Corporate Financial Distress: An Empirical Analysis of Distress Risk

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The President:

Prof. Ernst Mohr, PhD

In memory of my aunt Olga
and my grandmother Valentina

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Executive Summary

Research on corporate financial distress is relatively young in comparison to knowledge about mechanisms and processes in sound enterprises. Large failures and corporate scandals in recent years have pointed to the need for extended and deepened research on financial distress, especially on the accelerated impairment of value in the last stages prior to default, when distress risk achieves its highest level. A comprehensive analysis of the company's exposure to distress risk and an investigation of risk behavior in financial distress are significant for at least three reasons:

- Changes in the corporate cost of capital, which is an increasing function of the risk of a company, are important for investors when deciding whether to invest in comparable securities.
- Knowledge of risk and differentiation between systematic and unsystematic sources of financial distress are relevant for the choice of active and passive investment strategies in the securities of distressed companies.
- The behavior of distress risk is useful for understanding the adverse processes in a distressed company prior to default, which can be used to improve crisis management.

The empirical research undertaken in this dissertation analyzes the behavior of distress risk, its attributes, and pricing in equity returns. I integrate the theory of financial distress into modern asset pricing theory and examine a particular financial distress phenomenon from the theoretical capital market perspective. I show that recent developments in the stock markets require a revision of traditional portfolio theory. The growth of the derivatives market segment, the appearance of complex financial instruments, and the continuously increasing risk appetite of institutional investors lead to an increase in idiosyncratic risks in the economy. These risks can be exploited in order to achieve higher returns. I demonstrate that systematic risk consists of market risk and a nondiversifiable part of idiosyncratic volatility. Defined in this manner, the pricing of systematic risk can be easily explained with the rational asset pricing theory.

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1 Introduction

Two years ago, when I began writing this dissertation, distressed investing in European markets was experiencing a revival after the market turbulences during 2000-2001. While before 2000, distressed investing was mostly dominated by passive investment strategies and acquisitions of large amounts of distressed debt, after 2001 it started shifting towards active direct investments in single companies, reflecting the increasing interest of distressed investors in the control over troubled firms. The reason for this rebirth was a period of several years with prosperous economic conditions. The domination of a bullish investment sentiment, high levels of liquidity and resilience in the market have allowed industrial companies to raise their financial leverage in order to achieve the goals of their aggressive business plans.

Distressed investing is cyclical. As long as liquidity in capital markets is high and investors' expectations are positive, many highly leveraged firms are usually able to renegotiate debt covenants if they are breached and obtain additional funding. Thus, "*the very high volume of liquidity continues to keep <potentially> struggling companies afloat"* for a while.[1] The number of defaults under these economic conditions is usually low, whereas the recovery rates of defaulted debt are high. As soon as companies have reached a certain level of leverage but do not perform to their business plans, default can happen even in a booming economic environment. High levels of leverage in the economy and increasing volatility make equity value vulnerable, so that each possible decline in the enterprise value may rapidly impair equity and subordinated debt instruments.

Whereas the distressed debt market in the U.S. has a relatively long tradition, the high-yield market in Europe is very young.[2] The size of this growing market is still about 10% of the size of the U.S. market. However, the volume of this market has been growing continuously; it grew from $37 billion in 2000 to over $85 billion in 2003.[3] Fewer existing market participants and more supply in comparison to the high-yield market in the U.S. attract investors from overseas to make distressed investments on the European continent.

According to the "Distressed Investor Survey 2007", many distressed investors see the greatest investment opportunities in countries such as Germany, the UK, Italy, and France. The report concludes that Germany remains the most attractive market for dis-

[1] Quotation from the interview with John Vaux, Rotschild London for the European Distressed Debt 2007 survey.
[2] According to Singer and Burke (2004, 5), the European high-yield market was nonexistent prior to 1997.
[3] Ferguson (2004, 1).

tressed investors not only across Europe but also globally due to a lack of strength in its economy, low consumer confidence, and the sheer scale of medium-sized enterprises. According to the KPMG survey, the amount of non-performing loans in Germany increased from an estimated €100 billion in 2005 to an estimated €150.3 billion in May 2007.[4] Italy, another highly attractive market, has the weakest macroeconomics in Europe, low GDP growth, and high government debt. The slowdown of the French economy coupled with restrictive legislation may also push distressed companies into bankruptcy.[5]

Whereas the volume of the distressed debt market has been continuously growing since 2001, the number of defaults in Europe has varied reflecting the market's cyclicality. After some successive years of decline in the number of defaults, in 2006 Moody's recorded the highest increase in European default rates since 2003 with a total amount of distressed debt more than twice as high as that reported in 2005. Table 1 displays the time series of the number of defaulted European issuers and the defaulted volume on both rated and unrated bonds and loans from 1990 to 2006.

Year	Number of defaulting issuers	Volume (MM €)*
1990	2	427
1991	3	1,194
1992	4	773
1993	5	105
1994	5	1,097
1995	8	685
1996	4	1,099
1997	4	221
1998	3	267
1999	12	3,475
2000	5	870
2001	27	14,568
2002	36	59,453
2003	16	9,649
2004	7	2,223
2005	3	720
2006	10	1,535
Total	**154**	**98,361**

*) rounded

Table 1: European Corporate Default Counts and Volumes[6]

According to the "Distressed Investor Survey 2007", last year's high volumes of distressed debt are increasingly allocated in the direct investments of distressed investors, such as mezzanine and distressed equity. *"The 'buy to own' strategy is an ever growing agenda behind many of the distressed transactions. Investors are no longer interested in*

[4] KPMG Distressed Debt Investment and Exit Strategies Survey (2007, 8).
[5] European Distressed Debt Survey (2007, 4).
[6] Source: Moody's Investor Service (2007).

seeing the debt return just to par levels – they are seeking higher returns and as a result take higher risks when they invest".[7] Distressed equity is becoming more and more attractive to private equity and hedge fund investors and the number of investors acquiring control of a company through equitization continues to grow.[8]

The average expected return on a direct distressed investment varies and depends on the degree of competition, the number of opportunities, and the general development of the market. In "moderate" years, such as in the period from 2006 to 2007, investors usually expect to obtain a return of 15% to 20%. Kudla (2004) reports that this is an average return requirement of active external investors in distressed companies. In bullish years, investors' expectations can even reach 30%. For a comparison, an empirically estimated market rate of return for the financier of a sound company amounts to 8%.[9]

However, higher expectations of returns also mean a higher probability of losses. The corporate recovery rates are usually negatively correlated with the business cycle: they are relatively high in up markets (up to 50-60%), but relatively low in a recession (20-25%).[10] Most of corporate restructuring opportunities usually come with the turn of the credit cycle when markets start to slow down, looking forward to the next downturn. The biggest challenge for distressed investors is a proper estimation of the value and growth potential of a distressed company. All-too optimistic expectations or inadequate valuation underestimate financial distress risks and may result in failed restructuring efforts. Therefore, a detailed analysis of distress risk, its behavior and its attributes is the first task to perform before deciding whether to put new money into a distressed company.

[7] Quotation from the interview with Alistair Dick, Rotschild London for the European Distressed Debt 2007 survey.
[8] European Distressed Debt Survey (2007, 3).
[9] Spremann (2004, 48).
[10] Source: Moody's Investor Services (2007).

2 Motivation and Research Questions

2.1 Definition of the Problem

When entering financial distress, a company faces one of two possible conflicts. These can be defined either as a cash shortage on the assets side of the balance sheet, or as a debt overhang in liabilities. Both sets of circumstances however draw similar results, namely that cash flow is insufficient to cover current obligations. This forces companies into negotiations with creditors about the conditions of deferment on their debt repayment during the ensuing period of distressed restructuring.

When entering financial distress, companies are quickly confronted with the dilemma of raising capital to fund their restructuring. Given that, few are liable to trust this risky investment, especially when taking into consideration that a financial boost is not a guarantee to provide a lasting solution to the problems at hand.

This short introduction highlights two very fundamental considerations, which are of utmost relevance in defining the debate at hand in the following research:

– First of all, several failures of large joint stock companies in the U.S. and Europe over the recent decade such as Philipp Holzmann, Enron, WorldCom, Swissair, ABB, Parmalat have shocked investors across the globe and helped to raise the awareness that nowadays, not only small and medium enterprises, but also large corporations are not protected from default. The causes of financial distress and bankruptcy can be varied (systematic or unsystematic) when taking into consideration the instability, vulnerability, and ultimately the deep-rooted structural change taking place in the world economy.

Traditional views of the causes of financial distress, which have over time been partially confirmed by empirical results (Andrade and Kaplan, 1997; Asquith et al., 1994; Kaplan and Stein, 1993; Theodossiou et al., 1996; Whitaker, 1999), provide some evidence that financial distress arises in many cases from endogenous risk factors, such as mismanagement, high leverage, and a non-efficient operating structure in place. The correlation of these factors and financial distress is, according to capital market theory, of unsystematic nature. In such cases, emissions of so-called junk bonds or high yield bonds seem to be reasonable: the debtor obtains the required capital in order to implement the turnaround strategy and promises high returns to the investors in case of success, whereas private and institutional investors believe in the unsystematic nature of the default risk of junk bonds and substantially improve the performance of their well-diversified portfolios.

However, some observations of the development of the total risk of distressed firms portray an interesting picture: In phases of financial distress, firm-specific risk as well as systematic risk generally increase. This should bring to our attention that only one part of the risk in financial distress is of an unsystematic nature. Rare empirical research in this direction concludes that the tendency during the last 10 years has been a shift to the systematic nature of default risk (MacEnally and Todd, 1993; Vassalou and Xing, 2004). This allows us to conclude that we have two problems in this context: If default risk is of a systematic nature, why are the subsequent realized returns relatively low (Dichev, 1998)? If the risk of financial distress is however unsystematic, why can it not be diversified successfully? Are the unsystematic risks in financial distress so high that it is no longer possible to diversify them anymore and could it be that they will be rewarded in the market too?

– Secondly, the interest in investments in troubled companies has permanently increased despite the diminution in supply of new securities in the last few years or poor performance for investors in the second part of 1990s. Since the implementation of the new bankruptcy code (Insolvenzordnung) in Germany 1999, active institutional investors in distressed companies who participate in distressed equities and partially in the management of the company are now investing in continental Europe, where the risk aversion of investors has been traditionally so high that direct equity investing in distressed companies as alternative investment category has been in an embryonic stage of development. If the demand of distressed investors is increasing and becoming multifaceted, is it a sign that distress risk is rewarded by the market with higher returns?

I was unable to find any concrete and clear answers to these questions in the literature and in available empirical work. At the same time, I think that the dispute on this topic could prove to be very useful in preventing such unsuccessful cases such as the bankruptcy of Swissair, with large financial implications for a national economy. In that way, the overall objective of this dissertation project aims to close the research gap discussed above by investigating the behavior of default risk, its attributes, the influence of the nature of risk on the value of the company and to integrate the knowledge gained in order to provide new insights into this particular field of corporate financial distress research.

2.2 Research Questions

The preliminary review of the theory and empiricism has highlighted that the analysis of financial distress from the capital market perspective produces more questions than it is

capable of answering. Default risk embedded in the context of the traditional portfolio theory does not capture its specific attributes associated with financial distress and, consequently, provides incorrect information in the case of the valuation of distressed companies. Rare empirical studies account for distress risk and show a negative deviation in value of up to 36% in comparison to the value estimated according to classic portfolio theory and the CAPM.[11] Such overvaluation of distressed companies in a traditional context seems to be decisive for investment decisions of active investors.

Based on quantitative empirical research, this work aims at the development of a comprehensive framework of dynamic corporate financial distress cycle and a contribution to modern asset pricing theory by answering the question about the nature of distress risk and its pricing in equity returns. Therefore, the following broad research questions will be explored:

- How can financial distress be represented as a dynamic process that incorporates different phases of adverse development? Which economic signals are produced at each stage of financial distress and how does the transition from one to another stage of financial distress happen?
- What are the attributes of the risk in financial distress? Is the risk of default systematic or idiosyncratic?

In order to analyze the risk anomalies, a proper measure of the systematic risk in financial distress should be chosen. This is very important from the rational asset pricing point of view, because some of the empirical results which will be discussed below show that sometimes the beta chosen as a measure of risk does not change over the time of financial distress, whereas the total risk chosen as a measure of systematic risk experiences an increase owing to rising unsystematic component of the firm's variance.

- Is distress risk priced by the market? And if yes, what is the rational explanation of the distress risk premium? Is it a market variable which is omitted in the context of the CAPM and its extensions or is it, in contrast, a market mispricing anomaly?

These research questions are the basis for the theoretical discussion and empirical study introduced and developed in the dissertation at hand. The researched questions mentioned above and their refinements are reflected in the structure of the remaining chapters of this dissertation.

[11] Weckbach (2004, 185) identifies that distress risks add a substantial amount to the cost of capital of the company. The higher cost of capital reflects the lower value of a distressed company than if calculated by means of the discount rate estimated from the CAPM.

2.3 Structure of the Dissertation

The remainder of this dissertation is organized as follows:

Based on a comprehensive analysis of the existing theoretical and empirical literature, chapter 3 reconstructs the genesis of the corporate financial distress phenomenon. I critically review existing approaches of the definition of financial distress, discuss key terms and limitations, and develop a conceptual framework in which financial distress is seen as a dynamic process. I describe the dimensions of financial distress, phases, events which accelerate the transformation from one phase of financial distress to another, and investigate mechanisms of financial distress resolution which complete the financial distressed cycle. I also analyze the risk triggers and costs of financial distress and its micro- and macroeconomic implications.

Chapter 4 focuses predominantly on the theoretical and empirical aspects of distress risk. This chapter establishes the bridge between the existing theory of financial distress discussed in chapter 3 and my empirical study. I examine how distress risk is embedded in rational asset pricing theory, which techniques are available in order to measure distress risk, and discuss whether distress risk is a factor priced in equity returns or a mispricing anomaly. At the end of the chapter, I undertake a critical appraisal of the available empirical evidence, determine the research gap, and explain which particular field of this research gap I am going to explore in my empirical study and why.

Chapter 5 is the empirical study. It describes the research methodology, focusing on the multivariate regression analysis, and contains hypotheses derived for empirical testing. It also outlines the data sources and the definitions of variables used in research. The separate sections of this chapter present time-series analysis, portfolio analysis, and cross-sectional analysis of distress risk. The last section of this chapter contains an integrated interpretation of the findings.

Finally, chapter 6 summarizes the main conclusions, determines the niche of my empirical study among other empirical papers on corporate financial distress, discusses the implications of my research for theory and practice, and formulates suggestions for future research.

3 Genesis of Corporate Financial Distress

As a rule, the term "financial distress" is used in a negative connotation in order to describe the financial situation of a company confronted with a temporary lack of liquidity and with the difficulties that ensue in fulfilling financial obligations on schedule and to the full extent.[12] Very often, financial distress is determined in terms of failure, default, bankruptcy, or distressed restructuring, dependent on the underlying methodology and the objectives of the overall research. As a consequence, theoretical and empirical models of financial distress exhibit to a certain extent a one-sidedness in the context of the analysis questions. They mainly concentrate on the momentary perspective, when the adverse process has reached its lowest point and the decision about insolvency or distressed restructuring has to be made.[13] However, picking single negative events for the analysis of financial distress as a whole may be incorrect and produce biases. Distortions may arise because the examination of the deepest point of financial distress, also known as default, ignores the fact that the largest losses and increasing financial inflexibility happen several periods before this event occurs. [14]

In this chapter I critically review existing approaches to the definition of financial distress, show their advantages and limitations, and develop an alternative conceptual framework of the financial distress cycle where the phenomenon of financial distress is represented as an integrated process consisting of different subordinated stages between the extremes of corporate health, bankruptcy, and recovery.

3.1 Corporate Financial Distress: Key Terms and Limitations

The first question which should be answered if we think about financial distress as an economic term is whether it can be applied to all market participants or only to selected operating companies. Financial distress usually involves at least two counterparts, a debtor and a creditor. The definition of who is a creditor can be indistinct. In a broader sense, these can be not only providers of external capital, but also other stakeholders of the company such as suppliers or employees.[15] Hypothetically, every enterprise, including all-equity firms, is vulnerable to financial distress. In contrast, if financial distress is defined as an inability of the company to meet its current financial obligations, the examination of the phenomenon of financial distress can be limited to the analysis of com-

[12] See e.g. Gordon (1971, 348), Davydenko (2005, 2).
[13] Compare to Gilson (1989), Purnanandam (2005).
[14] Ward and Foster (1997), Pundado and Rodrigues (2005).
[15] Speaking about current obligations in financial distress Wruck (1990, 421) highlights *that "these obligations can include unpaid debts to suppliers and employees, actual or potential damages from litigation, and missed principal and interest payments under borrowing agreements".*

panies with external financing only. All-equity companies are not taken into consideration because without leverage operating difficulties of the company cannot be interpreted as financial distress.[16] High leverage constitutes the core of the financial distress problem. Therefore, the subject of the research at hand is firms with large amounts of debt.

Many researchers have tried to summarize different concepts of financial distress in order to present a complete picture of existing approaches, but no one has classified them.[17] One aim of this dissertation is to fill this gap. Based on a comprehensive analysis of current concepts available in the theoretical literature and in empirical research, definitions of financial distress can be grouped into three main categories:

a) Event-oriented definitions of financial distress

b) Process-oriented definitions of financial distress

c) Technical definitions of financial distress

Within the scope of the first classification group, financial distress is usually applied analogously to terms such as default, failure, or bankruptcy. Financial distress is defined *as "the inability of a firm to pay its financial obligations as they mature"*.[18] Beaver (1966) was one of the first researchers to point out that financial distress can have different forms of appearance. Dependent on the type of the event occurring, bankruptcy, bond default, an overdrawn bank account, or nonpayment of a preferred stock dividend can represent the operational form of financial distress.

Similar definitions of financial distress can be found in Andrade and Kaplan (1998), Baldwin and Mason (1983), and Brown, James and Mooradian (1992). These authors interpret financial distress as a crucial event whose occurance separates the time of a company's financial health from the period of financial illness and requires undertaking corrective actions in order to overcome the troubled situation. Andrade and Kaplan (1998) identify two forms of financial distress: the first one is default on a debt payment, and the second one is an attempt to restructure the debt in order to prevent the default situation. Brown, James and Mooradian (1992) classify a company as financially distressed if it is going to implement restructuring measures with the purpose to avoid a default or as a response to the anticipated default on a debt contract.[19]

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[16] Altman (2002, 8), Wruck (1991, 421).
[17] An extended survey of existing definitions of financial distress can be found by Broxtermann (2003, 3-6), Fitzpatrick (2004, 1-6), Weckbach (2004, 21-29).
[18] Beaver (1966, 71).
[19] Brown, James and Mooradian (1993, 102).

Whitaker (1999) criticizes a determination of financial distress in terms of a single event. He argues that default cannot be defined synonymously with financial distress because a company bears the vast majority of losses and other adverse effects during the time preceding default or bankruptcy.[20]

Opler and Titman (1994) define financial distress more broadly as a costly event that affects the relationship to debtholders and non-financial stakeholders. As a consequence, a company gains an impaired access to new capital and bears the increasing costs of maintaining this stricken relationship.[21] Gestel et al. (2006) characterize financial distress and failure as the result of chronic losses which cause a disproportionate increase in liabilities accompanied by a shrinkage in the asset value.[22] Hendel (1996) gives a probabilistic definition of financial distress as *"the likelihood of bankruptcy, which depends on the level of liquid assets as well as on credit availability"*.[23]

The development of the theory of financial distress as a process having specific dynamics began with an article by Gordon (1971). Gordon highlights that financial distress is only one state of the process, followed by failure and restructuring, and should be defined in terms of financial structure and security valuation.[24] The corporation enters this state when its power to generate earnings is becoming weak and the amount of debt exceeds the value of the company's total assets. Financial distress is characterized by yields of bonds lower than the risk free interest rate and significant difficulties in obtaining additional external financing.

The substantial contribution of process-oriented definitions to the concept of financial distress is that they reflect the evolution in understanding this complex phenomenon, the formation of a comprehensive theory of financial distress, and portray *"the expansion of the definition <...> from the singular bankrupt state to encompass states of distress between corporate health and bankruptcy"*.[25]

Purnanandam (2005) determines financial distress in terms of solvency. He develops a theoretical model of corporate risk management in the presence of financial distress costs. Financial distress is seen as an intermediate state between solvency and insolvency. A company is distressed when it misses interest payments or violates debt covenants. The transformation from a solvent to an insolvent state happens only on the date of maturity if the terminal value of the company's assets is lower then the face value of

[20] Whitaker (1999, 124).
[21] Opler and Titman (1994, 1015).
[22] Gestel et al. (2006, 980).
[23] Hendel (1996, 309).
[24] Gordon (1971, 347-348).
[25] Turetsky (2003, 24).

debt.[26] Thus, this definition clearly distinguishes financial distress from default and possible bankruptcy. A company can be distressed without defaulting. However, default and bankruptcy are not possible without the preceding period of financial distress.

The model by Purnanandam (2005) is similar to the concept of financial distress by Gilbert et al. (1990). In their study Gilbert et al. (1990) show that financial distress has different financial characteristics than bankruptcy. Financial distress is characterized by negative cumulative earnings over at least a few consecutive years, losses, and poor performance. Bankruptcy is one of the possible outcomes of financial distress.[27] A company in financial distress has the choice to restructure its debt and reach an appropriate level of solvency, to merge and, thus, disappear as an independent business entity, or to file for bankruptcy as a strategic response by the management or owners to financial problems.[28] Ward and Foster (1997), Pindado and Rodrigues (2004) also stress a legal and rather strategic character of bankruptcy. They criticize the identification of financial distress with bankruptcy procedure because strategic filing for Chapter 11 can happen even if a company is economically solvent. Filing for Chapter 11 is especially suspicious without going through financial distress beforehand.

Reexamining the predictive ability of auditors' opinions regarding corporate bankruptcy, Hopwood et al. (1993) confirm this hypothesis and note that bankruptcy without preceding financial distress is driven rather by management fraud than by a "natural" stressed situation.[29] Hence, the concept of financial distress seems to have a significant distinction from the theory of bankruptcy. Unlike filing for Chapter 11, financial distress does not depend on the legal procedure of a single country; it is an initial period of the distress cycle and it still allows the company to reflect, to react, and to recover without having to bear the administrative and direct costs of a bankruptcy procedure.[30]

The idea that financial distress is a separate economic category and, moreover, it should be seen as an overall process that combines single states of corporate decline is applied in the model by Turetsky and MacEwen (2001). They define financial distress as a series of subsequent stages characterized by a special set of adverse financial events. Each stage of financial distress has a distress point and continues until the next distress point is reached. Technically, each stage of financial distress is defined as an interval between two distress points. The onset of financial distress begins with a volatile decrease from

[26] Purnanandam (2005, 3).
[27] Pindado and Rodrigues (2005, 344), Ward and Foster (1997, 870).
[28] Gilbert et al. (1990, 170).
[29] If one remembers the recent big bankruptcy scandals of WorldCom, Enron, Parmalat, this argument seems to gain additional importance for further research not only in the field of corporate governance, but also in the theory of corporate financial distress and bankruptcy.
[30] Compare to Pindado and Rodrigues (2005, 345)

positive to negative cash flow. The following dividend reduction signalizes the change to the next stage leading to default. Technical default on debt precedes troubled debt restructuring which usually tends to reduce the risk of potential bankruptcy. Thus, for the first time, researchers succeeded in describing financial distress as a continuous process with a clear structure and a categorization of the distress events.

