in section 2.1.5, bargaining power can depend on a number of factors, including the strength of creditor rights granted by a country’s legal code. To demonstrate the

⁸⁰ Given zero recovery for equity holders under absolute priority in the asset model.

⁸¹ Similarly, I do not differentiate between bankruptcy costs and liquidation costs in the following.

3.3 HYPOTHESES

effect of differences in creditor rights across countries (as measured for example by the LSSV score) on reorganization outcomes, I therefore hypothesize that η in this setup varies nontrivially with a firm's country.

Given the relationships derived in the previous section, I formulate four hypotheses with regards to the influence of creditor rights on recovery rates, by analyzing the derivatives of recovery rates for varying bargaining power of equity holders:

H1: Firms in creditor-friendly jurisdictions reorganize late (low firm value):

With high bargaining power, equity holders can expect larger benefits from reorganization and therefore have an incentive to reorganize the firm early, rather than holding out in the hope of the firm's fortunes turning around.⁸² Differentiating the reorganization boundary value of the firm V_B with respect to equity holders' bargaining power η shows a positive sign:

$$\frac{\partial V_B}{\partial \eta} = \frac{\alpha \frac{(1-\tau)c}{r + \frac{\sigma^2}{2}} + \frac{K}{1 + \frac{\sigma^2}{2r}}}{(1-\eta\alpha)^2} > 0. \quad (3.17)$$

H2: Creditor-friendly jurisdictions have lower deviations from absolute priority

Not surprisingly, equity holders are less able to extract value in creditor-friendly jurisdictions, both for in-court and for out-of-court reorganizations. Differentiating deviations from the absolute rule $DAPR$ with respect to equity holders' bargaining power η shows a positive sign:

$$\frac{\partial DAPR_B}{\partial \eta} = \alpha + K \frac{\frac{(1-\tau)c}{r + \frac{\sigma^2}{2}} (1 - 2\eta\alpha) + \frac{\eta^2 K \alpha}{1 + \frac{\sigma^2}{2r}}}{\left[\frac{(1-\tau)c}{r + \frac{\sigma^2}{2}} + \frac{\eta K}{1 + \frac{\sigma^2}{2r}} \right]^2} > 0. \quad (3.18)$$

H3: Creditor-friendly jurisdictions have higher recovery rates for debt

⁸² This so far untested intuition is in line with arguments made by White (1996) and Adler, Capkun and Weiss (2007).

H1 and H2 highlight opposing effects for debt recovery rates in the model. On the one hand, one expects the reorganization boundary to be lower in creditor-friendly jurisdictions. On the other hand, debt holders need to share less of the reorganization benefits with equity holders (lower $DAPR$). Differentiating D_B with respect to bargaining power η shows the second effect to be stronger. Debt holders appropriate the part of the saved fixed bankruptcy costs that they do not need to pay away to equity holders. Interestingly, they are not affected by the proportional bankruptcy costs that are appropriated entirely by equity holders. *Differentiating E_B with respect to equity holders' bargaining power η shows a negative sign:*

$$\frac{\partial D_B}{\partial \eta} = -\frac{2\sigma^2 K}{r + \frac{\sigma^2}{2}} < 0. \quad (3.19)$$

H4: Creditor-friendly jurisdictions have lower recovery rates for equity

Equity holders recover less as they reorganize later (as evident from equation (3.17)) and extract less value from creditors (equation (3.18)). *Differentiating E_B with respect to equity holders' bargaining power η shows a positive sign:*

$$\frac{\partial E_B}{\partial \eta} = \alpha \frac{\frac{(1-\tau)c}{r + \frac{\sigma^2}{2}} + \frac{K\eta(2-\alpha\eta)}{1 + \frac{\sigma^2}{2r}}}{(1-\eta\alpha)^2} + K > 0. \quad (3.20)$$

The four hypotheses developed above will be tested empirically in chapter 4.

3.4 Sensitivity Analysis

Example calculation

This section presents a simple example to illustrate the mechanics of the Fan and Sundaresan (2000) model. I assume the following input parameters:

- Asset volatility σ is 30%.
- Risk-free interest rate r is 3%.
- Coupon c is 8.5%.⁸³
- Tax rate τ is 35%.
- Proportional bankruptcy cost factor α is 5%
- Fixed bankruptcy costs K are 0.05.
- Bargaining power η is 0.5.

These assumptions on firm characteristics are broadly similar to empirical U.S. market averages (see also the descriptive statistics of the empirical study in table 4.7 and table 4.14 of chapter 4); the bankruptcy costs are in the range reported by previous studies (see table 2.1).

Entering these values into (3.13) gives the reorganization boundary:

⁸³ Coupon c and bankruptcy cost K are absolute amounts in the model. Here and in the following, they are presented as relative figures. The effect of changes in firm size can be easily demonstrated by multiplying c and K by the face value of debt.

$$V_B = \left[\frac{(1 - 0.35) \cdot 0.085}{0.03 + \frac{0.3^2}{2}} + \frac{0.5 \cdot 0.05}{1 + \frac{0.3^2}{2 \cdot 0.03}} \right] \frac{1}{1 - 0.5 \cdot 0.05} = 0.766, \quad (3.21)$$

from (3.8) follows for the equity value:

$$E_B = \eta(\alpha V_B + K) = 0.5(0.05 \cdot 0.766 + 0.05) = 0.044, \quad (3.22)$$

from (3.9) for the debt value:

$$D_B = V_B - \eta(\alpha V_B + K) = 0.766 - 0.044 = 0.722, \quad (3.23)$$

and from (3.16) follows $DAPR = 0.061$.

For the given input parameters, the model estimates appear broadly reasonable, with estimates for debt recovery rates of 76.6% lying within the range of debt recoveries reported in empirical studies in the 60% to 80% range.⁸⁴ Note that the default boundary without reorganization in the Leland (1994) model would be only marginally smaller at 0.737.

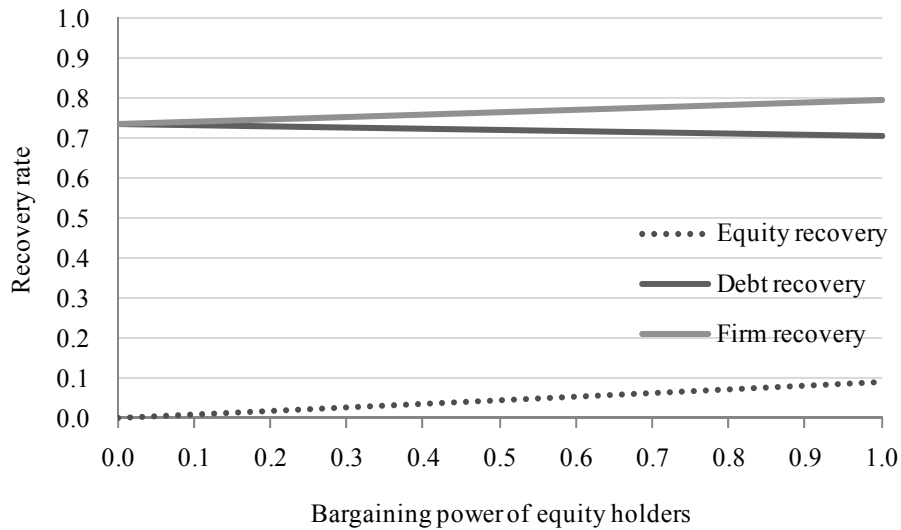
Sensitivity analysis

Of particular interest for my research question is the sensitivity of recovery rates to bargaining power. Fig. 3.1, using the same input parameters as the previous example, illustrates that with increasing bargaining power of equity holders, debt recovery rates decline, whereas equity and firm recovery rates rise.

⁸⁴ See table 2.3 in section 2.3. For example, Bris, Welch and Ning (2006) p.1288 report average debt recovery rates of 69.4%.

3.4 SENSITIVITY ANALYSIS

Fig. 3.1: Sensitivity of recovery rates to bargaining power



Note: The figure shows the firm, equity and debt recovery rates as a function of varying bargaining power of equity holders. The following input parameters are used: $\sigma=30\%$, $r=3\%$, $c=8.5\%$, $\tau=35\%$, $\alpha=5\%$, $K=0.05$, $\eta=0.5$.

Further sensitivities of recovery rates to model parameters are illustrated in table 3.2, with the expected sign and comparative statics analysis (three scenarios) based on the input parameters as presented for the base case scenario above.

Increasing bargaining power of equity holders decreases debt recoveries, but increases equity recoveries, firm recoveries and DAPR. Intuitively, equity holders reorganize the firm earlier (at a higher firm value) if they can appropriate more of the bankruptcy savings.

Increasing (proportional or fixed) bankruptcy costs increases firm recoveries, equity recoveries and DAPR. The higher savings from avoiding bankruptcy incentivize equity holders to reorganize early, and debt holders to share a higher proportion of the reorganized firm's equity with equity holders.

Increasing asset volatility increases DAPR but decreases all recovery rates. With higher risk, equity holders will wait much longer to reorganize the firm as the probability for a turnaround and high equity value increases.

An increased coupon results in higher recovery rates but lower DAPR – as the difference between the coupon and risk free rate (i.e. the risk premium) increases, it becomes more expensive for equity holders to save the firm and more attractive to reorganize early.

A higher risk free interest rate likewise results in lower recovery rates and higher DAPR.

3 CREDIT RISK MODEL AND HYPOTHESES

Similarly, a higher tax rate implies lower firm, debt and equity recovery rates but higher DAPR, as the higher value of the tax shield of debt increases the attractiveness of maintaining the capital structure of the firm.

In quantitative terms particularly noteworthy is the high sensitivity of firm recovery to asset volatility – with higher risk, equity holders will wait much longer to reorganize the firm. Equity recoveries and deviations from absolute priority on the other hand are particularly sensitive to bargaining power of equity holders.

Table 3.2: Sensitivity of recovery rates to model factors

	Firm recovery	DAPR	Debt recovery	Equity recovery
Bargaining power				
η	(+)	(+)	(-)	(+)
0	0.737	0.000	0.737	0.000
0.5	0.766	0.061	0.722	0.044
1	0.796	0.127	0.707	0.090
Proportional bankruptcy costs α				
α	(+)	(+)	(o)	(+)
0.01	0.750	0.040	0.722	0.029
0.05	0.766	0.061	0.722	0.044
0.1	0.786	0.089	0.722	0.064
Fixed bankruptcy costs K				
K	(+)	(+)	(-)	(+)
0.01	0.758	0.033	0.734	0.024
0.05	0.766	0.061	0.722	0.044
0.1	0.776	0.098	0.707	0.069
Asset volatility				
σ	(-)	(+)	(-)	(-)
0.2	1.149	0.049	1.095	0.054
0.3	0.766	0.061	0.722	0.044
0.4	0.522	0.079	0.484	0.038
Coupon				
c	(+)	(-)	(+)	(+)
0.06	0.544	0.076	0.505	0.039
0.085	0.766	0.061	0.722	0.044
0.1	0.899	0.056	0.852	0.047
Risk-free rate				
r	(-)*	(+)	(-)*	(-)
0.02	0.880	0.056	0.833	0.047
0.03	0.766	0.061	0.722	0.044
0.05	0.610	0.071	0.570	0.040
Tax rate				
τ	(-)	(+)	(-)	(-)
0.25	0.882	0.056	0.835	0.047
0.35	0.766	0.061	0.722	0.044
0.45	0.650	0.068	0.608	0.041

Note: To compute recovery rates the following input parameters are used: $\sigma = 30\%$, $r = 3\%$, $c = 8.5\%$, $\tau = 35\%$, $\alpha = 5\%$, $K = 0.05$, $\eta = 0.5$. Firm recovery is the value of debt recovery plus equity recovery. DAPR is equity recovery divided by firm recovery. *For all plausible input parameters, can be inverted for some extreme values of σ .

4 Empirical Study of U.K. and U.S. Recovery Rates

In this chapter, the hypotheses developed in section 3.3 will be tested empirically on recovery data of two separate samples of defaulted corporate issuers in the U.S. and the U.K. The first sample consists of firms conducting out-of-court reorganizations ('distressed exchanges'), the second of firms filing for bankruptcy. Descriptive statistics and results of regression analysis will be presented for both samples on the issuer firm and the instrument level. Additionally, default prices will be compared to recovery rates at emergence from bankruptcy, to portray historic return characteristics of defaulted debt and evaluate the markets efficiency in anticipating bankruptcy settlements.

4.1 Data Sources and Sample Selection

This empirical study intends to analyze the effect of differing creditor rights among countries on the recovery rates of debt and equity holders observed for defaulted firms. As discussed in section 2.2, the U.S. and the U.K. are particularly suited for a comparative study given similar cultures, legal systems and highly developed financial markets, but widely differing insolvency codes and creditor rights. Adding additional countries with different legal background (such as Germany, France or Scandinavian countries) to the study was considered. Unfortunately, insufficient recovery data were available in these countries on defaulted firms with matched debt and equity recovery rates, in particular due to the low number of defaulted bonds in these countries,⁸⁵ and the lack of pricing data on defaulted securities.⁸⁶ Nevertheless, this dataset, containing firm, debt and equity instrument specific attributes, prices and

⁸⁵ As capital markets have developed slower in other countries, the number of corporate bonds is generally low.

⁸⁶ In particular, defaulted companies tend to have very illiquid debt prices and equity prices, or trading may be suspended altogether. It is also difficult to obtain restructuring documentation, unless this has been submitted to the SEC or Companies House.

recovery data, to my knowledge, is the first such dataset assembled across countries.⁸⁷

The observation period covers corporate debt defaults in the U.S. and the U.K. from 1st January 1998 to 31st December 2007. Data prior to 1998 were not considered given the lack of debt market data availability in the U.K. before this time and overall low number of defaults.⁸⁸ Default events are categorized in out-of-court distressed exchanges and bankruptcies (resolved either in reorganization or liquidation).⁸⁹

To construct the U.S. dataset, Moody's Ultimate Recovery Database (URD) is used to obtain a list of all issuers that defaulted during the observation period, and those issuers' outstanding debt instruments at the time. Moody's URD includes all defaulted U.S. corporate issuers with debt in excess of \$50,000,000 at the time of default. For the observation period, the database lists 2,688 defaulted debt instruments in the U.S., attributable to 497 issuer firms.

The URD provides detailed information for each defaulted debt instrument, derived by Moody's from SEC and bankruptcy filings and news reports. Issuer specific information includes the name, country and industry as well as Bloomberg and CUSIP identifiers. Event specific information includes the default and bankruptcy dates, default type, resolution date, resolution type and sometimes a short description of the bankruptcy and resolution mechanism. Instrument specific information includes the instrument type, face amount, maturity, coupon, the percent of the issuer's debt subordinated to this instrument and Moody's seniority rank. The instrument's ultimate recovery rate (at resolution, expressed as % of face value) is derived either from a) the trading price at resolution (emergence from bankruptcy, liquidation or the exchange date for distressed exchanges) b) the settlement value (value of cash or instruments offered) or c) the liquidity value (observed at the next liquidity event such as an instrument maturity or call). Where available, Moody's usually gives preference to the trading price method. Any recovery portion attributable to unpaid coupons is excluded from reported recovery rates by discounting recoveries at the instruments coupon rate back to the last date the coupon was paid. For about half

⁸⁷ The lack of academic studies in this area reflects the difficulty in collecting recovery data for sets of both debt and equity of defaulted issuers.

⁸⁸ The U.K. high-yield market only started developing from mid-1997. See de Bondt and Marqués (2004) for a review of the U.K. and European high-yield market development.

⁸⁹ Distressed exchanges are included as default events only when impairing debt holders or having the apparent purpose of avoiding default. Instrument defaults that were consecutively cured are excluded from the database.

4.1 DATA SOURCES AND SAMPLE SELECTION

the securities, the default price (trading price 30-days after default, expressed as % of face value, denoted as P_D) is also recorded.

As Moody's URD only contains data for U.S. issuers, I used Moody's Default Risk Services Database (DRSD) to obtain a list of defaulted issuers in the U.K. The DRSD lists defaulted, rated debt securities of corporate issuers worldwide, going back to 1970. For the observation period the database lists 173 defaulted securities attributable to 60 issuer firms in the United Kingdom. Of these, I excluded 12 from the UK sample as they were resolved under foreign bankruptcy regimes,⁹⁰ and added four issuers⁹¹ as a result of a Datastream and Factiva search for U.K. bankruptcies. The DRSD contains issuer specific information (name, country, industry and a third party identifier such as CUSIP or SEDOL), event specific information (default and bankruptcy or exchange dates, default type, resolution date and type where available, and sometimes a short description of the default event) and instrument specific information (instrument type, face amount, maturity and coupon). Again, for about half the securities, the default price is available.

I complemented the DRSD data with data obtained from Datastream, the applicable exchange filings⁹² and Factiva news clippings, adding, in particular, the debt recovery rate, default price and seniority ranking (applying the same criteria as used by Moody's URD in order to ensure comparability). For a small number of debt instruments (18) where no debt recovery (settlement value or trading price at emergence) was available, the average trading price of other debt instruments of that issuer in the same seniority class was used.

For both samples, equity pricing data (at default and at emergence) were obtained from Datastream by cross-matching with the URD and DRSD datasets using the CUSIP code as identifier. Issuers without available equity prices at the time of

⁹⁰ Usually Chapter 11. UK issuers that issued debt in the United States can file for Chapter 11 bankruptcy protection there, which could be an attractive option, particularly before the implementation of the UK Enterprise Act of 2002 allowed for a more consensual restructuring under Administration. Examples of such "forum shopping" by U.K. firms that filed under Chapter 11 during our observation period include Virgin Media and NTL. Cenargo is an interesting case, where the firm's management initially filed for bankruptcy in the U.S., but creditors later managed to have the case reverted to the U.K. courts where their interests would be better represented. Within Europe, the European Insolvency Law 2000 regulates which national bankruptcy code applies to European companies and their subsidiaries, based on the 'center of main interest' (COMI) of the firm. See also Tilley (2005).

⁹¹ Clubhaus, Jarvis, Mytravel and Schefenacker.

⁹² Company Voluntary Arrangement or Scheme of Arrangement documentation as submitted to the UK Listing Authority.

default are excluded from the sample. I also excluded the 16 default events that did not result in the debt holders' claims being impaired.⁹³

The final dataset in the observation period contains 297 issuers with 1,757 corresponding debt instruments in the U.S., and 26 issuers with 84 debt instruments in the U.K. Table A.1 in the Appendix lists all the firms in the data sample. Table 4.1 shows the sample composition by country and event type.

Table 4.1: Number of defaults by default type

	United States		United Kingdom		Total	
	Firms	Instruments	Firms	Instruments	Firms	Instruments
Distressed Exchange	29	174	17	56	46	230
Bankruptcy – Emerged	179	1,199	2	5	181	1,204
Bankruptcy – Liquidated	89	394	7	23	96	417
All	297	1,767	26	84	323	1,851

Note: This table describes the composition of the sample of defaulted firms and corresponding debt instruments in the United States and the United Kingdom from 1998 to 2007, by reorganization type.

The U.S. sample is much larger than the U.K. sample with 297 vs. 26 firms. Nevertheless, this represents a fairly comprehensive sample of large U.S. and U.K. defaulted firms with traded debt and equity recoveries, applying Moody's inclusion criteria.⁹⁴ Interestingly, the relative use of distressed exchanges is much higher in the U.K. than in the U.S., whereas in-court restructurings (Bankruptcy – Emerged) are more frequently used in the U.S. than the U.K.

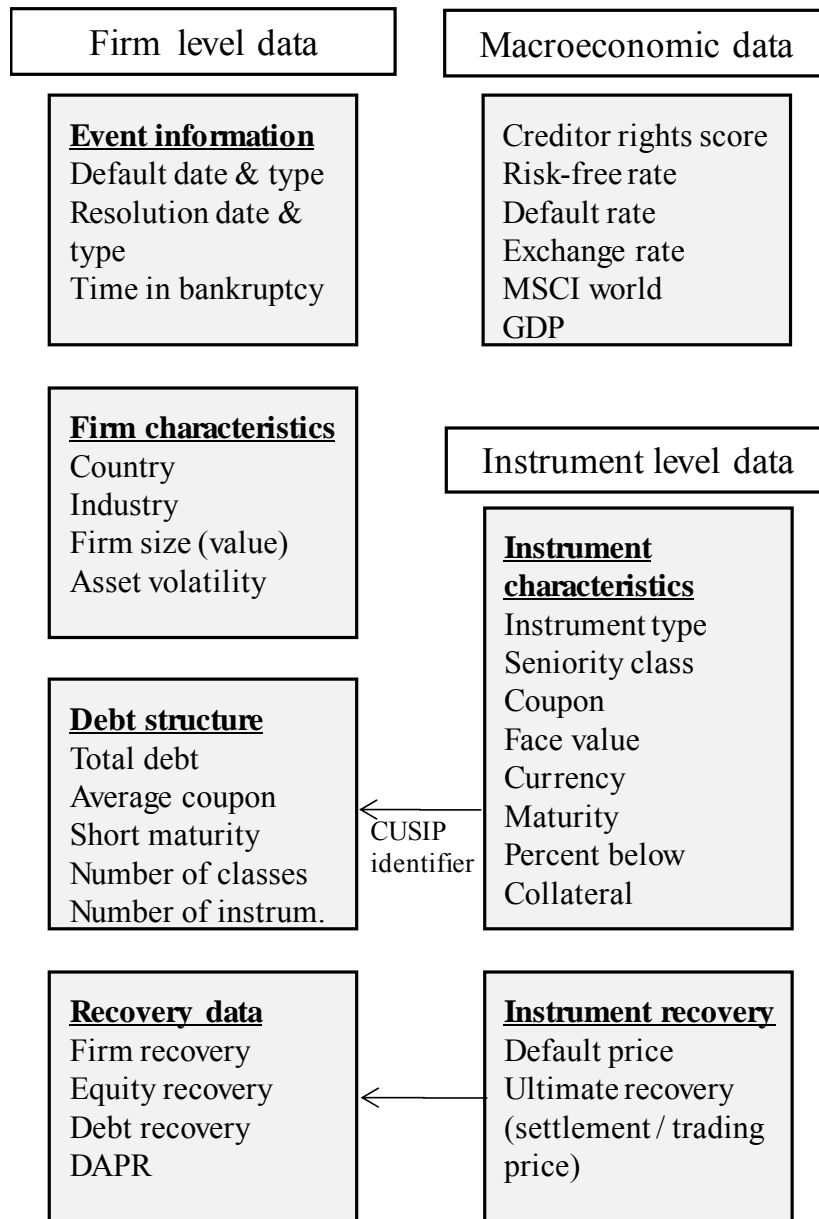
Fig. 4.1 provides an overview of the major data types collected for the sample on the instrument level, the firm level (aggregating instrument level data) and the macroeconomic level. Fig. A.1 in the Appendix provides an illustrative screenshot of the database layout.