The last group of my classification of the definitions of financial distress interprets the latter through identification of the main indicators. These indicators are usually used in empirical studies predicting financial distress, [31] analyzing the performance of distressed companies, [32] distressed restructuring, and implications of the national and international legal proceedings on the capital structure of the firm in question. [33]

The most important signals about financial distress can be received from the analysis of financial ratios of the company. Accounting based indicators of financial distress are still very popular among researchers and widely used as selection criteria. Despite the critique that financial ratios are past oriented and cannot capture the future dynamics and prospects of the company as a going concern, [34] they perform well in models predicting financial distress and probability of default.

Denis and Denis (1990) identify financial distress when a company experiences losses (negative pre-tax operating income or net income) over at least three consecutive years. Results of their empirical analysis of the dividend policy in financial distress show that after a company enters into financial distress, it usually experiences cash flow problems and is unable to pay dividends. Therefore, rapid and aggressive dividend reductions together with consecutive negative income can be used in order to determine financial distress situation.[35]

Asquith et al. (1994) choose the interest coverage ratio in order to define financial distress. The firm is classified as distressed if in any of two consecutive years its EBITDA is lower than 80% of the firm's interest expense. This marker incorporates the fact that a company facing financial distress usually experiences a decline in profitability, is overleveraged or has insufficient cash flows to cover current obligations. [36]

Platt and Platt (2002) highlight the lack of a consistent definition when a company enters financial distress and try to summarize different operational definitions of financial

[31] See e.g. Altman (2000), Beaver (1966), Duffi and Wang (2004), Ohlson (1980), Zmijewski (1984).
[32] Altman (1984), Andrade and Kaplan (1998), Opler and Titman (1994).
[33] E.g. the recent studies of Acharya at al. (2004), Davydenko and Franks (2004), Broadie et al. (2004).
[34] Hillegeist et al. (2004, 6).
[35] In their empirical study on the debt overhang problem, Franks and Sanzhar (2003) state that dividend reduction prior to financial distress and debt restructuring usually reaches more than 30%.
[36] Asquith et al. (1994, 632) show that the ratio of EBITDA to assets of troubled companies is about 12.8% lower than the mean value of other firms in the same industry.

distress in one selection mechanism. A company is considered to be financially distressed if one of the following events occurs: it experiences several years of negative net operating income or the suspension of dividend payments, financial restructuring or massive layoffs.[37]

Very often both accounting and market-based determinants are combined for the identification of financial distress in a model. This mixed approach allows researchers to capture the complicated and heterogeneous nature of the distress phenomenon connecting its endogenous and exogenous determinants. Opler and Titman (1994) use the median sales growth and the median stock return in order to identify troubled companies. Negative stock returns (a fall below -30%) indicate the unexpected character of adverse processes running in the company. Accompanied by a negative growth in sales, negative stock returns signal the existence of hidden operational problems of the company in its daily business. These two indicators are especially crucial during economic downturns because they reflect not only the efficient operational structure of the company, but also its dependence on investor sentiments, the situation of competitors as well as on general conditions of the industry.

Whitaker (1999) uses the measure of cash flow and market value of the company in order to identify when a firm enters into financial distress. Financial distress is defined as a situation when a company has insufficient cash flows to cover its obligations and incurs a decline in its market value. The proxy of cash flows for financial distress is not sufficient because a firm can have a temporary cash shortage which can be eliminated by utilizing other sources of coverage in the face of a temporary lack of liquidity.[38] Reduction in market value is said to be an additional insurance factor for the proper selection of companies in financial distress because it reflects lasting cash flow problems and, as a result, a decline in their worth.

To give a brief summary, different approaches to the definition of the term “Financial Distress” show how versatile, complex, and sometimes even controversial this economic category is. The state of the art in the theory of financial distress is rather to interpret it as dependent on the purpose of research under a particular point of view: financial, operational, legal, etc., which leads to using this term interchangeably with other similar financial definitions. The theory of financial distress, full of specific mechanisms and anomalies, still needs consolidation, an agreement about the consistent formal usage of similar economic criteria. The modern approach should interpret financial distress as a

[37] Platt and Platt (2002, 186-187).
[38] A temporary lack of liquidity usually can be covered by cash reserves, by a reduction of the level of inventories, by selling assets or taking additional credits.

heterogeneous and ynamic process with *"diverse characteristics that evoke various economic signals"*[39]. An alternative model allowing the integration of single aspects of current financial distress theory into a comprehensive concept will be introduced later in this chapter.

3.2 Risk Triggers in Financial Distress

Financial distress is a very complex and versatile process. The research on corporate financial distress is relatively young compared to the knowledge about mechanisms and processes running in sound enterprises. Difficulties in measuring financial distress very often lead to an identification problem of whether an individual factor is a trigger of financial distress or rather its consequence. In this section I analyze which risk factors can be understood as sources of financial distress.

The heterogeneity of financial distress has its origin in the diversity of the sources of financial difficulties. According to financial theory, these difficulties can be caused by exogenous or endogenous risk factors. The endogenous risk factors usually refer to the internal problems of the company. Therefore, they negatively affect only a particular firm or a small number of firms within the same network. The exogenous risk factors are pervasive; they can affect all companies in the market. The sketch below summarizes in a simplified manner the spectrum of external and internal risk sources:

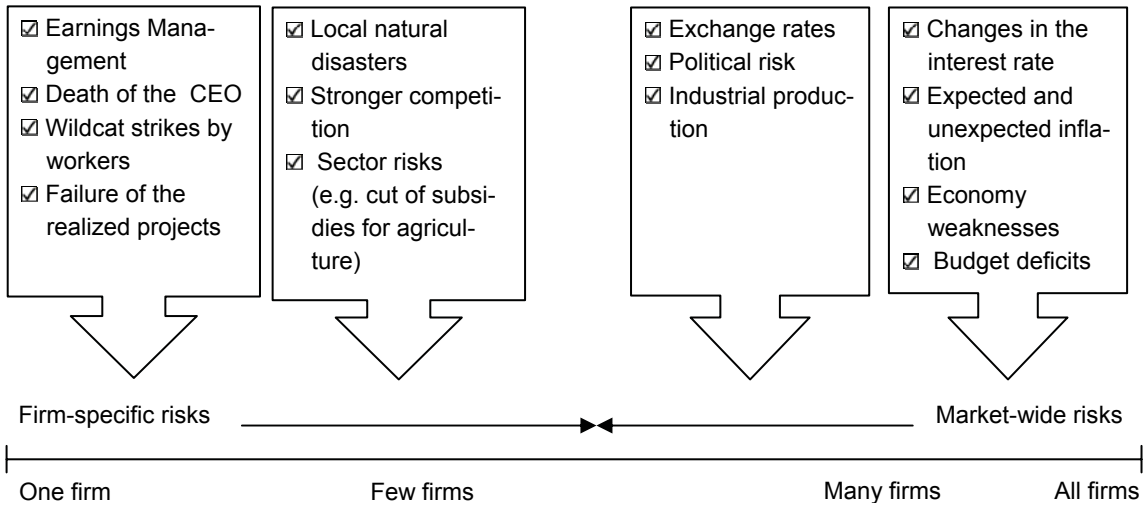

Figure 1: Risk Factors of the Company[40]

As a rule, the identification of sources of financial distress is attributed to the extended empirical research. Thus, Karels and Plakash (1987) divide all possible causes of financial distress into two groups: internal risk factors and external shocks. Internal risk fac-

[39] Turetsky (2003, 24).
[40] Adapted from Damodaran (2002, 67).

tors can be attributed to poor management. Potential forms of the appearance of bad management are the absence of a sense of a need for of change, inadequate communication, overexpansion, unintentionally improper handling of projects, or fraud. Exogenous shocks are independent of managerial skills. They can be classified into inefficiencies in regulatory development, turbulences in the labor market, or natural disasters. [41]

Similarly to Karels and Plakash (1987), but providing more detail in distinguishing between external and internal risk factors, Bibeault (1983) examines the proportion of every risk factor within each group. Bibeault reveals five significant sources of external risk: economic change, competitive change, government constraints, social alterations, and technological change.[42] His survey of 81 companies which failed because of external risks shows that about 41% of the companies experience declining performance as a result of bad macroeconomic conditions, 31% of the firms are subject to distress because of a changing competitive environment, 13% face regulatory restrictions on expansions in strategic sectors of the economy, and 15% suffer because of social or technological change. However, the overall survey states that 80% of all cases of financial distress happen because of the management factor, namely managerial incompetence.[43] Management inadequacy is also reported by Altman (1983) as the main source of financial distress. One of the highest percentages of default was recorded in 1980 when bad management accounted for over 94% of all business failures.[44]

Diametrically opposed results are provided by John et al. (1992). Investigating reasons for and responses to the poor operating performance of companies which restructure themselves in order to prevent default, they report that the most common cause for negative earnings and, as a consequence, poor performance are poor economic conditions. 95% of the troubled firms are distressed because of recession, 57% deteriorate because of increasing foreign competition, whereas the most common internal source of financial distress – so-called "creative accounting" or changes in accounting techniques – accounts for 37% of the firms.[45]

Mixed results on the sources of financial distress are obtained by Kaplan and Stein (1993). Analyzing leveraged buyouts from 1980 to 1989, they identify that financial distress is caused only partly by endogenous problems (namely, poor performance of the buyout deals). The frequency of the incidence of financial distress in their sample shows a positive dependency on periods with an increasing short-term interest rate. This posi-

[41] Karels and Prakash (1987, 575-577).
[42] See Bibeault (1983, 28-33).
[43] Bibeault (1983, 35).
[44] Altman (1983, 40).
[45] John et al. (1992, 900).

tive time trend as well as the observation that many firms failed in those years despite a positive operating performance are sufficient conditions to assume a causality of exogenous factors in financial distress.[46]

Asquith et al. (1994) recognize three reasons why a firm can become distressed. The most important cause of financial difficulties in their sample – poor firm-specific performance – is endogenous and responsible for the distress of 56.4% of the companies in the sample. Poor industry performance accounts for 22.2% of all failures and 21.4% fail because of high leverage.[47] Comparable results on the main source of financial distress are contained in the study by Whitaker (1999). 76.8% of the firms suffer from purely endogenous problems (poor management), 37.5% fail because of a mix of internal and external risk factors (poor corporate governance combined with industrial decline). The role of pure exogenous reasons is surprisingly small in the sample by Whitaker (1999): only 9.4% of all firms fail because of poor industry performance.[48]

Andrade and Kaplan (1998) analyze highly leveraged transactions and state that the onset of financial distress in the sample is triggered by cash flow shortages. They hypothesize and investigate four sources which can lead to financial distress: poor industry performance as a result of economic shocks, poor company performance, changes in the short-term interest rate as well as the firm's leverage.[49] In contrast to Asquith et al. (1994), their empirical results support the fact that the firm's leverage is the strongest factor causing financial distress. High leverage is primarily responsible for the lack of cash in the company. Andrade and Kaplan (1998) also make an observation concerning the correlation between the source and the severity of financial distress. Financial problems caused by economic shocks tend to be deeper and more severe.

A comprehensive analysis of the empirical work on the reasons for financial distress provides evidence that companies can fail for different reasons. The results of empirical investigations depend on the chosen time frame and the sample of the companies in question; they vary in the cross-section compared to the evaluations on the industry-level. However, the review of the literature shows that while in the 1980s financial distress was mostly driven by endogenous risk factors, in the 1990s researchers report an upward trend in the proportion of exogenous sources of financial distress.

Nwogugu (2004) offers a possible explanation of this trend: the evolutionary development of corporate enterprises as well as a change to more service-oriented economies

[46] Kaplan and Stein (1993, 352).
[47] Asquith et al. (1994, 633).
[48] Whitaker (1999, 127).
[49] Andrade and Kaplan (1998, 1450).

and an increasing role of governmental regulation provoke a shift from endogenous to exogenous causes of corporate failure.[50] Financial distress occurs as a consequence of management's failing ability to control and anticipate negative economic effects on the firm's profitability and future prosperity. In the sample by Nwogugu unanticipated economic shocks cause about 15 to 40% of all distressed situations.

The exogenous character of risk in financial distress is also confirmed in an empirical study of Denis and Denis (1995). Analyzing leveraged recapitalizations at the beginning of 1990s, they find that financial distress is caused by industry-wide problems. Schleifer and Vishny (1992), Opler and Titman (1994) analyze different aspects of the interdependence between industrial downturn and the occurrence of financial distress. Opler and Titman (1992) show that the financial distress of highly leveraged companies has its seeds in an industrial downturn. The performance decline is exogenous and driven by customers, competitors, and the management.[51] Therefore, in periods of economic recession, exogenous risk factors are primary sources of financial distress, while managerial incompetence can be rather seen as a response to external shocks.

The next step towards understanding the reasons for financial distress was taken by Maksimovic and Phillips (1998). They report significant differences between risk factors forcing enterprises into financial distress in periods of high business activity and in periods of cyclical downturn. The failure of companies during economic growth arises from low productivity and internal inefficiencies. In downturns firms experience financial distress mostly because of productive overcapacities and a low level of industrial cash flows. The dependence of the incidence of financial distress on external shocks shows that the number of bankruptcies is negatively correlated with the state of the economy: the proportion of companies going bankrupt during a recession is three times higher than under sound macroeconomic conditions.[52]

Thus, a comprehensive exploration of theoretical and empirical work on the risk factors in financial distress shows that the nature of risk is time-varying. And results from Maksimovic and Phillips (1998) confirm the hypothesis that the sources of financial distress might experience shifts from endogenous to exogenous ones, dependent on the degree of exogenous risk. I will come back to the role of external effects in financial distress later when I formulate hypotheses for my empirical study.

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[50] Nwogugu (2004, 1-3).

[51] Opler and Titman (1994, 1018). Customers in periods of economic decline prefer to change to competitors with more sound financial ratios. Strong competitors benefit from their ability to pursue aggressive expansive policy and dumping prices. Management can fail to response properly to industrial downturn revealing its inability to anticipate external effects.

[52] Maksimovic and Phillips (1998, 1497).

Combining the recent analysis of the causes of financial distress by Altman and Hotchkiss (2005) with the expert knowledge of previous research, all sources causing financial distress within the last 20 years can be summarized in two groups: exogenous risk factors versus endogenous risk factors. The most prominent internal sources of financial distress are bad management, poor operational performance, and high leverage. External reasons for financial distress are economic shocks, overcapacity and structural changes, deregulation of the key industries as well as natural disasters. Sometimes researchers take a wrong path by oversimplifying the real reasons for financial trouble.[53] However, it would be wrong to draw a line between the two the groups of factors. Even if managerial incompetence represents the most frequent causal factor of entry into financial distress, the reasons in many cases are mixed, interrelated, and should be analyzed in all their complexity.[54]

3.3 Conceptual Framework: Financial Distress as an Integral Process

As already mentioned in 3.1, an alternative approach to financial distress as a single event is to treat it as a process consisting of subsequent stages. In each of these stages different adverse processes and mechanisms occur.[55] The examination of these mechanisms is challenging and can be made in the context of the corporate failure framework based on the empirical research of Hambrick and D'Aveni (1988) and Kraus and Haghani (2004).

A deeper understanding of the adverse mechanisms in every stage of the downward spiral is needed in order to be aware of what happens in financial distress, why the value deterioration process becomes so irreversible (the fall in value can amount to 70% of the original pre-distressed value of the company or even more), [56] and to choose adequate actions in response to distress situations.

In this section I develop an integrative conceptual framework for the analysis of financial distress. I show nuances between seemingly similar terms of financial distress, failure as a part of the process, insolvency, bankruptcy, and distressed restructuring and illustrate how these different sub-processes can be embedded into the theory of financial distress. I use "corporate distress" synonymly with "corporate failure" as an overall term for the determination of single stages of the decline period and in order to reproduce

[53] Miller (1977, 50).
[54] Whitaker (1999, 127). 38% of the sample failed because of mixed causes of financial distress.
[55] Altman and Hotchkiss (2005), Hambrick and D'Aventi (1988).
[56] Andrade and Kaplan (1998), Russel et al. (1999).

them as a dynamic process. I explain advantages of representing financial distress as an integral process and analyze mechanisms running in each single stage.

3.3.1 Dimensions of Financial Distress

The dynamic nature of financial distress assumes that while moving in and out of financial trouble, the company passes through separate stages, each of which has specific attributes and, consequently, contributes differently to corporate failure. Financial distress is time-varying which incorporates that once entering it, the company does not stay in the same state until it is liquidated or until it recovers. Changes in financial conditions affect the transition from one state of financial distress to another.[57] If financial conditions become aggravated, the company most probably will face bankruptcy; if the performance of the company improves, it has a chance to overcome its financial difficulties and recover without defaulting. Therefore, an analysis of the coherence of change of financial conditions with the financial status of the firm should exploit three main dimensions of the distress dynamics: behavior over the *time window*, the impact on different *financial states,* and characteristic features of *performance at different distress stages*. Schematically, the process of corporate failure can be illustrated as follows:

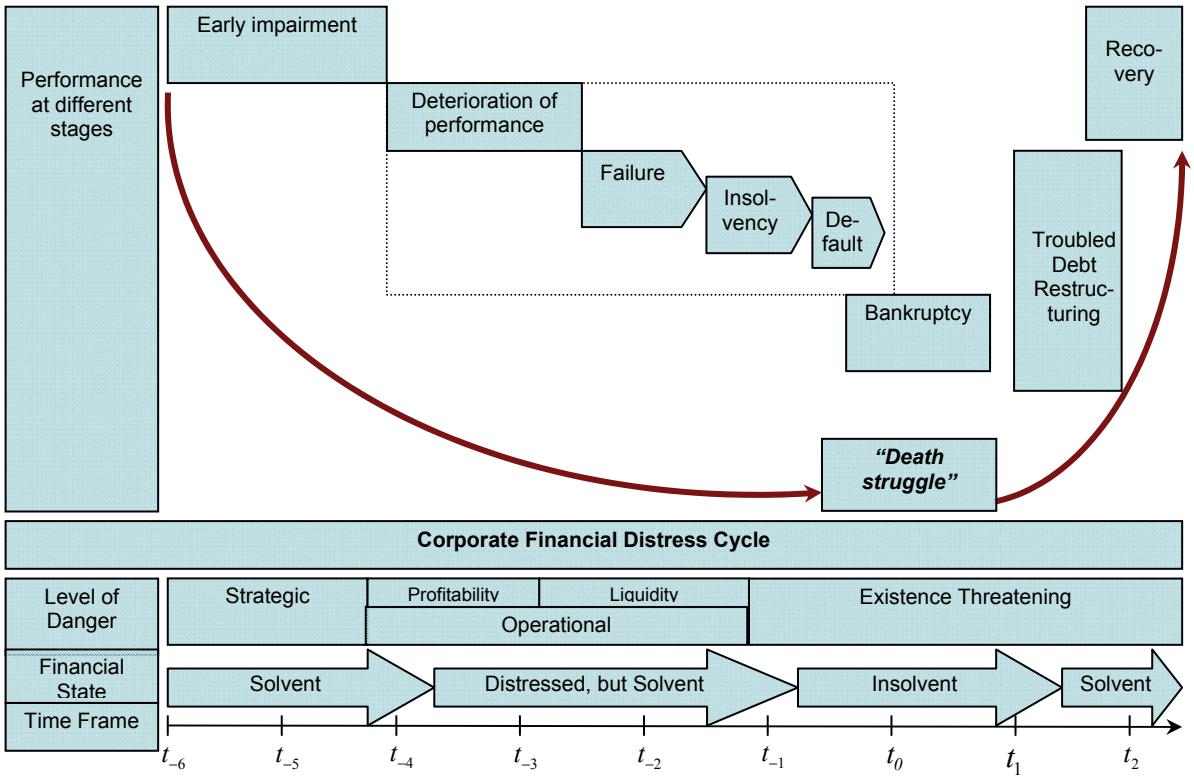

Figure 2: Corporate Failure as an Integral Continuous Process[58]

[57] Hill and Perry (1996, 60) point out that the initial conditions of financial distress change over time. During financial distress the company experiences fluctuations in financial ratios, transformations of its financial structure, and variation in economic indicators.

[58] Own illustration.

Corporate failure is shown as a three-dimensional process containing the time frame, financial states, and process stages. The time window covers the period from the first signs of slight deterioration in performance through accelerated impairment down to the deepest point and subsequent recovery. This is the so-called financial distress cycle. The determination of the average length of the failure process is complicated because of difficulties in the measurement of the onset of financial distress. In fact, the onset of financial distress cannot be accurately identified. Ex-ante predictions are unable to estimate the date when bankruptcy occurs by more then three years in advance.[59] Predicting default more than three years before bankruptcy significantly reduces the accuracy of the forecasting models.[60] An ex-post analysis of financial distress shows that the first observable signs of the deterioration of corporate health appear five to six years prior to bankruptcy. The existence of earlier signs of declining performance is questionable. Even if they exist, they are unobservable, very weak, mostly of strategic and not of a financial nature and, therefore, difficult to measure. Financial theory usually ignores these factors because of their low significance. Adverse developments usually become observable about one to two years before default, when the company becomes severely distressed.[61] It takes on average two to three years after default to restructure the debt of the company and achieve a pre-distressed level of performance.[62]

Financial states represent the second dimension of the corporate failure process. The fall of a company into distress usually happens because of a shift in liquidity. However, a reduction of liquid resources does not necessarily have a negative influence on a firm's solvency position. Typically, in the early stages of financial distress the company continues to be solvent, which makes it difficult to recognize the existence of negative processes inside the company. Event studies show that further decline in liquidity causing transition to the next distressed but solvent state might be indicated by an analysis of the change in cash flows in comparison to the total assets. [63]

Deepening financial distress triggers the illiquidity of the firm's assets; the value of the firm deteriorates below some lower threshold.[64] In this case, the financial state of the company is not stable anymore. Since financial distress does not necessarily lead to default, also in this period the company remains solvent which implies that it is possible

[59] Platt and Platt (2002, 188).
[60] Thus, Altman (1968) demonstrates that the prediction accuracy of the Z-Score model has an inverse relation to the number of years prior to failure: one year prior to bankruptcy the Z-Score can predict 94% of all failures, two years before – 72%, three years in advance – 48%, four years ahead – 29% and five years before – 36%.
[61] Hambrick and D'Aveni (1988, 14).
[62] Barker III and Mone (1994), Kraus and Haghani (2004).
[63] See Hill and Parry (1996, 63).
[64] Purnanandam (2005, 4).

that its financial position may improve before the date of maturity of the debt. The distressed but solvent state has different characteristics than the solvent one. The accelerating fall in value emphasizes an increasing role of the leverage in the detection of a possible transformation to insolvency.

The change in financial status to the insolvent state happens on the date of maturity when the company defaults on repaying its debt. The legal consequence of this event is bankruptcy. A transformation or the return to the solvent state is only possible after successful completion of distressed debt restructuring.

The last dimension of the integrated view on corporate failure is its stages. Since I will examine each of them in more detaile below, I want to finish the discussion about the dimensions of financial distress with a citation from Sherrer (1988) which exactly characterizes the reason why financial distress should not be analyzed as a snap-shot, but should be broken down into single stages: *"There are distinct phases of decline, and the danger signals vary with the stages. Sometimes not all of the symptoms appear; there is sufficient cause to worry if some occur"*[65].

3.3.2 Phases of the Downward Spiral

The analysis of the causality in 3.2 shows that most companies enter financial distress as a result of bad performance or adverse economic conditions, or both.[66] Corporate failure is a protracted process and runs through different stages.[67] I divide all phases of the financial distress cycle into four large intervals: early impairment, financial distress, "death struggle", and distressed restructuring. Then financial distress is broken down into four sub-stages: performance decline, economic failure, technical insolvency, and default. If a company defaults on its debt and the decision not to liquidate is made, it can go through the legal process of bankruptcy; otherwise, financial restructuring may be undertaken out of court. Since during the official bankruptcy period and especially in the first year of distressed restructuring the company still battles for maintaining itself as a going concern, I call this most crucial period of its lifecycle the "death struggle". Following the chosen methodology, I examine each of the consecutive phases of financial distress separately.

3.3.2.1 Early Impairment

A small number of empirical studies prove that the origins of corporate financial distress lie in the first period of time after entering the downward spiral, the so-called early im-

[65] Sherrer (1988, 32).
[66] Datta and Datta (1995, 18),Whitaker (1999, 123).
[67] See the discussion about an average length of financial distress cycle in 3.3.1.

pairment, six years or more before bankruptcy occurs. This stage sends very weak signals about the beginning of the deteriorating processes in the firm to third parties because of the absence of visible signs of approaching financial difficulties. As mentioned above, the company still earns positive cash flows from operations, which makes it complicated for even the most advanced models to identify impending losses.[68] In this period, the first strategic mistakes regarding the long-term focus of the business are made.[69] Using a metaphor, "*"the seeds of weakness are sown, such that <...> the eventual bankrupts already have lagging levels of slack and profitability"*,[70] but since results of strategic long-term decisions are not visible yet, no countermeasures can be undertaken at this time.

Researchers can only speculate about the fatal effect of external alterations or internal changes for the company's health at this stage. Weitzel and Jonsson (1989) speak in this context about the qualitative character of negative changes which are difficult to recognize and to communicate. These changes can influence the core technology of the company, its productive output, and limit access to resources or clients. [71] Miller (1977) demonstrates the difference between four possible strategic syndromes of failure. Two of them are of interest to us because they have a long-term strategic perspective and can be the symptoms of early impairment. The first syndrome is when a company does not recognize the change in the upward trend of overall economic development. This can happen if the management has overambitious, incautious expansion strategies and if the diversity in the firm's markets grows faster than the information system of the company. In this situation, the firm is unable to anticipate changing conditions and properly adjust its growth strategy. The second syndrome is just the opposite of the first and implies that managers overestimate the stability of the current economic situation. They are convinced of the results of pursuing the strategy of the past and disregard that a sudden change of economic conditions can turn success into failure.

Similarly to Miller (1977), Kudla (2004) states that early decline means an impairment of comparative advantages which can put the long-term success potential of the firm at risk. The company can experience a loss of technological benefits, follow a wrong strat-

[68] See e.g. Ohlson (1980), Zmijewsky (1984), Zurada (1998), Altman (2002). As already discussed in 3.3.1 different methods of predicting financial distress and bankruptcy are unable to forecast an adverse outcome further (earlier) than maximum 5 years prior to bankruptcy.
[69] Gless (1996).
[70] Hambrick and D'Aveni (1988, 13).
[71] Weitzel and Jonsson (1989, 98).

egy of expansion in declining industries, or try to expand in already overheated markets.[72]

Functional blindness[73] regarding the strategic problems is comprehensible. The examination of the non-financial situation is difficult and requires a certain level of subjective judgment.[74] At this level, corporate management and the realization of the corporate strategy can be seen as a source or, dependent on the underlying situation, as an accelerator of the transition to the stage of financial distress.

3.3.2.2 Financial Distress

Two to five years prior to bankruptcy the company migrates from the strategic to the operational level of the adverse development, entering financial distress itself. Financial distress can be subdivided into four sub-intervals: deterioration of performance, failure, insolvency, and default. Whereas deterioration and failure affect the profitability of the company, insolvency and default are rooted in its liquidity. Theoretically, the outcome of each interval can be positive, implying that the company breaks the downward trend, or negative indicating the continuing deterioration of the firm value and a movement downwards from one sub-interval of the spiral to another. In many real cases, when entering financial distress, the company traverses all the stages of decline.[75]

In general, financial distress is characterized by a sharp decline in the firm's performance and value.[76] This part of the overall process has two important characteristics: Moving down the spiral from one phase to another the sharp decline accelerates, whereas the length of each stage becomes shorter and shorter. Obviously, this decline of performance can continue longer than the economic failure of the company. The length of insolvency depends on the maturity structure of the firm's debt, whereas default is dependent on the date of maturity followed by renegotiation and turnaround or liquidation and is, therefore, the shortest stage of financial distress. The biggest challenge in financial distress is to recognize adverse processes as early as possible in order to gain more time for response. The later financial distress is anticipated, the more time pressure and the more questionable is the success of counter measures.

The deterioration of performance begins with significant breaches in profitability. A drop in sales, changes in operating income, and negative stock returns are indicators of

[72] Kudla (2004, 82).
[73] Gardner (1965, 20).
[74] Bibeault (1982, 17).
[75] Mueller (1986, 50).
[76] Opler and Titman (1994), Whitaker (1999).

further decline.[77] Whitaker (1999) reports that in early stages of financial distress operating income falls to 46.32% below industry average.[78] Flat sales, increasing customer complaints about product quality, delivery, and service as well as late financial and managerial information are signs of the early decline as well.[79] In this stage the company shows significant inefficiencies at the operational level, missing operational goals and related profit margins.

Despite the company still being solvent in this phase, its management may take some corrective actions in order to improve fluctuating profitability. However, very often the activities undertaken end in a flop. Typical reasons for the failure of these actions are "inertia and hyperaction".[80] Both of them are often observed in altering waves of managerial response to financial problems. First, the company experiences a lag in the reaction to adverse processes. As stressed above, it typically recognizes the necessity to act if the negative outcome is observable. This inertia is very costly for the company's performance: The median decline in the firm's value equals on average up to 20%.[81] Then the management overreacts, sometimes bearing excessive risks, in order *"to escape the spiral of decline"*.[82] Since in financial distress different adverse processes interact, a synergy effect accelerates the fall in value. As a result, the temporary improvement in the firm's value due to the managerial actions undertaken does not compensate for the negative effects accumulated in operating activity and financial distress due to the deterioration in the company's performance leads to failure.

Using economic criteria, Altman and Hotchkiss (2005) define failure as a situation when *"the realized rate of return on invested capital, with allowance for risk consideration, is significantly and continually lower than prevailing rates on similar investments"*.[83] Failure as a part of the distress cycle contains the information about the fact that continuously declining profitability and a company performance below the industrial average are not temporarily but permanent. At this time, the financial ratios of the company reflect revenues insufficient to cover costs, and the average return on investment (ROI) lies far below the cost of capital.

Failure indicates the movement of the firm from a viable, "tolerable" level of decline to the marginal.[84] Operational decline leads to the cash buffer becoming thin. Cash short-

[77] Opler and Titman (1994, 1019).
[78] Whitaker (1999, 127).
[79] Scherer (1988, 34).
[80] Hannan and Freeman (1984), Miller (1977).
[81] Whitaker (1999, 128).
[82] Hambrick and D'Aveni (1988, 15).
[83] Altman and Hotchkiss (2005, 4).
[84] Hambrick and D'Aveni (1988, 13).

age in consequence of a permanent reduction in cash flow triggers the change in the financial status of the company from solvent to distressed. Given the interaction between deteriorating profitability and insufficient liquidity, the stage of failure is more severe than prior phases of the distress cycle, it cannot be easily overcome, and it can lead to permanent damage and eventually irreparable decline.[85]

Many researchers have analyzed the effect of deterioration in profitability on the competitive position of a distressed company: the market average falls substantially behind that of its rivals and below the market average,[86] the trust of the stakeholders erodes,[87] the employees (the so-called intellectual capital of the firm) change jobs, eventually to competitors,[88] and the firm stands in a liquidity squeeze.[89]

If the firm does not break the downward spiral, failure rapidly progresses into insolvency. Very often, for companies paying dividends, the switch from failure to insolvency is accompanied by the decision to cut or suspend them.[90] The drastic reduction in dividends is usually used as an urgent measure in order to limit cash outflows. The role of dividend cuts in insolvency is not clear: on the one hand, it has a temporary positive effect in the form of a cash injection; on the other hand, it sends a negative signal to the capital markets and can make it difficult to obtain external financing.[91]

The most serious problem a company faces at this stage is a lack of cash flows generated from operating activity.[92] Ross et al. (2002) point out two important parts of the insolvency question: stocks and flows. Thinking about insolvency on a stock basis implies that the market value of the company's assets is less than the face value of its debt, which results in negative economic worth. Flow-based insolvency occurs when the operating cash flows are insufficient to cover current obligations. [93] In the theory of corporate finance, a cash shortage occurs together with a debt overhang. [94] However, chronologically cash-flow insolvency happens before stock-based insolvency. Since the lack of liquidity in insolvency represents a chronic condition,[95] it means that the decline in cash flows will automatically reduce the fair value of assets and increase leverage.

[85] Makridakis (1991, 116).
[86] Kudla (2004).
[87] Altman (1984), Branch (2002).
[88] Hambrick and D'Aveni (1988), Nosal (1998).
[89] Beaver (1966), Laitinen and Laitinen (1998), Wruck (1990).
[90] Turetsky and McEwen (2001, 329).
[91] Turetsky (2003, 25).
[92] Altman and Hotchkiss (2005, 5).
[93] Ross et al. (2002, 855).
[94] Uhrig-Homburg (2004, 1510).
[95] Altman and Hotchkiss (2005, 5).

Taken together, the insolvent stage is characterized by a volatile decrease in cash flows from operations, a release of reserves and other cash equivalents in order to cover continuing losses, and a sharp decrease in borrowing capacity due to high leverage.[96] Since the negative development reaches its culmination in insolvency, this stage of decline is very sensitive to adverse events. The dependence of the risk of default on the change in liquidity can be illustrated by the results of an empirical investigation of firm longevity by Turetsky and McEwan (2001). They examine the factors influencing the shift from the upper to the lower level of the downward spiral. Results show that the volatile decrease in cash flows from positive to negative has an enormous impact on subsequent default: a one-unit increase in liquidity measured by the current ratio reduces the risk of default by approximately 47%.[97]

The occurrence of default symbolizes the peak of the distress development. As already mentioned before, default describes an event when the company cannot repay the debt or interest to creditors at maturity and, consequently, violates the conditions of the agreement with the debtholder, which can be a reason for legal action.[98] Gilson et al. (1990) subdivide the event of default into two categories: payment default on an interest or principal amount and technical default on financial covenant in the debt of the company. [99] The principal difference between insolvency and default is the reference of the latter to the date of maturity. A company can be insolvent for a long time. However, only on the date of maturity can it become classified as defaulted on its debt. If the firm faces this event, the negotiation and the private debt restructuring or bankruptcy is the consequence.

The event of default contains an important message to all recipients of the company's financial information. It resolves a part of the uncertainty about the severity of financial distress. Before default, investors have incomplete information about the true magnitude of the adverse processes inside the distressed company, the intensity of financial distress as well as the time until default and the probability whether default will happen.[100] The information asymmetry accompanied by investors' risk aversion leads to a decreasing demand for the securities of the distressed company and, as a result, restricts the ability to obtain external financing in order to overcome its financial difficulties. Altman and Hotchkiss (2005) highlight that default differs from all other stages of financial distress insofar that it always involves a relationship between a company-debtor and creditors.

[96] D'Aveni (1989, 578), Kudla (2004, 82), Turetsky and McEwen (2001, 323).
[97] Turetsky and McEwan (2001, 332).
[98] Altman and Hotchkiss (2005, 5).
[99] Gilson et al. (1990, 330).
[100] Giesecke (2005, 2).

The default event sends an explicit signal that the company is severely distressed and should be reorganized or liquidated. For shareholders, the default signifies a transfer of control rights to the debtholders and the dependence of final payoffs on results of renegotiation.[101] Another very important issue is that default as a turning point is a positive sign for vulture investors to enter into negotiations about the future of the company, with the intention to conduct a turnaround.

The figure below illustrates the run of the downward spiral in financial distress:

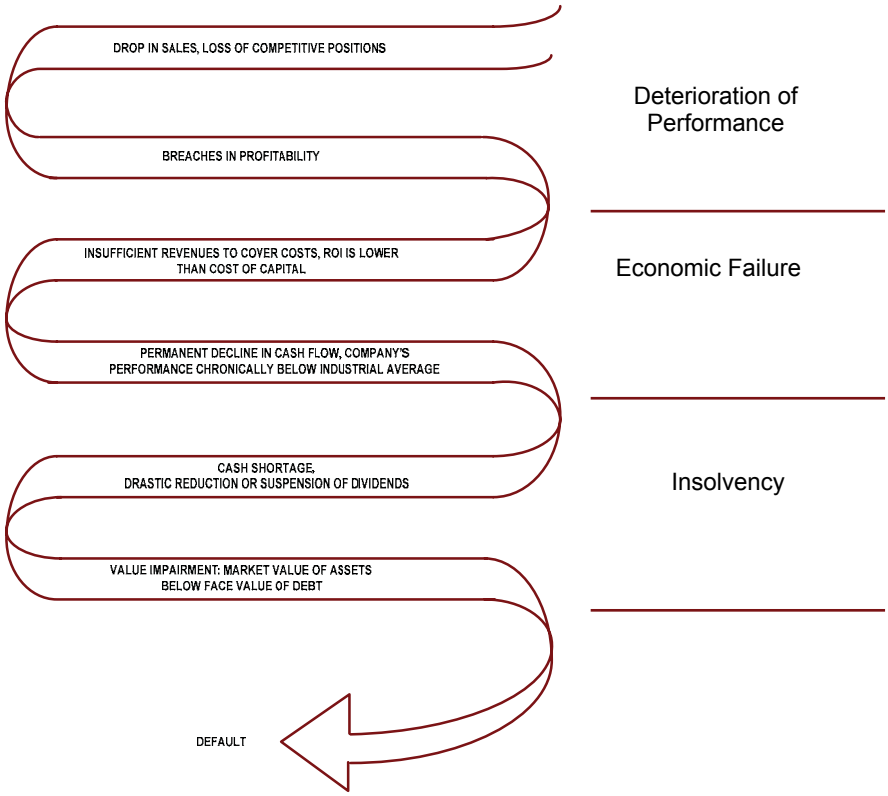

Figure 3: The Sequence of Adverse Events in the Downward Spiral[102]

Despite the fact that default can be seen as the lowest point of the downward spiral, it does not necessarily imply the end of the value deterioration. The value can decline even more after default. Default hides a danger of liquidation, but also gives the company a chance to survive. What outweighs becomes apparent by the outcome of the stage of distress cycle which I call the "death struggle".[103] The primary goal of the company in

[101] Shareholders are residual claimants in case of bankruptcy when the decision about the company's liquidation is made. This rule, called the absolute priority rule, causes conflicts of interest between managers and shareholders and creditors. In the case of default, debtors will be interested in the business as a going concern in order to keep their rights, whereas creditors would prefer to obtain invested money back and sell or liquidate the company if necessary. Distressed restructuring can help to solve this problem.
[102] Own illustration.
[103] In order to reproduce how dramatic events are following default I adopt an allegorical expression "death struggle" by Hambrick and D'Aveni (1988).

this period is to survive. The "death struggle" stage is probably the most dramatic phase of the corporate financial distress cycle. Therefore, I would like to discuss what happens within this phase in a separate section.

3.3.2.3 Death Struggle and Distressed Restructuring

For many companies the period after default is the time of truth, when corporate losses become visible not only for insiders, but also for the public, investors, and different stakeholders. No matter what triggers the company's entering the downward spiral and how fast it reaches the lowest point, the existence of many firms after default is threatened from the same consequences of financial distress: erosion of the support of external stakeholders, a high degree of internal inefficiencies, deteriorating internal climate and decision processes.[104] Default signals that the balance sheet of the company cannot absorb the decline in performance because financial resources have been completely exhausted.

The atmosphere inside the company struggling for its existence is very emotionally described in the book by Bibeault (1982) on corporate turnaround:

"... Now you've got a very difficult environment. You've got trade creditors on your back, you are failing to deliver your customers, the employees are all upset because they know that you are in trouble. And they are starting to abandon ship. The structure is starting to fall apart. There is an environment of pressure and shortage that most people don't want to cope with. When they get dumped into the crisis pressure cooker, they don't know what the hell to do."[105]

Reading between the lines of this quotation, one should notice that financial distress is destructive not only for the financial system of the company. It impairs its organizational structure, its relationship to external partners and negatively affects the attitude of the employees toward their work. The loss of a sufficient amount of financial and human resources is dangerous and can cause the company to be liquidated. Hence, the urgent task after default is to ensure the short-time survival of the company, to stop the cash outflow, and to restructure its debt.[106] After this short-term goal is ensured, the middle-term objectives are an increase in the cash inflows, achievement of the predistress level of operational performance, and the elaboration of a long-term strategy of sustainable development.[107]

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[104] Arogyaswamy et al. (1995, 498).
[105] This is a citation from an interview with Frank Grisanti, February 1978. In: Bibeault (1982, 76).
[106] Kudla (2004, 97).
[107] Asquith et al. (1994, 625).

As highlighted earlier, distressed restructuring can happen at any time during the financial distress cycle if the company recognizes the adverse development and undertakes successful action in order to break the downward trend. In this case, the firm can skip some of the stages of negative development. Whether the company will face default or not depends thereby on many specific factors and their combination with each other. The main determinants of the length of financial distress and its outcome are:

- Causes of financial distress
- Intensity of the adverse development
- Timing of counter actions
- Complexity of the managerial response

The managerial response to default is very crucial and implies the undertaking of distressed restructuring in order to prevent legal bankruptcy filing. Restructuring is a complex mechanism and encompasses many aspects of a distressed firm, such as its assets, creditors, shareholders, employees, management, and retirees.[108] Most of the restructuring processes run simultaneously. Researchers identify four main types of distressed restructuring: financial, governance, asset, and labor. The first two types of restructuring are used for the short-term elimination of the aftermath of default; the last two are applied to achieve the middle-term objectives of the recovery process.

Another approach to classifying distressed restructuring is to look at the restructuring dependent on the possible activities for improvement on the asset or the liabilities side of the balance sheet. First, a company pursues distressed debt reorganization in order to stabilize the fluctuation in liquidity. It negotiates with suppliers, employees, creditors, and other stakeholders about the conditions of the reorganization.[109] Typical actions for improvements on the assets side of the balance sheet are asset sales, mergers, capital expenditure reductions, and layoffs. [110] Empirical results show interesting statistics for turnaround activities before and after default:

[108] Datta and Datta (1995, 15).
[109] Review of the literature on the renegotiation process in financial distress can be found in Bolton and Scharfstein (1996), Gilson (1990), Nothardt (2001).
[110] Asquith et al. (1994, 625).

Type of restructuring	Before default	After default
Debt restructuring	28.15	100.00
Asset restructuring	69.63	65.93
- Divestitures	64.44	62.96
- Sale and leaseback	2.69	0.74
- Closing of operations and divisions	15.56	9.63
Governance restructuring	71.85	56.3
- Managerial	58.51	47.41
- Top executives	46.67	31.11
Labor recontracting	24.44	20.74
- Employee layoffs	21.48	18.52
-Wage concessions	8.15	5.93
- Reduction of retiree' benefits	0.00	1.48

Table 2: Restructuring Activities of Financially Distressed Companies[111]

According to the research of Datta and Datta (1995), if companies recognize financial distress before default, then the most effective actions in order to break the downward development are divestitures and management turnover. The company divests its assets in order to raise cash and to pay down the debt. The management crew is replaced because it is responsible for an inefficient realization of the operating policies and strategies and ignorance of the downward development. In every fourth case the company initiates cost-cutting measures and releases the employees in order to improve its operational performance.

The situation changes if default occurs. In the sample by Datta and Datta (1995) every company restructures its debt after default. Table 2 shows that the assets sales play a significant role in corporate restructuring both before and after default. The number of broken contracts with employees remains without any significant change, which demonstrates that this instrument of distress reduction does not have first priority but helps to cut costs. On average, the employment rate usually drops by 5%.[112] However, the importance of governance restructuring seems to decline slightly after default. This contradicts the results of Gilson (1989), who points out that the number of management replacements is significant during financial distress and tends to increase around default.[113]

The importance of the change in the team of top executives has a reasonable explanation. Abrupt decline, default, and entering the death struggle require the best management skills in order to save the company. In this situation the old management is very often replaced by new executives. This process is known in the literature as management

[111] Adopted from Datta and Datta (1995, 19).
[112] John et al. (1992, 911).
[113] Gilson (1989, 247).

turnover.[114] In keeping with the definition of management turnover, this action does not imply that every top manager is replaced by a new one. Sometimes companies confine themselves to hiring a new CEO or CFO, or replacing some of the most influential top managers. Nevertheless, almost all turnovers happen when the company has defaulted or experiences a severe operational decline.[115] There are many reasons why senior management resigns in default. Very often management turnover occurs because the default is more a special situation than a part of the everyday business, and the old managers usually do not have the appropriate skills and the necessary experience to deal with it.[116]

Many researchers point out that the fall into financial distress followed by default should be seen as a sign of the incompetence of the current top executives when they *"cannot cope with the problem or they themselves (or at least the CEO) are the problem"*[117]. This also forces management turnover. Empirical results show that on average between 30% and 70% of all top executives lose their jobs after default.[118] The significant number of management replacements in default occurs under pressure from the board of directors, because of the initiative of the creditors, or as a result of the will of private third-party investors financing the troubled company with solid amounts of equity.[119]

Hereafter, for the purposes of the research at hand, I will forgo the discussion of different types of restructuring instruments, turnaround strategies, and their organizational efficiency. Instead, I focus in more detail on financial restructuring as a decisive factor in the short-term struggle for the survival of the company. Therefore, I restrict the review of theoretical issues and empirical literature on corporate financial distress and recovery to the period of sharp decline in corporate performance and following distressed debt restructuring. The time frame used further in empirical research will cover the bottom of the financial distress cycle, representing the most crucial interval of the whole process:

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[114] Gilson (1989, 243) defines management turnover as *"any change in the group of individuals who together hold the titles of CEO, president, and chairman of the board"*. Another term used for management replacements is government restructuring (see Datta and Datta, 1995, 16).
[115] Gilson (1989, 261).
[116] Hofer (1980, 26).
[117] Bibeault (1982, 94).
[118] Ang and Chua (1981, 73) report a change in management in 30% of cases; Gilson (1989, 261) found that 52% of defaulted companies replace their top executives; Bibeault (1982, 93) estimates that about 70% of companies in trouble pursue governance restructuring as a first reaction to default.
[119] Gilson (1989, 250).