The following section will describe in more detail the variables used in the regression analysis.

⁹³ This included several cases where claims were seemingly fully satisfied, but closer inspection revealed that they were, in fact, only refinanced with a DIP facility by the existing lenders and no information given on ultimate DIP facility terms.

⁹⁴ Searching Moody's DRSD, Datastream and Factiva for defaulted bonds. For comparison, Standard and Poor's report only 64 defaults across all of Europe in the same time period.

Fig. 4.1: Overview of data types in the database



Note: The figure shows the data points collected for the sample of defaulted issuers in the U.S. and the U.K. from 1998 to 2007. Each issuer is represented with several debt instruments and one equity instrument in the database. Instrument level data were aggregated to derive debt structure and recovery data on the firm level. All data were recorded at the default date, except the ultimate recovery that was recorded at event resolution.

4.2 Choice and Definition of Variables

The structural equations, applied in the formulation of the four main hypotheses of this study (see equations (3.17), (3.18), (3.19) and (3.20)), show that recovery rates and deviation from absolute priority are a function of the risk free interest rate r , the asset volatility σ , the tax rate τ , the coupon c , equity holders' bargaining power η , and the bankruptcy cost factors α and K .

The independent variables r , σ , τ and c are observable and measured for the firm at the time of the default event, as described in the previous section. However, the equity holders' bargaining power η and the bankruptcy cost factors (α and K) are latent variables that are difficult to observe directly.⁹⁵ Therefore, to incorporate the effect of variations of bargaining power and bankruptcy costs into a regression equation, I follow the approach suggested by Davydenko and Strebulaev (2007)⁹⁶ and choose as empirical proxies several other firm characteristics known from previous empirical studies to influence bargaining power and bankruptcy costs.⁹⁷ The major proxy for bargaining power I intend to analyze is the issuer country's creditor rights. In addition, I include the number of debt classes and a dummy variable for issuers with any debt maturing in less than 12 months to proxy for bargaining power. I use firm size, a dummy variable for firm in the energy & utility industry and market default rates to proxy for bankruptcy costs. For the analysis of the bankruptcy sample, I also control for whether firms are reorganized or liquidated. For the instrument level analysis, I incorporate an additional measure of instrument seniority called *percent below*. All the independent variables are measured at the default date.

The definition and rational for choosing these variables for the empirical study is discussed in more detail in the following:

⁹⁵ Attempts to measure bankruptcy costs have been made in previous studies, as described in section 2.1.4. However, only a small proportion of direct costs is directly observable (i.e. court fees). For example, estimates of bankruptcy costs – by resorting to changes in book values or market values – fail to provide unbiased estimate of bankruptcy costs, and also vary widely by measurement methodology and sample as described Bris, Welch and Ning (2006).

⁹⁶ Davydenko and Strebulaev (2007) test the implications of the Fan and Sundaresan (2000) model for credit spreads.

⁹⁷ See section 2.3 for a discussion of previous empirical studies and proxies used in multivariate regression analysis of recovery rates, in particular Betker (1995) who studies proxies for bargaining power and Bris, Welch and Ning (2006) who study proxies for bankruptcy costs. Section 2.14 discussed determinants of bankruptcy costs in more detail, section 2.1.5 discussed determinants of bargaining.

Recovery Rates – The instrument recovery rate is calculated at event resolution (emergence from bankruptcy or exchange date) and expressed as a percentage of face value of the debt instrument.

As each issuer is represented with multiple (correlated) debt instruments in the data sample, including each instrument individually in the regression analysis could result in substantial overestimation errors. Instruments of the same issuer share the same issuer level characteristics (i.e. firm size, number of debt classes, industry type), therefore those issuers with many debt instruments (several firms in the sample have issued 20 to 40 bonds each) would be included too often in the regression, feigning statistical correlations.⁹⁸ To counter this effect, I aggregate all the debt instrument recoveries for the firm and first test debt recovery data on an issuer cluster level. In chapter 4.5, I also conduct tests on the instrument level, constructing balanced clusters to address these problems and considering additional instrument specific factors.

The debt recovery (R_D) is calculated as \$-weighted average recovery rate across all the issuer's debt instruments, expressed as a % of the face value of debt. The equity recovery rate (R_E) likewise is expressed as a % of the face value of debt (face value of debt is used as the denominator to allow for an easier comparison to debt recovery rates). Firm recovery rate (R_V) is the market value of equity and debt of the firm, divided by the face value of all debt. Deviation of absolute priority ($DAPR$) is the equity recovery divided by firm value.

Creditor rights – for the LSSV creditor rights score, the U.K. takes a value of 4 while the U.S. takes a value of 1. Given that my data set is limited to these two countries, I use a country dummy variable *UK* for firms incorporated in the U.K., to capture the effect of different creditor rights in both countries.⁹⁹

⁹⁸ See Wooldridge (2002) section 11.5 or Cohen, Cohen, West and Aiken (2003) chapter 14 for a detailed discussion of pitfalls associated with cluster sample analysis and unobserved cluster effects, as well as remedies.

⁹⁹ This is the same approach as in other studies who have compared creditor rights in the U.S. and the U.K., see for example Acharya, Sundaram and John (2010) p.4 or Acharya, Amihud and Litov (2010) p.30.

Asset volatility – the issuer’s asset volatility σ is obtained from Moody’s KMV Creditedge database.¹⁰⁰ To mirror the relationship in equation (3.13), the variance (asset volatility²) is used as the appropriate variable for the empirical study. Riskier firms provide an incentive to delay restructuring as the chances of a turnaround are higher.¹⁰¹ Firm recoveries could also be lower due to a quicker deterioration in firm value for risky firms.

Coupon – for the firm level analysis, the \$-weighted average coupon rate (c_{avg}) of all debt instruments of the issuer is used, representing the cost of debt of the issuer similar to the c of the single console bond in the Fan and Sundaresan (2000) model. With a higher coupon rate, debt service becomes more costly and it becomes more attractive for equity holders to refinance early.

Risk free interest rate – To measure the risk-free interest rate r , the 3-month Libor rate (U.S. or U.K. as applicable) at the default date as reported on Datastream is used. With a higher risk free rate, the default point (and accordingly recoveries) is expected to be lower – equity holders’ incentives to renegotiate the capital structure are smaller when the coupon is cheap compared to the risk free rate.

Taxes – In line with most other recovery rate studies and in order to reduce complexity, this study does not control for changes in tax rate across countries or time.¹⁰²

Firm size – To control for the influence of firm size, the logarithm of *firm value* is used.¹⁰³ Firm size is the implicit scaling factor in the Fan and Sundaresan

¹⁰⁰ KMV calculates equity price implied asset volatility applying the Vasicek-Kealhofer model and own adjustments based on historic data. Details of the estimation methodology can be found in Crosbie and Bohn (2003) p.16-17. An advantage of using the KMV derived values is that the adjustments smooth asset volatilities, producing a more stable, predictive value of asset volatility and avoiding exaggerated jumps in asset volatility (i.e. from quickly deteriorating equity prices around default). Where the asset volatility at the exchange date was not available for the individual issuers in Creditedge, I used either the last available asset volatility for the issuer or the industry average at the default date.

¹⁰¹ See for example Acharya, Amihud and Litov (2010) for a detailed discussion on the relationship between bankruptcy rules and corporate risk taking.

¹⁰² None of the other recovery rate studies cited in this thesis have controlled for taxes. One reason is that tax rates are difficult to estimate, given the range of exemptions corporations benefit from, and complex rules regarding tax loss carry-forwards in bankruptcies.

¹⁰³ Transformation to normality as the firm value measured in absolute terms is not normally distributed. Such transformation of firm and asset values is standard and was applied in similar studies including Betker (1995), Franks and Torous (1994) and Acharya, Bharath and Srinivasan (2007).

(2000) model. With larger firm size, the impact of the fixed bankruptcy costs K in the structural model gets smaller – a large firm can more easily afford court and advisor fees, and is therefore expected to recover more in a bankruptcy.¹⁰⁴

Number of debt classes – Complex debt structures make it more difficult for debt holders to coordinate, weakening their bargaining position vs. equity holders. To measure the complexity of the debt structure, I follow Betker (1995) and count the number of different seniority *classes* of debt in an issuer's debt structure. A number of studies use the number of debt instruments instead of classes.¹⁰⁵ However, I consider *classes* a better measure as it specifically measures differing interests between creditors, whereas the number of instruments is often more a reflection of firm size.¹⁰⁶ Moody's URD ranks the debt instruments (such as senior secured, senior unsecured, subordinated, junior subordinated) of an issuer into different seniority classes. Debt seniority can arise from legal subordination (as specified in the debt documentation or inter-creditor agreements), differences in collateral (secured or not) or structural subordination (being located in different issuing entities)

In addition to increasing creditors' coordination costs, the presence of junior debt holders can also increase equity holders' bargaining position vs. senior debt holders, as junior debt holders' interests may be more aligned with equity holders'.¹⁰⁷ For example, junior debt holders potentially prefer more risky investments and may argue for a higher firm valuation in order to increase the value of their claims. However, higher coordination costs and diverse creditor interests may also increase renegotiation frictions and time, and make liquidation more likely. While renegotiation costs are not modeled in the Fan and Sundaresan model, they could most easily be interpreted as a reduction in the benefits of avoiding bankruptcy (i.e. complex restructurings may be easier and more cost efficient to conduct in-court in Chapter 11 or Administration, or even

¹⁰⁴ This is corroborated in empirical studies for example by Betker (1995), Bris, Welch and Ning (2006) and Baird, Bris and Zhu (2007).

¹⁰⁵ For example Franks and Torous (1994) and Gilson (1997). Davydenko and Strebulaev (2007) instead use the number of instruments divided by assets of the firm.

¹⁰⁶ For example, in my data sample, Qwest Communications, a relatively straightforward debt exchange, had 30 individual debt issues, but only two distinct classes: secured bank loans and senior unsecured bonds. Lexington Precision Corp. on the other hand was a small but complex restructuring involving only 4 debt issues, secured bank loans, senior unsecured bonds, senior subordinated bonds and junior subordinated bonds each ranking separately and being offered different exchange terms including cash, new bonds and equity warrants.

¹⁰⁷ See for example Weiss (1990), Unal, Madan and Güntay (2003) or Pyo and Thompson (2007).

more easily in a liquidation regime such as Chapter 7 or Administrative Receivership).¹⁰⁸

Short maturity – The dummy *short maturity* equals one if any debt instruments mature in the next twelve months. Gertner and Scharfstein (1991) and Berglöf and von Thadden (1994) show that upcoming refinancing needs reduce the bargaining power of equity holders in out-of-court restructurings as they have little time to find new financing sources, and short maturity creditors may prefer to hold out and be paid in full ahead of other creditors

Industry – To control for industry effects, I include an industry dummy *energy & utility* that equals one for firms active in the utility or energy industry (using Moody's specific industry codes), as previous studies have shown those industries to exhibit particularly high recovery rates. For example, Acharya, Bharath and Srinivasan (2007) find the utility and the energy sectors to have the two highest recovery rates in their sample (though only utility significantly so). They hypothesize this to have regulatory reasons. Another reason could be that both industries exhibit particularly high tangible assets that can be more easily sold in liquidations.¹⁰⁹

Default cycle – To account for the effect of market disruptions and the economic cycle on debt and asset prices that could affect recovery rates, the *default rate* in the year of the issuer's default is used as a control variable.¹¹⁰ Altman, Brady, Resti and Sironi (2005), Bruche and González-Aguado (2010) and others report a significant influence of default rates on recovery rates, whereas other macroeconomic variables (such as GDP growth or stock market developments) seem to have little or no explanatory value in previous empirical studies.¹¹¹

¹⁰⁸ Francois and Morellec (2004) model this effect as a time-dependent bargaining cost. Alternatively, Davydenko and Strebulaev (2007) in their extension of the Fan and Sundaresan (2000) model and Eraslan (2008) in his 3-party bargaining model interpret renegotiation frictions as the *probability* that renegotiations fail, leading to costly liquidation of the firm. See also section 3.1.

¹⁰⁹ Similarly, Davydenko and Strebulaev (2007) specifically include a non-utility dummy in their regression equation and find a significant positive influence on credit spreads.

¹¹⁰ U.S. default rates as reported by Altman, Karlin and Kay (2008) are applied to both the U.S. and the U.K. sample, as the much larger U.S. market is likely to impact the U.K. market as well and in order to avoid introducing another variable linked to the country into the multivariate regression. Using instead European default rates, as reported by Credit Suisse (2010) for the U.K. sample, does not significantly change the regression results.

¹¹¹ Altman, Brady, Resti and Sironi (2005) find that macroeconomic variables become insignificant once default rates are included in the regression.

4.2 CHOICE AND DEFINITION OF VARIABLES

Table 4.2: Bond default rates in the United States

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Default rate	1.60%	4.15%	5.07%	9.80%	12.80%	4.66%	1.25%	3.38%	0.76%	0.51%

Source: Altman, Karlin and Kay (2008) p.13.

Liquidations – For the bankruptcies sample, I control for the resolution type (liquidated or emerged) by including a dummy *liquidated*, which equals one if the issuer was liquidated (whether in Chapter 7 or in Chapter 11). As discussed in section 2.1.4 on bankruptcy costs, I expect firm values to be lower for firms that are liquidated, given generally higher liquidation than reorganization costs. I also expect *DAPR* to be close to zero, as absolute priority should generally be observed in liquidations.

Instrument seniority – Finally, for the analysis of instrument level recovery rates a proxy for instrument seniority is considered. *Percent below* indicates the percentage of an issuer's debt subordinated to this instrument, thus acting as a loss buffer in case of bankruptcy. Alternatively, I also consider other measures of instrument seniority, including the debt seniority class, whether debt is collateralized, and whether it is bank debt or bond debt.¹¹²

Table 4.3 summarizes all the variables used in the empirical study.

All the dependent and independent variables are examined through SPSS for accuracy of data entry, missing values, and fit between their distributions and the assumptions of multivariate analysis. To improve pairwise linearity and reduce the extreme skewness and kurtosis, *firm size* is logarithmically transformed. The few missing values (1 for coupon, 5 for asset volatility, and 2 for short maturity) are replaced by the sample mean. The data were carefully screened for outliers, but none excluded. In particular, cases with high debt recovery rates (above 100%) and high equity recovery rates (above 30%) are individually reviewed for economic rationale but found to be representative parts of the sample. Autocorrelation is not an issue in the analysis, as no time-series data were used (while our sample extends over 9 years, recovery rates and independent variables are only sampled once for each defaulted issuer at the default or resolution date). However, there are potentially state/time-dependent effects that could influence recovery rates. The *default rate* variable is introduced specifically to correct for such effects.

¹¹² I did not, however, consider differences in debt covenants, as these become largely meaningless in bankruptcy proceedings. Nevertheless, debt covenants could also have an impact on the reorganization time and resolution in distressed exchanges.

Table 4.3: Description of variables

	Description	Source
Panel A: Dependent variables (recovery rates)		
<i>Debt recovery rate</i> (R_D)	Market value of debt divided by face value of debt	U.S.: Moody's URD U.K.: Datastream, company filings
<i>Equity recovery rate</i> (R_E)	Market value of equity divided by face value of debt	Datastream, company filings
<i>Firm recovery rate</i> (R_V)	Market value of firm (debt plus equity) divided by face value of debt	Constructed from equity and debt recoveries
<i>DAPR</i>	Market value of equity divided by firm value	Constructed from equity and debt recoveries
Panel B: Independent variables (firm and instrument characteristics)		
<i>UK</i>	Dummy variable, 1 if issuer is based in U.K.	U.S.: Moody's URD & DRSD
<i>Asset volatility</i> (σ)	Asset volatility of firm value	KMV
<i>Firm size</i> (V_B)	Market value of firm (debt plus equity) in \$m	Constructed from equity and debt recoveries
<i>Coupon</i> (c_{avg})	\$-weighted average coupon rate of all debt instruments of issuer	Moody's URD & DRSD
<i>Risk-free rate</i> (r)	3-month Libor rate	Datastream
<i>Classes</i>	Number of debt seniority classes	Moody's URD & DRSD, company filings
<i>Energy & utility</i>	Dummy variable, 1 if issuer is energy or utility firm	Moody's URD & DRSD
<i>Short maturity</i>	Dummy variable, 1 if any debt instrument maturing in <1 year	Moody's URD & DRSD
<i>Default rate</i>	% of outstanding bonds defaulted in calendar year in the U.S. market	Altman, Karlin and Kay (2008)
<i>Liquidated</i>	Dummy variable, 1 if issuer is liquidated	Moody's URD & DRSD
<i>Percent below</i>	% of issuers debt subordinated to the instrument	Moody's URD, company filings

Note: The table describes the variables used in the analysis of recovery rates. URD is the Ultimate Recovery Database provided by Moody's corporation. The URD contains data on U.S. issuers only. DRSD is the Default Risk Services Database by Moody's, providing data for rated issuers worldwide.

4.3 Recovery Rates in Distressed Exchanges

This section discusses descriptive statistics and regression analyses for the sample of 46 distressed exchanges in the United States and the United Kingdom.

4.3.1 Descriptive Statistics

Table 4.4 presents mean firm recovery rates for the sample of distressed exchanges, split by industry group.¹¹³ Noteworthy are the energy & utility and the telecommunications industries, with the largest number of distressed exchanges (8 each). Interestingly, these also exhibit the highest recovery rates (above 90%). The high recovery rates for the energy & utility sector are in line with expectations and previous empirical studies (see the discussion of the industry in section 4.2). The high recovery rates for the telecommunications sector are unexpected though. On the contrary, given that the defaults in the sector stem largely from a raft of restructurings in the wake of the 2001-2002 telecom bust, one would have expected lower recovery rates.¹¹⁴ However, while recovery rates in bankruptcies were indeed low for telecommunication firms,¹¹⁵ several large telecommunication firms, such as Qwest or Level 3, used the opportunity to strengthen their capital structure by coercing debt investors to accept opportunistic exchange offers, even though nominal firm values were still quite high.¹¹⁶

¹¹³ Classified using Moody's industry codes.

¹¹⁴ Given the postulated negative relationship between recovery and default rates.

¹¹⁵ As will be shown in chapter 4 (see table 4.11).

¹¹⁶ Debt holders more readily agreed to such offers during wide-spread industry distress, given increased risk averseness and uncertainty about firms' prospects.

Table 4.4: Recovery rates by industry (distressed exchanges)

Industry	Firm recovery rate (mean)	Number and names of defaulted firms
Automotive	58.09%	1 Schefenacker
Construction	71.54%	3 Foster Wheeler, Luxfer, Fortress
Consumer products	83.40%	4 Hartmarx, Salton, Scovill Fasteners, Texon Int.
Distribution	70.00%	1 Foxus DIY
Energy & utility	95.26%	8 Abraxas Petroleum (2x), AES Drax, British Energy, Danka Business Systems, Grant Geophysical, Kelley Oil & Gas
Leisure & entertainment	71.60%	4 Clubhaus (2x), Mytravel, Silverleaf Resorts
Manufacturing	67.28%	3 Hybridon, Lexington Precision, Trikon Technologies
Media	86.24%	5 Central European Media., Charter Com., Sirius Satellite Radio, Telewest Com., XM Satellite
Metals & mining	49.32%	2 Coeur d'Alene Mines, Weirton Steel
Natural products	83.99%	1 Gaylord Container
Packaging	65.60%	1 IFCO Systems
Services	27.41%	2 Envirosource, Timco Aviation Services
Technology	42.60%	3 Acterna, Jarvis, Marconi
Telecommunications	92.63%	8 Alamosa, Esprit Tel., FiberNet Tel., Jazztel, Level 3 Com., Qwest Com., Suncom Wireless, Talk America
All	76.73%	46

Note: This table reports mean firm recovery rates for the sample of distressed exchanges in the U.S. and the U.K. from 1998 to 2007, stratified by industry. Firm recovery rate is the market value of the firm (debt plus equity) divided by face value of debt at the exchange date.

Table 4.5 shows firm recovery rates by year of default. The number of distressed exchanges picks up in 2000 (6) and peaks with the bust of the dot-com/telecom bubble in 2001 (11) and 2002 (10). Firm recovery rates are markedly lower in 2001, but surprisingly stable otherwise.

4.3 RECOVERY RATES IN DISTRESSED EXCHANGES

Table 4.5: Recovery rates by year of default (distressed exchanges)

Year	Firm recovery rate (mean)	Number and names of defaulted firms
1998	52.62%	2 Hybridon, Trikon
1999	95.71%	2 Abraxas Petroleum, Kelley Oil & Gas
2000	80.47%	3 Aviva Petroleum, Central European Media, Grant Geophysical
2001	45.31%	6 Coeur d'Alene Mines, Danka Businesses Services, Envirosource, Esprit Tel., Scovill Fasteners, Fortress
2002	78.56%	11 Acterna, Clubhaus, FiberNet Tel., Gaylord Container, Hartmarx, Qwest Com., Silverleaf Resorts, Talk America, Texon Int., Timco Aviation, Weirton
2003	89.56%	10 Abraxas Petroleum, AES Drax, Alamosa, British Energy, IFCO Systems, Jazztel, Lexington Precision, Marconi, Sirius Satellite, XM Satellite
2004	88.13%	5 Clubhaus, Foster Wheeler, Level 3 Com., Telewest Com.
2005	73.31%	3 Charter Com., Jarvis, Salton,
2007	74.84%	4 Focus DIY, Luxfer, Schefenacker, Suncom Wireless
All	76.73%	46

Note: This table reports mean firm recovery rates for the sample of distressed exchanges in the U.S. and the U.K. from 1998 to 2007, stratified by the exchange year. Firm recovery rate is the market value of the firm (debt plus equity) divided by face value of debt at the exchange date.

Table 4.6 presents summary statistics for the dependent variables (recovery rates), separately for the U.S. and the U.K. sample. The average firm recovery rate is markedly higher at 87.29% in the U.S. compared to only 58.71% in the U.K. As hypothesized (H1), companies incorporated in the creditor-friendly U.K. apparently reorganize at a much lower firm value. With average DAPR of 17.17% in the U.S. against 5.58% in the U.K., equity holders recover much more in the U.S. (17.25%) than the U.K. (2.99%), as do creditors (70.04% in the U.S. *versus* 56.17% in the U.K.). While the figures for the U.S. are broadly in line with the expectations from the example calculation derived in section 3.4 and only slightly lower than previous studies,¹¹⁷ the low U.K. debt recovery rate is surprising. I hypothesized (H2) higher debt recovery rates in the creditor-friendly jurisdiction – intuitively as well as by the model relationships expressed in equation (3.19). However, the results show that the difference in firm recovery rates is larger in absolute terms than the difference in equity recovery rates, thus still resulting in a reduced recovery value for debt holders in the U.K.¹¹⁸ In

¹¹⁷ See section 2.3. Franks and Torous (1994) report creditor recovery rates of 80.1% and deviations from absolute priority of 9.51% (of face value of debt – the corresponding figure in our sample would be 7.67%). Eberhart, Moore and Roenfeldt (1990) report 7.6% (of face value of debt) deviation from absolute priority for a sample of bankruptcy settlements.

¹¹⁸ The results are also markedly lower than debt recovery rates in U.K. out-of-court reorganizations reported by Davydenko and Franks (2008) of 78% and by Franks and Sussman (2005b) of 73.8 to 76.7%. However, the samples presented in these studies were

section 4.3.2, these results will be analyzed further to see whether the relationships hold after controlling for the independent variables in a multivariate regression analysis.

Table 4.6: Summary statistics of dependent variables (distressed exchanges)

	United States				United Kingdom			
	Mean	Median	Std. dev.	N	Mean	Median	Std. dev.	N
<i>Firm recovery rate</i>	87.29%	83.99%	36.28%	29	58.71%	63.78%	27.49%	17
<i>DAPR</i>	17.17%	11.28%	16.52%	29	5.58%	3.96%	4.75%	17
<i>Debt recovery rate</i>	70.04%	74.27%	25.26%	29	56.17%	58.53%	27.05%	17
<i>Equity recovery rate</i>	17.25%	7.11%	21.92%	29	2.99%	2.57%	2.61%	17

Note: This table reports summary statistics for recovery rates for the sample of distressed exchanges in the U.S. and the U.K. from 1998 to 2007. *Firm recovery rate* is the market value of the firm (debt plus equity) divided by face value of debt at the exchange date. *DAPR* is the deviation from absolute priority, calculated as market value of equity divided by market value of the firm. *Debt recovery rate* is the market value of debt divided by face value of debt. *Equity recovery rate* is the market value of equity divided by face value of debt.

Table 4.7 presents summary statistics for the firm characteristics. The average asset volatility is slightly higher in the U.S. with 30.03% *versus* 24.01% in the U.K.¹¹⁹ Average firm size is more than twice as large in the U.S. than the U.K. (\$1,963m and \$911m), however the median firm sizes are similar, as the U.S. sample is skewed by some very large telecommunications and media firms (e.g. Charter Communications, Level 3 and Qwest). The average coupon c_{avg} is comparable in both countries, whereas the risk-free interest rate is lower in the U.S. for most of the observation period (except a short period in 2001 and in 2006). The average number of seniority *classes* in the U.S. is 2.28, slightly higher than in the U.K. with 1.65. Whereas several U.S. firms in the sample have up to 4 seniority ranks, none have more than 2 in the U.K. sample. This may be due to a general reluctance by U.K. issuers and investors to use complex debt structures, or the later development of the U.K. high-yield debt market.¹²⁰

composed only of bank loans to small firms. As will be discussed in more detail in section 4.5, bank loans exhibit much higher recovery rates than bond debt and are thus not directly comparable with studies containing unsecured or subordinated bond debt.

¹¹⁹ This is similar to the 24.49% reported in the U.S. study of Davydenko and Strebulaev (2007) and the 23-28% for U.S. sub-investment grade issuers reported by Schaefer and Strebulaev (2008).

¹²⁰ See also de Bondt and Marqués (2004), who describe the development of the U.K. high-yield market since inception in 1997, and Armour and Deakin (2001) who discuss cause and effects of the more concentrated nature of debt structures in the U.K.

4.3 RECOVERY RATES IN DISTRESSED EXCHANGES

Table 4.7: Summary statistics of firm characteristics (distressed exchanges)

	United States				United Kingdom			
	Mean	Median	Std. dev.	N	Mean	Median	Std. dev.	N
<i>Asset volatility</i>	30.03%	29.66%	12.19%	29	24.01%	22.28%	9.33%	17
<i>Firm size (\$m)</i>	1,963	258	5.572	29	911	282	1.593	17
c_{avg}	8.65%	8.32%	1.96%	29	8.39%	7.82%	2.23%	16
r	3.07%	2.20%	1.77%	29	4.76%	4.63%	0.89%	17
<i>Classes</i>	2.28	2.00	0.92	29	1.65	2.00	0.49	17

Note: This table reports summary statistics for firm characteristics for the sample of distressed exchanges in the U.S. and the U.K. from 1998 to 2007. *Asset volatility* is the KMV asset volatility. *Firm size* is the market value of the firm (debt + equity). c_{avg} is the \$-weighted average coupon of the firm's debt instruments. r is the applicable 3-month Libor rate. *Classes* is the number of creditor classes of the issuer with different seniority ranks.

4.3.2 Regression Analysis

To determine the significance of the country effect on recovery rates, control for the impact of the independent variables and test the hypotheses developed in section 3.3, I conduct a series of regression analyses, using ordinary least squares (OLS) estimates.¹²¹

Regression analysis is a well-known, widely used technique that has been the preferred method in the previous empirical studies of recovery rates (see table 2.3 in section 2.3). Multivariate regression analysis allows to assess the impact of several independent variables together even when these are partially correlated to each other. OLS regression analysis was preferred over the use of second generation statistical models (such as structural equation modeling) given its widespread use, comparability to previous studies, robust results and ease of interpreting results.

I specify three regression equations, adding progressively more control variables. Each of the three regression equations is tested separately for each of the four measures of recovery rates as the dependent variable. Formally, we define the four measures k of the recovery rate (RR) as

$$RR_k = \begin{cases} R_V & \text{for } k = 1 \\ R_D & \text{for } k = 2 \\ R_E & \text{for } k = 3 \\ DAPR & \text{for } k = 4, \end{cases} \quad (4.1)$$

where R_V is the firm recovery rate (defined as market value of debt plus equity, divided by the face value of debt); R_D is the debt recovery rate (measured as market value of debt divided by face value of debt); R_E is the recovery rate of equity holders of the firm (market value of equity divided by face value of debt); and $DAPR$ is the deviation from the absolute priority rule (measured as market value of equity divided by the market value of the firm).

The first, univariate regression specification includes as independent variable only the *UK* country dummy variable with the linear prediction equation

$$RR_{k,j} = \beta_{0,k} + \beta_{1,k}UK_j + \varepsilon_{k,j}, \quad (4.2)$$

where $\beta_{0,k}$ is the constant, the coefficient $\beta_{1,k}$ expresses the influence of the

¹²¹ See any standard statistical textbook such as Cohen, Cohen, West and Aiken (2003), Hair, Black, Babin, Anderson and Tatham (2006) or Tabachnick and Fidell (2006) for explanations of regression techniques.

4.3 RECOVERY RATES IN DISTRESSED EXCHANGES

independent variable UK for firm j on the dependent variable $RR_{k,j}$ and $\varepsilon_{k,j}$ is the error term. The subscript k here indicates that the regression equation is estimated four times, once for each dependent variable as defined in equation (4.1).

In additional multivariate tests, I control for the independent variables related to credit risk, bargaining power and bankruptcy costs as described in section 4.2. In the second specification, I include as independent variables only the country factor and the four standard credit risk factors:¹²²

$$RR_{k,j} = \beta_{0,k} + \beta_{1,k}UK_j + \beta_{2,k}\sigma_j^2 + \beta_{3,k}c_{avg,j} + \beta_{4,k}r_j + \beta_{5,k}\ln(V_B)_j + \varepsilon_{k,j} \quad (4.3)$$

where $\beta_{1,k}$ to $\beta_{5,k}$ are regression coefficients for the independent variables, the independent variable σ^2 is the squared asset volatility of the firm, c_{avg} is the average coupon, r is the risk-free interest rate and V_B is the firm value. All the independent variables are specific to firm j and are defined as described in table 4.3 of section 4.2.

In the third specification, I also add the additional proxies for bargaining power and bankruptcy costs:

$$\begin{aligned} RR_{k,j} = & \beta_{0,k} + \beta_{1,k}UK_j + \beta_{2,k}\sigma_j^2 + \beta_{3,k}c_{avg,j} + \beta_{4,k}r_j + \beta_{5,k}\ln(V_B)_j \\ & + \beta_{6,k}classes_j + \beta_{7,k}energy\&utility_j \\ & + \beta_{8,k}short\ maturity_j + \beta_{9,k}default\ rate_j + \varepsilon_{k,j}, \end{aligned} \quad (4.4)$$

where $\beta_{6,k}$ to $\beta_{9,k}$ are regression coefficients for the additional independent variables, *classes* is the number of seniority classes, *energy & utility* is an industry dummy variable, *short maturity* is a dummy variable for debt maturing in the next 12 months and *default rate* is the average bond market default rate in the year of the firm's default.

The formulation of the regression equations links the variables known to influence recovery rates from the Fan and Sundaresan (2000) strategic renegotiation model, and additional proxies in place of the unobservable variables for bargaining power η and bankruptcy costs (α and K), as discussed in section 4.2. Given the known but undefined relationship of these additional proxies to recovery rates, a test of the model fit of the Fan and Sundaresan (2000) model to recovery data is difficult. Instead, the regression equation measures the coefficient of the influence of each of the identified parameters on recovery rates, linking them in the standard linear form in the multivariate regression equation.

¹²² Asset volatility, coupon, risk-free interest rate and firm size being easily measurable and present in almost every structural credit model as discussed in section 3.1.

The structural model of Fan and Sundaresan (2000) discussed in section 3.2 does also imply additional nonlinear relationships between the parameters that could affect the estimation results. However, the linear form of the regression equation is simpler to interpret and allows for a closed-form calculation of the least squares.¹²³ It also enhances the comparability of results to previous empirical studies of recovery rates studies (see table 2.3 in section 2.3) that have generally used a linear model.¹²⁴

4.3.3 Regression Results

Univariate regression

Table 4.8 reports univariate regression results for the country factor UK on all four dependent variables.

¹²³ See for example Cohen, Cohen, West and Aiken (2003), section 6.4.4. Challenges of using non-linear regression models include the need for iterative numeric estimation procedures and the difficulties in economically interpreting constant and coefficients. A transformation i.e. to a logarithmic model is non-trivial given the complex multiplicative and additive model relationships in the structural equations. Here, given the interest to analyze the strength of the influence of the individual factors on recovery rates, I choose interpretability over model fit.

¹²⁴ Davydenko and Strebulaev (2007) p.22 discuss this issue in their test of the Fan and Sundaresan (2000) model for credit spreads and find no significant difference when controlling for non-linear effects.

4.3 RECOVERY RATES IN DISTRESSED EXCHANGES

Table 4.8: Impact of country factor on recovery rates in distressed exchanges

	Firm recovery rate	DAPR	Debt recovery rate	Equity recovery rate
	(1)	(2)	(3)	(4)
<i>UK</i>	-0.286*** (-2.805)	-0.111*** (-2.701)	-0.139* (-1.752)	-0.143** (-2.659)
<i>Const.</i>	0.873*** (14.094)	0.172*** (6.843)	0.700*** (14.550)	0.173*** (5.292)
<i>F</i>	7.869***	7.296**	3.068*	7.071**
<i>R</i> ²	0.152	0.123	0.065	0.138
<i>N</i>	46	46	46	46

Note: This table reports the results of univariate regression analysis of corporate issuers' recovery rates for debt and equity, for the sample of distressed exchanges in the U.S. and U.K. from 1998 to 2007. The dependent variable in regression (1) is the *firm recovery rate* (defined as market value of debt plus equity, divided by the face value of debt); in regression (2) the deviation from the absolute priority rule (measured as market value of equity divided by the market value of the firm); in regression (3) the *debt recovery rate* (measured as market value of debt divided by face value of debt); and in regression (4) the recovery rate of equity holders of the firm (market value of equity divided by face value of debt). The independent variable *UK* is a country dummy. Values of t-statistics are reported in parentheses. Coefficients and F values marked ***, **, and * are significant at the 1%, 5%, and 10% significance level, respectively. Critical t-values (N = 46) are 2.687/2.013/1.679.

The country factor has a statistically significant influence on all 4 recovery rate variables:

- U.K. firms reorganize at a firm value about 28.6% (of face value of debt) lower than comparable U.S. firms, confirming Hypothesis I. Firms reorganize later in a creditor-friendly regime.
- As already seen in the descriptive statistics in table 4.6, deviations from absolute priority and equity recovery rates are significantly lower in the U.K. than the U.S. The average equity recovery rate is 14.3% (of face value of debt) lower in the U.K., which is economically highly significant considering a mean equity recovery rate in the U.S. of 17.25%. These results support Hypothesis II and IV – *equity holders are less able to extract value from creditors in a creditor-friendly regime.*
- Debt recovery rates are also significantly and on average 13.9% lower in the U.K. than the U.S. This result is contrary to Hypothesis III. Equation (3.19) shows that in the Fan and Sundaresan (2000) model, creditors should always benefit from a better bargaining position. Also, “intuitively” one would expect for a creditor-friendly regime to offer higher recovery rates for creditors. After all, scholars have long argued that creditor rights are important to protect creditors and maximize debt recovery rates in default.¹²⁵ However, the data sample shows that even

¹²⁵

See for example Jackson (1982).

though deviations from absolute priority are much lower in the U.K., creditors are more affected by the lower firm value in the U.K.

Multivariate regression

Table 4.9 reports multivariate regression results for all four dependent variables in each of the two regression specifications (including control variables).

F-statistics show all regressions to be statistically significant at least at the 10% level. They also have economically significant explanatory values, with adjusted R^2 values between 0.091 and 0.368¹²⁶

Again, the results show a significant effect of the country dummy *UK* on all recovery rates even after adjusting for the firm specific factors in all regressions except regression (6). Most importantly, comparing the univariate results to the two multivariate regression equation results, one notes that while the addition of the control variables has significantly enhanced the explanatory value of the regression equations (R^2), the coefficient values for the *UK* country dummy remain largely stable, enhancing its validity. Only for the dependent variable *debt recovery rate* does the coefficient vary more strongly (0.139/0.176/0.105). The reported adjusted R^2 values are also significantly higher than in comparable studies of recovery rates, underlining the validity of the model.¹²⁷

¹²⁶ For the multivariate regressions, I report the lower, adjusted R^2 values that correct for the number of independent variables and sample size.

¹²⁷ The only other cross-country study of recovery rates I am aware of, by Davydenko and Franks (2008), reports adjusted R^2 value of 6.2% to 10.7%.

4.3 RECOVERY RATES IN DISTRESSED EXCHANGES

Table 4.9: Determinants of recovery rates in distressed exchanges

	Firm recovery rate		DAPR		Debt recovery rate		Equity recovery rate	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>UK</i>	-0.292**	-0.243**	-0.103**	-0.136***	-0.176**	-0.105	-0.113*	-0.135**
	(-2.632)	(-2.163)	(-2.090)	(-2.709)	(-2.124)	(-1.321)	(-1.893)	(-2.149)
<i>Asset volatility</i> ²	-0.315	-0.223	0.394	0.424	-0.946**	-0.899**	0.628*	0.674**
	(-0.514)	(-0.375)	(1.449)	(1.597)	(-2.069)	(-2.144)	(1.894)	(2.028)
<i>ln(firm value)</i>	0.089***	0.057*	0.006	0.008	0.058**	0.031	0.032*	0.027
	(2.827)	(1.666)	(0.401)	(0.506)	(2.472)	(1.258)	(1.844)	(1.393)
<i>c_{avg}</i>	1.111	-0.973	0.758	0.354	-0.983	-2.157	2.081	1.156
	(0.436)	(-0.364)	(0.673)	(0.296)	(-0.518)	(-1.142)	(1.513)	(0.772)
<i>r</i>	-0.688	-7.330*	0.462	-1.106	-0.452	-4.246	-0.156	-3.000
	(-0.203)	(-1.668)	(0.308)	(-0.562)	(-0.179)	(-1.368)	(-0.085)	(-1.218)
<i>Classes</i>		0.013		-0.059**		0.063		-0.049
		(0.192)		(-2.028)		(1.370)		(-1.350)
<i>Energy & utility</i>		0.342**		-0.042		0.305***		0.034
		(2.447)		(-0.670)		(3.093)		(0.430)
<i>Short maturity</i>		-0.135		-0.004		-0.083		-0.053
		(-1.137)		(-0.076)		(-0.988)		(-0.799)
<i>Default rate</i>		-0.019		-0.009		-0.007		-0.011
		(-1.415)		(-1.448)		(-0.801)		(-1.546)
<i>Const.</i>	-0.910	0.183	-0.058	0.184	-0.237	0.402	-0.682	-0.222
	(-1.146)	(0.198)	(-0.166)	(0.444)	(-0.400)	(0.616)	(-1.589)	(-0.428)
<i>F</i>	3.959***	3.198***	1.896	1.824*	3.796***	3.910***	3.182**	2.256**
<i>Adj. R²</i>	0.247	0.305	0.091	0.142	0.237	0.368	0.195	0.201
<i>N</i>	46	46	46	46	46	46	46	46

Note: This table reports the results of regression analysis of corporate issuers' recovery rates for debt and equity, for the sample of distressed exchanges in the U.S. and U.K. from 1998 to 2007. The dependent variable in regression (1) and (2) is the *firm recovery rate* (defined as market value of debt plus equity, divided by the face value of debt); in regression (3) and (4) the deviation from the absolute priority rule (measured as market value of equity divided by the market value of the firm); in regression (5) and (6) the debt recovery rate (measured as market value of debt divided by face value of debt); and in regression (7) and (8) the recovery rate of equity holders of the firm (market value of equity divided by face value of debt). The independent variable *UK* is a country dummy. *Asset volatility*² is the squared KMV asset volatility. *ln(firm value)* is the logarithm of the market value of the firm. *c_{avg}* is the average cost of debt of the firm. *r* is the applicable 3-month Libor rate. *Classes* is the number of creditor classes of the issuer with different seniority ranks. *Energy & utility* is a dummy for firms in the energy or utility sectors. *Short maturity* is a dummy variable indicating if an issuer has a debt maturity in the next 12 months. *Default rate* is the default rate of U.S. corporate bonds in the event year as reported by Altman, Karlin and Kay (2008). Values of t-statistics are reported in parentheses. Coefficients marked ***, **, and * are significant at the 1%, 5%, and 10% significance level, respectively. Values of t-statistics are reported in parentheses. Coefficients and F values marked ***, **, and * are significant at the 1%, 5%, and 10% significance level, respectively. Critical t-values (N = 46) are 2.687/2.013/1.679.

As control variables, I included credit risk factors (asset volatility σ , the average coupon c_{avg} and the risk free interest rate r), bargaining power proxies (*classes* and the *short maturity* dummy) and bankruptcy cost proxies (the normalized *firm size*, a dummy for the *energy & utility* industry and the U.S. market *default rate* in the year of the issuers default). I find significant coefficients for *asset volatility*, *firm size* and the *energy & utility* dummy.

Riskier firms have significantly lower debt recovery rates and higher equity recovery rates, as value gets shifted from creditors to equity holders.

The firm size has a statistically and economically significant positive influence on firm recovery rates, as well as on debt and equity recovery rates, though the effect is slightly lessened when including the additional control variables in regressions (2), (6) and (8). Hypothesizing a link between firm size and bankruptcy costs (fixed costs have a smaller impact on recovery rates when spread over a larger firm value), one clearly would have expected a positive sign effect for firms in the bankruptcy sample (with smaller incurred bankruptcy costs). For the sample of distressed exchanges instead, one would have expected a negative sign from the model relationships for the firm recovery rate, equity recovery rate and DAPR, as firms with lower fixed bankruptcy costs should have a lower incentive to reorganize later (see also see the sensitivities and signs in table 3.2). Possible explanations for the inverted sign could be a link of firm size with possible transactions costs of the reorganization itself (larger firms can better afford to conduct complex capital structure reorganizations),¹²⁸ instrument liquidity and information issues (smaller firms may shun the information requirements to obtain debt and equity holder approvals for a reorganization, or have different managerial incentives).

The *energy & utility* dummy is highly significant with the expected sign. Comparable firms in the energy & utility industry have on average more than 30% (of face value) higher debt and firm recovery rates. The inclusion of this highly significant dummy variable does also reduce the coefficient and the significance of the country effect on debt recovery rates in regression (6), linked to the fact that the U.K. sample has a larger proportion of firms in the sectors.

Classes has a statistically significant effect only in regards to deviations from absolute priority, though the negative impact is small.¹²⁹

¹²⁸ See Gilson (1997) for a discussion of the link between asset structure and transaction costs in reorganizations.

¹²⁹ Using the number of securities as an alternative measure yields similar results.

4.3 RECOVERY RATES IN DISTRESSED EXCHANGES

The average coupon rate, the risk free interest rate (except in regression (2)) and the *short maturity* dummy are not statistically significant. Empirically, this result is in line with other recovery rate studies¹³⁰ and not particularly surprising for firms near bankruptcy, given that upon the filing of the bankruptcy the terms of the existing indebtedness become nearly meaningless. While credit risk models discussed in chapter 3 highlight the relationship of c and r to the reorganization boundary, in practice this influence may be less clear for firms with complex debt structures, rolling maturities and diverse lending terms.¹³¹

Finally, for the sample of distressed exchanges I cannot confirm the link between market default rates and recovery rates found in studies of bankruptcy settlements.¹³² This may be due to the lesser credit deterioration in distressed exchanges, or that the timing of distressed exchanges is more discretionary than filing for bankruptcy, allowing the firm to choose an appropriate time with less market disruptions. I also tested frequently used alternative measures for the economic environment such as GDP growth or changes in the MSCI World index, however these did not prove more significant.¹³³

Robustness of the regression results is evaluated along several dimensions in addition to the above detailed t-tests and F-tests for significance. Residuals scatterplots are screened for the assumptions of multivariate analysis (normality, linearity and homoscedasticity).¹³⁴ The independent variables are tested for multicollinearity. The Pearson correlations matrix (see table 4.10) shows that several – economically intuitive – correlations are statistically significant. As already shown in table 4.7, the U.K. exhibits higher risk-free interest rates and U.K. borrowers generally have less complex capital structures (fewer classes). Firm size is linked to the average coupon (larger firms can borrow more cheaply) and classes (larger firms have more complex capital structures). The risk free

¹³⁰ Acharya, Bharath and Srinivasan (2007) control for the bond coupon and find no significant influence on bond recovery rates in bankruptcies. Altman, Brady, Resti and Sironi (2005) control for the risk-free rate and find no significant effect on default recovery rates, likewise Davydenko and Strebulaev (2007) find no significant influence on sub-investment grade credit spreads.