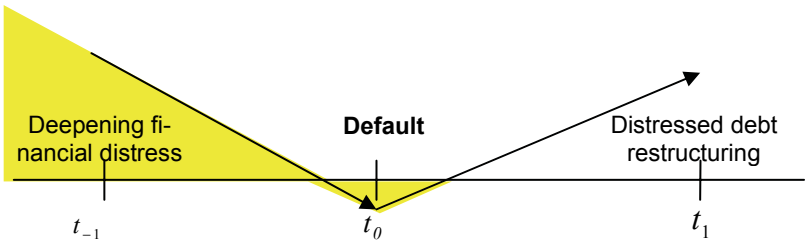

Figure 4: Thematic Content of the Empirical Research at Hand

3.4 Mechanisms of Financial Distress Resolution

In the previous section I analyzed different stages of the downward spiral of the distress cycle. Distressed restructuring can be seen as a mirror of corporate decline, moving the company towards the resolution of financial distress and giving it a chance to survive and return to financial health. Successful restructuring stops the erosion of the firm's value. In this section I discuss the instruments of financial distress resolution, the choice of the proper type of troubled debt restructuring, and the efficiency of the selected method of reorganization.

3.4.1 Troubled Debt Restructuring and the Distress Cycle

Distressed restructuring fulfills two basic functions: first, it is designed in order to avoid or remedy default, and second, it allows a company to remain alive until financial distress is resolved and financial health reaches an appropriate pre-distressed level. The most important tasks of distressed restructuring are the reduction or the deferment of debt payments or, as an alternative, the replacement of troubled debt with fixed interest by securities having residual payoffs.[120] Debt reduction can be performed in three general ways: by raising new capital, by renegotiating terms with creditors, or by merging with another company.[121]

Ross et al. (2002) summarize the ways of resolving financial distress and their rates of success in the following graph:

[120] Gilson et al. (1990, 325).
[121] Roe (1987, 233).

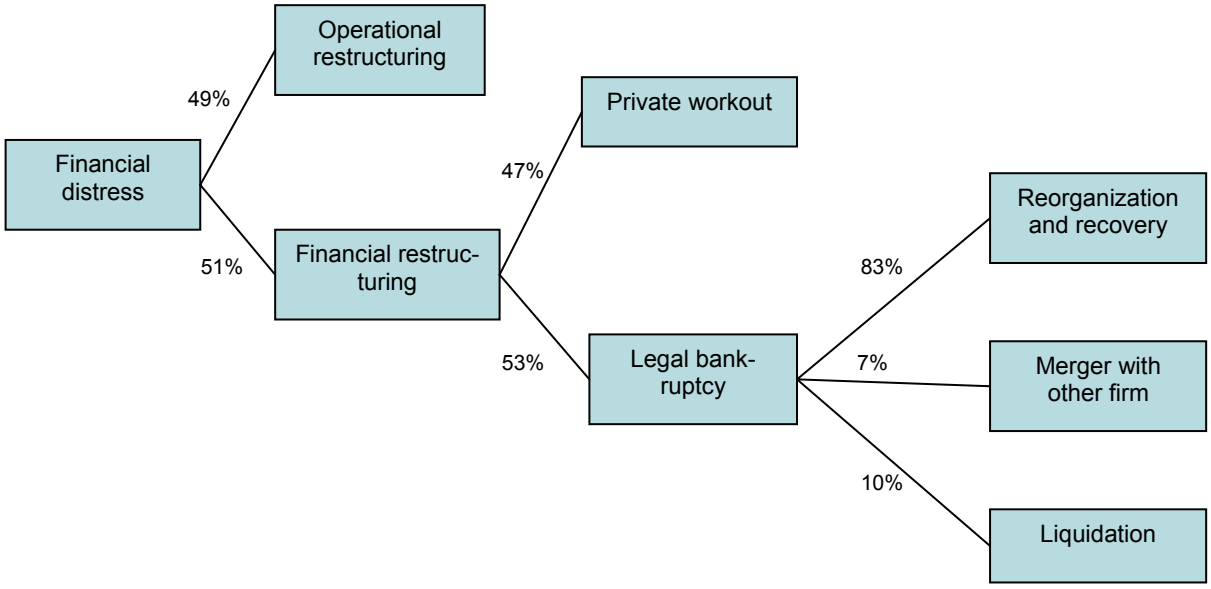

Figure 5: Ways of Resolving Financial Distress[122]

In this section I focus primarily on troubled debt restructuring and the ways of resolving financial distress through the renegotiation of terms of debt indentures with old creditors.

There are different approaches to defining financial restructuring. One possibility is to describe it as a process involving private recontracting with banks and other financial institutions and negotiation with public bondholders.[123] In this case, private and public debt restructuring are distinguished. Private debt has two properties differentiating it from public debt: it is secured, and it has a senior priority. In addition, private debt is mainly restructured by direct negotiation, whereas bargaining about altering the conditions of public contracts seems to be more complicated because of the high dispersion of public creditors. In many cases, public debt can only be restructured through tender offers or coercive exchanges.[124]

With respect to the form of financial distress resolution, troubled debt restructuring can be defined as an attempt of the company to work out a distressed reorganization with creditors to avoid a formal bankruptcy declaration under the condition of continuation independent operations.[125] Here, organizational forms of the troubled debt reduction can be differentiated between out-of-court restructuring, prepackaged bankruptcy, or traditional Chapter 11 protection. Empirical studies indicate that more than 90% of the distressed firms try to negotiate with debtholders out of court first, and only if the results of

[122] Ross et al. (2002, 858).
[123] Datta and Datta (1995, 19).
[124] Compare to Asquith et al. (1994, 639-642).
[125] Compare to Altman and Hotchkiss (2005, 5).

this procedure are not successful, do they file for bankruptcy protection under Chapter 11.[126]

The methodological approach of Gilson (1990) offers a fairly complete definition, covering not only possible methods of the resolution of financial distress, but also distinguishing the distressed restructuring mechanism from measures of strategic or ordinary change in corporate capital structure. It combines important characteristics of previous definitions and interprets debt restructuring as a transaction in which the existing debt contract is replaced by a new one as a response to the actual or anticipated default, with one of the following consequences:

- Reduction of the required interest or principal payments on the debt
- Extension of the maturity of the debt
- Exchange of the debt on equity securities (common stock or securities convertible into common stock)[127]

Indeed, the Gilson's definition captures two issues which are the core actions in financial restructuring and which at the same time raise serious problems affecting the outcome of the reorganization: Troubled debt restructuring implies the redesign of debt contracts and/or the change of the priority of debt claims. In the sub-chapter below, I study impediments to successful reorganization arising in conjunction with the need to adjust incomplete debt contracts and how they can be mitigated.

3.4.2 Obstacles to Efficient Debt Reduction

As long as the debtor intends to resolve financial difficulties out of court, the restructuring has an informal character. As soon as a distressed company enters Chapter 11, the reorganization becomes a legal procedure with formal regulations. The informal setting of debt restructuring comprises an approval of the reorganization plan among all classes of creditors. Usually this occurs unanimously. The debt restructuring can be enforced only if all classes of creditors reach consensus on the reorganization decision.[128] This

[126] See e.g. empirical studies of Franks and Torous (1994), Gilson et al. (1990), Gilson (1995).
[127] Gilson (1990, 357).
[128] The percentage of unanimous votes sufficient for the reorganization to be effective is not clearly defined in the literature. Thus, Ma et al. (1997) state that a successful offer typically requires at least 75% to 80% of unanimous votes. Yang (2003, 6) reports that unanimous votes of more than 85%-90% of all bondholders give the company the right to restructure the debt out of court. McConnell and Servaes (1991, 95) speak about a significant majority, which equals 90% or more of all debtholders. In accordance with the U.S. Trust Indenture Act of 1939 unanimous agreement pertains to every change in the core terms of the public debt agreement: interest rate, principal amount, maturity of debt. To compare in the case of Chapter 11 the approval of the reorganization plan is effective by the agreement of half of the creditors or the largest debtholders, which accumulate at least 2/3 of the outstanding debt. (More about in Roe (1987)).

can be complicated if the troubled company has many small public debtholders.[129] In this context, researchers recognize the existence of three obstacles which arise from the incompleteness of the company's debt contracts and the specific characteristics of a given financial distress situation and can result in difficulties in the reduction of distressed debt. These obstacles are control rights, the holdout problem, and information asymmetry.

Troubled debt restructuring can only be implemented if the creditors approve the plan of reorganization. De facto claimants of the company can choose whether to restructure the company or not. This situation emerges from the distribution of control rights. Financial contracting theory postulates that shareholders are a class of residual claimants, whereas debtholders have a fixed claim. The shareholders hold the control rights as long as the company is solvent. When the company is financially sound, shareholder gains have unlimited upside potential, whereas if the company defaults, the risk is limited by the amount that the shareholders invested in the company. In contrast, the upside potential of creditor gains is always limited by some fixed amount. Therefore, debt contracts are written in such a way that in case of default the control over the company as well as the wealth is transferred from shareholders to creditors. Equity claims in default become almost worthless, while the claims of the debtholders change their character from fixed to residual. The control rights of the creditors, their actual ability to influence the outcome of distressed restructuring, and their wish to obtain the amount of debt paid in full produce a well-known incentive problem.[130]

The holdout problem arises when some of the creditors refuse to participate in the reorganization plan and, therefore, block the possibility of restructuring troubled debt out of court. The stimulus to "hold out" exists because of the divergent incentives of dispersed claimants. In classic out-of-court restructuring, the renegotiation would imply a debt reduction by means of the creditor's giving up their claims on the principal, the extension of the maturity of debt, a decrease in the interest, or an exchange of the old debt for stocks. However, some of the creditors would like to hold out in order to benefit at the expense of other debtholders, of those who agree to negotiate. Holdout incentives originate from the residual character of payoffs to the claimants: the more debtholders negotiate about their debt the higher the payoff for remaining creditors.[131] Workouts have a

[129] Brown (1989, 121) highlights that negotiations about an approval of the restructuring plan with many classes of creditors are a typical example of claimants' collective action problem: When the value of the company decreases dramatically, conflicting incentives of the claimholder classes who try to obtain the debt amount paid in full make distressed restructuring difficult.
[130] For extensive research on the hidden obstacles of financial contracting see Easterbrook and Fischel (1983), Hart (2001).
[131] Haugen and Senbet (1988, 30).

very strong tendency to produce holdouts because they allow the firm to pay the claimant holding out in full.[132]

Brown (1989), Gertner and Scharfstein (1991), and Gilson (1997) suggest that holdouts strengthen the bargaining power of small creditors in comparison to large debtholders. Theoretically, the financial health of the company is unlikely to depend on the concessions granted by minor debtholders. This makes room for each individual claimholder to hold out for personal benefits. However, taken as a whole, the holdout decisions of single creditors negatively affect the overall success of restructuring. In addition, smaller bondholders are usually dispersed and uncoordinated. Therefore, dispersion can be seen as a negative factor which allows small creditors to reject the reorganization plan and to free ride on other creditors.[133]

According to Chatterjee et al. (1995), hypothetically, large bondholders could also hold out in order to *"extract further concessions from the firm"*.[134] However, this danger seems to be less harmful because a delay of a voluntary restructuring would increase the probability of bankruptcy and the risk of losing large unsecured amounts of debt.

Since the holdout stands in the way of a successful restructuring, many researchers examine methods of reducing or eliminating this adverse effect.[135] For instance, Diamond (1984) and Gilson (1997) find evidence that the holdout problem can be substantially reduced if the company has a few large private creditors instead of dispersed public claimholders. Haugen and Senbet (1988) propose including provisions in the contract signed by bondholders. Gartner and Scharfstein (1991) recommend mitigating the holdout problem by offering more secure debt, debt with shorter maturity, or cash in exchange for public debt.

Another obstacle to voluntary debt restructuring is information asymmetry. The phenomenon of an asymmetric distribution of market information has been subject to extensive research for a long time and can be applied to almost any kind of contract between two economic agents.[136] Since capital markets are not completely informationally effi-

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[132] Datta and Datta (1995, 20). Debt restructuring within the scope of private workouts enables the firm to pay the holdout creditor in full.

[133] Franks and Sussman (2000, 8-9). "Free riding" is another term for the holdout problem. Originally, the free rider problem was associated with the process of takeovers (see Grossman and Hart (1980)). In the financial distress literature, free riding is used to describe the behavior of debtholders with small stakes which hold out. I use the term "free riding" analogously to the holdout problem.

[134] Chatterjee et al. (1995, 335).

[135] Haugen and Senbet (1988, 30) formulate two very crucial effects of free riding: Since free riding blocks the restructuring initiative, it may block (a) discipline of managers by the capital market and (b) the prevention of cash outflows away from the bankrupt company.

[136] The outcome of the analysis of incentives of economic agents under asymmetric information is known as "Agency theory". Classical papers on information asymmetry and agency theory were written by Akerlof (1970), Jensen and Meckling (1976), Myers and Majluf (1984).

cient, there are always market participants who are better informed about the subject of a deal and counterparts which know less about the real conditions of the subject of a contract. By definition, insiders always know more than outsiders. The asymmetric information in financial distress causes uninformed creditors to be uncertain about the survival chances of the troubled company and its true value.[137] Therefore, they would be less willing to agree on voluntary distressed restructuring if they believe that the stock of the company is overvalued. It is more likely that they would force the company to file for legal bankruptcy in order to obtain more insider information instead of exchanging their senior claims for junior debt or common stocks with last priority out of court.

As can be seen, the method of the resolution of financial distress plays a significant role in the success or failure of debt restructuring. The time spent in default and the costs of the resolution have direct influence on the probability of reorganization. Extensive research in the recent decades has paid increasing attention to the determinants influencing the choice of the organizational form of distressed restructuring. Many researchers have analyzed the factors affecting the process of company decision making with respect to the choice of the proper restructuring mechanism.

Below I discuss three important methods of resolving financial distress: out-of court restructuring, prepackaged bankruptcy, and filing for Chapter 11.

3.4.3 Methods of Reducing Financial Distress

3.4.3.1 Out-of-Court Restructuring

Restructuring out-of-court allows a distressed company to renegotiate the terms of its debt contracts without filing for protection under Chapter 11. Another name for restructuring out-of-court is a workout. The workout can be done in two forms: through the renegotiation of debt contracts with private creditors or by means of a tender or an exchange offer.[138] A typical workout represents a transaction involving at least two classes of securities, one of which is old debt and the other one is common or preferred stock or debt with different terms. The debtor makes an offer to the creditors to exchange the old debt with the goal reducing it and preserving the value of the company and preventing bankruptcy.[139]

Generally, the firm has three options for how to restructure its debt out of court:

- By alteration of the terms of the original debt contract without any changes in the priority of claims

[137] Datta and Datta (1995, 20).
[138] Chatterjee et al. (1996, 5).
[139] Compare to Lie et al. (2001, 183), Roe (1987, 236).

- By offering a priority-reducing exchange
- And, finally, by a priority jump in exchange offers

The first type of debt restructuring is usually applied to private debtholders. The renegotiation of private debt contracts can include a covenant waiver, a reduction of interest, an extension of the maturity of the debt, the placement of a new loan from an existing private creditor, or debt forgiveness. Private debtholders are usually banks and non-bank financial institutions holding large amounts of secure debt of highest priority. Asquith et al. (1994) show that private creditors seldom make unilateral concessions and would predominantly prefer to waive a covenant. Covenant waiving happens in about 78% of all private debt workouts in the sample. This finding is consistent with Brown et al. (1993) who analyze the terms of restructuring distressed debt and obtain the result that private debtors usually extent the maturity of their debt and/or waive the covenants without altering the priority of their distressed claims.[140] Debt forgiveness is a rare event because private creditors, especially banks, have institutional constraints. Their debt is secured, and, therefore, they have no incentives to make concessions except for situations in which the company is severely distressed and claims of private debtholders are impaired.[141]

Priority-reducing exchange offers include swaps of common stock or of a package combining debt with lower priority and equity for the existing debt. The interest on new debt is usually paid in cash or common shares. Offering a priority-reducing exchange, companies can choose between two options: to offer unregistered securities to bondholders or to use the services of an intermediary for the purpose of the financial transaction. Mooradian and Ryan (2005) investigate the role of investment banks in the resolution of the information asymmetry problem in public workouts. Despite the fact that the costs of employing an investment bank are relatively high,[142] the participation of an investment bank provides economic benefits resulting in the reduction of the information asymmetry and of transaction costs. Mooradian and Ryan (2005) show that the evaluation of the fair value of securities for the exchange by an investment bank sends positive signals to the creditors about the current financial position of the distressed company. This results in a reduction in the creditors' uncertainty about the going-concern ability of the troubled company. The investment bank's opinion is classified by the debtholders as proof of confidence and motivates more of them to accept the exchange offer. This

[140] Brown et al. (1993, 103).
[141] James (1996, 711) states that the claims of a bank or other secured private debtholders are negatively affected when the face value of the debt is greater than the value of the collateral minus transaction and bankruptcy costs.
[142] Mooradian and Ryan (2005, 1597) estimate that the total fees for investment bank services vary from 5% to 7% of the face value of the restructured amount of debt.

increases the percentage of successful debt reduction and leads to a better operating performance after restructuring.

The third type of debt reduction out of court is the design of exchange offers with an enhanced level of security and seniority of debt. Since a more senior status automatically implies a higher priority, this type of exchange offer is known as offers with priority jumps.

The possibility that offering claims with more senior priority to public debtholders can be efficient in the resolution of the holdout problem is proved in the theoretical model by Gertner and Scharfstein (1991) and confirmed empirically by Brown et al. (1993), James (1996), Chatterjee et al. (1995), and other researchers. As mentioned in 3.4.2, the most dangerous impediments to public workouts are holdouts. The holdout problem prevents the firm from reducing public debt because small individual claimants believe that they are not pivotal in the exchange process and, therefore, can hold out without participating in the workout and obtain the total amount of their debt at the cost of participants of the exchange. Payoffs to senior creditors are generally higher than to junior claimants. Therefore, granting senior debt to junior debtholders in exchange will increase their payoffs in the case of liquidation in comparison to their current position and make holding out useless.

In addition to the advantages of the private workouts discussed above, Schwartz (1993) highlights that it is in the interest of all classes of creditors to follow a cost reducing strategy and to restructure their debt out of court. Since the administrative costs of filing for bankruptcy protection are high, workouts should be employed more frequently compared to legal bankruptcy: The claimants not only receive the share of the firm in the amount they would obtain if it came to bankruptcy, but also collect a portion of the savings from the avoidance of going to court.[143] In especially severe cases of the holdout problem, when different classes of creditors do not find consensus about debt restructuring, coercive tactics can alleviate the holdout and force reorganization. Coercive offers are designed to make private bondholders worse off if they reject the workout. The company can offer an exit content which can be approved by consent of the majority of tendering bondholders. The acceptance of the exit offer allows the company to strip restrictive covenants of debt indentures and leave the non-participating bondholders with securities of minimal value. Therefore, it is advantageous for small debtholders to participate in distressed restructuring instead of rejecting it.[144] In coercive tenders senior

[143] Schwartz (1993, 595).
[144] See Chatterjee et al. (1995).

debt is usually repurchased with cash, since cash is the only way to offer more senior claims to senior creditors, whereas junior debt is often exchanged for equity.

Coercive offers have no clear resonance in the financial literature. Some researchers emphasize the unfairness of the coercive tender offers pertaining to small creditors because of the limitations of the effective rights of minor debtholders to vote for or against the debt restructuring.[145] Other researchers, in contrast, defend coercive tactics and rate them as a reasonable and effective technique for the resolution of the holdout problem.[146] Moreover, Chatterjee et al. (1995) find that coercive tendering reduces the costs of public workouts and diminishes the old debt by more than 50%.[147]

Last but not least, several researchers analyze the complexity of the mix of public and private debt in troubled debt restructuring and the role of large private claimants in the resolution of information and holdout problems. James (1996) finds that the composition of public debt exchange offers depends on the variety of different classes of creditors in the troubled firm. An involvement of private debtholders in out-of-court restructuring positively affects the participation of small public bondholders in the exchange. Concessions of private lenders mitigate the necessity of exchange for the bondholders. This has a direct impact on the reduction of the holdout problem and the outcome of the restructuring. Empirical findings show that if the bank does not participate in public exchange, the distressed offer contains about 0.78 cents of senior debt per dollar of junior debt and the effect of public debt reduction is low. If private debtholders make concessions, waive a covenant or extend maturity, less senior debt is offered to the bondholders and the outcome of the exchange results in a larger reduction of public claims.[148]

To summarize, out-of-court restructuring can be seen as an effective instrument of financial distress resolution which does not produce additional legal costs which arise when filing a bankruptcy petition. As a rule, companies try to restructure their debt out of court, and only if this attempt fails, is a formal bankruptcy the next step that can be taken. Public workouts usually take less time than the legal bankruptcy procedure. Franks and Torous (1994) show that on average the company spends about 1.5 years restructuring itself out of court, whereas the reorganization under Chapter 11 takes over 2.5 years. Gilson et al. (1990) provide similar results. In their sample companies are able to restructure themselves out of court within 15 months while unsuccessful restructuring ends in a bankruptcy and requires an additional 20 months for further reorganization

[145] See for example Mitchell (1990), Coffee and Klein (1991).
[146] A comprehensive theoretical discussion in defense of coercive tactics is provided by Bab (1991), Bagnoli and Lipman (1988), Kahan and Tuckman (1993).
[147] Chatterjee et al. (1995, 353).
[148] James (1996, 719-724).

under Chapter 11. Therefore, out-of-court restructuring effectively reduces the time that a company spends in financial distress.

Nevertheless, public workouts are not safe from holdouts and information problems, which adversely affect distressed restructuring and can endanger the success of the outcome. Theoretical models and empirical findings, however, confirm that in many cases holdouts and information asymmetries can be mitigated. Companies can offer more secured debt in exchange for the old, reduce the complexity of the debt, outsource the management of the exchange offer to investment banking specialists, and force coercive exit content agreements.