¹³¹ Alternative measures for r (e.g. treasury rates) or the debt maturity profile (e.g. shortest/average maturity, proportion of short term debt) are also not significant.

¹³² Altman, Brady, Resti and Sironi (2005) link default recovery rates to market supply of defaulted bonds; Acharya, Bharath and Srinivasan (2007) link recovery rates to market supply of assets from distressed industries.

¹³³ As the risk-free rate and default-rate are both time-dependent variables measured at the default date of the firm, it could also be useful to test for lagged-effects of these variables instead.

¹³⁴ See any statistical textbook, for example Tabachnick and Fidell (2006), section 5.3.2.

interest rate is linked to the default rate and the number of classes. However, the low values of the variance inflation (VIF) indicate that these correlations do not pose a problem for the multivariate analysis. VIF is reported in table 4.10 for the multivariate regression with firm recovery rate as the dependent variable and all the independent variables included. The VIF remains below 2 for all regressions and variables, and thus significantly below the critical value for VIF of 10.¹³⁵

Table 4.10: Pearson's correlation matrix and variance inflation factor (distressed exchanges)

	UK	Asset vol. ²	ln(firm value)	c_{avg}	r	Classes	Energy & utility	Short maturity	Default rate	VIF
<i>UK</i>	1	-.237	.027	-.062	.485	-.364	.005	-.180	-.289	1.517
<i>Asset volatility²</i>	-.237	1	-.049	.007	-.270	.081	-.068	.071	.271	1.129
<i>ln(firm value)</i>	.027	-.049	1	-.392	-.249	.359	.029	.165	-.150	1.743
<i>c_{avg}</i>	-.062	.007	-.392	1	-.066	-.089	-.031	-.270	-.037	1.469
<i>r</i>	.485	-.270	-.249	-.066	1	-.419	.288	-.200	-.506	2.856
<i>Classes</i>	-.364	.081	.359	-.089	-.419	1	-.024	.257	-.001	1.524
<i>Energy & utility</i>	.005	-.068	.029	-.031	.288	-.024	1	.349	-.099	1.452
<i>Short maturity</i>	-.180	.071	.165	-.270	-.200	.257	.349	1	.094	1.468
<i>Default rate</i>	-.289	.271	-.150	-.037	-.506	-.001	-.099	.094	1	1.747

Note: This table reports the Pearson correlation coefficients and the VIF (variance inflation factor) for the independent variables used in the regression analysis for the distressed exchanges sample. The VIF is shown for the multivariate regression with firm recovery rate as the dependent variable and all the independent variables included. The independent variable *UK* is a country dummy. *Asset volatility²* is the squared KMV asset volatility. *ln(firm value)* is the logarithm of the market value of the firm. c_{avg} is the average cost of debt of the firm. r is the applicable 3-month Libor rate. *Classes* is the number of creditor classes of the issuer with different seniority ranks. *Energy & utility* is a dummy for firms in the energy or utility sector. *Short maturity* is a dummy variable indicating if an issuer has a debt maturity in the next 12 months. *Default rate* is the default rate of U.S. corporate bonds in the event year as reported by Altman, Karlin and Kay (2008).

¹³⁵ As suggested for example by Cohen, Cohen, West and Aiken (2003) p.423 and Hair, Black, Babin, Anderson and Tatham (2006) p.230. In addition to the VIF, I also tested for multicollinearity of the variables using the conditioning index proposed by Belsley, Kuh and Welsch (2004). None of the regressions exceed the suggested critical value of 30 for the conditioning index coupled with variance proportions greater than 0.5 for at least two variables.

4.4 Recovery Rates in Bankruptcies

This section discusses descriptive statistics and regression analyses for the sample of 277 bankruptcies in the United States and the United Kingdom.

4.4.1 Descriptive Statistics

Table 4.11 presents firm recovery rates for the sample of bankruptcies, split by industry group:

Table 4.11: Recovery rates by industry (bankruptcies)

Industry	Firm recovery rate (mean)	Number of firms
Automotive	52.49%	6
Chemicals	39.29%	5
Construction	34.57%	2
Consumer products	53.64%	24
Distribution	59.98%	36
Energy & utility	71.08%	21
Environment	17.85%	3
Healthcare	48.13%	17
Leisure & entertainment	62.57%	12
Manufacturing	78.83%	22
Media	48.01%	9
Metals & mining	59.19%	14
Natural products	66.21%	3
Packaging	72.79%	2
Services	48.26%	25
Technology	52.11%	16
Telecommunications	34.88%	49
Transportation	48.61%	11
All	53.31%	277

Note: This table reports mean firm recovery rates for the sample of bankruptcies in the U.S. and the U.K. from 1998 to 2007, stratified by industry. Firm recovery rate is the market value of the firm (debt plus equity) divided by the face value of debt at emergence from bankruptcy.

Compared to the sample of distressed exchanges, the bankruptcy sample contains a larger number of distribution, services and manufacturing companies. Particularly noteworthy is the markedly lower recovery rate in the telecommunications sector, most of which occurred during the telecom bust in 2001 and 2002. The energy & utility sector again exhibits far above average recovery rates also for the bankruptcies sample (together with the manufacturing and with the packaging sector, though the latter with an insignificant sample size).

Table 4.12 shows firm recovery rates by year of default. The number of bankruptcies peaks with the bust of the dot-com/telecom bubble in 2001 (65) and 2002 (57). Recovery rates are low during this period but rise strongly thereafter, consistent with theories correlating default and recovery rates (see p.66).

Table 4.12: Recovery rates by year of default (bankruptcies)

Year	Firm recovery rate (mean)	Number of Firms
1998	44.87%	12
1999	55.13%	30
2000	50.17%	42
2001	49.10%	65
2002	40.86%	57
2003	68.60%	33
2004	57.21%	17
2005	69.96%	12
2006	100.20%	7
2007	84.24%	2
All	53.31%	277

Note: This table reports mean firm recovery rates for the sample of distressed exchanges in the U.S. and the U.K. from 1998 to 2007, stratified by the year of default. Firm recovery rate is the market value of the firm (debt plus equity) divided by face value of debt at emergence from bankruptcy.

Table 4.13 presents summary statistics for the dependent variables in the bankruptcy sample. Unfortunately, with only 9 bankruptcies in the U.K. sample (compared to 268 in the U.S.), statistical significance is limited. No other bankruptcies of firms with traded debt and equity could be identified in the U.K. Nevertheless, it is interesting to note the marked differences in the observed mean recovery rates between both countries. As for the sample of distressed exchanges, all recovery rates are much lower in the U.K. than in the U.S. The firm recovery rate in the U.K. is only 21.14% vs. 52.68% in the U.S. – with almost no deviations from absolute priority in the creditor-friendly regime, equity holders’ ability to extract concessions in formal bankruptcy proceedings is close to zero. Focusing on the U.S. sample, it is not surprising that all recovery rates are significantly lower than for distressed exchange (compare table 4.13 and table 4.6). Firm recovery rates are lower given bankruptcy costs, and deviations from absolute priority are also lower given reduced benefits from bargaining as detailed in section 2.1.1. The reported recovery rates are broadly in line with previous U.S. studies.¹³⁶

¹³⁶ For example, Altman and Eberhart (1994) p.70 report average ultimate debt recovery rates of 50.46%.

4.4 RECOVERY RATES IN BANKRUPTCIES

Table 4.13: Summary statistics of dependent variables (bankruptcies)

	United States				United Kingdom			
	Mean	Median	Std. dev.	N	Mean	Median	Std. dev.	N
<i>Firm recovery rate</i>	54.39%	48.37%	46.42%	268	21.14%	1.67%	28.43%	9
<i>DAPR</i>	4.52%	0.53%	11.97%	268	0.22%	0.00%	0.67%	9
<i>Debt recovery rate</i>	48.77%	46.27%	28.13%	268	21.01%	1.67%	28.22%	9
<i>Equity recovery rate</i>	5.72%	0.15%	31.56%	268	0.14%	0.00%	0.41%	9

Note: This table reports summary statistics for recovery rates for the sample of bankruptcies in the U.S. and the U.K. from 1998 to 2007. *Firm recovery rate* is the market value of the firm (debt plus equity) divided by face value of debt at emergence from bankruptcy. *DAPR* is the deviation from absolute priority, calculated as market value of equity divided by market value of the firm. *Debt recovery rate* is the market value of debt divided by face value of debt. *Equity recovery rate* is the market value of equity divided by face value of debt.

Table 4.14 presents summary statistics for the independent variables. Asset volatility, coupon, risk-free rate and the number of seniority classes are broadly in line with the distressed exchange sample (see table 4.7), as would be expected for independent samples. The average firm values however are much lower in both countries for the bankruptcy sample compared to the distressed exchange sample (63% lower in the U.S.; 68% lower in the U.K.). Partially, this would be expected given lower firm recovery rates in bankruptcies. However, the differences in firm values are higher than can be explained by recovery rates or the default boundary alone. Another explanation would be a downscaling of the firm between the boundary points for distressed exchange and bankruptcy – as the firm becomes distressed and unable to refinance, it will neglect growth opportunities and may attempt to repay its debts as they become due as long as possible from liquidity and asset sales in order to avoid insolvency. By the time it files for bankruptcy, it may be a much smaller firm.¹³⁷ Finally, there may also be a sample bias in that smaller firms are more reluctant to complete a distressed exchange given transaction costs and management competence required for such a transaction.¹³⁸

¹³⁷ This effect has been reported for firms within bankruptcy for example by Hotchkiss (1995) p.11, who finds median declines in revenues, assets, and employees close to 50 percent during bankruptcy.

¹³⁸ See for example Baird, Bris and Zhu (2007), who discuss the relatively high bankruptcy costs and complexity of bargaining with creditors of small firms. On the other hand, Morrison (2009) argues that small firms do frequently and successfully bargain with their lenders.

Table 4.14: Summary statistics of firm characteristics (bankruptcies)

	United States				United Kingdom			
	Mean	Median	Std. dev.	N	Mean	Median	Std. dev.	N
<i>Asset volatility</i>	31.64%	30.92%	13.98%	268	33.72%	33.00%	9.03%	9
<i>Firm size (\$m)</i>	534	165	1,555	268	199	23	392	9
<i>c_{avg}</i>	8.82%	8.81%	2.21%	268	10.94%	10.84%	2.17%	9
<i>r</i>	3.00%	1.99%	1.96%	268	5.06%	5.19%	1.01%	9
<i>Classes</i>	2.30	2.00	0.93	268	1.33	1.00	0.71	9

Note: This table reports summary statistics for firm characteristics at default for the sample of bankruptcies in the U.S. and the U.K. from 1998 to 2007. *Asset volatility* is the KMV asset volatility. *Firm size* is the market value of the firm (debt + equity). *c_{avg}* is the \$-weighted average coupon of the firm's debt instruments. *r* is the applicable 3-month Libor rate. *Classes* is the number of creditor classes of the issuer with different seniority ranks.

4.4.2 Regression Analysis

The regression equation for the bankruptcy sample is constructed in the same way as for the distressed exchange sample. Thus the first, univariate specification reads:

$$RR_{k,j} = \beta_{0,k} + \beta_{1,k}UK_j + \varepsilon_{k,j}. \quad (4.5)$$

where $\beta_{0,k}$ is the constant, the coefficient $\beta_{1,k}$ expresses the influence of the independent variable *UK* for firm *j* on the dependent variable $RR_{k,j}$ and $\varepsilon_{k,j}$ is the error term. $RR_{k,j}$ stands for the four measures of the recovery rate (R_V , R_D , R_E , $DAPR$) as defined in equation (4.1) for the regression analysis of the distressed exchange sample, with the subscript *k* indicating that the regression equation is estimated four times, once for each dependent variable.

The second, multivariate specification includes the credit risk factors:

$$RR_{k,j} = \beta_{0,k} + \beta_{1,k}UK_j + \beta_{2,k}\sigma_j^2 + \beta_{3,k}c_{avg,j} + \beta_{4,k}r_j + \beta_{5,k}\ln(V_B)_j + \varepsilon_{k,j} \quad (4.6)$$

where $\beta_{1,k}$ to $\beta_{5,k}$ are regression coefficients for the independent variables, the independent variable σ^2 is the squared asset volatility of the firm, c_{avg} is the average coupon, r is the risk-free interest rate and V_B is the firm value. All the independent variables are specific to firm *j* and are defined as described in table 4.3 of section 4.2.

In the third specification, I add the proxies for bargaining power and bankruptcy costs as in the analysis of the distressed exchange sample. I also include as an additional proxy for bankruptcy costs the dummy variable *liquidated* for firms that were liquidated rather than reorganized in bankruptcy:

4.4 RECOVERY RATES IN BANKRUPTCIES

$$\begin{aligned}
 RR_{k,j} = & \beta_{0,k} + \beta_{1,k}UK_j + \beta_{2,k}\sigma_j^2 + \beta_{3,k}c_{avg,j} + \beta_{4,k}r_j + \beta_{5,k}\ln(V_B)_j \\
 & + \beta_{6,k}classes_j + \beta_{7,k}energy\&utility_j \\
 & + \beta_{8,k}short\ maturity_j + \beta_{9,k}default\ rate_j \\
 & + \beta_{10,k}liquidated_j + \varepsilon_{k,j},
 \end{aligned}
 \tag{4.7}$$

where $\beta_{6,k}$ to $\beta_{9,k}$ are regression coefficients for the additional independent variables, *classes* is the number of seniority classes, *energy & utility* is an industry dummy variable, *short maturity* is a dummy variable for debt maturing in the next 12 months, *default rate* is the average bond market default rate in the year of the firm's default, and *liquidated* is a dummy variable indicating that the firm was liquidated.

4.4.3 Regression Results

Univariate regression

Table 4.15 reports univariate regression results for the country factor UK on all four dependent variables.

Table 4.15: Impact of country factor on recovery rates in bankruptcies

	Firm recovery rate	DAPR	Debt recovery rate	Equity recovery rate
	(1)	(2)	(3)	(4)
<i>UK</i>	-0.315** (-2.572)	-0.043 (1.104)	-0.273*** (-2.941)	-0.043 (-.665)
<i>Const.</i>	0.527*** (23.835)	0.045*** (6.443)	0.483*** (28.873)	0.045*** (3.806)
<i>F</i>	6.614**	1.218	8.650***	0.433
<i>R</i> ²	0.020	0.001	0.027	-0.002
<i>N</i>	277	277	277	277

Note: This table reports the results of univariate regression analysis of corporate issuers' recovery rates for debt and equity, for the sample of bankruptcies in the U.S. and U.K. from 1998 to 2007. The dependent variable in regression (1) is the firm recovery rate (defined as market value of debt plus equity, divided by the face value of debt); in regression (2) the deviation from the absolute priority rule (measured as market value of equity divided by the market value of the firm); in regression (3) the debt recovery rate (measured as market value of debt divided by face value of debt); and in regression (4) the recovery rate of equity holders of the firm (market value of equity divided by face value of debt). The independent variable UK is a country dummy. Values of t-statistics are reported in parentheses. Coefficients and F values marked ***, **, and * are significant at the 1%, 5%, and 10% significance level, respectively. Critical t-values (N = 277) are 2.594/1.969/1.65.

As for the sample of distressed exchanges, I can confirm a statistically significant and similar-size negative influence of the country factor U.K. on firm recovery rates, and a slightly larger and more significant negative effect on debt recovery rates. I do not find a statistically significant effect on equity recovery rates and deviations from absolute priority. While inspection of means in table 4.13 clearly shows that both are much lower in the U.K., statistical significance is reduced

both by the small sample U.K. size ($N = 9$) and the very high standard deviation of equity recovery rate and DAPR. While most U.K. bankruptcies have equity recovery rates of zero, so do many U.S. bankruptcies, with medians for the U.K. of 0%, and 0.15% for the U.S.

- For the bankruptcies sample, Hypothesis I is confirmed. *Firms reorganize at a lower firm value in a creditor-friendly regime.*
- We cannot confirm or negate hypotheses II and III.
- As in the sample of distressed exchanges, we find evidence contrary to Hypothesis IV – *the creditor-friendly U.K. regime has lower recovery rates than the equity-friendly U.S. regime.* Again, creditors are worse off in U.K. bankruptcies due to significantly lower firm values at bankruptcy resolution compared to the U.S.

Multivariate regression

Table 4.16 reports regression results for all four dependent variables in each of the two regression specifications (including the control variables):

F-statistics show all regressions to be statistically significant at the 1% level (regression (4) at the 5% level). They also have economically significant explanatory value particularly for debt and firm recovery rates ((1), (2), (5) and (6)) with adjusted R^2 values between 0.247 and 0.349. The explanatory value for the regressions of *equity recovery rate* and *DAPR* are much lower however at 0.047 and 0.046 for *DAPR* (regressions (3) and (4)) and 0.043 and 0.054 for equity recovery rates (regressions (7) and (8)).

The negative effect of the country factor on firm and debt recovery rates is confirmed, though statistical significance is lost in regression (2) after inclusion of the control variables. Generally, we observe that the coefficient and significance of *UK* is reduced the more control variables are included. Whereas the coefficient of the univariate regression estimated U.K. firms to have 27.3% (of face value) lower debt recovery rates than comparable U.S. firms, this is reduced to 13.7% in the multivariate regression. The change highlights the importance to control for additional factors in addition to creditor rights across countries in the bankruptcies sample. In particular, we find a strong impact of the *default rate* on the significance of the *UK* coefficient; given that the U.K. sample is more concentrated in the high default years of 2000 to 2002 (excluding this control variable from regression (2) again shows a high significance of the country factor).

Regression analysis of the bankruptcy sample also provides a number of interesting insights into the effect of the control variables on the recovery rates. As for the distressed exchange sample, the regressions include as control variables credit risk factors (asset volatility σ , the average coupon c_{avg} , and the

4.4 RECOVERY RATES IN BANKRUPTCIES

risk free interest rate r), bargaining power proxies (*classes* and the *short maturity* dummy) and bankruptcy cost proxies (the normalized firm size, the *energy & utility* dummy, the *default rate* in the year of the issuers default and for the bankruptcy sample also the *liquidated* dummy).

Table 4.16: Determinants of recovery rates in bankruptcies

	Firm recovery rate		DAPR		Debt recovery rate		Equity recovery rate	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>UK</i>	-0.207*	-0.155	-0.061	-0.060	-0.179**	-0.137*	-0.031	-0.019
	(-1.863)	(-1.424)	(-1.562)	(-1.462)	(-2.116)	(-1.663)	(-0.474)	(-0.274)
<i>Asset volatility</i> ²	-0.268*	-0.282*	0.010	0.018	-0.257**	-0.278**	-0.022	-0.015
	(-1.740)	(-1.941)	(0.179)	(0.320)	(-2.199)	(-2.535)	(-0.236)	(-0.160)
<i>ln(firm value)</i>	0.102***	0.119***	0.010**	0.010**	0.071***	0.085***	0.029***	0.031***
	(7.647)	(8.627)	(2.030)	(2.016)	(7.056)	(8.243)	(3.615)	(3.555)
<i>c_{avg}</i>	-1.121	-0.287	0.469	0.555	-1.691**	-1.049	0.546	0.734
	(-1.185)	(-0.319)	(1.406)	(1.637)	(-2.357)	(-1.544)	(0.972)	(1.294)
<i>r</i>	3.841***	1.168	1.154***	1.025**	2.720***	0.538	1.071*	0.582
	(3.779)	(1.008)	(3.219)	(2.352)	(3.527)	(0.616)	(1.774)	(0.798)
<i>Classes</i>		-0.060***		-0.011		-0.044***		-0.016
		(-2.939)		(-1.371)		(-2.837)		(-1.226)
<i>Energy & utility</i>		0.100		0.036		0.016		0.084*
		(1.455)		(1.380)		(0.315)		(1.934)
<i>Short maturity</i>		0.152***		0.010		0.118***		0.037
		(3.865)		(0.695)		(4.009)		(1.486)
<i>Default rate</i>		-2.110***		-0.024		-1.848***		-0.250
		(-3.874)		(-0.116)		(-4.502)		(-0.729)
<i>Liquidated</i>		0.070*		-0.007		0.060**		0.006
		(1.732)		(-0.443)		(1.992)		(0.229)
<i>Const.</i>	-1.376***	-1.478***	-0.212**	-0.211*	-0.762***	-0.846***	-0.571***	-0.582***
	(-4.731)	(-5.027)	(-2.063)	(-1.908)	(-3.453)	(-3.820)	(-3.308)	(-3.144)
<i>F</i>	19.138***	15.105***	3.752***	2.339**	19.332***	15.782***	3.491***	2.582***
<i>Adj. R²</i>	0.247	0.338	0.047	0.046	0.249	0.349	0.043	0.054
<i>N</i>	277	277	277	277	277	277	277	277

Note: This table reports the results of regression analysis of corporate issuers' recovery rates of debt and equity, for the sample of bankruptcies in the U.S. and U.K. from 1998 to 2007. The dependent variable in regression (1) and (2) is the firm recovery rate (defined as market value of debt plus equity, divided by the face value of debt); in regression (3) and (4) the deviation from the absolute priority rule (measured as market value of equity divided by the market value of the firm); in regression (5) and (6) the debt recovery rate (measured as market value of debt divided by face value of debt); and in regression (7) and (8) the recovery rate of equity holders of the firm (market value of equity divided by face value of debt). The independent variable *UK* is a country dummy. *Asset volatility*² is the squared KMV asset volatility. *ln(firm value)* is the logarithm of the market value of the firm. *c_{avg}* is the average cost of debt of the firm. *r* is the applicable 3-month Libor rate. *Classes* is the number of creditor classes of the issuer with different seniority ranks. *Energy & utility* is a dummy for firms in the energy or utility sector. *Short maturity* is a dummy variable indicating if an issuer has a debt maturity in the next 12 months. *Default rate* is the default rate of U.S. corporate bonds in the event year as reported by Altman, Karlin and Kay (2008). *Liquidated* is a dummy variable indicating if the issuer has been liquidated as a result of the bankruptcy proceedings. Values of t-statistics are reported in parentheses. Coefficients and F values marked ***, **, and * are significant at the 1%, 5%, and 10% significance level, respectively. Critical t-values (N = 277) are 2.594/1.969/1.65.

All the control variables except *energy & utility* and the average coupon have a statistically significant influence on debt and firm recovery rates. However, as

reflected in the lower adjusted R^2 values for those regressions, only a few variables have significant influence on equity recovery rates and *DAPR*: the firm size, the risk free interest rate and the *energy & utility dummy* (regression (8) only).

Firm size has the economically strongest effect on all recovery rates, especially equity recovery rates. This finding is consistent with the presence of significant fixed bankruptcy costs.

Riskier firms exhibit significantly lower debt recovery rates and firm recovery rates, also for the bankruptcy sample.

All recovery rates are higher for firms that default in a high interest rate environment. One explanation is that a high interest rate environment makes it more difficult to refinance maturing debt (regularly or in a distressed exchange), thus forcing firms into bankruptcy at an earlier stage.

However, statistical significance of the risk-free rate is lost when *default rate* is included as an additional explanatory variable. This is not surprising giving the high correlation between the two variables of 0.54 (see table 4.17), by far the highest of any variables in the analysis. A high default rate is often associated with high interest rates.¹³⁹ Apparently, it is not so much the risk-free rate that has a significant economic impact on recovery rates (via a lower default point), but rather the default rate (via higher bankruptcy costs in fire sales).

A high number of *classes* significantly reduce firm and debt recovery rates, but not equity recovery rates or *DAPR*. The complexity inherent in the number of classes in a bankruptcy thus seems to affect less the bargaining power of claimants than the bankruptcy costs incurred in lengthy negotiations.

For the bankruptcy sample, the *energy & utility dummy* only has a significant, positive effect on equity recovery rates in the multivariate regression. Firm recovery rates – while above average for the industry as seen in table 4.11 – are not significantly different after controlling for other factors such as firm size.

Debt and firm recovery rates are statistically and economically significantly higher in the presence of *short maturity* debt. This is consistent with the expectation that maturing debt provides an external trigger for bankruptcies, at higher firm values, and generally with a view of bankruptcy as triggered by liquidity default rather than strategic default.

¹³⁹ See Moody's Analytics (2009) for a detailed discussion of the theoretical and empirical relationships.

4.4 RECOVERY RATES IN BANKRUPTCIES

Finally, we expected the *liquidated* dummy to have a negative influence on all recovery rates due to the incurrence of additional liquidation costs. Contrary to this, we rather find a small positive influence on firm and debt recovery rates in the multivariate regression, even though the mean recovery rates are lower for liquidations in the sample. While firms that get liquidated have both lower recovery rates and smaller firm size in the sample,¹⁴⁰ liquidation costs may in effect not be higher than Chapter 11 reorganization costs for similar firms when they have easily sellable assets and where liquidation provides a quicker resolution of the bankruptcy.

As detailed for the regression analysis for the distressed exchange sample in section 4.3.3, robustness of the regression results is supported by residual screening for normality, linearity and homoscedasticity,¹⁴¹ and the independent variables are tested against multicollinearity using the VIF and the conditioning index by Belsley, Kuh and Welsch (2004). Table 4.17 shows the correlation matrix for the independent variables and the VIF (significantly below the critical value of 10 for all regressions).

¹⁴⁰ In our sample, mean firm size is 58% smaller and mean firm recovery rate is 16% (of face value of debt) smaller than for reorganized firms.

¹⁴¹ Note that residual screening of the regressions with equity recovery rate or DAPR as dependent variables revealed these to be skewed in the bankruptcy sample. A logarithmic transformation of the dependent variables here greatly improves the estimation results, normality of residuals and R^2 . However, I decided against using transformed values for the dependent variables here for consistency among the regressions and to preserve interpretability of the results.

Table 4.17: Pearson's correlation matrix and variance inflation factor (bankruptcies)

	UK	Asset vol. ²	ln(firm value)	c_{avg}	r	Classes	Energy & utility	Short maturity	Default rate	Liqui- dated	VIF
UK	1	.004	-.180	.168	.176	-.169	-.051	-.121	.050	.162	1.162
Asset volatility ²	.004	1	-.072	-.124	-.076	.005	-.069	.041	.042	.116	1.046
ln(firm value)	-.180	-.072	1	-.284	-.098	.322	.104	.066	.061	-.300	1.386
c_{avg}	.168	-.124	-.284	1	.250	.060	-.002	-.086	-.073	.033	1.238
r	.176	-.076	-.098	.250	1	-.036	.107	.006	-.540	-.065	1.610
Classes	-.169	.005	.322	.060	-.036	1	.014	.064	.075	-.106	1.187
Energy & utility	-.051	-.069	.104	-.002	.107	.014	1	.061	-.030	-.045	1.037
Short maturity	-.121	.041	.066	-.086	.006	.064	.061	1	.015	-.049	1.031
Default rate	.050	.042	.061	-.073	-.540	.075	-.030	.015	1	.114	1.490
Liquidated	.162	.116	-.300	.033	-.065	-.106	-.045	-.049	.114	1	1.150

Note: This table reports the Pearson correlation coefficients and the VIF (variance inflation factor) for the independent variables used in the regression analysis for the bankruptcies sample. The VIF is shown for the multivariate regression with firm recovery rate as the dependent variable and all the independent variables included. The independent variable *UK* is a country dummy. *Asset volatility*² is the squared KMV asset volatility. *ln(firm value)* is the logarithm of the market value of the firm. c_{avg} is the average cost of debt of the firm. r is the applicable 3-month Libor rate. *Classes* is the number of creditor classes of the issuer with different seniority ranks. *Energy & utility* is a dummy for firms in the energy or utility sector. *Short maturity* is a dummy variable indicating if an issuer has a debt maturity in the next 12 months. *Default rate* is the default rate of U.S. corporate bonds in the event year as reported by Altman, Karlin and Kay (2008). *Liquidated* is a dummy variable indicating if the issuer has been liquidated as a result of the bankruptcy proceedings.

4.5 Recovery Rates on an Instrument Level

The previous two chapters presented results for the distressed exchange and the bankruptcy samples aggregated on a firm level. This chapter analyses unaggregated instrument level recovery data, and the interplay of instrument and firm level factors on recovery rates.

4.5.1 Descriptive Statistics

The importance of instrument seniority for recovery rates can be seen in table 4.18, where bond recovery rates for the whole sample are stratified by seniority class.

There is a clear instrument hierarchy of bankruptcy recovery rates (right half of table 4.18), with the most senior instrument (revolver loans) recovering on average 76.02% at default, and the most junior instrument (junior subordinated bonds) recovering on average only 14.18%. Loans typically recover more than bonds as they are frequently better collateralized and benefit from stronger covenant protection than secured bonds. Revolvers frequently have higher recovery rates than term loans, as revolvers are not always fully drawn and banks

4.5 RECOVERY RATES ON AN INSTRUMENT LEVEL

may be able to prevent a distressed borrower from drawing on the loan prior to default.¹⁴² Interesting to note is also that the median recovery rate is typically higher than the mean for the senior instrument, whereas the opposite is true for junior instruments. This indicates a positively skewed recovery rate distribution for defaulted loans and a negatively skewed one for defaulted junior debt. We explore this point in more detail in section 4.6.1.

Table 4.18: Recovery rates in the U.S and the U.K. by instrument type

Instrument type	Distressed Exchange				Bankruptcies			
	Mean	Median	Std. dev.	N	Mean	Median	Std. dev.	N
Revolver loans	97.38%	100.00%	8.43%	33	76.02%	94.26%	31.33%	316
Term loans	88.42%	100.00%	20.29%	39	64.51%	71.33%	32.61%	284
Senior secured bonds	70.30%	95.00%	37.23%	17	51.21%	41.91%	33.21%	229
Senior unsecured bonds	66.16%	68.40%	27.31%	107	38.16%	27.71%	32.23%	552
Senior subordinated bonds	65.16%	60.49%	32.98%	14	20.14%	6.06%	31.70%	130
Subordinated bonds	65.40%	56.73%	36.89%	18	17.03%	4.61%	28.14%	97
Junior subordinated bonds	73.02%	73.02%	23.61%	2	14.18%	0.89%	26.85%	13
All debt instruments	74.66%	81.66%	28.98%	230	49.10%	44.39%	37.16%	1,621
Equity	11.98%	4.99%	18.70%	46	5.54%	0.14%	31.05%	277

Note: This table reports summary statistics for instrument recovery rates at resolution in the U.S. and the U.K. from 1998 to 2007, stratified by instrument and default type.

Instrument recovery rates in distressed exchanges (left half of table 4.18) are much higher (as expected from the discussion in section 2.1.2) and differentiate less between instrument seniority – even junior lenders expect a sizeable payoff to participate in a distressed exchange at all. Noteworthy is also that both loan types typically recover 100% in distressed exchanges, as banks are generally much more reluctant than bondholders to take any write offs on their loans.¹⁴³

4.5.2 Regression Analysis

As the number of debt instruments per firm varies widely in both samples, including them all in the instrument level regression analysis would bias the sample, overweighting large firms and overestimating goodness of fit for the common (firm specific) variables. I therefore choose two debt instruments for each issuer to construct balanced clusters, one instrument from the most senior class and another one from the second most senior class. In case of multiple

¹⁴² Loan contracts specify conditions precedent to drawing that typically include among other covenant tests, non-default clauses and material adverse change clauses. See the Loan Market Association's standardized Multicurrency Term and Revolving Facilities Agreement.

¹⁴³ See also Asquith, Gertner and Scharfstein (1994) and James (1996) who discuss how banks seek to avoid write-offs.

instruments in a class, I choose the bond with the largest issue size, as it is likely to be the most liquid.¹⁴⁴

The regression equations are constructed in a similar way as for the firm level analysis.

The recovery rate of instrument i of firm j ($R_{j,i}$) is a function of the firms overall debt recovery $R_{D,j}$, and how this is distributed among the different debt classes. As a measure of instrument seniority, we introduced the measure *percent below_j*, indicating the percentage of debt of firm j subordinated to the instrument i .

Thus, the first specification reads:

$$R_{j,i} = \beta_0 + \beta_1 \text{percent below}_{j,i} + \beta_2 R_{D,j} + \varepsilon_{j,i}. \quad (4.8)$$

where β_0 is the constant, β_1 and β_2 are regression coefficients for the two independent variables, and $\varepsilon_{j,i}$ is the error term.

In the second specification, $R_{D,j}$ is replaced by the independent variables hypothesized to influence debt recovery rates in the firm level analysis. For the distressed exchange sample, this reads:

$$\begin{aligned} R_{j,i} = \beta_0 + \beta_1 \text{percent below}_{j,i} + \beta_2 UK_j + \beta_3 \sigma_j^2 + \beta_4 (c/r)_{j,i} \\ + \beta_5 \ln(V_B)_j + \beta_6 \text{classes}_j + \beta_7 \text{energy\&utility}_j \\ + \beta_8 \text{short maturity}_j + \beta_9 \text{default rate}_j + \varepsilon_{j,i}. \end{aligned} \quad (4.9)$$

where β_2 to β_9 are regression coefficients for the additional independent variables, the independent variable UK is the country dummy, σ^2 is the squared asset volatility of the firm, c/r is the coupon divided by the risk-free interest rate, *classes* is the number of debt seniority classes of the firm, *energy & utility* is an industry dummy variable, *short maturity* is a dummy variable for debt maturing in the next 12 months and *default rate* is the average bond market default rate in the year of the firm's default.

Note that, whereas the average coupon c_{avg} and the risk-free interest rate r were used in the firm level analysis, here the instrument coupon c is used and combined with the risk free interest rate r to a new variable c/r , that can be interpreted as the instruments credit spread. On the firm level analysis, the average coupon c_{avg} is a measure of the cost of debt of the firm, influencing the

¹⁴⁴ Issuers with only one class of debt are nevertheless included, with just one bond from that class. Altogether, 532 bonds are thus chosen for the 277 issuers in the sample.

firm's capacity to service its debt and thus the default boundary. On the instrument level, the individual instrument's coupon is largely meaningless regarding the default boundary. Instead, the credit spread c/r provides a measure of the riskiness of the instrument.

For the second specification regarding the bankruptcy sample, the *liquidated* dummy variable is also added to control for the resolution type:

$$\begin{aligned}
 R_{j,i} = & \beta_0 + \beta_1 \text{percent below}_{j,i} + \beta_2 UK_j + \beta_3 \sigma_j^2 + \beta_4 (c/r)_{j,i} \\
 & + \beta_5 \ln(V_B)_j + \beta_6 \text{classes}_j + \beta_7 \text{energy\&utility}_j \\
 & + \beta_8 \text{short maturity}_j + \beta_9 \text{default rate}_j \\
 & + \beta_{10} \text{liquidated}_j + \varepsilon_{j,i}.
 \end{aligned} \tag{4.10}$$

4.5.3 Regression Results

Table 4.19 presents results of multivariate regression analysis of instrument recovery rates, separately for the distressed exchanges and bankruptcies samples.

F-statistics show all regressions to be statistically significant at the 1% level.

As debt recovery is defined as the average recovery rate across a firm's debt instruments, we expect to be able to explain instrument recovery entirely by debt recovery and the distribution of it among the firm's debt instruments. Indeed, the adjusted R^2 of 0.724 (distressed exchange sample) and 0.730 (bankruptcy sample) indicate that *debt recovery* and *percent below* together explain more than two-thirds in the variation of instrument recovery rates. Each of the two independent variables explains approximately half of the variance, with standardized coefficients (not shown) of 0.664/0.541 for *percent below* and 0.549/0.613 for *debt recovery*. I also test alternative measures for instrument seniority (not shown) used in previous studies, such as the seniority class, the presence of collateral and whether the instrument is private bank debt or public bond debt. While all these measures are statistically significant, they do not add substantially to the explanatory value of the regression when included together with the measure *percent below*, and have a lower statistical and economic significance when included on their own. Previous empirical studies (see table 2.3 in section 2.3) have generally used other control variables to account for instrument seniority. One difficulty of using *percent below* may be the necessity to determine exactly the capital structure of the issuer of the debt instrument. Given the much higher significance of this measure for recovery rates in this study, it should nevertheless be considered when pricing defaultable claims.

4 EMPIRICAL STUDY OF U.K. AND U.S. RECOVERY RATES

Table 4.19: Determinants of instrument recovery rates

	Distressed Exchanges		Bankruptcies	
	(1)	(2)	(3)	(4)
<i>Percent below</i>	0.528*** (9.463)	0.545*** (6.216)	0.741*** (29.440)	0.791*** (24.457)
<i>Debt recovery rate</i>	0.759*** (10.712)		0.768*** (24.334)	
<i>UK</i>		-0.158** (-2.322)		-0.142** (-2.157)
<i>Asset volatility</i> ²		-0.469 (-1.335)		-0.156* (-1.860)
<i>ln(firm value)</i>		0.038** (2.227)		0.076*** (9.829)
<i>c/r</i>		0.002 (0.175)		-0.009* (-1.793)
<i>Classes</i>		-0.013 (-0.319)		-0.111*** (-8.823)
<i>Energy & utility</i>		0.201*** (2.654)		0.045 (1.118)
<i>Short maturity</i>		-0.066 (-1.022)		0.118*** (5.061)
<i>Default rate</i>		0.302 (0.452)		-1.270*** (-4.139)
<i>Liquidated</i>				0.029 (1.201)
Const.	0.058 (1.125)	-0.107 (-0.316)	-0.058*** (-3.111)	-0.777*** (-5.369)
F	112.715***	8.186***	717.578***	73.588***
Adj. R ²	0.724	0.432	0.730	0.539
N	85	85	532	532

Note: This table reports the results of regression analysis of instrument recovery rates for the sample of distressed exchanges and bankruptcies in the U.S. and U.K. from 1998 to 2007. The independent variable *percent below* is the percentage of the issuer's debt that is subordinated to this instrument. *Debt recovery rate* is the \$-weighted average recovery rate of all the issuers debt. The independent variable *UK* is a country dummy. *Asset volatility*² is the squared KMV asset volatility. *ln(firm value)* is the logarithm of the market value of the firm. *c/r* is the coupon of the debt instrument divided by the applicable 3-month Libor rate at default. *Classes* is the number of creditor classes of the issuer with different seniority ranks. *Energy & utility* is a dummy for firms in the energy or utility sector. *Short maturity* is a dummy variable indicating if an issuer has a debt maturity in the next 12 months. *Default rate* is the default rate of U.S. corporate bonds in the event year as reported by Altman, Karlin and Kay (2008). Values of t-statistics are reported in parentheses. Coefficients and F values marked ***, **, and * are significant at the 1%, 5%, and 10% significance level, respectively. Critical t-values for N = 85 are 2.636/1.989/1.663 and for N = 532 are 2.585/1.964/1.648.

In regressions (2) and (4), *debt recovery* is replaced by the *UK* country dummy and other independent variables known to influence debt recovery rates from the firm level analysis. Again, both regressions are highly significant with adjusted R² of 0.432 and 0.539.

The country factor has a statistically significant (at the 5% level), negative influence on the debt recovery rate also on the instrument level. The regression

equation predicts U.K. instrument recovery rates to be 15.8%/14.2% (of face value) lower than for comparable U.S. instruments.

Results for the control variables are generally in line with the results for the analysis of debt recovery rates on the firm level. Firm size again has a statistically and economically highly significant positive effect for both samples. In addition, the *energy & utility* dummy is significant for the distressed exchange sample. The asset volatility, *c/r*, *classes*, *short maturity* and the *default rate* only affect the bankruptcy sample.

4.6 Recovery Rates and Prices at Default

The discussion in this chapter so far has focused on recovery rates as measured by ultimate recovery at emergence from bankruptcy or the effective date of the distressed exchange. In this section, we analyze the link between default recovery and ultimate recovery, and the return characteristics of defaulted instruments in bankruptcies.

The default recovery is measured as the trading price at default (taken 30 calendar days post the default announcement to give prices time to adjust to the default event). The sample excludes any debt instruments without trading prices available at the time of default.¹⁴⁵ Given the small number of bankruptcy reorganizations in the U.K. sample, the analysis in this section is limited to the U.S. sample.

4.6.1 Return Characteristics of Defaulted Debt

Table 4.20 shows the default price, ultimate recovery rate, skewness of ultimate recovery rates and bankruptcy period internal rate of return of defaulted debt instruments, stratified by instrument type.

¹⁴⁵ This excludes a large number of untraded bank loans as well as illiquid bonds without current prices at default.

Table 4.20: Instrument recovery and bankruptcy period returns in the U.S.

Instrument type	Default price	Ultimate recovery rate					
	Mean	Mean	Median	Std. dev.	Skew	IRR	N
Revolver loans	64.97%	67.26%	74.48%	29.16%	-0.558	2.55%	81
Term loans	62.31%	61.10%	65.78%	29.01%	-0.383	-1.50%	133
Senior secured bonds	50.67%	59.02%	60.89%	28.50%	-0.408	6.65%	64
Senior unsecured bonds	37.08%	40.57%	34.40%	32.79%	0.257	5.31%	285
Senior subordinated bonds	18.96%	17.08%	5.94%	24.65%	1.688	-7.84%	83
Subordinated bonds	17.42%	13.33%	5.64%	19.31%	2.040	-20.03%	38
Junior subordinated bonds	8.57%	0.24%	0.24%	n.a.	n.a.	n.a.	2
All debt instruments	43.17%	44.96%	43.43%	34.15%	0.110	3.17%	686
Equity	5.04%	5.72%	0.15%	31.79%	9.968	10.35%	264

Note: This table reports default prices, ultimate recovery rates and bankruptcy period returns for the instruments of bankrupt corporate issuers in the U.S. from 1998 to 2007, stratified by instrument type. IRR is the internal rate of return from default to emergence from bankruptcy, weighted by instrument face value.

The bankruptcy period (from default to emergence from bankruptcy) internal rate of return (IRR) of each instrument class is derived as proposed by Fridson and Yan (2002) as a simple, unweighted return on the class mean price. Fridson and Yan assume the mean time in bankruptcy for the whole sample as the holding period to calculate discounted returns. In contrast, I calculate and apply the mean times in bankruptcy separately for each instrument type, with a mean time in bankruptcy across the whole sample of 1.3 years. This allows to consider for differences across instrument types. Interestingly, the mean time for secured bonds is much longer (2.4 years) than for subordinated bonds (1.2 years). This may reflect the reluctance of secured debt holders to realize write-offs, and their greater willingness for longer negotiations, given that secured debt incurs interest payments during bankruptcy proceedings, whereas unsecured debt holders' interest is frozen.¹⁴⁶

Fridson and Yan (2002) find that subordinated bonds significantly underperform senior debt. While the degree of underperformance decreases over time when comparing an earlier sample from 1980 to 1992 to a sample from 1992 to

¹⁴⁶ Typical junk bond investors, such as hedge funds, also have high return hurdles and short investment horizons. Bank lenders, however, tend to be more concerned about loss-avoidance. These effects are studied in detail by Helwege (1999), who finds that the presence of junior bondholders is related to quicker resolution of bankruptcy, whereas bank lenders tend to take longer to resolve bankruptcy proceedings.

4.6 RECOVERY RATES AND PRICES AT DEFAULT

2000,¹⁴⁷ Fridson and Yan query whether this is really indicative of learning by bond investors.

I can confirm the underperformance of subordinated bonds for my more recent observation period of 1998 to 2008, again the subordinated bond classes all show a negative IRR. This finding supports the argument that investors have not learned from past low returns, or that other, fundamental reasons drive the underperformance of the asset class.

One reason may be the significant positive skewness of the subordinated debt classes. Ward and Griepentrog (1993) report defaulted bond returns to have significant positive skewness. Looking at our sample, we find that subordinated bonds do have a low median payoff (see column 4 of table 4.20) but occasionally very high returns, i.e. a positively skewed distribution. For loans and secured bonds however, the median is higher than the mean for loans – this indicates a negatively skewed return distribution. The possibility to earn very high returns (a number of subordinated bonds in the sample exhibit total returns larger than 1000%) is highly attractive to investors in junior defaulted debt, often hedge funds, that praise their own ability for asset selection and are incentivized to seek such returns.¹⁴⁸ The skewness of recovery rates by instrument class is calculated in column six of table 4.20. The table shows a clear hierarchy of skewness by seniority rank, with the secured asset classes (incl. loans) exhibiting negative skewness and the subordinated asset classes and equity exhibiting very positive skewness.¹⁴⁹

Fig. 4.2 illustrates this point, showing the recovery distributions separately for loans (revolver and term loans), unsecured bonds and subordinated (incl. junior and senior subordinated) bonds.