3.4.3.2 Bankruptcy under Chapter 11

Unlike out-of-court restructuring, Chapter 11 grants an exclusive chance to troubled but economically viable companies for the ultimate restructuring of its claims. It provides legal rules governing the process of negotiation if a voluntary reorganization is impaired through the absence of consent between the creditors.

The role of legal protection under Chapter 11 in the mitigation of financial distress has found much response in the economic and normative literature. Using a citation from Mooradian (1994), Chapter 11 is, in fact, "*...the most prominent and controversial feature of the corporate bankruptcy law"*.[149] Such judgment of this court protected bankruptcy procedure is not surprising. Filing Chapter 11 has a number of advantages compared to alternative methods of financial distress resolution. However, on the other hand, the legal bankruptcy procedure has a number of inefficiencies which limit its use to the last resort when other possibilities are exploited without any positive effect.

Many researchers recognize the uniqueness of the main principles of Chapter 11. This arises from the role of Chapter 11 in the corporate reorganization process. White (1994) shows that corporate bankruptcy law is designed to filter economically inefficient firms. While Chapter 7 is intended for the liquidation of economically unviable companies, Chapter 11 should preserve value in the case when the failing firm is economically efficient.[150] Secondly, filing Chapter 11 resolves the collective action problem which is especially severe in out-of-court restructurings. Jackson (2003) highlights the regulatory function of bankruptcy law, which protects the going concern value of a troubled company from its destruction by putting constraints on creditors' efforts. He compares the need for bankruptcy law with the need to control the fishing of a lake: *"if everybody fishes without limit, you end up killing off the fish population; there is no second gen-*

[149] Mooradian (1994, 1403).
[150] White (1994, 269).

eration".[151] Hence, Chapter 11 ensures an orderly and coordinated procedure for the restructuring of distressed claims. The third important function of Chapter 11 is a transfer of wealth among the parties involved in the process of reorganization.[152]

Theoreticians and empiricists agree that there are three features of the Chapter 11 process which are essential for understanding the controversial character of legal bankruptcy: the automatic state, voting rules, and the maintenance of equity value:[153]

- An "automatic state" prevents creditors from collecting their debt from the troubled company until it emerges from bankruptcy within the time intended for the legal reorganization procedure.[154] Being under Chapter 11 protection, the company continues to operate as an independent entity; significant decisions, however, are made only after a review and the approval of the court. This state gives a troubled company a chance to become sound. On the other hand, this state can also cause additional social costs associated with filing Chapter 11 for strategic reasons in order to obtain legal protection from creditors.
- Chapter 11 allows more realistic rules of voting for the reorganization plan compared to out-of-court restructuring. Reorganization under legal protection needs the approval of half of the number as well as two-thirds in value of outstanding debt in every class of creditors. Once approved, Chapter 11 is binding for every individual creditor. It leaves no room for holding out. The legal procedure requires that all claimholders are organized into groups dependent on the priority of claims held. Therefore, every public debtholder is treated equally, independent of his decision to vote or not to vote. In case of acceptance of the reorganization plan every creditor must restructure his or her claims, which implies that the non-voting minor creditors are virtually forced to accept the offer.[155] The positive aspect of the Chapter 11 voting rules is a clear reduction of the holdout problem. The negative is that minor creditors do not have any instruments to influence the bankruptcy decision and must obey the verdict of the majority.
- Chapter 11 grants the debtor extensive bargaining power, which is known as debtor-in-possession or DIP. The DIP status ensures a 120-day "exclusive" period in which the debtor has to submit a plan of reorganization which can be extended if approved

[151] Roundtable on preserving value in Chapter 11 (2003, 13).
[152] Eraslan (2003, 3).
[153] Gertner and Scharfstein (1991, 1209) demonstrate that Chapter 11 has an enormous effect on the efficiency of the company's operations.
[154] Gilson et al. (1990, 317).
[155] See e.g. . Mooradian (1994, 1419), Gertner and Scharfstein (1991, 1210).

by the judge.[156] As a result, the debtors are willing to enforce such a plan of reorganization, which could allow maximizing the shareholders' payoff in the case of liquidation or reorganization.[157]

The value of new securities distributed to any class of claimholders within the scope of the restructuring is predetermined by the so-called absolute priority rule. The absolute priority rule means that the fulfillment of obligations in bankruptcy happens in accordance with the seniority of debt. More senior creditors usually bear less risk and receive their amount in full. More junior debtholders are seen as residual claimants. However, the results of many empirical studies show a significant departure from this rule in practice.[158] To some extent, this deviation can be explained by the structure of the bankruptcy procedure, which is extremely costly and time-consuming.[159] In many cases, creditors would prefer to get back a lesser amount of invested capital in order to avoid the costs of additional negotiation. Some researchers regard the deviations from the absolute priority rule as an effective mechanism which benefits equity holders and preserves the going concern value of the company.[160]

Besides benefits, Chapter 11 has its limitations and is often seen as a rather ineffective legal procedure incurring high direct administrative costs and professionals' fees.[161] The lengthy procedure results in higher value deterioration compared to alternative methods of financial distress resolution.[162] Chapter 11 is also criticized for protecting economically inefficient companies which go bankrupt for strategic reasons.[163]

Empirical investigations show that the direct costs of bankruptcy vary between 4% and 10% of the asset value.[164] This is much higher than the costs incurred by a debt reduction out of court or in prepackaged bankruptcy. Moreover, the legal bankruptcy procedure requires a great deal of time for the development of the reorganization plan, extensions of this "exclusive" time, court judgments and hearings. On average, bankrupt companies spend one to two years longer in Chapter 11 than companies which attend public workouts. However, this number cannot be a significant measure of the efficiency

[156] The bankruptcy procedure has been repeatedly criticized since often firms that should be liquidated continue to exist as they are granted extensions to the 120-day requirement. The revisited U.S. Bankruptcy Act limits these extensions to a maximum of 18 months. (More about this in Altmann and Hotchkiss (2005), Chapter 2).
[157] Gertner and Scharfstein (1991, 1212).
[158] On the deeper analysis of reasons and consequences of deviation from the absolute priority rule see for example Franks and Torous (1989), Weiss (1990), Betker (1995a), or recent studies of Bebchuk (2002), Carapeto (2003).
[159] Gilson et al. (1990, 318).
[160] Longhofer and Carlstrom (1995, 26).
[161] See e.g. Altman (1984), Gilson et al. (1990), Weiss (1990), Betker (1997). Professionals' fees are direct legal, accounting and other fees paid in Chapter 11 for completing a debt restructuring.
[162] See e.g. Yost (2002, 8-9).
[163] See e.g. Mooradian (1994), White (1994).
[164] A comprehensive review of empirical studies on the direct costs of bankruptcy can be found in Altman and Hotchkiss (2005, 95-96).

of the bankruptcy procedure because the most severely distressed companies seek protection under Chapter 11.[165] The pro-debtor character of the bankruptcy law reduces the collective bargaining problem in Chapter 11, eliminates, to some extent, information asymmetry, but also has limitations when it comes to the efficient selection between economically viable firms. Therefore, Chapter 11 is criticized for a suboptimal allocation of capital, the waste of corporate resources, and keeping inefficient firms alive.[166] A possible explanation for these inefficiencies is that the control over the troubled company in Chapter 11 remains with its management, which acts on behalf of the shareholders and tries to avoid liquidation. In accordance with the absolute priority rule, liquidation would leave equity holders with nothing and managers without their jobs.[167]

To summarize, Chapter 11 has both advantages and disadvantages. On the one hand, there is a long and extremely costly procedure, the violation of the absolute priority rule, and a management bias, which leads to an inefficient continuation of companies which otherwise would be liquidated.[168] On the other side, there is the issue that Chapter 11 is a perfect way to reduce market imperfections. Chapter 11 offers tools for an effective restructuring process which eliminate holdouts, lower tax penalties for debt reduction, alleviate information asymmetry by disclosing business prospects of the company supervised by the court.[169] The positive and negative sides of the Chapter 11 process are seldom in balance. Which side outweighs the other depends on the severity of financial distress and the underlying situation.

3.4.3.3 Prepackaged Bankruptcy

Prepackaged bankruptcy, also called “prepack”, is a hybrid method of financial distress resolution, combining some of the features of a public workout with the characteristics of the legal Chapter 11 procedure. The main objective of prepackaged bankruptcy is to combine the advantages from restructuring out of court and under Chapter 11 while avoiding the disadvantages of both methods. The outcome is then a more efficient tool for the resolution of financial distress.[170]

In a typical prepackaged bankruptcy the debtor and his creditors agree on the plan of debt restructuring out of court. This is a typical property of out-of-court restructuring. However, as in a traditional restructuring under Chapter 11, the negotiated reorganiza-

[165] See Gilson et al. (1990).
[166] Tashjian et al. (1996, 136).
[167] Compare to Brown (1989), Mooradian (1994).
[168] Compare to Hege (2003, 254).
[169] Compare to Gilson (1997, 163).
[170] McConnell and Servaes (1991, 93).

tion plan should be filed and approved by the bankruptcy court in order to let the restructuring take effect.

The most important benefits from this mixed strategy are that (a) the company has a clearly defined plan for how to emerge from bankruptcy, and (b) holdouts are not possible. These advantages arise from the fact that prepackaged bankruptcy can take place only after the reorganization plan has been accepted by the court, and after its approval all claimholders must participate in any exchange of securities. The mitigation of the holdout problem and a clearly defined exit strategy from bankruptcy increase the firm's chances to survive as a going concern.[171]

Salerno and Hansen (1991) summarize four components of a successful prepackaged bankruptcy resolution:

- The willingness and capability of the management to recognize financial problems
- The willingness and ability of the management to employ special professionals (lawyers, investment bankers, accountants) to develop a reorganization plan
- The formulation of a viable and realistic exit strategy
- The willingness of one or more groups of creditors to negotiate the prepackaged bankruptcy and their acceptance of the reorganization proposal.[172]

Betker (1995b) criticizes *"anecdotal evidence"* of the benefits of prepackaged bankruptcy as presented by Salerno and Hansen (1991). He points out that the real advantages of prepackaged bankruptcy are a shorter time spent in financial distress, and, therefore, lower indirect costs, tax benefits from avoiding the cancellation of an indebtedness income, and the preservation of the firm's net operating losses.[173] If the company restructures its debt in a workout by means of an exchange of debt with higher face value for liabilities with a lower face value, the difference between the face values is said to be taxable income. If debt is exchanged for equity and if the ownership of the existing shareholders becomes less than 50% of their original rights, the firm bears net operating losses which are not tax deductible. In both cases, companies filing Chapter 11 or going through prepackaged bankruptcy do not bear these "additional" costs, which make both procedures potentially less costly than workouts.[174]

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[171] Altman and Hotchkiss (2005, 52).
[172] Compare to Salerno and Hansen (1991, 39).
[173] Betker (1995b, 17). Empirical results by Betker show that the present value of future tax savings from prepackaged bankruptcy compared to a workout account for about 3% of the total asset value.
[174] Yost (2002, 6).

Gilson (1997) finds that one of the most important benefits of prepackaged bankruptcy might be a combination of lower reorganization costs if reorganization is done out of court with a larger flexibility in reducing leverage as in Chapter 11.[175]

Prepackaged bankruptcies experienced constant growth between 1983 and 1993. Thus, the percentage of prepackaged bankruptcies grew from 0.7% in 1986 to 20.9% in 1993, but after 1993 "prepacks" experienced a relative drop in the growth rate accompanied by an increase in the absolute number of Chapter 11 filings. The figure below illustrates the evolution of prepackaged bankruptcies in the United States from 1986 to 2001:

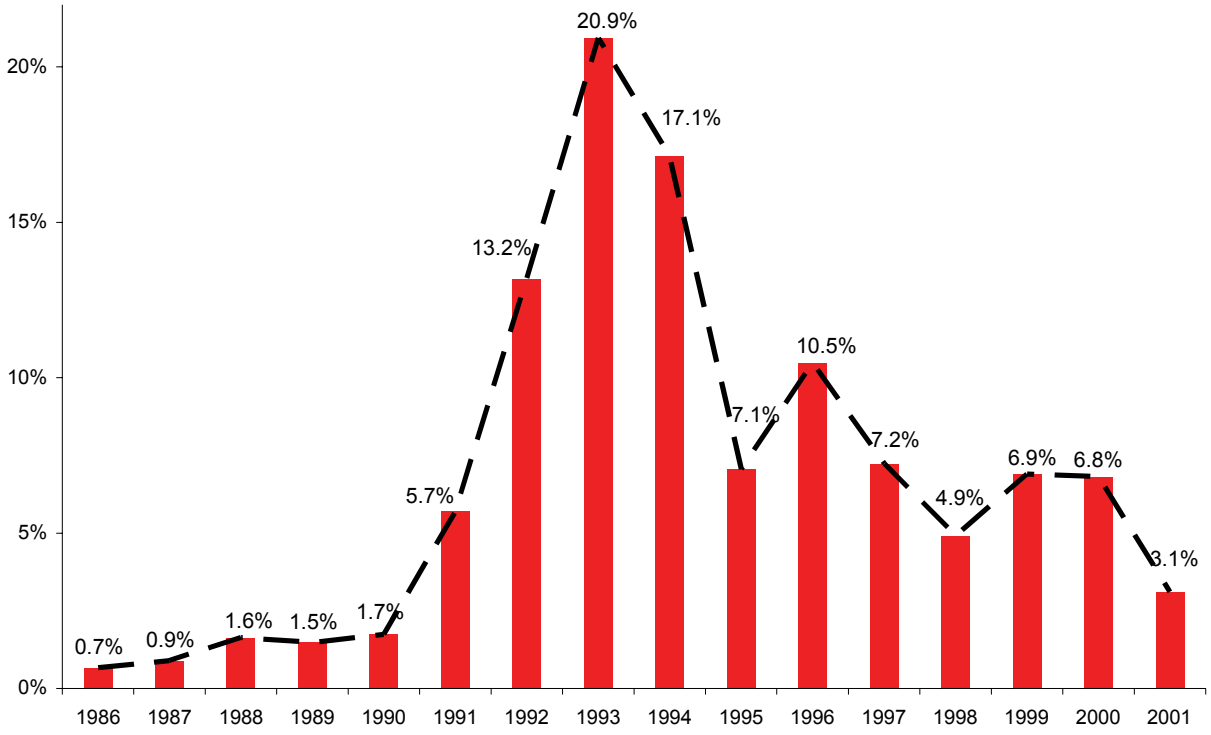

Figure 6: Time Series of the "Prepacks" in Percent of the Total Number of Public Bankruptcies[176]

Experts expect that the number of prepackaged bankruptcies will increase again after October 2005, when the new Bankruptcy Code has begun to be enforced.[177] The new Bankruptcy Act of 2005 opens more possibilities for "prepacks". The reduction under the old American bankruptcy law contained a provision which could be potentially used by minor dissident debtholders in order to stop undesired prepackaged bankruptcy. Earlier, voting for the acceptance of the reorganization plan could happen only before filing Chapter 11. In this case, if unsatisfied minor debtholders challenged the legitimacy of

[175] Gilson (1997, 190).
[176] Source: www.bankruptcydata.com
[177] See the interview with Hugh McDonald, a partner of Allen & Avery in Bank Loan Report from February 20, 2006.

the voting process, the court could reject the plan of reorganization. The new Act allows the vote solicitation process to continue even after filing Chapter 11.

To recapitulate, prepackaged bankruptcy plays the role of the golden mean between out-of-court restructuring and the legal Chapter 11 procedure. It offers an inexpensive solution for the holdout problem, which can be seen as a major obstacle of the success of a public workout.[178] Second, offering the benefits of Chapter 11, it reduces both administrative and indirect costs of the expensive bankruptcy procedure. Given the fact that a reasonable degree of creditor consent can be achieved voluntarily out of court, prepackaged bankruptcy, indeed, can significantly accelerate the process of the resolution of financial distress.

3.4.4 When to Pursue Which Method?

An examination of alternatives available to a distressed company for the restructuring of its troubled debt shows that none of them is an ideal recipe for the success of the reorganization. Each of the three options has advantages and disadvantages which should be analyzed before selecting the manner of resolving financial distress. The choice of a proper method of distressed debt reduction should be based on an analysis of the factors which determine restructuring in each particular situation. In this chapter I analyze the determinants of the company's choice among traditional Chapter 11, out-of-court restructuring, and prepackaged bankruptcy. I conduct a comparative analysis of the existing empirical studies on financial distress resolution and answer the question of which method and when better fits the needs of a single company in financial difficulties.

From the perspective of shareholder value maximization, distressed restructuring should be organized in a way that minimizes the costs of financial distress and preserves the going concern value of the company. Therefore, it is to be expected that the equity holders and the managers of the firm would try to negotiate with creditors on the type of restructuring which has the least direct and indirect costs, takes the shortest period of time, and results in the lowest deterioration of the company's value. This is an "ideal" scenario for distressed debt reduction. In real life, companies in financial trouble often deal with opposing interests of creditors, which produce conflicts negatively affecting the results of the reorganization.

Going over the benefits and limitations of the options available for distressed debt reduction discussed in chapter 3.4.3, Table 3 summarizes empirical findings about the most important characteristics of existing restructuring mechanisms. At first glance, out-of-court restructuring seems to be the most attractive way of resolving financial distress.

[178] Compare to Tashjian et al. (1996, 155).

It has the shortest restructuring period: on average, distressed debt restructuring can be completed in as little as 1.5 years.[179] The shorter time period which the company spends in reorganization is reflected in significantly lower direct and indirect costs of financial distress.[180] However, the existence of the non-trivial collective bargaining problem, which is difficult to solve out of court because of the conflict of interest between the company and minor claimholders, can result in a relatively high rate of failed reorganizations. Gilson et al. (1990) report that the portion of companies which failed to reorganize out of court the first time and then ended in the Chapter 11 equals 53% of the sample.[181]

Three barriers of public workouts – the collective bargaining problem, incentives to hold out, and the degree of information uncertainty – can be relatively easily reduced by means of bankruptcy filing. An automatic stay in Chapter 11 is an option for the company in distress to preserve its value and to delay paying the creditors in a legal way. However, exactly this protracted state involves high administrative costs and produces inefficiencies which almost double the period of time needed to complete distressed reorganization, as compared to the public workout. In the end, the savings potential from the resolution of the creditor bargaining problem can be outweighed by lost opportunities and a suboptimal allocation of resources and may cause an even larger deterioration of value. Moreover, many companies file for Chapter 11 after a failed public workout. The failed attempt to resolve financial distress out of court is considered as one of the reasons for the relatively low success rates in Chapter 11, as compared to out-of-court restructuring because it signals that the company has hidden existence-threatening problems.[182]

Prepackaged bankruptcy significantly relaxes the problem of information asymmetry and holdouts. At the same time, the requirement of the court's approval of a voluntarily accepted plan of reorganization reduces legal costs and the length of the restructuring period. It makes prepackaged bankruptcy the more attractive alternative. However, the company in prepackaged bankruptcy cannot join the "automatic stay" of Chapter 11 and postpone the negotiation with creditors which can be crucial for companies with severe liquidity problems.[183]

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[179] Franks and Torous (1994), Gilson et al. (1990).
[180] Indirect costs of financial distress represent the lost opportunities of the company and gains not realized because of the loss of key employees, suppliers, and customers. They are not observable and therefore difficult to calculate. In contrast, the administrative or direct costs of bankruptcy can be calculated more precisely. Empirical studies show that out-of-court restructuring has the lowest rate of costs of financial distress: 2.8% of the total asset value.
[181] Gilson et al. (1990, 328).
[182] See the results of the comparative analysis in Table 3.
[183] See Yost (2002).

As can be seen, each method of resolution of financial distress resolves only a particular set of problems the company faces in default. For instance, out-of-court restructuring offers unique opportunities to recover from which the defaulted firm cannot benefit by choosing a different way of reorganization. However, also Chapter 11 or prepackaged bankruptcy can be more beneficial in some cases.

There are two important issues which should be considered in the selection of the proper method of restructuring: (a) an economic rationale for reorganization, namely, whether the company should be liquidated or not, and (b) firm characteristics affecting the choice in a particular situation. The empirical literature provides evidence for four main determinants of the restructuring choice: the severity of financial distress, the severity of the liquidity crisis, the heterogeneity of the creditor's claims, and the magnitude of managerial discretion.

Intuitively, if a company experiences severe financial distress, it will rather seek to benefit from the "automatic stay" in Chapter 11, trying to delay negotiations with its creditors. Furthermore, a company in Chapter 11 can request special debtor-in-possession financing to cover the costs of restructuring, while payments to old claimholders are frozen until the end of the reorganization.

Similarly to severe financial distress, poor cash reserves can push a company into Chapter 11. The company then joins the automatic stay, takes advantages of the tax relief and a special handling of loss carryforwards.[184] Based on empirical results, Yost (2002) argues that Chapter 11 seems to be the best alternative for companies in deepening financial distress. They usually experience a very sharp decline in the book-to-market ratio and their operating income by a disproportionally high increase in the net loss carryforwards.[185] In addition, Chatterjee et al. (1996) stress that the companies in Chapter 11 tend to be of small size, have more bank debt, and multiple classes of bondholders which are very difficult to coordinate outside of legal bankruptcy.[186]

Larger size of the company, fewer classes of creditors, smaller amount of bank debt as well as stronger corporate governance in the company are factors which help to recognize financial distress earlier, do not incur a severe holdout problem, and make it possible to reduce the debt out of court.

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[184] Investopedia defines net loss carryforward as "*an accounting technique that applies the current year's net operating losses to future years' profits in order to reduce tax liability*". (Source: http://www.investopedia.com/terms/l/losscarryforward.asp)
[185] Yost (2002, 18).
[186] Chatterjee et al. (1996, 13).

Summarizing the results, the main conclusion obtained from Table 3 is that larger companies with less severe financial distress, a less crucial level of liquidity, relatively better financial performance and stronger management position regarding the maximization of the shareholder value usually restructure their debt more efficiently in public and private workouts. Companies with heterogeneous creditors, medium size, a "medium" liquidity crisis, and a moderate decline in performance have better chances to survive under prepackaged bankruptcy. And, last but not least, in many cases companies of a smaller size which are in deepening insolvency, with the poorest performance, lowest liquidity, weak corporate governance which creates incentives for the managers to delay the point of default, with a surplus of tangible assets over intangibles have better prospects if they try to restructure themselves under Chapter 11. These observations made by many researchers are consistent with my conceptual framework of the corporate financial distress cycle in which better-quality firms break the downward spiral before entering into a death struggle, medium-quality companies, which still have a chance to avoid the bankruptcy, restructure themselves after default, and low-quality firms follow the complete path of bankruptcy.