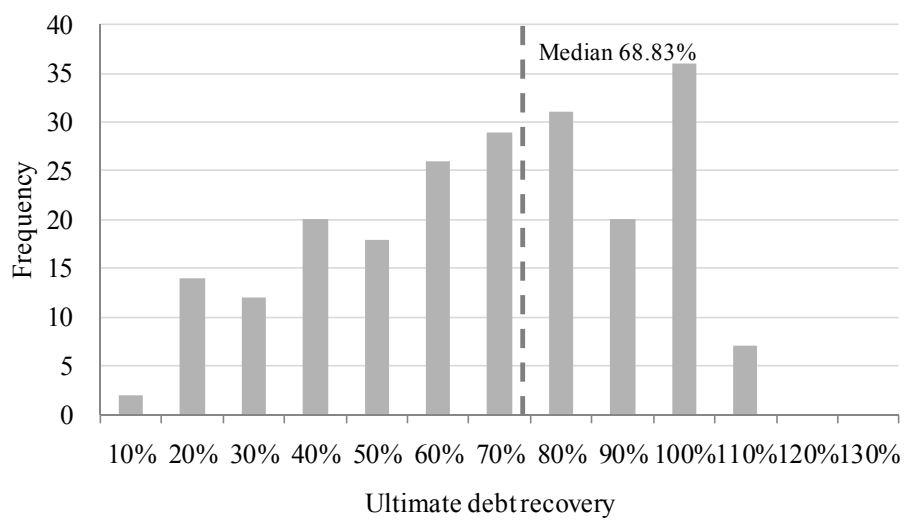
¹⁴⁷ Fridson and Yan (2002) extrapolate returns from mean recovery rates reported by Altman and Eberhart (1994) for 1980 to 1992. In their own sample from 1992 to 2000, senior subordinated bonds perform better though subordinated bonds overall still underperform.

¹⁴⁸ See for example Flood (2001) p.268ff.

¹⁴⁹ Skewness is the third standardized central moment of the return distribution (here: the recovery distribution), and can be calculated as $s = \frac{E[(x - \text{mean})^3]}{\sigma^3}$. For more details on the calculation and properties of skewness, see for example Engelbrecht (2008).

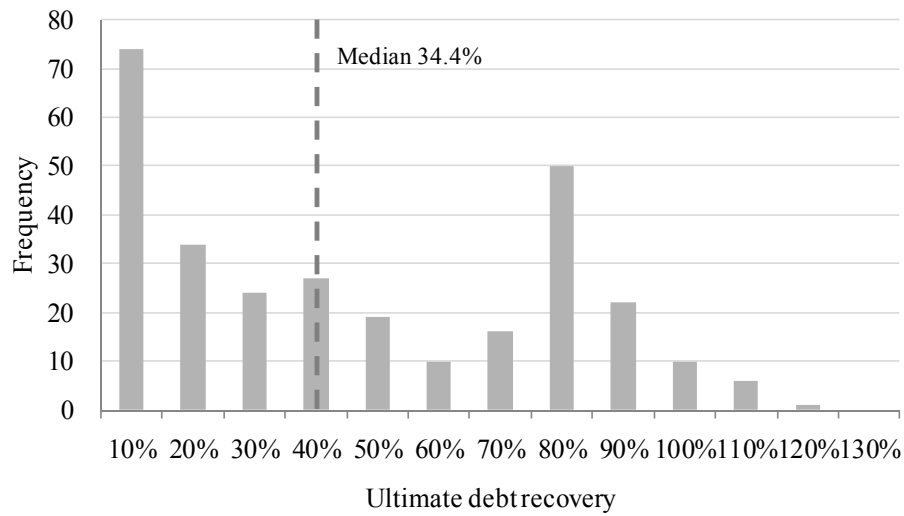
Fig. 4.2: Recovery distributions by instrument type

a) Loans

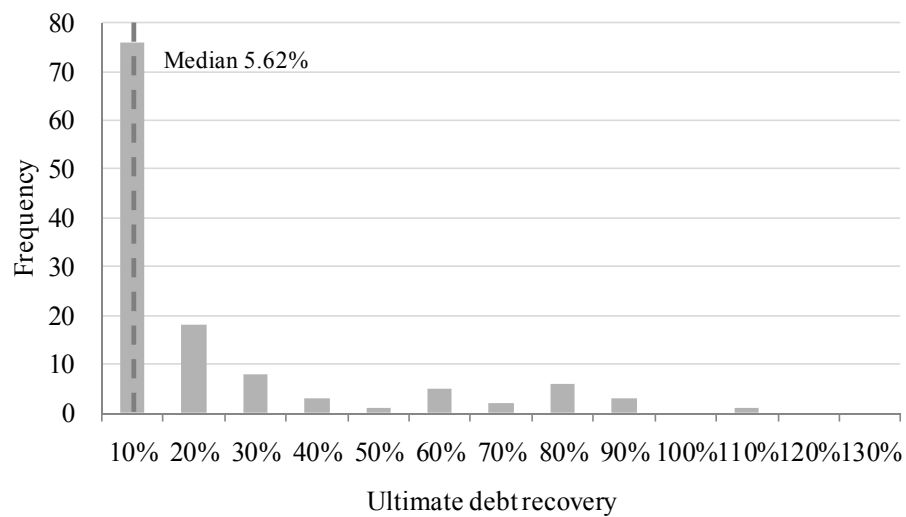


4.6 RECOVERY RATES AND PRICES AT DEFAULT

b) Unsecured bonds



c) Subordinated bonds



Note: This figure shows ultimate recovery rates of the instruments of bankrupt corporate issuers in the U.S. from 1998 to 2007, split by instrument type. Recovery rates are grouped in decimals. N = 686.

Indeed, the recovery distributions are starkly different. Loan recovery rates are widely spread between 20% and 100%, with recovery rates close to 100% not uncommon.¹⁵⁰ Defaulted subordinated bonds have a lottery like pay-off: whereas in most cases they fail to recover more than 10% of face value, the recovery distribution shows a fat right tail with several observations of payoffs in the range of 80-90%.

Defaulted debt has in recent years frequently been cited as an attractive alternative asset class with low correlations to traditional asset classes.¹⁵¹ Given the very different return distributions of individual defaulted debt classes, they may attract different types of investors wishing to include them as an alternative class in their portfolio allocations.¹⁵² It would thus be worthwhile for future empirical research to differentiate these asset classes' characteristics in more detail.

It should be pointed out that the sample presented in table 4.20 only includes those instruments with available default prices. However, for a significant portion of debt instruments (N = 907) no default prices are available. Comparing the ultimate recovery rates of these two parts of the sample, we find them to be broadly similar across the instrument classes except for bank loans, with term loans in the sample without default prices showing average recovery rates 5.2% higher and revolver loans even 13.3% higher than presented in table 4.20. This difference is economically significant, and raises the question why traded bank loans would be of lower value than untraded bank loans. The most likely explanation is that banks are only selling those loans they expect to be seriously impaired, and are more comfortable holding the higher quality loans. While there is ample literature on the uniqueness of banks loans and bank's portfolio management, evidence on loan trading remains sparse. Gande and Saunders (2009) find that the first time a loan trades in the secondary market, it elicits a positive stock movement for the borrower. Dahiya, Puri and Saunders (2003) on the other hand show that loan sales generally are more common for debtors with weak operating and financial performance, and also convey additional private information to the market that the bank has about the relative weakness of the

¹⁵⁰ Note that 57 instruments in the sample have recovery rates above 100% (the largest being the subordinated bond of DDI with 136.9% recovery of face value). This was usually due to some positive price development in the securities (often equity) offered to creditors during the bankruptcy period between plan proposal and emergence (for example for the bonds of Foster Wheeler, Mirant and Dade Behring), or in a few cases due to agreed default interest rates that were higher than the contractual pre-default interest rate on that instrument (for example Regal Cinemas).

¹⁵¹ See for example Anson (2002).

¹⁵² See Guse and Rudolf (2007) for a discussion of portfolio optimization with skewness.

borrower. And Altman, Gande and Saunders (2010) find that banks private information of a borrowers financial distress is reflected in falling loan prices ahead of a default event, as banks sell problematic loans. The initial evidence presented in this thesis – that loan sales in secondary loan markets are associated with an adverse selection bias – raises interesting implications for market participants and researchers in secondary loan markets and warrants further study.

4.6.2 Efficiency of Debt Markets in Predicting Bankruptcy Settlements

Many academics and practitioners focus on the recovery rate at default as measured by the default price instead of ultimate recovery rates to calibrate their models.¹⁵³ One advantage of that approach is that trading prices are easily observable in the market, and many market participants do trade out of distressed securities following an insolvency filing, thus considering default price as their true recovery.

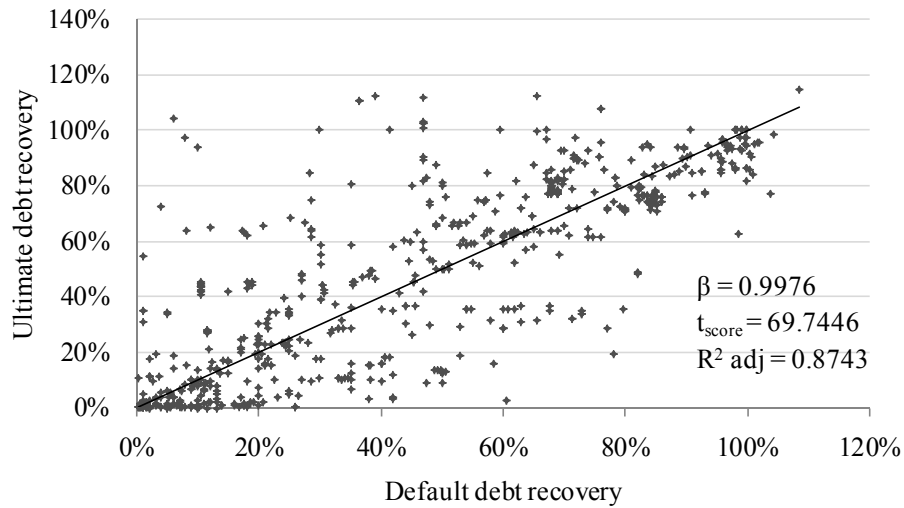
However, this also raises the question whether default prices are good indicators of ultimate recovery rates. Previous studies have found mixed evidence. Eberhart, Moore and Roenfeldt (1990) for a sample of 30 U.S. bankruptcies from 1979 to 1985 find equity prices at default to be good predictors of discounted ultimate recovery rates, even when accounting for deviations from absolute priority. Eberhart and Sweeney (1992) similarly find defaulted bond prices to be efficient in anticipating ultimate bankruptcy settlements for their sample from 1979 to 1990. On the other hand, as described in the previous section, Fridson and Yan (2002) and others have found widely varying returns by debt instrument type. Campbell, Hilscher and Szilagyi (2008) find abnormally low (negative) returns for distressed equity in their sample of U.S. listed companies from 1963-1998. In particular, anticipating deviations from absolute priority seems to be difficult. Eberhart and Sweeney (1996) find that as much as 85% of the noise in prices of defaulted securities may be attributable to deviations from absolute priority.

In the following, I therefore analyze the relationship of recovery rates at default and at emergence, for debt and equity instruments of firms in the bankruptcy sample. I plot simple linear regressions to test the predictive value of default

¹⁵³ See Altman and Hotchkiss (2006) p.307.

prices on ultimate recovery rates.¹⁵⁴

Fig. 4.3: Regression of default debt recovery on ultimate debt recovery



Note: This figure shows the influence of default recovery on ultimate recovery for the debt instruments of bankrupt corporate issuers in the U.S. from 1998 to 2007. The sample includes all U.S. bankruptcy cases with available default recovery, $N = 686$.

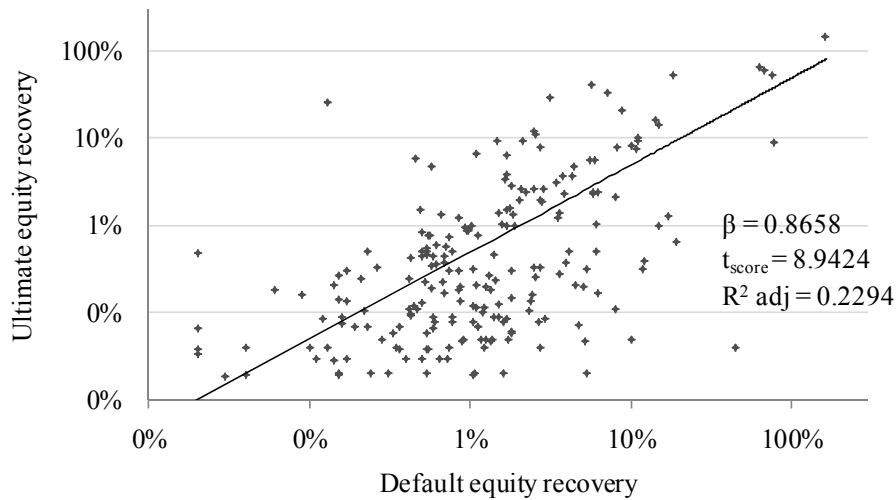
Fig. 4.3 shows a scatter plot and linear regression of the default prize and ultimate recovery for debt instrument in the sample.

The default prize is a statistically highly significant (at the 1% level) indicator of ultimate recovery rates, and explains about 87.43% (R^2) of variations. The slope of the linear regression is close to 1. Apparently, default prices (seen over the whole sample) are very good indicators of ultimate recovery rates.

¹⁵⁴ This approach is similar to the study of Eberhart, Moore and Roenfeldt (1990). However, they additionally differentiate regression coefficients by the proportion of the ultimate recovery rate paid in adherence and in deviation to absolute priority, and find both components to be reflected in default prices.

4.6 RECOVERY RATES AND PRICES AT DEFAULT

Fig. 4.4: Regression of default equity recovery on ultimate equity recovery



Note: This figure shows the influence of default equity recovery on ultimate equity recovery for bankrupt corporate issuers in the U.S. from 1998 to 2007. The sample includes all U.S. bankruptcy cases with available equity default recovery, $N = 264$.

Fig. 4.4 shows the scatter plot for default price and ultimate recovery for equity. As can be seen, equity recovery rates spread more widely. The explanatory value of default prices is relatively low with an adjusted R^2 of only 22.94%. The slope is slightly lower than one, indicating that the expected ultimate equity price is lower than the default price (though outliers pull up average ultimate recoveries). Apparently, equity recovery rates are far more difficult to predict by market participants than debt recovery rates. Given that equity holders are only residual claimants and exposed to any variations in firm value and deviations in absolute priority, this result is not surprising.

4.7 Hypotheses Testing and Interpretation

The results presented in this chapter show a significant influence of the country factor on recovery rates in distressed exchanges and bankruptcies, on both the firm and the instrument level.

Hypothesis I is confirmed for both distressed exchanges and bankruptcies: *Firms in creditor-friendly jurisdictions reorganize at a lower firm value.*

Hypothesis II is confirmed for distressed exchanges: *Creditor-friendly jurisdictions have lower deviations from absolute priority.* (Results for the bankruptcy sample are not conclusive).

Hypothesis III is rejected, instead the data show for both distressed exchanges and bankruptcies: *Creditor-friendly jurisdictions have lower recovery rates for debt.*

Hypothesis IV is confirmed for distressed exchanges: *Creditor-friendly jurisdictions have lower recovery rates for equity.* (Results for the bankruptcy sample are not conclusive).

Confirming hypothesis I, we find that strategic delay plays a significant role in the U.K., with average firm recovery rates in distressed exchanges approximately 30% (of face value) lower than in the U.S., for both distressed exchanges and bankruptcies. While this finding *per se* does not answer the question of which country's bankruptcy system is more efficient, the dramatically large effect size does highlight the need for additional research into the economic implications of such strategic delay.

Hypotheses II and IV are confirmed for the distressed exchange sample. Clearly, equity holders are able to extract more concessions from creditors when the jurisdiction accords few rights creditors. Such bargaining is particularly pronounced in distressed exchanges, given its voluntary nature. In bankruptcy proceedings however, potential cost savings are diminished, and equity holders' bargaining power is weakened as they have to share control of the firm and of the timing of financial reorganization with creditors and the courts. Interesting to note is that deviations from absolute priority do exist in the creditor-friendly U.K. regime at all (frequently for distressed exchanges), and are not a feature unique to the U.S. jurisdiction, on which academic studies of deviations from absolute priority have focused to date.

The rejection of hypothesis III contradicts expectations. Economic intuition dictates that a creditor-friendly regime should result in higher recovery rates for creditors. The model relationships portrayed in equation (3.19) highlighted the opposing effects for debt recovery rates, with firms reorganizing at a lower firm value but with lower deviations from absolute priority. Empirically, the results

show that the reorganization boundary is substantially lower in the U.K., while savings for creditors by avoiding deviations from absolute priority are small.¹⁵⁵

Across the samples, recovery rates for the firm, debt, and equity, as well as deviations from absolute priority, are significantly higher for distressed exchanges than for bankruptcies. This reflects both the more voluntary nature of distressed exchanges, compared to bankruptcy filings, and their lower transaction costs.

Results for debt recovery rates (hypothesis III) on the firm level are also confirmed on the instrument level. Instrument recovery rates are significantly lower in the U.K. than in the U.S. The inclusion of other firm-level control variables significantly enhances the predictive value of the regression equation. However, the most important determinant of instrument recovery rates is the instrument seniority as measured by the subordinated debt cushion (*percent below*). Ultimate recovery rates vary substantially by instrument seniority, with junior instrument exhibiting positive skewness and senior instruments negative skewness. While holding returns during the bankruptcy period are seen to vary strongly among firms and instrument types, markets are fairly efficient in pricing debt instruments at the time of default, accounting for both ultimate firm recovery and deviations from absolute priority.

Overall, the study has demonstrated the importance of considering differences in creditor rights across countries in predicting recovery rates.

4.8 Limitations and Alternative Explanations

4.8.1 Model Assumptions

Theoretically, I motivated my hypotheses on the Fan and Sundaresan (2000) model, assuming a strategic default decision of equity holders in distressed exchanges and bankruptcies that is dependent on equity holders' relative bargaining power vs. creditors. However, the low debt recovery rates observed in the U.K. imply that other explanations in addition to differences in bargaining power may be necessary to explain the effect of the country factor on debt

¹⁵⁵ On the other hand, Davydenko and Franks (2008) p.14 compare the recovery rates of their sample in the U.K., Germany and France to those found in other studies for the U.S. They express surprise to find relatively high recovery rates in the U.S. which they attribute to creditor rights in the U.S. that are stronger than estimated by the LSSV score. In contrast, I postulate that it is specifically the far weaker creditor rights in the U.S. that lead to higher recovery rates there, as firms default strategically at higher firm values.

recovery rates. Possible explanations could be non-strategic default, sample bias, or the role of management and other stake holders.

The derived hypotheses have only considered the renegotiation boundary in the context of strategic defaults. This seems a reasonable assumption for out-of-court distressed exchanges. And indeed, the debt recovery rates predicted by the Fan and Sundaresan (2000) model are close to empirical values observed in distressed exchanges in the U.S.¹⁵⁶ For the U.K. sample however, observed firm recovery rates are much lower than predictable by the Fan and Sundaresan model (for the distressed exchange sample and even more so for the bankruptcy sample). Entering as the independent variables in our simple example of section 3.4 the observed means of the U.K. distressed exchanges sample ($r = 4.76\%$, $c = 8.39\%$, $\sigma = 24.01\%$ and $\tau = 0.35$), we obtain a minimum value for the reorganization boundary V_B of 71.36% (for $\eta = 0$, the boundary is independent of bankruptcy costs and equals the solution as derived by Leland (1994)). This is much higher than the empirically observed mean U.K. recovery rate for distressed exchanges of 58.71%. Yet even at this lower empirical firm recovery rate, we can still observe deviations from absolute priority for almost all cases in the U.K. sample. Firm recovery rates in both samples also vary much more widely (between 0.21% and 162.2%) than can be explained by the theoretical model alone. A main assumption of strategic default models is that equity holders need to inject new equity into the firm to cover cash-flow shortfalls, and thus have an incentive to default and reorganize strategically. In practice however, equity holders may not need to inject cash into an unprofitable firm for a while if the firm has enough cash reserves. Instead, equity holders may choose to strategically delay default for as long as possible. Exogenous factors – such as liquidity or covenant constraints rather than strategic considerations – may then later lead to a default event at a lower boundary value and force the firm to restructure.¹⁵⁷ Given these incentives, we can assume that a creditor-friendly regime such as the U.K. has more such exogenous default events than an equity-friendly regime as U.S. In fact, 10 of the 17 distressed exchanges in the U.K. sample were preceded by a payment default, possibly indicating liquidity problems.¹⁵⁸ This would be consistent with the observed lower recovery rates for the firm and for debt holders. Bargaining in default to avoid formal bankruptcy still allows equity holders to obtain a small payout.

¹⁵⁶ Table 3.2 in section 3.4 shows the values predicted by the model for a range of reasonable input parameters.

¹⁵⁷ Davydenko (2009) finds a large variation in the default boundary and default trigger (low asset value or liquidity constraint) for a sample of U.S. defaults.

¹⁵⁸ Some of these (for example AES Drax, Clubhaus, Avon Energy) also had extended periods of up to 12 months of negotiations with creditors until the terms of a distressed exchange could finally be agreed upon.

The samples may also be biased if firms choose not only the reorganization boundary differently in both countries, but also the type of procedure, i.e. whether to reorganize in bankruptcy or out-of-court. For example, it may be that U.K. firms conducting an out-of-court reorganization in the U.K. might have chosen to reorganize in a lenient Chapter 11 bankruptcy process in the U.S. instead if located there. The high frequency of distressed exchanges and liquidations in the U.K. compared to the high frequency of bankruptcy reorganizations in the U.S. (as documented in table 4.1 of chapter 4) supports this notion. This could particularly be the case for firms with low firm value or complex debt structures, making a formal proceeding more attractive. Such firms would exhibit a lower firm recovery rate than firms conducting a distressed exchange in the U.S. Similarly, there may well be distressed firms in the U.K. who never appear in either sample – having strategically delayed bankruptcy long enough for a business recovery to occur, these firms may recover and avoid any kind of reorganization. Such sample bias would thus increase recovery rates for the U.S. distressed exchange sample (as some firms with lower firm values will instead appear in Chapter 11) as well as for the U.S. bankruptcy sample (as these same firms will still have a higher recovery rate than the average bankruptcy case). It will also result in lower default rates in the U.K. compared to the U.S. This study does not fully capture these dynamics as we do not model the choice of procedure to resolve financial distress, or the dynamics of abandoning negotiations to conduct a distressed exchange and choose court-proceedings instead.