Table 3: Summary of Empirical Results on the Choice among Available Methods of Financial Distress Resolution

Out-of-Court Restructuring

Author(s)	Sample	Determinants of Restructuring Choice	Solvency Characteristics Before Default	Direct Costs	Length	Recovery Rate[d]	Success Rate
Yost (2002)	174 companies that started restructuring between 1988 to 1999.	Less severe financial distress, liquidity and coordination problems, better performance among distressed companies, stronger corporate governance	– M/B ratio: 1.679 (industrial median: 1.4797) – Operating income to total assets: 0.023 – Net operating loss carryforwards to total assets: 0.369 – Current liabilities to total assets: 0.356 – Long-term debt to total assets: 0.405 – Number of long-term debt contracts: 4.73 – Total liabilities to total assets: 0.850	N/A	N/A	N/A	N/A
Franks and Torous (1994)	82 listed companies identified as financially distressed by Standard and Poor's Credit Watch over 1983 to 1990.	More solvent and more liquid companies	– Fewer long-term debt[a] (mean 6.07) – Smaller face value of long-term debt (mean 388.9m) – Curent ratio: 1.38[b] – Market solvency ratio: 0.78[c] – Median cumulative raw return: -59%	N/A	17 months	80.1%	N/A
Gilson, John, Lang (1990)	169 publicly traded companies experiencing distress during 1978-1987	Firm has more intangible assets, less heterogeneous creditors, lower costs of restructuring.	– Market value/replacement cost ratio: 0.83 – Number of debt contracts: 7.0 – Book value of total assets: 633m – Total liabilities to total assets: 0.94 – Long-term debt to total assets: 0.64 – Prior 3-year stock return: -36.4	0.65% of book value of assets	15 months	N/A	47%
Chaterjee, Dhillon and Ramirez (1996)	191 publicly traded firms during the period 1989-1992.	High leverage, large amounts of public debt, less severe liquidity crisis and coordination problem, higher-quality firms with greater EBIDT ratios and less economic distress.	– Total assets: 1 296m (2 252m)[e] – Total liabilities: 1 046m (2 206m) – Long-term debt: 487m (661m) – Total liabilities to total assets: 0.86 (0.98) – Long-term debt to total assets: 0.33 (0.51)	N/A	N/A	N/A	59%

Prepackaged Bankruptcy							
Yost (2002)	174 companies that started restructuring between 1988 to 1999.	Medium severe financial distress, medium liquidity and coordination problems, moderate performance among distressed companies, weaker corporate governance	– M/B ratio: 1.193 (industrial median: 1.3585) – Operating income to total assets: 0.048 – Net operating loss carryforwards to total assets: 0.063 – Current liabilities to total assets: 0.339 – Long-term debt to total assets: 0.437 – Number of long-term debt contracts: 4.3889 – Total liabilities to total assets: 0.8498	N/A	N/A	N/A	N/A
Chaterjee, Dhillon and Ramirez (1996)	Analysis of 191 publicly traded firms during the period 1989-1992.	Medium leverage, moderate liquidity crisis and coordination problems, good-quality firms with good EBIDT ratios and medium economic distress.	– Total assets: 378m – Total liabilities: 451m – Long-term debt: 98m – Total liabilities to total assets: 1.15 – Long-term debt to total assets: 0.28	N/A	N/A	N/A	95%
Tashjian et al. (1996)	49 companies pursuing prepackaged bankruptcy from January 1980 to June 1993.	Total time spent for negotiation, lower costs than in Chapter 11	– N/A	1.85%	21.6 months	72.9%	N/A
Chapter 11							
Yost (2002)	174 companies that started restructuring between 1988 to 1999.	The most severe financial distress, liquidity and coordination problems, poor performance among distressed companies, weaker corporate governance.	– M/B ratio: 1.2879 (industrial median: 1.299) – Operating income to total assets: -0.0296 – Net operating loss carryforwards to total assets: 0.234 – Current liabilities to total assets: 0.452 – Long-term debt to total assets: 0.325 – Number of long-term debt contracts: 5.000 – Total liabilities to total assets: 0.900	N/A	N/A	N/A	N/A

Franks and Torous (1994)	82 listed companies identified as financially distressed by Standard and Poor's Credit Watch over 1983 to 1990.	Less solvent, less liquid firms.	– Greater number of long-term debt (mean 6.64) – Higher face value of long-term debt (mean 326.2m) – Current ratio: 1.06 – Market solvency: 0.81 – Median cumulative raw return: -76%	Incremental costs over workout equal to 4.49% of the firm's value	27 months	50.9%	N/A
Gilson, John, Lang (1990)	169 publicly traded companies experiencing distress during 1978-1987	Firm has more tangible assets, more distinct classes of creditors, more complex capital structure, higher costs of restructuring.	– Market value / replacement cost ratio: 0.61 – Number of debt contracts: 6.0 – Book value of total assets: 317m – Total liabilities to total assets: 1.01 – Long-term debt to total assets: 0.58 – Prior 3-years stock return: -48.6	2.8% (according to Weiss, 1990)	20 months	N/A	31% of the original sample [53% of firms filed Chapter 11 after workout]
Chaterjee, Dhillon and Ramirez (1996)	Analysis of 191 publicly traded firms during the period 1989-1992.	Lower leverage, severe liquidity crisis and coordination problems, bad-quality firms with low EBIDT ratios, high proportion of bank debt and high degree of economic distress.	– Total assets: 858m – Total liabilities: 830m – Long-term debt: 177m – Total liabilities to total assets: 0.87 – Long-term debt to total assets: 0.29	N/A	N/A	N/A	67%
Weiss (1990)	37 listed companies filed Chapter 11 between Nov. 1979 and Dec. 1986.	Size of the firm, complexity of creditor claims	– N/A	2.8% of the book value of total assets	30 months	N/A	N/A

[a] The number of entries in the long-term debt section of Moody's manuals.

[b] The current ratio is the value of current assets divided by the value of current liabilities.

[c] The market solvency is the face value of total debt divided by the market value of equity plus the face value of total debt.

[d] The proportion of the face value of a creditor's claim that is paid.

[e] Private workouts (numbers for public workouts in parenthesis)

3.5 Financial Distress: Destructive Process or Instrument of "Natural Selection"?

The analysis of financial distress would not be complete without the examination of the function of financial distress in the life cycle of the company and its beneficial role in the improvement of organizational efficiency. I will talk later about the costs incurred in financial distress as well as the adverse implications of a single corporate default from a micro- and macroeconomic standpoint. In this section I answer the question whether financial distress can be advantageous for the company.

Despite the different and sometimes controversial opinions about the role of financial distress in the economy, it is unlikely that one would doubt that financial distress is a not too rare event and must be accepted as a natural process which may affect many companies over their life cycle. However, some of these companies can recognize financial distress at early stages and make conscious efforts in order to avoid default and bankruptcy, while some of the firms are unable to deal with financial difficulties. Why does this happen? Makridakis (1991) argues that financial distress has an enormous learning effect helping companies to adapt to a rapidly changing environment and to learn permanently what to do in order to eliminate the negative consequences of stress situations.[187]

Kahl (2002) also supports the idea that financial distress is an efficient process whose benefits outweigh its costs.[188] Developing a dynamic model of liquidation decision, he shows that creditors benefit from financial distress because they learn about the distressed company's economic viability. If a firm defaults, the creditors obtain control rights and the option to liquidate immediately or, keeping leverage high, to pursue distressed restructuring. At each point in time the claimholders can revise their decision and liquidate the company if it should not recover fast enough. Thus, the role of financial distress is twofold: on the one hand, it facilitates learning about the firm's ability to survive, and, on the other hand, this process accelerates the liquidation if the firm cannot improve its performance within a reasonable period of time.

Another important advantage of financial distress is that it triggers an effective change in the managerial control over the company, [189] pushing the firm to alter its operational strategy in order to raise declined efficiency.[190] Some researchers insist upon the unique function of financial distress in improving the firm's bargaining power and resolving the

[187] Makridakis (1991, 115).
[188] Kahl (2002, 136).
[189] Diamond (1993), Gilson (1989), Hart and Moore (1995).
[190] Ofek (1993).

financial contracting problem.[191] Financial contracts are originally incomplete and cannot incorporate all possible scenarios which can happen in the future. Since the main goal of financial contracting is to provide the platform for an optimal allocation of resources in order to attain a socially efficient outcome, financial distress and bankruptcy help to distinguish between economically viable and inefficient companies which should be liquidated. A company is economically viable if it is worth more as a going concern than if it were shut down. Therefore, financial distress can be seen as a selection mechanism which terminates unprofitable companies.[192]

The role of financial distress as a selection mechanism is also examined by Kahl (2001). He challenges the question of whether financial distress efficiently selects between troubled companies which should be liquidated and the firms which should survive as independent entities. Results of his research show that the poor operating performance of economically weak companies is not tolerated for long by the market.[193] As a rule, after entering financial distress, the "bad" firms with poor future prospects end in liquidation or are acquired by other market players. Firms with an originally better performance have higher rates of success and need a shorter time to regain financial health. Therefore, financial distress is an efficient selection mechanism which helps to reallocate resources in the economy from the poorly performing companies towards better uses, while "good" assets are kept within the surviving firm.[194]

Wruck (1990) points out that financial distress creates shareholder value and improves corporate performance. Especially for companies with a high level of debt, financial distress provides gives a chance to improve their longevity by forcing them to refocus their corporate strategy and to change their organizational structure, which leads to an increase in organizational efficiency in comparison to the pre-distressed period.[195]

In addition, Jensen (1989) shows that high leverage, being a catalyst of financial distress, can also protect the value of the company. First, high amounts of debt holding by creditors are often reorganized under a new management crew. Hence, financial distress creates strong incentives for the creditors to monitor the operating activity of the management and reduces conflicts of interest. Second, financial distress in highly leveraged

[191] Hart (2001), Smith and Strömberg (2004).
[192] Smith and Strömberg (2004).
[193] Kahl (2001, 32).
[194] The selection mechanism analyzed by Kahl (2001) is to some extent similar to a Darwinian process of natural selection, where those able to adapt to the changing environment survive and those unable disappear. Therefore, I would agree with scientists who stress the importance of financial distress as an instrument of natural but at the same time regulated selection. The existence of bankruptcy laws is decisive because it alleviates market imperfections.
[195] Wruck (1990, 435).

companies forces quicker reorganization. And, third, restructuring activity stops shrinkage and preserves the value of the company from further deterioration.[196]

To summarize, it is wrong to consider financial distress only as a negative protracted process associated with deadweight losses, layoffs, and broken organizational structures. In a broader economic sense, financial distress can be seen as an instrument of natural selection which is regulated by bankruptcy law and helps to differentiate between economically viable and inefficient firms needing to be liquidated.

3.6 Costs of Financial Distress

Besides direct fees for professional assessment and other charges incurred by the renegotiation of debt, financial distress has hidden, so-called indirect costs. Indirect costs are defined as lost opportunities which the company misses as a result of a deteriorating solvency position.[197] While lost opportunities can materiale in lost sales, decreased productivity, and losses of market positions, their roots are hidden in the sources of financial distress, such as a suboptimal allocation of resources, asymmetric information, and the conflict-of-interest problem.[198] These costs are unobservable and difficult to estimate. There are two main questions concerning the estimation of financial distress costs. The first one is more generic: How should financial distress costs be valued? The second problem is more challenging: What is the correct way to select which losses are born exclusively of financial distress?

The primary subject of the analysis in this section is costs and their components which arise in the firm if and only if it enters financial distress. I review current developments of the theory examining determinants and attributes of distress costs, discuss the distinction between direct and indirect costs, introduce results of empirical studies on their magnitude, and answer the question about the impact of financial distress costs on corporate value. Since the direct costs of financial distress occur only at the time of legal bankruptcy or renegotiation of debt out of court, the largest part of this section deals with the concept of the indirect costs of financial distress.

3.6.1 The Status Quo in the Examination of the Financial Distress Costs Question

Traditionally, financial distress costs attract the attention of researchers investigating the matters of corporate valuation and capital structure decisions. Central questions debated in this field are addressed to the proper measurement and the determinants of financial

[196] Jensen (1989, 72-73).
[197] Chen and Merville (1999, 277).
[198] Fisher and Martel (2005, 156).

distress costs and whether the magnitude of typical financial distress costs is significant such that they should be introduced into theoretical models of corporate valuation and capital structure decision making.[199] Another important question studied in the theoretical literature is what the upper and lower bounds of distress costs are and how high marginal distress costs can be.

Since financial distress costs do not accrue if the company is healthy, they have special properties distinguishing them from the usual cost of capital of sound firms. Unlike cost of capital, distress costs are time varying. This in turn has implications for their dynamics. Distress costs have a long-term nature. [200] They are incurred on every stage of the corporate financial distress cycle. However, in their dynamics, distress costs are non-monotonic and non-linear. Empirical investigations show that while approaching default a company experiences a sharp increase in distress costs, and the closer the firm comes to default, the larger the costs are and the more dramatic the value impairment compared to the pre-distressed level is.[201] Another important consequence of the time-variation and non-linearity of distress costs is that they tend to increase in recessions, which stresses the dependence of the distress costs on macroeconomic shocks and default risk.[202] In addition, a large portion of distress costs is unobservable, which makes it difficult to estimate the real magnitude of these costs and to make suggestions about a going concern value.

Distress costs are insufficiently studied in financial literature. Given that direct costs of financial distress are relatively low in percentage terms of the pre-distressed value and happen only once when a company defaults and renegotiates its debt, the examination of indirect costs should be the subject of more extensive research, because these costs are hardly predictable and their amount is not fixed. Bankruptcy costs represent only a small fraction of financial distress costs, whereas total indirect costs tend to be large and arise independently of the incidence of default.[203]

The difficulties incurred by the estimation of distress costs are linked to a lack of general understanding concerning which individual pieces, aside from the reported costs of bankruptcy, constitute their total amount. Recent empirical studies shed light on the magnitude and determinants of distress costs. In these studies, indirect costs are very often determined as opportunity or deadweight losses which include the decline in market share, decreased productivity, reduced capital expenditures, sale of assets at lower

[199] Almeida and Philippon (2006, 2).
[200] Babenko (2003), Kahl (2002).
[201] Babenko (2003, 2). See also Dothan (2006, 154-160), Weckbach (2004, Chapter 7).
[202] Almeida and Philippon (2006, 3).
[203] Chen and Merville (1999, 277).

prices, and restrictive terms from suppliers.[204] In addition to specification of indirect losses happening in financial distress, several researchers have developed theoretical models isolating indirect distress costs and analyzing their indicators. The main problem in this context is whether the poor operating performance of a company is a cause or a consequence of financial distress.[205] In order to overcome this dilemma, many researchers assume that the poor operating performance is a source of financial distress.[206]

Below I discuss the existing methodologies for the identification of distress costs in more detail and show the quantitative results of the available empirical studies which estimate the magnitude of indirect costs.

3.6.2 Magnitude and Determinants of the Indirect Costs of Financial Distress

Despite the importance of the distress cost question for corporate finance theory,[207] there are relatively few studies analyzing the determinants and the magnitude of indirect costs. One attempt to summarize the results of empirical research on total distress costs was made by Weckbach (2004). A more complete summary of the recent empirical findings can be found in Altman and Hotchkiss (2005). Both reviews show that, paradoxically, the main research is concentrated on the direct costs of financial distress, whereas indirect costs have found less attention in the literature.

The estimation of indirect distress costs is usually based on historical information which is gathered from publicly available financial statements of troubled companies. Following from the empirical studies, the estimated mean of indirect distress costs varies between 10% and 20% of the firm value.[208] However, recent developments in financial distress theory may cause a revision of the current view of the magnitude and scope of indirect costs.

Altman (1984) was the first to highlight the need for estimating distress costs and developed a methodology for determining them.[209] He interprets indirect bankruptcy costs as *"lost profits that a firm can be expected to suffer due to significant bankruptcy poten-*

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[204] Dothan (2006, 148).
[205] Andrade and Kaplan (1997, 1444). For detailed information on the causes of financial distress see discussion in the chapter 3.2.
[206] See e.g. Pindado and Rodrigues (2005).
[207] A number of researchers discuss distress costs within the scope of capital structure and cost of capital analysis. Since I do not explicitly analyze open questions of corporate valuation and optimal capital structure, I will skip this issue in the dissertation at hand. However, for the interested reader the book by Altman and Hotchkiss (2005) may be recommended as a starting point. It contains suggestions on literature for further examination.
[208] Altman and Hotchkiss (2005, 96).
[209] In the rest of this section I do not take into consideration direct costs of financial distress. I will discuss them later. Therefore, when talking about distress costs below, I mean indirect costs of financial distress.

tial"[210]. Altman (1984) measures bankruptcy costs in two ways: as profit losses from estimated foregone sales and as abnormal losses resulting from the difference between estimated and actual earnings. The regression methodology provides evidence that, on average, indirect costs equal 10.5% of the company's value. An analysis of earnings expectations shows an even stronger effect: "lost profits" can cost a company up to 20.8% of its value.

Opler and Titman (1994) do not estimate the absolute amount of distress costs but find that they are positive and significant for the company.[211] The authors answer the question regarding which costs constitute the total distress costs of a troubled company. According to the conducted research, total distress costs consist of three classes of factors causing losses in sales:

- *"Customer-driven losses"*. Uncertainty about the future prospects of the troubled company reduces the willingness of the customers to pay for its products. Financial difficulties have negative influences on customer confidence, resulting in the customers ceasing to do business with the distressed firm, causing sales to collapse. This effect becomes stronger as the company approaches default.[212]
- *"Competitor-driven losses"*. If a company is in distress, competitors may pursue an aggressive marketing and price strategy in order to attract the customers of the vulnerable company and, therefore, squeeze the troubled competitor out of the market. As a consequence, the distressed company suffers losses in sales leading to a loss of the market share. [213]
- *"Management-driven losses"*. The considerable role of inefficient management in corporate decline was discussed in the section 3.3.2.3. However, pertaining to the distress costs approximated by the losses in sales, Opler and Titman (1994) do not find any significant evidence of a managerial component in distress costs.[214]

Babenko (2003) supplements this catalog with *"employee-driven losses",* which originate in the loss of intangible assets when revenues of the firm decline.[215] Financial distress decreases the incentives of the employees to work hard and stimulates them to renegotiate their compensation packages or to leave the company. Both declining productivity and replacement of employees are costly and destroy the company's value.

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[210] Altman (1984, 1067).
[211] Opler and Titman (1994, 1037).
[212] Babenko (2003, 9).
[213] Opler and Titman (1994, 1016).
[214] Opler and Titman (1994, 1037).
[215] Babenko (2003, 3). In this context, intangible assets represent the intellectual capital of the company (its employees).

Andrade and Kaplan (1998) examine distress costs by isolating purely financially distressed and highly leveraged companies from firms which are economically weak. Similarly to Altman (1984), they quantify the indirect costs in two ways: first, by measuring changes in operating performance, both absolute and relative to the industry, and, second, by an estimation of the value of the firm before and after financial distress. Operating performance is calculated as the percentage change of three types of margins: the operating, capital expenditure, and net cash flow margins. Estimated distress costs in the amount of 10% to 20% support the idea that the amount of indirect costs can be substantial for the firm's value.[216] An important contribution of the study by Andrade and Kaplan (1998) is that that (a) high distress costs are incurred in the presence of adverse economic shocks; in their absence the percentage of the costs would be negligible, and (b) bankruptcy and Chapter 11 do not produce high distress costs; most of them occur while the firm is in a downward spiral, before it faces default. The significance of the economic conditions as a factor driving the indirect costs of distress is supported by Maksimovic and Phillips (1998). They found that bankruptcy and Chapter 11 are not related to indirect costs. Examining asset sales and plant closures, the authors demonstrate that these activities by the manufacturers depend on the situation of the industry, which can cause opportunity costs.[217] Hence, Maksimovic and Philipps (1998) provide indirect evidence for the findings of Andrade and Kaplan (1998) that distress costs are much higher in the period before bankruptcy and are sensitive to changes in macroeconomic environment.

The next important step in the quantification of distress costs is made by Chen and Meville (1999). They extend the work of Altman (1984) and Opler and Titman (1994) by two additional dimensions of distress costs and highlight that ignoring the temporal pattern of financial distress and foregone investment opportunities significantly underreports the magnitude of distress costs.[218] Chen and Merville (1999) show that the constantly increasing risk of default and the abandonment of profitable investments alone can reduce the value of the firm by 65%. Total indirect costs vary between the lower boundary of 8% and the upper boundary of 80% of the market value, depending on the severity of financial distress and the intensity of default risk.

According to their research, total indirect distress costs consist of four single items of opportunity losses, such as:

– The loss of customer confidence and therefore the opportunity loss of sales

[216] Andrade and Kaplan (1997, 1488).
[217] Maksimovic and Phillips (1998, 1522).
[218] Chen and Merville (1999, 277).

- The loss of important suppliers
- The loss of key managers
- Foregone investment opportunities

Similarly to previous findings, Chen and Merville (1999) observe that the largest drop in value occurs before default. This result is of utmost importance for the theory of corporate financial distress. It implies that the value of the distressed company, even if it never fails, can be substantially impaired in the presence of distress costs.[219] Unfortunately, the authors do not investigate the weight of each class of losses in the total amount of distress costs and the impact of single classes on the firm's value, but they stress the importance of further research on the magnitude and scope of the single components of indirect costs.

Another very important finding of Chen and Merville (1999) is that if a company enters financial distress and follows a pattern of a steadily increasing risk of default, their sales and profit losses will be higher than those of a firm which has a less identifiable distress risk pattern.[220] This means that the risk of financial distress has a direct influence on the value of the company and is one of the most important determinants of the magnitude of distress costs. In fact, this result from Chen and Merville (1999) underlies the core investigation of the dissertation at hand. I believe that distress risk is responsible for most of the indirect distress costs and therefore has, among other factors, the largest impact on the value of the firm. Default risk patterns in financial distress are subject to detailed analysis in chapter 4.

Summarizing the knowledge extracted from the current research, indirect costs can be very highly dependent on the temporal path of financial distress. A pattern of distress with a disproportionately high increase of default risk is related to higher costs. Companies with a lower risk of default are likely to bear lower losses. The magnitude of the indirect costs also depends on the economic conditions: higher costs are usually associated with macroeconomic shocks, whereas the deadweight losses arising from the firm-specific difficulties are insignificant. However, it is unclear whether distress risk and economic conditions are related to each other. If one were to hypothesize that default risk is an empirical proxy for deteriorating macroeconomic conditions, the effect of the risk on the distress costs may be even stronger. In addition, the opportunity losses are negatively related to the holding of liquid assets, which shows that better liquidity re-

[219] This result is consistent with investigations by Andrade and Kaplan (1997, 1487). They report that *"costs of financial distress are heavily concentrated in the period after the firms become distressed, but before they enter Chapter 11"*.

[220] In this context I use the terms "distress risk" and "default risk" synonymously.

sults in lower costs.[221] And, finally, the size and the leverage force small companies with solid amounts of debt to follow a more conservative investment policy during distress, leading to underinvestment and an increase in distress costs.[222] At the aggregate level, indirect costs tend to be high compared to the value of the firm. These findings open a bright field for the future research on the determinants and methods of reduction of the indirect costs of financial distress.