Yet another view on the reorganization decision is the role played by management. Management usually has the initiative for formulating a distressed exchange and deciding on when to file for bankruptcy. The endogenous credit risk models discussed in section 3.1 generally assume management to act as agents for equity holders. However, there may be agency conflicts not only between equity holders and debt holders, but also between management and equity holders in financially distressed firms that could lead to different reorganization outcomes. For example, if management is removed in bankruptcy but unaffected by financial reorganization out-of-court, it would prefer to reorganize out-of-court earlier, particularly in a creditor-friendly regime.¹⁵⁹ On the other hand, management might want to delay bankruptcy even more. Thus, the effect of variations in creditor right on the default boundary is similar for managers as for equity holders, but could also vary with firm level determinants of managerial incentives and power. It could, therefore, be useful to include such additional measures in the study.

¹⁵⁹ See for example Acharya, Amihud and Litov (2010) who find that firms in creditor-friendly countries take less leverage due to risk-averse managers, or Eckbo and Thorburn (2003) who discuss the role of management incentives.

Similarly, I did not in detail consider heterogeneity and differing interests between debt holder classes. In particular, it would be interesting to study the effect of complex debt structures with bargaining between senior and junior debt holders on the default decision and recovery rates. Multi-party bargaining models have provided a theoretical framework for such studies.¹⁶⁰ Unfortunately, empirical evidence remains sparse on the break-down of absolute priority between debt classes and their influence on the reorganization boundary. A notable exception is the recent study by Eraslan (2008) who analyzes the allocation between secured and unsecured debt and equity to estimate implied liquidation costs in a 3-party bargaining model. Also, Capkun and Weiss (2008) present evidence on the frequency and determinants of deviations from absolute priority for senior and junior debt. Unfortunately, neither quantify the size of deviations nor match the senior and unsecured parts of the debt structure.

To summarize, between the influence of management, heterogeneous creditors, debt structure and other factors influencing bargaining and default resolution, the reduction of equity holders bargaining power to a factor η is highly simplified and abstract. The design of bankruptcy laws affects bargaining power in more indirect ways. Nevertheless, the dynamics presented in the Fan and Sundaresan (2000) model offer an elegant way to assess the dynamics of the main factors affecting credit risk, bargaining and financial reorganization, and this study confirms its empirical significance.

4.8.2 Data Restrictions

Empirically, I find a significant effect of the country factor *UK* on recovery rates. I hypothesized such an effect to arise due to differences in creditor rights in the U.K. and the U.S. But the different recovery rates could also be related to differences in bankruptcy costs or other institutional differences in the two countries. Unfortunately, my data set was limited to these two countries due to the unavailability to date of detailed debt and equity recovery data in other countries. Incorporating additional countries in a future study would allow to work out more explicitly the effect of differences related to creditor rights (as captured for example by the LSSV score), rather than general country differences. Nevertheless, the large difference in creditor rights of both countries makes a comparison of them highly relevant, as previous research on other aspects of corporate finance has shown.¹⁶¹ Concerning the differences in

¹⁶⁰ See for example the multi-party bargaining models by Noe and Wang (2000), Breccia (2004), Eraslan (2008), Hackbarth, Hennessy and Leland (2007) or Annabi, Breton and François (2008) as discussed in section 3.1.

¹⁶¹ See for example Acharya, Sundaram and John (2010) or Acharya, Amihud and Litov (2010).

bankruptcy costs, empirical evidence to date is sparse, but suggests that bankruptcy costs are lower in the creditor-friendly U.K. regime, given shorter restructuring time and less scope for costly bargaining and litigation.¹⁶² Differing bankruptcy costs are thus likely linked to differences in creditor-rights and have the same sign effect on recovery rates and deviations from absolute priority.

The dataset was also restricted in several other ways. A significant number of defaulted firms were excluded if they did not have both traded debt and traded equity. The resulting dataset of large, public firms naturally has different governance mechanisms and claimant classes, affecting reorganization results. The U.K. sample is much smaller than the U.S. sample. While the distressed exchange sample in the U.K. (with seventeen issuers) is still representative, the sample size of the U.K. bankruptcies sample (with only nine issuers) arguably limits its statistical significance.

For the instrument level analysis, I could only choose two debt instruments of each firm for statistical reasons. Information was inevitably lost regarding the treatment of the other debt instruments of the defaulted firms.

Recovery rates are calculated based on market prices for equity and debt on the resolution date. In particular, the debt instruments of defaulted issuers are often very illiquid, with few trades, and with private trades that are not publicly reported. As discussed in section 4.6.1, bank loans generally seldom trade and available pricing data may be affected by a selection bias. For loans originated in the U.K., pricing and recovery data were often not available at all.

4.8.3 Unobserved Factors

The bankruptcy code in the U.K. has changed substantially with the Enterprise Act of 2002. The reform of the Administration procedure has strengthened unsecured creditor rights at the cost of secured creditors and made reorganization in-court more viable. As substantial differences in creditor rights *versus* the U.S. remain,¹⁶³ one can confidently use the whole time period for the study. Nevertheless, as the Administration procedure becomes more frequently used in the U.K., it would be interesting for future studies to analyze the impact of the new rules on the outcomes of informal reorganizations and bankruptcies.

¹⁶² See for example White (1996), who discusses differences in bankruptcy costs across the E.U. and the U.S. Djankov, Hart, McLiesh and Shleifer (2008), table 2 estimate bankruptcy costs of 6% of assets in the U.K. and 7% in the U.S. for a fictional case study.

¹⁶³ As reflected in the unchanged LSSV score reported by Djankov, McLiesh and Shleifer (2007) p.304.

The proxies for bargaining power and bankruptcy costs (as described in section 4.2) are noisy measures of the underlying variables, limiting the statistical significance of their coefficients and making their relationships to recovery rates difficult to interpret. The impact of the underlying variables may actually be larger than indicated by the proxies. However, analysis of the control variables other than the country factor is not central to my research question.

Each of the independent variables could be related to country differences themselves. Interest rates are clearly country specific. However, the correlations between the independent variables are low or insignificant enough to give statistical comfort to include them together with the country dummy.

Furthermore, the independent variables reflecting the debt structure of the issuer (the coupon, short maturity and debt seniority) are potentially endogenous to bargaining between equity holders and debt holders in distress. They may reflect *ex ante* expectations at issuance by the issuer and investors for the resolution of financial distress.¹⁶⁴ For example, riskier issuers may need to pay higher coupons or be unable to obtain long maturity debt as debt holders anticipate lower recovery rates. Similarly, the regression coefficients for the influence of the country factor on recovery rates could be influenced by the other variables, if these have adapted to expectations regarding the recovery process in that country.¹⁶⁵ However, any adjustments in such practices would be to counter the lower recovery rates in the creditor-friendly country. This might lead us to underestimate the effect size of the country factor, but the sign and statistical significance of the estimates would not be affected.

Likewise, the debt structure may also reflect a history of financial distress of the issuer (for example high coupons, complex debt structures, and short term debt are often the result of distressed rescue financings) that may affect future reorganizations. I do not control separately for repeated defaults, but rely on the variables related to debt structure themselves to capture such effects adequately.

Finally, a number of other factors that I did not control for in this study could affect recovery rates. For the instrument level analysis, additional instrument characteristics such as covenants or collateral terms could certainly affect instrument recovery rates but potentially also the reorganization boundary. It would also be interesting to control for factors related to the power of

¹⁶⁴ See for example Koziol (2007), who provides a detailed discussion of optimal debt contract design including covenants, collateral and put right features.

¹⁶⁵ See for example the discussion in Davydenko and Franks (2008) on how lending practices adapt to local bankruptcy codes.

management (i.e. management shareholdings, tenure), equity holder structure (i.e. institutional shareholdings) and debt structure (debt holder type).

The discussion in this section regarding model assumptions, data restrictions and unobserved factors portrays a wide field of future research needs. The empirical analysis in this thesis already found a statistically and economically highly important effect of creditor rights on the default boundary, debt and equity recovery rates. Such future research would therefore be a worthwhile undertaking.

5 Conclusion

This thesis intended to study the influence of differences in creditor rights among countries on the valuation of debt and equity securities of defaulted companies.

Chapter 2 provided an overview of the mechanisms for the resolution of financial distress, bargaining in default and how firm value gets accorded to different claimants in a financial reorganization. A review of restructuring out-of-court via a distressed exchange, or restructuring in-court in bankruptcy proceedings, shows these lead to different financial outcomes, as the avoidance of bankruptcy costs incentivizes creditors to share costs savings with equity holders, in deviation of absolute priority. The intricacies of U.S. bankruptcy law were reviewed to demonstrate how equity holders gain bargaining power in bankruptcy proceedings vis-à-vis creditors. Comparing the U.S. to the U.K. bankruptcy law showed the latter to accord substantially more rights to creditors. Finally, a review of previous empirical studies highlighted the need for additional international evidence.

Chapter 3 provided the theoretical basis for the study of recovery rates. Existing structural credit pricing models are reviewed, with a focus on the derivation of the default boundary and debt holder recoveries. The Fan and Sundaresan (2000) model was identified as the most appropriate for analyzing the effect of varying creditor rights, and testable hypotheses were derived for the influence on the default boundary and deviations from absolute priority. The model showed that weaker creditor rights are associated with higher deviations from absolute priority, incentivizing equity holders to reorganize at higher firm values, given that they share in the resultant cost savings. Creditor recovery rates should be marginally smaller due to the deviations from absolute priority. A sensitivity analysis illustrated the range of predicted recovery rates, for varying firm characteristics.

Chapter 4 described the empirical study, analyzing the determinants of recovery rates for a comprehensive sample of distressed exchanges and bankruptcies in the U.S. and the U.K. from 1998 to 2007. Relevant parameters were derived from the Fan and Sundaresan (2000) model and previous empirical studies, and their influence on recovery rates tested in multivariate regression analyses.

The study confirms the hypothesis that both distressed exchanges and bankruptcies in the creditor-friendly U.K. jurisdiction occur at a lower relative firm value than in the U.S. Secondly, it documents that deviations from absolute priority are frequent for distressed exchanges even in the U.K., though, as hypothesized, at a much lower level than in the U.S. Thirdly, contrary to expectations, debt recovery rates are significantly lower in the creditor-friendly U.K. than in the U.S., as firm's delay financial reorganization more than implied

by the equity holders' optimal reorganization decision. The results are confirmed on the firm and the instrument level. Finally, market prices of debt and equity instruments at default of the issuer are found to be fairly efficient indicators of ultimate recoveries, though these vary widely.

This thesis builds on two streams of research – one documenting the determinants of recovery rates and deviations from absolute priority in the United States, and another one on the effects of varying creditor rights – and combines them in a study of creditor rights and recovery rates in an international context. Using a unique dataset that combines matched debt and equity recovery data, the study is the first to document strategic bargaining and deviations from absolute priority across countries. The findings suggest that the design of bankruptcy codes matters to firms in their decision when and whether to reorganize out-of-court and influences the value claimants can recover in reorganizations and bankruptcies. Newly presented evidence that the creditor-friendly U.K. jurisdiction has lower recovery rates for debt holders than the U.S. is contrary to expectations, and challenges conventional wisdom. However, it can be explained by the greater willingness of equity holders in the U.S. to reorganize early. In the U.K. on the other hand, strategic delay in resolving financial distress is common, as bankruptcy law treats equity holders and managers harshly and debt holders offer little incentive to reorganize out-of-court. Acharya, Amihud and Litov (2010) p.42 find that “*strong creditor rights have a ‘dark side’ to them by reducing managerial incentives to undertake value-enhancing but risky projects.*” This thesis highlights a similar “dark side”: stronger creditor rights, by incentivizing firms to delay financial reorganization, contribute to lower creditor recovery rates.

The results raise a number of important implications for market participants and academics alike. Lenders need to consider the lower recovery rates in creditor-friendly countries in their investment decisions. The overall impact of creditor rights on creditor returns is not necessarily negative, as lower creditor recovery rates may also be associated with lower default rates in creditor-friendly countries. Therefore, lenders to firms in creditor-friendly countries need to consider both in their models. On the other hand, investors in already defaulted securities will only need to consider the lower recovery rates, as well as the differences in the outcomes from distressed exchanges and bankruptcies, and should, all else being equal, prefer securities from equity-friendly jurisdictions. For rating agencies, the results highlight the need to estimate default and recovery parameters not just across industries, but also across countries. For lawmakers, the results indicate that strong creditor rights do incentivize firms to delay financial reorganization, potentially aggravating financial difficulties and ultimately making a rescue more costly or impossible. In balancing different policy goals such as maximizing debt recovery rates, speed of resolution, and pre-serving firms as a going-concern, lawmakers therefore need to consider the effects of creditor rights provisions both ex-post bankruptcy and ex-ante on the reorganization decision of firms.

International evidence on defaulted debt markets has been severely constrained by the limited availability of debt and equity recovery data outside the U.S. This thesis, while seeking to address this gap, has been limited by the same factors to focus on only two countries, the U.S. and the U.K. It would therefore be useful to include additional countries, with different legal origins, in a future study, when such recovery data becomes available. The observation period of this study ends in December 2007, excluding a large number of defaults from the financial crisis started that year. Including this more recent period could increase the sample size and potentially provide evidence from other countries. It would also be useful to study in more detail how firms choose between restructuring in- or out-of-court, and control for default rates to estimate the overall impact of creditor rights on lenders' returns. Finally, this study considers differences in recovery rates between junior and senior debt classes only in the instrument level analysis. For future research, it would be interesting to study deviations from absolute priority between these classes, in addition to equity holders, both theoretically and empirically. For example, one could consider how the privileged status of secured lenders in the U.K. and the prominent role that junior claimants play in U.S. bankruptcy proceedings impact their recovery rates.

The number of corporate debt defaults and financial leverage in the United States and Western Europe remain on record highs. In this economic environment, the implications of this thesis for the resolution of financial distress are more relevant than ever.

Appendix

Table A.1: Defaulted issuers in data sample

Panel A: United Kingdom			
Name	Industry	Event type	Default date
AES Drax Energy Ltd.	Energy & utility	Distressed Exchange	23-Dec-2003
British Energy plc	Energy & utility	Distressed Exchange	14-Feb-2003
Central Eur. Media Ent. Ltd.	Media	Distressed Exchange	20-Oct-2000
Clubhaus plc	Leisure & entertainment	Distressed Exchange	17-May-2002
Clubhaus plc (2)	Leisure & entertainment	Distressed Exchange	26-May-2004
Danka Business Systems plc	Energy & utility	Distressed Exchange	29-Jun-2001
Esprit Telecom Group plc	Telecommunications	Distressed Exchange	15-Dec-2000
Foxus DIY Holdings Ltd.	Distribution	Distressed Exchange	26-Jul-2007
IFCO Systems N.V.	Packaging	Distressed Exchange	9-Jan-2003
Jarvis plc	Technology	Distressed Exchange	31-Aug-2005
Jazztel plc	Telecommunications	Distressed Exchange	18-Mar-2003
Luxfer Holdings plc	Construction	Distressed Exchange	6-Feb-2007
Marconi Corporation plc	Technology	Distressed Exchange	16-May-2003
Mytravel plc	Leisure & entertainment	Distressed Exchange	20-Dec-2004
Schefenacker plc	Automotive	Distressed Exchange	2-May-2007
Telewest Communications	Media	Distressed Exchange	16-Jul-2004
Texon International plc	Consumer products	Distressed Exchange	25-Nov-2002
Cenargo International plc	Transportation	Bankruptcy - Emerged	15-Jan-2003
FLAG Telecom Holdings Ltd.	Telecommunications	Bankruptcy - Emerged	30-Mar-2002
Atlantic Telecom Group plc	Telecommunications	Bankruptcy - Liquidated	5-Oct-2001
Cammell Laird Holdings plc	Transportation	Bankruptcy - Liquidated	20-Mar-2001
Damovo Group S.A.	Services	Bankruptcy - Liquidated	30-Oct-2006
Dolphin Telecom plc	Telecommunications	Bankruptcy - Liquidated	27-Jul-2001
Energis plc	Telecommunications	Bankruptcy - Liquidated	14-Mar-2002
Ionica plc	Telecommunications	Bankruptcy - Liquidated	29-Oct-1998
RSL Communications plc	Telecommunications	Bankruptcy - Liquidated	1-Mar-2001

APPENDIX

Panel B: United States

Name	Industry	Event type	Default date
Abraxas Petroleum Corp.	Energy & utility	Distressed Exchange	17-Dec-1999
Abraxas Petroleum Corp.(2)	Energy & utility	Distressed Exchange	24-Jan-2003
Acterna Corp.	Technology	Distressed Exchange	9-Aug-2002
Alamosa Holdings Inc.	Telecommunications	Distressed Exchange	11-Nov-2003
Aviva Petroleum Inc.	Energy & utility	Distressed Exchange	1-May-2000
Charter Communications Inc.	Media	Distressed Exchange	27-Sep-2005
Coeur D'Alene Mines Corp.	Metals & mining	Distressed Exchange	31-Jul-2001
Envirosource Inc.	Services	Distressed Exchange	24-Jul-2001
FiberNet Telecom Group Inc.	Telecommunications	Distressed Exchange	30-Oct-2002
Foster Wheeler Ltd.	Construction	Distressed Exchange	21-Sep-2004
Gaylord Container Corp.	Natural products	Distressed Exchange	1-Mar-2002
Grant Geophysical Inc.	Energy & utility	Distressed Exchange	7-Feb-2000
Hartmarx Corp.	Consumer products	Distressed Exchange	15-Jan-2002
Hybridon Inc.	Manufacturing	Distressed Exchange	5-May-1998
Kelley Oil & Gas Corp.	Energy & utility	Distressed Exchange	17-May-1999
Level 3 Communications Inc.	Telecommunications	Distressed Exchange	2-Dec-2004
Lexington Precision Corp.	Manufacturing	Distressed Exchange	17-Dec-2003
Qwest Communications Int.	Telecommunications	Distressed Exchange	26-Dec-2002
Salton Inc.	Consumer products	Distressed Exchange	26-Aug-2005
Scovill Fasteners Inc.	Consumer products	Distressed Exchange	3-Aug-2001
Silverleaf Resorts Inc.	Leisure & entertainment	Distressed Exchange	2-May-2002
Sirius Satellite Radio Inc.	Media	Distressed Exchange	7-Mar-2003
Suncom Wireless Holdings.	Telecommunications	Distressed Exchange	31-Jan-2007
Talk America Holdings	Telecommunications	Distressed Exchange	1-Apr-2002
The Fortress Group Inc.	Construction	Distressed Exchange	28-Dec-2001
Timco Aviation Services Inc.	Services	Distressed Exchange	28-Feb-2002
Trikon Technologies Inc.	Manufacturing	Distressed Exchange	14-May-1998
Weirton Steel Corp.	Metals & mining	Distressed Exchange	18-Jun-2002
XM Satellite Radio Holdings	Media	Distressed Exchange	28-Jan-2003
360Networks Inc.	Telecommunications	Bankruptcy - Emerged	28-Jun-2001
aaiPharma Inc.	Healthcare	Bankruptcy - Emerged	10-May-2005
Acterna Corp.(2)	Technology	Bankruptcy - Emerged	6-May-2003
Adelphia Bus. Solutions Inc.	Media	Bankruptcy - Emerged	27-Mar-2002
Advanced Lighting Tech. Inc.	Manufacturing	Bankruptcy - Emerged	5-Feb-2003
Allied Holdings Inc.	Automotive	Bankruptcy - Emerged	31-Jul-2005
Amerco Inc.	Services	Bankruptcy - Emerged	20-Jun-2003
American Banknote Corp.	Media	Bankruptcy - Emerged	8-Dec-1999
American Homepatient Inc.	Healthcare	Bankruptcy - Emerged	31-Jul-2002
American Homestar Corp.	Construction	Bankruptcy - Emerged	11-Jan-2001
American Rice Inc.	Natural products	Bankruptcy - Emerged	11-Aug-1998
AMF Bowling WW Inc.	Leisure & entertainment	Bankruptcy - Emerged	2-Jul-2001
Amtrol Inc.	Manufacturing	Bankruptcy - Emerged	19-Dec-2006
Anacomp Inc.	Services	Bankruptcy - Emerged	19-Oct-2001
Anchor Glass Container (2)	Packaging	Bankruptcy - Emerged	8-Aug-2005

APPENDIX

Anicom Inc.	Telecommunications	Bankruptcy - Emerged	5-Jan-2001
Applied Extrusion Tech. Inc.	Packaging	Bankruptcy - Emerged	1-Dec-2004
Arch Wireless Inc.	Telecommunications	Bankruptcy - Emerged	6-Dec-2001
Armstrong World Ind. Inc.	Manufacturing	Bankruptcy - Emerged	6-Dec-2000
Assisted Living Concepts Inc.	Healthcare	Bankruptcy - Emerged	1-Oct-2001
ATA Holdings Corp.	Transportation	Bankruptcy - Emerged	27-Oct-2004
Atlas Air Worldwide	Transportation	Bankruptcy - Emerged	31-Jan-2004
ATX Communications Inc.	Telecommunications	Bankruptcy - Emerged	15-Jan-2004
Audio Visual Services Corp.	Services	Bankruptcy - Emerged	17-Dec-2001
Aurora Foods Inc.	Consumer products	Bankruptcy - Emerged	8-Dec-2003
Avado Brands Inc.	Leisure & entertainment	Bankruptcy - Emerged	4-Feb-2004
Axiom Transaction Sol. Inc.	Technology	Bankruptcy - Emerged	8-Nov-1999
Bally Total Fitness Corp.	Services	Bankruptcy - Emerged	31-Jul-2007
Bayou Steel Corp.	Metals & mining	Bankruptcy - Emerged	22-Jan-2003
Bruno's Inc.	Distribution	Bankruptcy - Emerged	2-Feb-1998
Burlington Industries Inc.	Consumer products	Bankruptcy - Emerged	15-Nov-2001
Bush Industries Inc.	Consumer products	Bankruptcy - Emerged	31-Mar-2004
Carematrix Corp.	Healthcare	Bankruptcy - Emerged	9-Nov-2000
Carmike Cinemas Inc.	Leisure & entertainment	Bankruptcy - Emerged	8-Aug-2000
Chart Industries Inc.	Manufacturing	Bankruptcy - Emerged	8-Jul-2003
Chiquita Brands Int. Inc.	Natural products	Bankruptcy - Emerged	28-Nov-2001
Choice One Com. Inc.	Telecommunications	Bankruptcy - Emerged	5-Oct-2004
Classic Communications Inc.	Media	Bankruptcy - Emerged	13-Nov-2001
Coho Energy Inc.	Energy & utility	Bankruptcy - Emerged	23-Aug-1999
Comdisco Inc.	Services	Bankruptcy - Emerged	16-Jul-2001
Contour Energy Co.	Energy & utility	Bankruptcy - Emerged	15-Jul-2002
Covad Com. Group Inc.	Telecommunications	Bankruptcy - Emerged	15-Aug-2001
Covanta Energy Corp.	Energy & utility	Bankruptcy - Emerged	1-Apr-2002
Curative Health Services Inc.	Healthcare	Bankruptcy - Emerged	27-Mar-2006
Dan River Inc.	Consumer products	Bankruptcy - Emerged	31-Mar-2004
Datapoint Corp.	Technology	Bankruptcy - Emerged	3-May-2000
DDI Corp.	Technology	Bankruptcy - Emerged	11-Aug-2003
Delta Air Lines Inc.	Transportation	Bankruptcy - Emerged	14-Sep-2005
Eagle Food Centers Inc.	Distribution	Bankruptcy - Emerged	29-Feb-2000
Eagle Geophysical Inc.	Energy & utility	Bankruptcy - Emerged	29-Sep-1999
Eagle-Picher Industries Inc.	Manufacturing	Bankruptcy - Emerged	11-Apr-2005
Enron Corp.	Energy & utility	Bankruptcy - Emerged	1-Dec-2001
EOTT Energy Partners LP	Energy & utility	Bankruptcy - Emerged	8-Oct-2002
Exide Technologies Inc.	Automotive	Bankruptcy - Emerged	14-Apr-2002
Exodus Com. Corp.	Services	Bankruptcy - Emerged	26-Sep-2001
FAO Inc.	Distribution	Bankruptcy - Emerged	13-Jan-2003
Farm Fresh Inc.	Distribution	Bankruptcy - Emerged	7-Jan-1998
Federal-Mogul Corp.	Automotive	Bankruptcy - Emerged	1-Oct-2001
Fibermark Inc.	Consumer products	Bankruptcy - Emerged	31-Mar-2004
Fields Aircraft Spares Inc.	Manufacturing	Bankruptcy - Emerged	9-Nov-1999
Fine Host Corporation	Leisure & entertainment	Bankruptcy - Emerged	7-Jan-1999

APPENDIX

Fleming Companies Inc	Distribution	Bankruptcy - Emerged	1-Apr-2003
Forcenergy Inc.	Energy & utility	Bankruptcy - Emerged	21-Mar-1999
Genesis Health Ventures Inc.	Healthcare	Bankruptcy - Emerged	22-Jun-2000
Geneva Steel Co.	Metals & mining	Bankruptcy - Emerged	1-Feb-1999
Gentek Inc.	Manufacturing	Bankruptcy - Emerged	11-Oct-2002
Geotek Communications Inc.	Telecommunications	Bankruptcy - Emerged	29-Jun-1998
Global Crossing Ltd.	Telecommunications	Bankruptcy - Emerged	28-Jan-2002
Globix Corp.	Services	Bankruptcy - Emerged	1-Mar-2002
Golden Books Family	Media	Bankruptcy - Emerged	26-Feb-1999
Guilford Mills Inc.	Consumer products	Bankruptcy - Emerged	13-Mar-2002
Hayes Lemmerz Int. Inc.	Automotive	Bankruptcy - Emerged	5-Dec-2001
Headway Corp.Res.	Services	Bankruptcy - Emerged	1-Jul-2003
Heartland Wireless Com. Inc.	Media	Bankruptcy - Emerged	4-Dec-1998
Home Products Int. Inc.	Consumer products	Bankruptcy - Emerged	20-Dec-2006
Hvide Marine Inc.	Transportation	Bankruptcy - Emerged	9-Sep-1999
ICG Communications Inc.	Telecommunications	Bankruptcy - Emerged	14-Nov-2000
Imperial Sugar Co.	Consumer products	Bankruptcy - Emerged	16-Jan-2001
IMPSAT Fiber Networks Inc.	Telecommunications	Bankruptcy - Emerged	11-Jun-2002
Innovative Clinical Sol. Inc.	Healthcare	Bankruptcy - Emerged	14-Jul-2000
Insight Health Services Corp.	Healthcare	Bankruptcy - Emerged	29-May-2007
Integrated Electrical Services	Services	Bankruptcy - Emerged	14-Feb-2006
Intermet Corp.	Automotive	Bankruptcy - Emerged	28-Sep-2004
ITC Deltacom Inc.	Telecommunications	Bankruptcy - Emerged	25-Jun-2002
JCC Holding Company	Leisure & entertainment	Bankruptcy - Emerged	4-Jan-2001
Kaiser Aluminum Corp.	Metals & mining	Bankruptcy - Emerged	12-Feb-2002
Kaiser Group int. Inc.	Services	Bankruptcy - Emerged	9-Jun-2000
KCS Energy Inc.	Energy & utility	Bankruptcy - Emerged	18-Jan-2000
Key3Media Group Inc.	Services	Bankruptcy - Emerged	3-Feb-2003
Keystone Cons. Ind. Inc. (2)	Metals & mining	Bankruptcy - Emerged	26-Feb-2004
Kitty Hawk Inc.	Transportation	Bankruptcy - Emerged	1-May-2000
Kmart Corp.	Distribution	Bankruptcy - Emerged	22-Jan-2002
Komag Inc.	Technology	Bankruptcy - Emerged	24-Aug-2001
Lason Inc.	Technology	Bankruptcy - Emerged	5-Dec-2001
Leap Wireless Int. Inc.	Telecommunications	Bankruptcy - Emerged	13-Apr-2003
Loehman's Inc	Distribution	Bankruptcy - Emerged	15-May-1999
Loews Cineplex Enter. Corp.	Leisure & entertainment	Bankruptcy - Emerged	15-Feb-2001
Magellan Health Services Inc.	Healthcare	Bankruptcy - Emerged	11-Mar-2003
Mariner Post-Acute Network	Healthcare	Bankruptcy - Emerged	18-Jan-2000
Marketing Specialists Corp.	Services	Bankruptcy - Emerged	24-May-2001
Master Graphics Inc.	Media	Bankruptcy - Emerged	7-Jul-2000
McLeodUSA	Telecommunications	Bankruptcy - Emerged	30-Jan-2002
McLeodUSA (2)	Telecommunications	Bankruptcy - Emerged	28-Oct-2005
Metal Management Inc.	Metals & mining	Bankruptcy - Emerged	20-Nov-2000
Metals USA Inc	Distribution	Bankruptcy - Emerged	14-Nov-2001
Metrocall Inc.	Telecommunications	Bankruptcy - Emerged	3-Jun-2002
Mirant Corp.	Energy & utility	Bankruptcy - Emerged	15-Jul-2003

APPENDIX

Mississippi Chemical Corp.	Chemicals	Bankruptcy - Emerged	15-May-2003
Motient Corp.	Telecommunications	Bankruptcy - Emerged	10-Jan-2002
MPOWER Holding Corp.	Telecommunications	Bankruptcy - Emerged	8-Apr-2002
National Energy Group Inc.	Energy & utility	Bankruptcy - Emerged	4-Dec-1998
Nationsrent Inc.	Services	Bankruptcy - Emerged	17-Dec-2001
Newcor Inc.	Manufacturing	Bankruptcy - Emerged	25-Feb-2002
Northwest Airlines Corp.	Transportation	Bankruptcy - Emerged	14-Sep-2005
Northwestern Corp.	Energy & utility	Bankruptcy - Emerged	14-Sep-2003
NTELOS Inc.	Telecommunications	Bankruptcy - Emerged	4-Mar-2003
NTL Inc.	Telecommunications	Bankruptcy - Emerged	8-May-2002
Nu-Kote Holdings Inc.	Technology	Bankruptcy - Emerged	6-Nov-1998
Oglebay Norton Company	Metals & mining	Bankruptcy - Emerged	23-Feb-2004
Oneida Ltd.	Consumer products	Bankruptcy - Emerged	9-Mar-2006
Owens Corning	Manufacturing	Bankruptcy - Emerged	5-Oct-2000
Pacific Gas & Electric	Energy & utility	Bankruptcy - Emerged	6-Apr-2001
Paracelsus HealthCare Corp.	Healthcare	Bankruptcy - Emerged	15-Sep-2000
Pentacon Inc.	Distribution	Bankruptcy - Emerged	23-May-2002
Peregrine Systems Inc.	Technology	Bankruptcy - Emerged	22-Sep-2002
Phonetel Technologies Inc	Telecommunications	Bankruptcy - Emerged	14-Jul-1999
Phycor Inc.	Healthcare	Bankruptcy - Emerged	31-Jan-2002
Pillowtex Corp.	Consumer products	Bankruptcy - Emerged	14-Nov-2000
Pioneer Companies Inc.	Chemicals	Bankruptcy - Emerged	31-Jul-2001
Planet Hollywood Int.	Leisure & entertainment	Bankruptcy - Emerged	12-Oct-1999
Polymer Group Inc.	Consumer products	Bankruptcy - Emerged	11-May-2002
Prandium Inc.	Leisure & entertainment	Bankruptcy - Emerged	6-May-2002
Railworks Corporation	Services	Bankruptcy - Emerged	20-Sep-2001
RCN Corp.	Telecommunications	Bankruptcy - Emerged	27-May-2004
Redback Networks Inc.	Services	Bankruptcy - Emerged	3-Nov-2003
Reptron Electronics Inc.	Technology	Bankruptcy - Emerged	28-Oct-2003
Safety Components Int. Inc.	Services	Bankruptcy - Emerged	10-Apr-2000
Safety-Kleen Corp.	Environment	Bankruptcy - Emerged	9-Jun-2000
Salant Corp.	Consumer products	Bankruptcy - Emerged	29-Dec-1998
Samuels Jewelers Inc.	Distribution	Bankruptcy - Emerged	4-Aug-2003
Silicon Graphics Inc.	Technology	Bankruptcy - Emerged	8-May-2006
SLI Inc.	Manufacturing	Bankruptcy - Emerged	9-Sep-2002
Southern Mineral Corp.	Energy & utility	Bankruptcy - Emerged	29-Oct-1999
Special Metals Corp.	Metals & mining	Bankruptcy - Emerged	27-Mar-2002
Spectrasite Holdings Inc.	Services	Bankruptcy - Emerged	15-Nov-2002
Spiegel Inc.	Distribution	Bankruptcy - Emerged	17-Mar-2003
Stage Stores Inc.	Distribution	Bankruptcy - Emerged	1-Jun-2000
Sterling Chemicals Holdings	Chemicals	Bankruptcy - Emerged	16-Jul-2001
Sun Healthcare Group Inc.	Healthcare	Bankruptcy - Emerged	14-Oct-1999
Sunbeam Corp.	Consumer products	Bankruptcy - Emerged	6-Feb-2001
Sunterra Corp.	Leisure & entertainment	Bankruptcy - Emerged	31-May-2000
Superior Telecom Inc.	Manufacturing	Bankruptcy - Emerged	3-Mar-2003
Syrtech Corp.	Consumer products	Bankruptcy - Emerged	16-Feb-2005

APPENDIX

Teligent Inc.	Telecommunications	Bankruptcy - Emerged	21-May-2001
The Boyds Collection Ltd.	Distribution	Bankruptcy - Emerged	20-Oct-2005
Thermadyne Holdings Corp.	Manufacturing	Bankruptcy - Emerged	19-Nov-2001
Tokheim Corporation	Manufacturing	Bankruptcy - Emerged	28-Aug-2000
Tower Automotive Inc.	Automotive	Bankruptcy - Emerged	2-Feb-2005
TransTexas Gas Corp. (2)	Energy & utility	Bankruptcy - Emerged	14-Nov-2002
Trico Marine Services Inc.	Energy & utility	Bankruptcy - Emerged	21-Dec-2004
TRISM Inc.	Transportation	Bankruptcy - Emerged	16-Sep-1999
Trump Hotels & Casino Res.	Leisure & entertainment	Bankruptcy - Emerged	21-Nov-2004
US Airways Inc.	Transportation	Bankruptcy - Emerged	12-Aug-2002
USG Corp.	Manufacturing	Bankruptcy - Emerged	25-Jun-2001
Vencor Inc.	Healthcare	Bankruptcy - Emerged	13-Sep-1999
Viasystems Group Inc.	Technology	Bankruptcy - Emerged	1-Oct-2002
Viatel Inc.	Telecommunications	Bankruptcy - Emerged	2-May-2001
Viskase Companies Inc	Chemicals	Bankruptcy - Emerged	13-Nov-2002
Vista Eyecare Inc.	Distribution	Bankruptcy - Emerged	5-Apr-2000
Warnaco Group Inc.	Consumer products	Bankruptcy - Emerged	11-Jun-2001
Washington Group Int. Inc.	Construction	Bankruptcy - Emerged	14-May-2001
Waste Systems Int. Inc.	Environment	Bankruptcy - Emerged	11-Jan-2001
Weblink Wireless Inc.	Telecommunications	Bankruptcy - Emerged	23-May-2001
WHX Corp.	Metals & mining	Bankruptcy - Emerged	8-Mar-2005
Williams Com. Group	Telecommunications	Bankruptcy - Emerged	22-Apr-2002
Winn-Dixie Stores Inc.	Distribution	Bankruptcy - Emerged	22-Feb-2005
Wireless One Inc.	Telecommunications	Bankruptcy - Emerged	10-Feb-1999
WorldCom Inc.	Telecommunications	Bankruptcy - Emerged	21-Jul-2002
XO Communications Inc.	Telecommunications	Bankruptcy - Emerged	17-Jun-2002
Acme Metals Inc.	Metals & mining	Bankruptcy - Liquidated	29-Sep-1998
ACT Manufacturing Inc.	Manufacturing	Bankruptcy - Liquidated	21-Dec-2001
Adelphia Com. Corp.	Media	Bankruptcy - Liquidated	25-Jun-2002
Advanced Radio Tel. Corp.	Telecommunications	Bankruptcy - Liquidated	20-Apr-2001
AgriBioTech Inc.	Distribution	Bankruptcy - Liquidated	26-Jan-2000
Allegiance Telecom Inc.	Telecommunications	Bankruptcy - Liquidated	14-May-2003
American Architectural Prod.	Manufacturing	Bankruptcy - Liquidated	18-Dec-2000
ANC Rental Corp.	Services	Bankruptcy - Liquidated	13-Nov-2001
At Home Corp.	Services	Bankruptcy - Liquidated	28-Sep-2001
Bethlehem Steel Corp.	Metals & mining	Bankruptcy - Liquidated	15-Oct-2001
Birmingham Steel Corp.	Metals & mining	Bankruptcy - Liquidated	3-Jun-2002
Biscayne Apparel Inc.	Consumer products	Bankruptcy - Liquidated	5-Feb-1999
Borden C&P	Chemicals	Bankruptcy - Liquidated	3-Apr-2001
Budget Group Inc.	Services	Bankruptcy - Liquidated	29-Apr-2002
Cellnet Data Systems Inc.	Telecommunications	Bankruptcy - Liquidated	4-Feb-2000
Cone Mills Corp.	Consumer products	Bankruptcy - Liquidated	24-Sep-2003
Converse Inc.	Consumer products	Bankruptcy - Liquidated	21-Jan-2001
Costilla Energy Inc.	Energy & utility	Bankruptcy - Liquidated	3-Sep-1999
Crown Pacific Partners LP	Natural products	Bankruptcy - Liquidated	29-Jun-2003
CTC Com. Group Inc.	Telecommunications	Bankruptcy - Liquidated	3-Oct-2002

APPENDIX

Dailey International Inc.	Energy & utility	Bankruptcy - Liquidated	28-May-1999
Dairy Mart	Distribution	Bankruptcy - Liquidated	24-Sep-2001
Decisionone Corp.	Services	Bankruptcy - Liquidated	14-Feb-2000
Discovery Zone Inc.	Leisure & entertainment	Bankruptcy - Liquidated	20-Apr-1999
Drug Emporium Inc.	Distribution	Bankruptcy - Liquidated	26-Mar-2001
Drypers Corp.	Consumer products	Bankruptcy - Liquidated	10-Oct-2000
DT Industries Inc.	Manufacturing	Bankruptcy - Liquidated	13-May-2004
e.Spire Communications Inc.	Telecommunications	Bankruptcy - Liquidated	22-Mar-2001
Einstein/Noah Bagel Corp.	Distribution	Bankruptcy - Liquidated	27-Apr-2000
Etoys Inc.	Distribution	Bankruptcy - Liquidated	7-Mar-2001
Family Golf Centers Inc	Leisure & entertainment	Bankruptcy - Liquidated	4-May-2000
Flooring America Inc.	Distribution	Bankruptcy - Liquidated	15-Jun-2000
Focal Communications Corp.	Telecommunications	Bankruptcy - Liquidated	19-Dec-2002
Friede Goldman Halter Inc.	Energy & utility	Bankruptcy - Liquidated	19-Apr-2001
Fruit of the Loom Inc.	Consumer products	Bankruptcy - Liquidated	29-Dec-1999
Galey & Lord Inc.	Consumer products	Bankruptcy - Liquidated	19-Feb-2002
Genuity Inc.	Technology	Bankruptcy - Liquidated	27-Nov-2002
Globalstar L.P.	Telecommunications	Bankruptcy - Liquidated	15-Feb-2002
Golden Books Family Ent.(2)	Media	Bankruptcy - Liquidated	4-Jun-2001
Grand Union Company	Distribution	Bankruptcy - Liquidated	3-Oct-2000
GST Tel. Inc.	Telecommunications	Bankruptcy - Liquidated	17-May-2000
Harvard Industries Inc.	Manufacturing	Bankruptcy - Liquidated	15-Jan-2002
Heilig-Meyers Corp.	Distribution	Bankruptcy - Liquidated	16-Aug-2000
Homeland Holding Corp.	Distribution	Bankruptcy - Liquidated	1-Aug-2001
Huntco Inc.	Metals & mining	Bankruptcy - Liquidated	4-Feb-2002
InaCom Corp.	Distribution	Bankruptcy - Liquidated	16-Jun-2000
Insilco Technologies Inc.	Telecommunications	Bankruptcy - Liquidated	16-Dec-2002
Integrated Health Services	Services	Bankruptcy - Liquidated	2-Feb-2000
Interliant Inc	Services	Bankruptcy - Liquidated	2-Aug-2002
Iridium LLC	Telecommunications	Bankruptcy - Liquidated	13-Aug-1999
JPM Company	Manufacturing	Bankruptcy - Liquidated	1-Mar-2002
Just for Feet Inc.	Distribution	Bankruptcy - Liquidated	4-Nov-1999
Kasper A.S.L.	Consumer products	Bankruptcy - Liquidated	5-Feb-2002
Kevco Inc.	Distribution	Bankruptcy - Liquidated	5-Feb-2001
National Steel Corp.	Metals & mining	Bankruptcy - Liquidated	6-Mar-2002
Oakwood Homes Corp.	Manufacturing	Bankruptcy - Liquidated	15-Nov-2002
PCD Inc.	Technology	Bankruptcy - Liquidated	21-Mar-2003
Petsec Energy Inc	Energy & utility	Bankruptcy - Liquidated	13-Apr-2000
Phar-Mor Inc.	Distribution	Bankruptcy - Liquidated	21-Sep-2001
PHP Healthcare Corporation	Healthcare	Bankruptcy - Liquidated	19-Nov-1998
Physicians Resource Group	Healthcare	Bankruptcy - Liquidated	1-Feb-2000
Pinnacle Holdings Inc.	Telecommunications	Bankruptcy - Liquidated	21-May-2002
Pluma Inc.	Technology	Bankruptcy - Liquidated	14-May-1999
Polaroid Corp.	Technology	Bankruptcy - Liquidated	12-Oct-2001
Radio Unica Corp.	Media	Bankruptcy - Liquidated	3-Oct-2003
Recoton Corp.	Manufacturing	Bankruptcy - Liquidated	8-Apr-2003

APPENDIX

Rythms Netconnections Inc.	Telecommunications	Bankruptcy - Liquidated 2-Aug-2001
Service Merchandise Comp.	Distribution	Bankruptcy - Liquidated 27-Mar-1999
Seven Seas Petroleum Inc.	Energy & utility	Bankruptcy - Liquidated 14-Jan-2003
System Software Associates	Technology	Bankruptcy - Liquidated 3-May-2000
The IT Group	Environment	Bankruptcy - Liquidated 16-Jan-2002
TransAmerican Energy Corp.	Energy & utility	Bankruptcy - Liquidated 20-Apr-1999
Tropical Sportswear Int. Inc.	Consumer products	Bankruptcy - Liquidated 16-Dec-2004
TwinLab Corp.	Healthcare	Bankruptcy - Liquidated 6-Sep-2003
U.S. Aggregates Inc.	Manufacturing	Bankruptcy - Liquidated 11-Mar-2002
US Office Products Company	Distribution	Bankruptcy - Liquidated 5-Mar-2001
USN Communications Inc.	Telecommunications	Bankruptcy - Liquidated 18-Feb-1999
Venture Stores Inc	Distribution	Bankruptcy - Liquidated 20-Jan-1998
Verado Holdings Inc.	Services	Bankruptcy - Liquidated 15-Feb-2002
Video Update Inc.	Distribution	Bankruptcy - Liquidated 18-Sep-2000
Vlasic Foods Int. Inc.	Consumer products	Bankruptcy - Liquidated 29-Jan-2001
Waxman Industries Inc.	Distribution	Bankruptcy - Liquidated 2-Oct-2000
Weiner's Stores Inc.	Distribution	Bankruptcy - Liquidated 16-Oct-2000
Weirton Steel Corp. (2)	Metals & mining	Bankruptcy - Liquidated 19-May-2003
Wherehouse Entertainment	Distribution	Bankruptcy - Liquidated 20-Jan-2003
Winstar Communications Inc.	Telecommunications	Bankruptcy - Liquidated 18-Apr-2001
World Access Inc.	Telecommunications	Bankruptcy - Liquidated 24-Apr-2001
Worldcorp Inc.	Transportation	Bankruptcy - Liquidated 12-Feb-1999
Zany Brainy Inc.	Distribution	Bankruptcy - Liquidated 15-May-2001

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