3.6.3 Direct Costs of Financial Distress

The direct costs of financial distress are typically related to the legal process of distressed restructuring which takes place after default. Therefore, they are usually analyzed with respect to reorganizations under Chapter 11 or other methods of financial distress resolution. A partial comparison of the direct costs of different available methods of distressed restructuring has been undertaken in 3.4.4. The results of this comparative analysis show that Chapter 11 produces the highest relative amount of direct costs. In order to avoid repetition, I focus in this section on the examination of the direct costs incurred in the case of legal bankruptcy.

Direct costs represent the compensation provided to lawyers, accountants, consultants, and expert witnesses for supporting the legal negotiation procedures.[223] From an economic perspective, direct costs embody wealth transfers in the form of payments from creditors to professionals.[224] Following from the definition, direct costs arise only in the case of distressed reorganization or liquidation. Unlike "lost opportunities", direct costs of financial distress have more resonance in the literature. Many researchers design their own analysis and compare their estimations to the findings of other authors. Most of these results show that direct costs do not vary excessively across empirical studies. On average, professional fees, payable as compensations to the different parties supporting distressed restructuring during the bankruptcy process, vary from 3.1% to 4.3% of the bankrupt firm's pre-distress value.[225] However, because of difficulties in data collection and the different sizes of the examined samples, the literature provides a mixed picture of the significance of direct costs for corporate valuation.[226] A chronological review of

[221] Pindado and Rodrigues (2005, 355).
[222] Chen and Merville (1999, 285). It must be pointed out that the role of leverage in financial distress is not clearly understood and needs additional analysis. Pindado and Rodrigues (2005, 351) found a negative relation between leverage and total costs, indirectly supporting the idea of Wruck (1990, 433) that leverage plays a positive role in financial distress, serving as a catalyst of organizational change.
[223] Compare to Bris, Welch, and Zhu (2005, 3).
[224] Branch (2002, 40).
[225] Branch (2002, 54).
[226] Altman (1984, 1073) and Warner (1977, 339) state that the main problem in reducing the efficiency of the estimation of direct costs is the absence of an aggregate database collecting fees records. These records are dispersed among district courts throughout the country.

previous studies on direct costs can be found by Lubben (2000), Branch (2002), Bris, Welch, and Zhu (2005). Therefore, I will forgo their detailed analysis and present only significant results.

During the last three decades, empirical research on direct costs has been concentrated on the following aspects of bankruptcy fees:

- The estimation of the magnitude of direct costs and their determinants (Warner, 1977; Weiss, 1990; Altman, 1984; Betker, 1997; Branch, 2002; LoPucki and Doherti, 2004)
- The investigation of the relevance of direct costs for the capital structure decision (Ang, Chua, and McConnell, 1984)
- The comparison of the significance of direct costs to other corporate events (Lubben, 2000)
- The detection of differences between reorganization in Chapter 11 versus liquidation in Chapter 7 in terms of direct costs (White, 1983; Fisher and Martel, 2005; Bris, Welch, and Zhu, 2005).

Analyzing direct costs based on 11 cases of bankrupt railroad companies, Warner (1977) shows that one year prior to bankruptcy these costs tend to be 4% of the market value of the firm.[227] Altman (1984) estimates the costs of 12 bankrupt retailers and 7 bankrupt companies from other industries. The direct costs measured just prior to the bankruptcy equal 6.2% of the firm value.[228] Using a sample of 86 bankruptcies recorded by the Western District of Oklahoma, Ang, Chua, and McConnell (1982) report that administrative costs account for 7.5% of the liquidation value.[229] Betker (1997) provides a size of the direct costs equal to 3.93% of the total pre-bankruptcy value.[230] Weiss (1990), Lubben (2000), and LoPucki and Doherty (2004) find that the professional's fees incurred by large private and public companies are relatively low (3.1%, 1.82%, and 1.4% of total asset value prior to bankruptcy respectively).[231] And, finally, Bris, Welch, and Zhu (2005) demonstrate that the median costs measured as a fraction of the pre-bankruptcy value of total assets are as low as 2%.[232]

Despite the fact that the relative amount of the direct costs may seem to be not too high and therefore not crucial for corporate decisions, the dollar amounts of payable fees can

[227] Warner (1977, 343).
[228] Altman (1984, 1078).
[229] Ang, Chua, and McConnell (1982, 224).
[230] Betker (1997, 61).
[231] Weiss (1990, 289), Lubben (2000, 540), and LoPucki and Doherty (2004, 13).
[232] Bris, Welch, and Zhu (2005).

be more substantial, especially if paid by large public corporations. For instance, 22 of the companies which went bankrupt in 1994 had median attorney expenses of about 300 000 dollars, whereas the median of total direct fees of these firms lies above 420 000 dollars (with a mean of 1 million dollars).[233] Another example of the absolute amount of fees is provided by Betker (1997). A seven-year long restructuring of LTV Corp. which happened between 1982 and 1993 produced about $237 million in legal fees, while Southland's prepackaged bankruptcy took one year and cost more than $61 million.[234]

Another important subject in the discussion of the magnitude of direct costs is the question of the existence of scale effects. First hypothesized by Warner (1977), this effect was confirmed by Ang et al. (1982), Betker (1997), LoPucki and Doherty (2004), and Bris et al. (2005). The scale effect determines that the direct costs of bankruptcy are a concave function of the market value of the firm: they increase with the size of the company at a rate declining with the square of the size. Another determinant of direct costs is the duration of bankruptcy: the longer the company remains bankrupt, the higher the legal fees are. Other things being equal, a doubling of the time in bankruptcy increases direct costs by 57%.[235]

To summarize, legal fees are significantly lower than the indirect costs of financial distress. However, if measured in the absolute numbers, amounts to be paid can be still quite high. Like indirect costs, they are non-linear, but legal fees have different determinants than indirect costs. While indirect costs show a strong dependence on the intensity of the distress risk, direct costs are positively related to the length of bankruptcy and increase with the firm's size at a decreasing rate. Moreover, Fisher and Martel (2005) found that direct costs are irrelevant for the choice of a restructuring option. They hypothesize that a company will look for the restructuring alternatives associated with lower indirect costs rather than with the low legal fees.[236] In addition, legal fees during bankruptcy are significantly lower than the direct costs of other corporate events like the issue of new securities, tender offers, or M&A activities.[237] Hence, Chapter 11 represents a sizable bargain and allows the company to redesign completely its capital portfolio at a lower cost in comparison to other possibilities.

[233] Lubben (2000, 529).
[234] Betker (1997, 59).
[235] LoPucki and Doherty (2004, 17).
[236] Fisher and Martel (2005, 166).
[237] Lubben (2000, 542).

3.7 Micro- versus Macroeconomic Implications of Financial Distress

According to Branch (2002), financial distress costs are not restricted to the company in trouble. These costs usually affect their stakeholders, competitors, and may even have influence on third parties. In this context, Branch (2002) speaks the "real" costs borne by financial distress of a single business entity and classifies them into four subgroups:

1) Real costs incurred directly by the bankrupt company
2) Real costs borne directly by the claimants of the defaulted firm
3) Losses of the bankrupt company that are offset by the gains of another entities
4) Real costs accumulated by parties other than the bankrupt company and its debtholders.[238]

Category (1) represents the direct costs of financial distress, category (2) includes costs borne by the stakeholders of a distressed company, category (3) covers indirect costs, and category (4) encompasses losses which are borne in the economy by bankruptcy or shut down the corporation in default. Until now, I have analyzed costs and benefits, advantages and disadvantages of the incidence of financial distress looking at the troubled company itself (category of costs (1), partially (2), and (3)). In this section I analyze the effects of the financial distress of a single company on competitors, company stakeholders as represented by employees, stock markets, and the national economy as a whole, concentrating mostly on the last (4) category of the costs in Branch's classification.

The theoretical and empirical literature does not provide any answers concerning the micro- and macroeconomic implications of corporate bankruptcies. Traditionally, financial distress is seen as a negative event for the economy, accompanied by massive employee layoffs, the interruption of the product chain by the failure of one of the suppliers, deadweight losses incurred by the government and the society supporting the turnaround of large "national brands" or strategically important corporations.[239] It might be that many of the ideas I come up with here seem to have a speculative character in the absence of theoretical and empirical evidence. However, I clearly disagree with the above interpretation of the question at hand. The point I will bring up is that the implica-

[238] Branch (2002, 40).
[239] Prominent examples of an active participation of the government in restructuring are the recent cases of the bankruptcy of SwissAir, formal national air carrier in Switzerland, or the Korean concern Daewoo, which faced bankruptcy in 1998-1999.

tions of financial distress for micro- and macroeconomics are not investigated properly and additional research is required.

It is an indisputable fact that the bankruptcy of large corporations may shock the national economy. Graham et al. (2002) analyze the effect of the two largest bankruptcies in U.S. history, Enron and WorldCom, which were caused by crisis in corporate governance. The researchers observe the substantial cumulative impact of these two adverse events on the national economy: the bankruptcy of Enron and WorldCom cost the U.S. economy about $37 to $42 billion of GDP. Examining the impact of a single default on the stock market and translating changes in the stock market into effects on consumer expenditures, the authors report that each "moderate" collapse of large corporations lowers the GDP by roughly 0.35% or $35 billion in the year of bankruptcy. This is comparable to government spending on homeland security, or a $10 increase in the per barrel price of crude oil.[240]

The dependence of listed companies on industry performance and their competitors has as a consequence that the financial difficulties of the one company may affect the performance of rivals. Financial distress can have a contagion effect, transmitting lost confidence and financial instability from sick to healthy firms. Two recent papers confirm my hypothesis that financial distress of a single company may have harmful consequences both for other firms and at the aggregate level. Boissay (2006) analyses the financial contagion phenomenon when a company defaults on its trade credit. Since trade credits are widely used in the economy, the non-payment of large amounts has an adverse impact on the liquidity of the suppliers at the micro-level and may cause a chain reaction, which implies that one economic agent defaults because his client, another economic agent, has defaulted previously. Dependent on the collection costs, the degree of diversification and the state of the business cycle, the probability of contagion varies from 3.4% to 11.3%.[241] High collection costs, a low degree of diversification, and weak economic conditions are a good base for the propagation of severe contagion. The empirical analysis of financial distress implications at the macroeconomic level shows that the contagion effect lowers GDP by at least 0.4%.[242]

Unlike Boissay (2006), Kennedy (2000) focuses on the micro-level and investigates to what extent bankruptcy filings are associated with a decline in profits and margins by a troubled firm's competitors. He finds that financial distress prior to default causes an

[240] Graham et al. (2002, 6).
[241] Collection costs represent fees to the factoring companies for managing and collecting receivables. Boissay (2006, 24) reports these costs to be between 1% and 3%.
[242] Boissay (2006, 26).

abnormally high growth in sales by business rivals, which profit from the weaknesses of the distressed firm. However, around bankruptcy the gross margin of the competitors drops by a cumulative 6.5% of sales, resulting in a temporary decline in operating performance. Testing for negative effects of industry shocks and multiple filings on rivals, Kennedy (2000) concludes that the changes in the intensity of the product market competition are negatively affected by the change in the behavior of distressed companies.[243]

The link between product market competition and the financial situation of the company is also examined by Hendel (1996). Constructing a theoretical model of optimal pricing as a function of liquidity and the business cycle, Hendel (1996) predicts an aggressive pricing strategy of distressed firms. Troubled companies usually reduce prices and sell inventories below marginal costs in order to raise liquidity and avoid bankruptcy.[244] This behavior forces the competitors of the distressed company to bring their prices down as well and pursue an even more aggressive pricing policy such that they make losses today in order to increase the probability of gains in the future which result from the suppression of the troubled competitor. Pricing becomes more aggressive in recessions, causing a drop in inventories. At the aggregate level, reduction of inventories may have a negative impact on the level of GDP. [245]

Besides the influence of financial distress on competitors or its impact at the aggregate level, financial distress might affect stock and labor markets. Facing financial difficulties, companies lay off employees in order to prevent bankruptcy and to reduce costs. Proponents of the financial distress hypothesis find that layoffs are a negative signal for investors. They reflect the currently weak financial conditions of the firm and affect a decline in stock prices. Thus, layoffs are interpreted by the market participants as a confirmation that financial distress is becoming severe and long-lasting. In contrast, according to the potential benefits hypothesis, the financial distress of a company may have benefits. Although corporate layoffs are considered a sign of the presence of financial problems, they allow substantial cost savings in the distressed company and, consequently, improve its operational efficiency. Hence, stock prices react more positively to layoffs by financially weaker firms than to layoffs by healthy ones.[246] Wertheim and Robinson (2004) find that the reaction of the market to the layoffs of a troubled firm depends on the quality of information available at the moment of a layoff announcement. If the signal of the potential benefits dominates the signal about financial distress,

[243] Kennedy (2000, 17).
[244] Hendel (1996, 320).
[245] Blinder and Maccini (1991) find that inventory reductions added up to 87% of the GNP decline in the postwar recessions in the U.S. In his model, Hendel (1996) explains this effect with the aggressive pricing politics of distressed companies in economic downturns aimed at reshaping the company's assets in order to survive.
[246] Igbal and Shetty (1995, 68).

markets tend to react positively and vice versa. Therefore, the potential benefit hypothesis does not contradict the financial distress hypothesis.

However, the impact of corporate layoffs on the labor market is not that clear. This problem is analyzed by Nosal (1998). He develops a theoretical model of the labor market over the business cycle. In this model, financial distress happens only during a recession which is characterized by low productivity or low demand for the firm's product. Therefore, financial distress can be seen as a natural process and as a part of the recession mechanism. Low states of the business cycle imply that the productivity of allocated resources declines. The release of workers by troubled companies reduces the wealth of the former employees and shrinks their consumption. Sometimes companies overreact and fire more employees than necessary, which leads to underused capacities. This results in temporary underemployment and an inefficient use of resources. As soon as the state improves, companies hire workers again and employment increases. Hence, in the model framework of Nosal (1998) financial distress and layoffs can be examined as an effect of the business cycle.

Summarizing this chapter, financial distress has a variety of effects on the micro- and macroeconomic environment. The bottom line is that financial distress can produce real costs for both micro-level and the aggregate economy. Under sound competition and oligopolistic markets, the blackout of a single company should not be problematic for the economy. The niche of the defaulting firm can be occupied by a strong competitor relatively easily and quickly. On the other hand, in a networked economy with a strong interdependence of markets and market participants, the default of one company can cause a domino effect spreading out and moving whole industries towards a crisis.

3.8 Chapter Summary

This chapter deals with the theoretical aspects of corporate financial distress. Analyzing the state of the art in theory and research, I develop a conceptual framework of the failure process combining previous knowledge about single distress events. Now, based on the concept designed, financial distress can be more adequately defined as a very dynamic and complicated process of the value deterioration of a single company passing through different stages and distressed events in its adverse development, with two possible outcomes: distressed restructuring or liquidation.

After a crucial examination of the available literature on corporate financial distress, it can be concluded that the current theoretical and empirical research concentrates mostly on single stages of adverse development and investigates certain aspects (subordinated mechanisms) of the distress cycle. A comprehensive analysis of single distress events

merged into an integrated theory is still lacking. Therefore, it seems to be reasonable to present in the summary of this chapter the main results obtained by the examination of the theoretical and empirical paradigms. Particularly, the following findings should be of interest for future research:

- Financial distress is a heterogeneous dynamic process producing diverse economic signals to third parties. These signals and their intensity vary from state to state. Therefore, an event-oriented approach to the examination of financial distress may have some limitations and cause inconsistency in the formal use of similar economic criteria such as financial distress, failure, insolvency, default, and bankruptcy. A consolidation of the theory into a comprehensive concept explaining economic signals, their mechanics, and the change from state to state may contribute to a better understanding of what happens to the value of a firm in the downward spiral.
- The sources of financial distress can be classified into two groups: exogenous or macroeconomic shocks, and endogenous or microeconomic problems. External risk factors can be represented by the macroeconomic conditions, overcapacity and structural changes, deregulation of key industries, political crises, and natural disasters. The spectrum of internal risk factors is broader. Those can be, among other things, high leverage, a decline in operating activities, fraud, managerial incompetence, weak corporate governance, but, at the end of the day, all of them result from bad management and/or its failure to recognize and anticipate the adverse development. In addition, researchers do not have a unified opinion on whether poor operating performance is the source or the consequence of financial distress. This is only one of the examples of the fact that, in many cases, the reasons for financial distress are mixed and interrelated with each other. Therefore, an analysis of the risk factors should be performed regarding all their complexity. In reality, there are no investigations of the sources of risk and how they affect the distress risk on a stage-by-stage basis. Since risk plays a decisive role in the assessment of the chances and threats of any potential restructuring, the examination of its shifts from state to state deserves more attention.
- An integral approach to the analysis of financial distress has a number of advantages. It links three important methodological components in a logical manner: the causes, triggers, and the catalysts of financial distress. It is important to understand that financial distress does not necessarily lead to default. A serious conflict in financial distress exists between the observability of adverse processes and the time to respond. Very often, a decline in operating performance becomes visible shortly before

the company enters the state close to default. Hence, there is not much time left to reflect and to perform "first aid". Keeping in mind that each state has different distress triggers, it is not enough to describe each stage of financial distress; it is more important to understand which factors force the transition from one state to another.

- Under some circumstances, financial distress can be seen as a strategic mechanism of natural selection. Financial distress drives companies with inefficient organizational structures to reorient their business and redesign their long-term strategy. However, this selection mechanism can be quite destructive. On the microeconomic level, financial distress leads to a loss of market share, damages customer confidence, can lead to large layoffs and cause conflicts with the firm's stakeholders. Empirical studies document that in the extreme case indirect costs can be up to 80% of the pre-distress value of the firm. Simulations of the paths of the value impairment in financial distress show an accelerated value decline close to default. Similar modeling of indirect costs confirms this observation by yielding the results of a sharp increase in indirect costs around Chapter11.
- Higher costs are usually incurred in the presence of economic shocks. In this respect, it is not clear to what extent financial distress has an influence on the macroeconomic environment: Is financial distress an effect of the business cycle or it is an idiosyncratic economic phenomenon?

This chapter has given an introductory overview of the theory of financial distress, of different processes running simultaneously in the downward spiral, and the mechanisms ensuring financial distress resolution. The following chapters, and, in particular, the empirical part of this dissertation deal in more detail with a particular question of financial distress theory. I will go back to the risk factors in financial distress and analyze their nature and attributes.

4 Financial Distress and Risk: State of the Art in Theory and Empirical Research

An analysis of financial distress phenomenon from the capital market theory point of view is incomplete without the investigation of distress risk, its nature and attributes. Since the impairment prior to bankruptcy adds up to two-thirds of the market capitalization, the increasing role of the risk factor is obvious.

An examination of the literature on risk attributes in financial distress shows that it is highly fragmented and incomplete. Available research in this field covers some observations on technical default of debt and subsequent increase in both systematic and unsystematic risk (Fargher et al., 2001; Beneish and Press, 1995) on unchanged or even declining behavior of equity beta and systematic risk (Aharony et al., 1980; Johnson, 1989; McEnally and Todd, 1993) as well as on the positive influence of the capital structure on changes in the security's risk (Hamada, 1972; Rubinstein, 1973; Zavgren, 1985).

In the section below I review the state of the art in modern capital market theory starting from mean-variance analysis and the Capital Asset Pricing Model (CAPM). I briefly discuss the risk-return tradeoff, the effect of diversification, and the role of financial distress risk. Special attention is given to the discussion of the systematic risk behavior of companies approaching financial distress and to the current academic research on the role of the idiosyncratic volatility in the asset pricing.

4.1 The Capital Market Theory Perspective on Risk and Financial Distress

4.1.1 Default Risk and Diversification

The basic paradigm of asset pricing is based upon the security's expected returns determined by risks. Therefore, *"the central task of financial economics is to figure out what are the real risks that drive asset prices and expected returns"*.[247] In other words, asset pricing deals with the sources of risk and the economic forces which determine rewards for bearing risk.[248]

The understanding of the risk-return tradeoff is fundamental in the capital market theory. It starts with mean-variance analysis and the optimal portfolio selection of Markowitz (1952). Markowitz quantified risk and showed that under a reasonable set of assumptions a single asset or a portfolio of assets is considered to be efficient if no other

[247] Cochrane (2001, 455).
[248] Campbell (2000, 1516).

assets or portfolio of assets can have a higher expected return with the same risk, or lower risk with the same or higher expected return.[249] About ten years later, Sharpe (1964), Lintner (1965), and Mossin (1966) modified the efficient frontier into the mean-variance frontier by adding a riskless asset. By means of splitting an investment between the money-market fund and the portfolio of stocks, an investor can pick the portfolio on the mean-variance frontier with the highest mean return for the acceptable level of volatility in accordance with the degree of personal risk tolerance.

Mean-variance analysis builds the framework for the CAPM that determines which risks should be priced in equilibrium. One of the important concepts here is that of diversification. In traditional portfolio theory the risk of a security is measured by the standard deviation of its returns. At the aggregate level the standard deviation of portfolio's returns can be reduced by combining stocks whose returns are less than perfectly positively correlated.[250] Therefore, diversification is aimed at the identification of negative covariance within asset groups in order to minimize the likelihood of generating large losses.[251] Werner (1997) describes two possible diversification strategies. The first one exploits the correlation between securities in order to form a portfolio with higher returns and lower variance. The second strategy utilizes the Law of Large Numbers: an investor builds a portfolio by investing small fractions of wealth in each of a large number of securities. This action results in a reduction of risk.[252] Since the risk is usually defined as the probability of adverse outcome, the main goal of diversification can be seen in the mitigation of default risk. Given that default risk cannot be totally hedged away because it reflects the substantial risk in companies' futures, someone must bear this risk.[253]

The CAPM recognizes the effect of diversification and predefines that the total risk can be decomposed into two elements which are complementary to each other. The first component is market risk, which affects all market participants. The second term is the idiosyncratic volatility, which is firm-specific. Idiosyncratic risk does not have a strong correlation with the market and therefore should be eliminated through diversification. In the CAPM world, the investor does not care about the total volatility but about the risk remaining after diversification. This part of total risk is not diversifiable or system-

[249] See Reilly and Brown (2003, 211ff.). The main assumptions of Markowitz's efficient frontier are based on the maximization of the utility function of individual investors and on the investor preferences of higher returns to lower returns and of less risk to more risk.
[250] Jay (1993, 72).
[251] Bernstein (1985, 22).
[252] Werner (1997, 90). The Law of Large Numbers says that as soon as the number of securities N with i.i.d. returns becomes infinite, portfolio return, due to diversification, converges to the riskless return.
[253] Kealhofer and Bohn (2001, 1).

atic. Thus, CAPM postulates that only systematic risk is relevant for investors in an efficient stock market and bearing this risk is rewarded by a risk premium. The CAPM does not answer the question whether the risk of default is systematic or not. Instead, the CAPM gives reasons for the existence of a risk premium, suggesting that only the systematic portion of the default risk gains higher returns.

For a long time, asset pricing theory considered the fact that idiosyncratic risk can be diversified away if an investor keeps a sufficiently large number of assets in his portfolio as an axiom. Therefore, researchers have concentrated on the investigation of the systematic component in order to explain the existence of the premium for bearing high risk. The fact that some of the firm-specific risk factors may correlate with the market and, as a result, be nondiversifiable did not receive attention in academic research. Cho (1997) challenges the traditional view in the CAPM world. He argues that not only systematic risk, but also a part of the firm-specific risks, is not diversifiable. Cho analyzes firm-specific operating risk and shows its covariance with the market return. Using covariance term decomposition and reintegrating the CAPM, he proves that including the nondiversifiable part of the firm-specific risk into the valuation increases the cost of capital and reduces the value of the company. Given that Cho's observation of is true, investors permanently overvalue financially distressed companies, quantifying only the systematic risk, and underestimate the real risk premium.

Motivated to investigate the influence of risk on corporate value in financial distress I analyze the behavior and the attributes of systematic and idiosyncratic risk of firms approaching financial difficulties. The sections below deal with these issues.

4.1.2 Systematic Risk Behavior in Financial Distress

From a methodological point of view, an examination of risk behavior in financial distress is hindered by the lack of alternative definitions and measures of systematic and idiosyncratic risk. The theory of the CAPM and its deviations are based on the two basic propositions: (a) there is a linear relationship between return on a risky asset and its systematic risk and (b) the only relevant risk measure is the systematic risk or beta. The stability and significance of beta as a measure of risk has been seriously questioned in the last few decades, which produced many controversial empirical results. This discrepancy in the opinion of researchers about risk has inevitably found its reflection in the analysis of distress risk.

As mentioned in 3.3, financial distress should be examined as an adverse continuous process. In this context, special attention should be paid to the intensity of risk which changes from stage to stage. At the beginning of the corporate failure process, distress

risk increases monotonically. In the downward spiral this risk starts to rise exponentially, resulting in a disproportionately large decline in value. To be able to understand which factors cause impairment in value, which implications this has for capital structure, for the costs of financial distress, and last but not least for asset pricing, it is useful to study the behavior of systematic risk and idiosyncratic volatility in the presence of increasing probability of default. In this section, I analyze systematic risk behavior in financial distress, the main characteristics of risk at each stage of the failure process and investigate which measures of risk can be used to reproduce the behavior path of systematic risk in financial distress.

Previous empirical studies report that systematic risk is not static. It behaves differently at particular stages of the failure process. Fargher et al. (2001) examine how market risk perceptions change around the periods which provide warnings about financial distress. They apply the findings that initial technical violations of debt covenants are associated with the initial stage of financial distress and analyze the shifts in the firm's risk around this event.[254] In an efficient market initial violations of debt covenants should be anticipated in the form of increasing risk which is relevant for investors holding securities of companies-violators. To prove it, the market model used is:

$$r_{it} = \alpha_i + \beta_i \cdot r_{Mt} + \varepsilon_t \qquad (1)$$

Fargher et al. (2001) take the variance of both sides of equation (1) and decompose the total variance into the systematic risk (β_i) and the firm-specific idiosyncratic variance (σ_e^2). Results of tests for changes in risk show that firms-violators are more risky than the average firm. They experience a significant positive increase both in the systematic and the idiosyncratic risk. However, an increase in the systematic risk is not related to a change in the underlying asset beta but appears to be due to an increasing leverage.[255] This is consistent with the findings of Hamada (1972) and DeJong and Collins (1985) on the effects of capital structure on systematic risk based on the CAPM estimations. These researchers also find that systematic risk is affected by the financial leverage of the firm in question. A positive correlation between systematic risk and leverage results in an increasing beta. Intuitively, this has to hold in the failure process too, since financial leverage is associated with financial distress and bankruptcy. On the contrary, empirical evidence on corporate decline shows that the effect of leverage on beta, and, consequently, on market risk loses its explanatory power with the entry of a firm into finan-

[254] See e.g. Beneish and Press (1995), Wilkins (1997).
[255] Fargher et al. (2001, 472).

cial distress. The behavior of systematic risk becomes "somewhat of an anomaly"[256] and the beta estimation declines after running, for instance, an OLS regression.

MacEnally and Todd (1993) do not negate the question of positive relation between beta and leverage and, therefore, between beta and financial distress. However, they conclude that generally, but not completely *"leverage-increasing impact of financial distress may be more than outweighed by possible decline in systematic earnings risk"*.[257] These researchers postulate that systematic risk is a function of leverage and systematic earnings risk. If company moves into financial distress, it experiences a high increase in leverage. Thus, the systematic risk goes up. However, one to two years prior to default the systematic component of the earnings risk drops, which offsets the effect of leverage and leads to the decline in the overall systematic risk. Reduction in the correlation between earnings and the economy-wide factors in the deepening financial distress is explained by an increasing role of the firm-specific risks which are important with respect to the survival of the firm.

A similar observation is made by Fargher et al. (2001). The researchers report that the change in idiosyncratic risk is a significant predictor of the future delisting because of poor performance. This result verifies that idiosyncratic risk plays an important role in the downward spiral and is responsible for a substantial proportion of value deterioration.

Aharony et al. (1980) study risk-return characteristics of companies from the onset of financial distress until the actual bankruptcy. To measure the changes in the risk between bankrupt and non-bankrupt firms, as usual, the CAPM is applied. Consistent with the financial theory on corporate financial distress, the results show that expected returns of firms prior to bankruptcy drop with substantial increase in total risk. Both total and unsystematic risks behave in the same direction. Similar to McEnally and Todd (1993), systematic risk (measured by beta) is found to decrease as soon as a distressed company passes the initial stage of performance decline and enters the accelerating spiral of value impairment. Aharony et al. (1980) make a conclusion that beta is not *"a useful indicator of firm deterioration over time"*[258] and confirm the observations of many researches that corporate failure is accompanied by a rise in idiosyncratic volatility (Altman and Brenner, 1981; Dichev, 1998; Opler and Titman, 1994).

[256] Johnson (1989, 34).
[257] McEnally and Todd (1993, 18).
[258] Aharony et al. (1980, 1006).

Johnson (1989) addresses observed decreases in equity beta prior to default to methodological problems in the estimation of systematic risk.[259] He argues that beta is not constant over time and its estimates are very sensitive to the nonsynchronous trading.[260] A properly estimated beta, i.e. adjusted for these effects, has invariant changes prior to default. This happens because not beta but skewness plays an important role as a measure of risk in imminent bankruptcy. Holding the mean constant, increasing variance affects higher expectations of returns. Since equityholders have a contingent claim on the assets, which is limited by the value of equity equal to zero if bankruptcy occurs, increasing probability of default will influence only the upper tail of the probability distribution of returns to equityholders. This implies that prior to default positive skewness will be positively related to expected returns.

In his research, Johnson (1989) also points out that not only the analysis of equity but also behavior of the value of debt, debt betas and their relation to the equity risk could provide useful insights into the risk behavior of firms approaching default. This idea has been explored by Reilly et al. (1998) in their investigation of the risk-return characteristics of defaulted debt. The major conclusion emerging from this study is that defaulted debt is "very stock-like", has similar risk-return characteristics to firms of smaller size and should be analyzed more as a stock than as a bond.[261] Examining bond issues which are trading while in default, Reilly et al. (1998) find that defaulted debt has significantly higher total volatility than investment-grade debt but the proportion of systematic risk measured by beta is relatively low.

Selected examples show aberrant empirical evidence on the risk characteristics of financially distressed companies. The results are controversial and vary depending on the geographical area of the sample, the length of observing time series, and on the model assumptions underlying the chosen measure of the shifts in risk. If risk is quantified by total volatility, distressed stocks experience a significant increase in risk in comparison to sound companies. When risk is measured in terms of systematic risk, its behavior very often is interpreted as an anomaly: in the initial stage of financial distress beta increases, whereas in the downward spiral it declines and remains invariant prior to and just after the announcement of default. The determinants of this anomaly remain unknown. Moreover, idiosyncratic volatility increases with increasing probability of default. Empirical evidence confirms that shifts in idiosyncratic volatility at the later stages of financial distress are responsible for the delisting of default candidates from the stock

[259] Johnson (1989, 33).
[260] The influence of infrequent trading on shares is analyzed by Dimson (1979).
[261] Reilly et al. (1998, 47).

exchange. All these observations stress the importance not only of systematic risk but also of the idiosyncratic factors for the risk-return relationship of distressed stocks.

Therefore, prior to investigating the systematic and the idiosyncratic risk effects in the cross-section empirically, I discuss current developments in the asset pricing literature on the role of idiosyncratic volatility in stock returns.

4.1.3 Does Idiosyncratic Risk Matter?

Considerable attention has been paid to the role of idiosyncratic volatility in asset pricing after a series of research papers on the increase of the volatility of individual stocks during the late 1990s. Campbell et al. (2001) document a dramatic rise in the idiosyncratic volatility of stock returns relative to market volatility over the past three decades.[262] They also observe that firm-specific variance is strongly countercyclical and roughly doubles in recessions. High idiosyncratic volatility may be the result of a decline of correlations among individual stocks, which lowers the explanatory power of the market model.

According to Campbell et al. (2001), the main forces which drive an increase in idiosyncratic volatility are the break up of conglomerates, the early listing of companies in their life cycle, when they have predominantly firm-specific risks in their portfolio, and the leverage effect. To some extent, the effect of the early listings is verified by Fama and French (2004), who find that newly listed companies have riskier fundamentals. Following the argumentation by Campbell et al. (2001) and Fama and French (2004), Brown and Kapadia (2007) investigate the previously documented effect and show that the increase in idiosyncratic risk in the U.S. stock market is a result of new listings by riskier companies, whose access to public equity was granted in the post-war period due to a great development of financial markets.[263]

Malkiel and Xu (2003) confirm the persistent nature of idiosyncratic volatility over the recent decades. They report that the monthly idiosyncratic volatility of most volatile stocks tripled in the 1990s in comparison to the 1960s. This effect may be caused by the growth in the proportion of trading done by institutional investors, the redirection of firms' preferences towards unique investment projects with a high proportion of firm-specific risks, and the increasing prominence of young risky NASDAQ firms in the market.[264]

[262] Campbell et al. (2001, 37).
[263] Brown and Kapadia (2007, 358).
[264] Malkiel and Xu (2003, 641-642).

The input from academia in studying the information content of idiosyncratic risk is accompanied by recent trends in the capital markets: (a) an impetuous development of the derivatives markets where the price of an option on an individual stock depends on the total volatility and its larges component – idiosyncratic risk, and (b) a rapid implementation of investment strategies which use arbitrage to exploit the mispricing of individual securities. According to Ingersoll (1987), large pricing errors happen when idiosyncratic volatility is high.

Directions in the current research on idiosyncratic volatility in asset pricing can be summarized by three fundamental questions:

1) Does idiosyncratic risk really matter?
2) What is the economic rationale for the existence of the idiosyncratic risk premium?
3) How does idiosyncratic risk affect stock returns, or, more precisely, is the idiosyncratic risk premium positive or negative?

While the first and the third question belong rather to the area of empirical research, the answer to the second question is possible only by applying a sound theoretical concept. However, a consistent theory able to explain why idiosyncratic volatility may be priced by the market does not exist. In contrast, empirical evidence on the positive relation between return and idiosyncratic volatility contradicts the dominant market risk theory in portfolio management and asset pricing that only market risk, not economy wide firm-specific risks, is relevant for the asset returns.

There are two common explanations of why idiosyncratic volatility may be priced in equity returns: The first one assumes under-diversification, the second – existence of the non-traded assets in the portfolio of investors. The reasons for under-diversification are analyzed by Levy (1978), Merton (1987), Malkiel and Xu (2006), Goetzmann and Kumar (2007) to some extent. While institutional investors in reality tend to take intentionally more idiosyncratic risks in order to achieve extraordinary returns, individual investors usually do not hold well-diversified portfolios because of wealth constraints or by choice of an investment. Transaction costs (Brennan, 1975), search costs associated with incomplete information (Merton, 1987) can substantially limit possibilities for assembling an adequate “fully” diversified portfolio. In addition, investors may choose stocks from certain categories, styles, or industries; they may prefer to hold securities with higher variance or positive skewness in order to capture positively skewed returns (Golec and Tamarkin, 1998; Polkovnichenko, 2005; Barberis and Huang, 2005; Mitton and Vorkink, 2007). Hence, investor preferences induce them to remain underdiversified

in an attempt to obtain higher returns.[265] There is also a group of investors which cannot diversify their portfolios. They hold employee stock option plans which are derivative products and, thus, depend largely on the idiosyncratic part of the total volatility of the underlying stock.[266]

Institutional investors may experience regulatory constraints such as taxes, liquidity needs, imperfect divisibility of securities, or restrictions on short sales which cause under-diversification. Therefore, in terms of the CAPM, if a large group of "constrained" investors is permanently underdiversified, the group of "unconstrained" investors will be unable to hold the market portfolio as well, because the sum of the total holdings of the two groups makes up the whole market.[267] As long as price-setting investors are underdiversified, they will demand compensation for bearing idiosyncratic risks and influence stock prices. Campbell et al. (2001) find that underdiversified portfolios have a stronger increase in volatilities in economic downturns than well-diversified ones. With rising idiosyncratic volatility, especially when the economy turns down, a larger number of stocks must be held in the portfolio to obtain a given level of diversification.[268]

Another explanation of the existence of the idiosyncratic risk premium is based on the assumption that investors hold large amounts of nontraded assets in their portfolios, which are sources of idiosyncratic risk. The two most important components of nontraded assets are human capital and private business. Both elements constitute a large part of the investors' portfolios. Up to 70% of all holdings of private equity investors are concentrated in a single firm, which makes such portfolios extremely unbalanced.[269] Given that the traded assets are not correlated with the nontraded assets, as soon as the firm-specific risk increases, the risk aversion of investors will rise as well, so that investors will require an additional premium for holding more risky traded stocks.[270] Therefore, labor and proprietary income should be considered in the asset pricing.

If there is an economic rationale for the idiosyncratic risk premium, this premium may be present in equity returns. Consequently, the next issue is to integrate this premium into existing asset pricing models and to determine whether it is positive or negative.

Empirical evidence on the relation between idiosyncratic volatility and return is mixed. While Goyal and Santa-Clara (2003), Chua, Goa, and Zhang (2006), Jiang and Lee (2006), Fu (2007) report a statistically significant positive effect of idiosyncratic volatil-

[265] Boyer, Mitton, Vorkink (2007, 4).
[266] Brown and Kapadia (2007, 359).
[267] Malkiel and Xu (2006, 2).
[268] Campbell et al. (2004, 34).
[269] Moskowitz and Vissing-Jorgensen (2002, 745).
[270] Goyal and Santa-Clara (2003, 977).

ity on equity returns, Hirt and Pandher (2005), Boyer et al. (2007) and other researchers demonstrate that idiosyncratic volatility is negatively related to expected returns.

Malkiel and Xu (2006) extend the CAPM for the case in which investors, for some exogenous reasons, are underdiversified, so that expected returns of "constrained" investors will be subject not only to their systematic risk, but also to the firms' undiversified idiosyncratic volatilities:

$$r_i^c - r_f = \beta_i \cdot \left(r_m - r_f\right) + \beta_{I,i} r_\varepsilon \tag{2}$$

where r_i^c represents the expected return of a constrained investor, $\beta_{I,i} = \frac{Cov\left(R_i, \varepsilon_m^I\right)}{\sigma^2\left(\varepsilon_m^I\right)}$ is the sensitivity of the market-wide undiversified idiosyncratic risk factor, and r_ε is the market-wide idiosyncratic risk premium that emerges because of constrained investors. Equation (2) says if not all investors can hold the market portfolio, the expected risk premium will be determined not only by the observed market return measured by beta, but also by an extra premium because undiversified investors will be exposed to the idiosyncratic risk as a result of constraints.[271]

In contrast, Hirt and Pandher (2005) and Boyer, Mitton, and Vorkink (2007) document that idiosyncratic volatility is negatively priced in stock returns. The fact that stocks with high idiosyncratic volatility have lower expected returns is known in the literature as the idiosyncratic volatility puzzle.[272] Johnson (2004) explains this phenomenon by means of an option pricing theory. It is a well-known fact that the equity of levered firms can be seen as a call option on the firm's assets. The sensitivity of the option value with respect to the underlying stock price decreases with idiosyncratic volatility. Holding the premium on the total assets of the firm constant, increasing idiosyncratic volatility lowers exposure of the call option to systematic risk. Lower systematic risk results in lower expected returns.[273] Chua, Goa, Zhang (2006) disagree with Johnson (2004) about a constant premium on the firm's assets and show that idiosyncratic volatility has a positive effect on the equity premium, and this effect dominates the negative effect of volatility on systematic risk (equity beta).[274] Boyer et al. (2007) argue that some investors are ready to pay a premium for high idiosyncratic volatility because the latter is an indicator of stocks with a high level of skewness exposure. Since skewness offers an option

[271] Malkiel and Xu (2006, 13).
[272] For the first time, a steady increase in idiosyncratic volatility while aggregate market volatility remained roughly level through time was documented by Campbell et al. (2001). This effect is known as the idiosyncratic volatility puzzle.
[273] Johnson (2004, 1965).
[274] Chua, Goh, Zhang (2006, 17).

with an upside potential for stock returns, this is a "desired" risk for investors with risk appetite. Thus, individual preferences of investors explain their readiness to pay an additional amount for holding stocks with high idiosyncratic risk and low average expected returns *"in return for a chance at an extreme winner"*.[275]

Some researchers find that stocks with high idiosyncratic volatility earn abysmally low average returns. Ang, Hodrick, Xing, and Zhang (2006) point out that the average monthly difference between returns of the portfolio with the lowest idiosyncratic volatility and the portfolio with the highest idiosyncratic risk equals -1.06%.[276] There is also empirical evidence of no significant relation between idiosyncratic volatility and expected returns (Bali and Cakici, 2006).

The difficulties in the measurement of idiosyncratic volatility, which account for a large dispersion in empirical results, arise because of its unobservability. Idiosyncratic risk is usually estimated relative to the systematic risk measured by estimated beta, and is therefore model dependent. In addition, the estimates of idiosyncratic volatility are sensitive to data frequency, the weighting scheme used to compute average portfolio returns, and breakpoints applied to sort stocks into portfolios.[277]

Despite the fact that theoreticians and empiricists still do not have a unified opinion with respect to the economic content of the idiosyncratic volatility puzzle, research on the idiosyncratic risk premium continues to challenge traditional capital market theory. It is obvious that if idiosyncratic volatility continuously increases the market should respond in some way to this tendency. Developed capital markets have a number of constraints which restrain investors to hold well-diversified portfolios. Thus, the presence of high proportions of idiosyncratic volatility is not disputable anymore. Researchers try to explore the phenomenon of idiosyncratic volatility, analyzing its nature and attributes. They also decompose the idiosyncratic volatility into an expected and an unexpected part in order to correct for the fact that realized returns are usually used as a proxy for expected returns. They apply different analytical procedures to the estimation of idiosyncratic risk. In my dissertation I contribute to this new direction of empirical research by investigating the idiosyncratic volatility effect in pricing financially distressed stocks. Jiang and Lee (2006) show that idiosyncratic risks are related to macroeconomic variables. They suggest that this relation may point at the fact that idiosyncratic risks are not fully diversified. I use this finding by Jiang and Lee (2006) later in my empirical study and (a) assume that idiosyncratic volatility of distressed stocks cannot be fully diversi-

[275] Boyer, Mitton, Vorkink (2007,15).
[276] Ang, Hodrick, Xing, and Zhang (2006, 261).
[277] Baki and Cakici (2006, 21-22).

fied and (b) test the hypothesis that non-diversifiable idiosyncratic risk of financially distressed firms is priced in equity returns.

4.2 Models of Distress Risk Assessment

The question of how to measure distress risk has a long history in the financial literature. During the recent decades many researchers and theoreticians have investigated this issue by developing new approaches for forecasting financial distress and bankruptcy. Prediction of financial distress has been analyzed from the economic, financial, accounting, statistical, and even informational point of view.

Most of the research in this area can be chronologically divided into two parts: before and after the 1990s. The techniques of distress risk assessment before the 1990s were dominated by static single-period models which try to find unique characteristics that differentiate between distressed and non-distressed firms. An extensive review of these classification models can be found in Altman (1983), Zavgren (1983), Foster (1986), and Jones (1987). The examination of distress risk during and after the 1990s has led to the development of dynamic models which would be able to determine each firms' distress risk at each point in time.[278] An extensive review of "new techniques" in comparison to the previous discriminant models can be found in Mosmann et al. (1998), Cybinski (2003), Weckbach (2004), and Altman and Hotchkiss (2005).

Cybinski (2003) points out that within the recent decades no new methodology has been introduced. Most extensions of the already existent models occur when either a new statistical technique or a new database becomes available.[279] In the absence of theory, extensions to the available techniques concentrate on the analysis of accuracy of forecasts and the manner of its improvement.

As already noted, there are different possibilities for classifying existing forecasting models. The classification can be done in a chronological manner (Altman and Hotchkiss, 2005) or based on the classification of underlined statistical or mathematical approaches (Uhrig-Homburg, 2002; Cybinski, 2003).

To give an example of chronological classification, Altman and Hotchkiss (2005) divide all techniques for the prediction of corporate financial distress into the following groups:

- Qualitative analysis (Subjective models)
- Univariate analysis (Use of accounting-based ratios or market indicators for the distress risk assessment: Beaver, 1966)

[278] Shumway (2001, 102).
[279] Cybinski (2003, 11).

- Multivariate analysis (including Discriminant, Logit, Probit, Non-Linear Models – Neural Networks, Recursive Participating Analysis based on the accounting or market information: Altman's Z-Score, Ohlson's O-Score, A Simple Hazard Model of Shumway)
- Discriminant and Logit Models in Use (Z-Score for manufacturing, ZETA-Score for Industrials, Private Firm Models – Z''-Score, EM (Emerging Markets) Score, etc.)
- Artificial Intelligence Systems (Expert Systems, Neural Networks Credit Model of S&P)
- Contingent Claim Models (KMV Credit Monitor Model, Risk of Ruin)
- Mixed Ratios / Market Value Models (Moody's Risk Calc, Z-Score / Market Value Model).[280]

An interested reader is advised to have a look at the reviews mentioned above. I will concentrate on the most important models which can be used in empirical research to obtain an accurate estimate of distress risk.

For these purposes, I classify all relevant models which are widely used in empirical studies into two groups depending on the type of data applied in research: (a) techniques based on accounting information, so-called accounting-based models and (b) market-based models which utilize capital market information.

4.2.1 Accounting-Based Models

Accounting-based models test the usefulness of information contained in the financial statements of a company to provide an adequate assessment of the financial distress risk. These techniques are based on a single financial ratio or a number of ratios which are computed and compared to a benchmark for this ratio or weighted combination of the ratios in order to allocate the firm to one of two groups: sound or financially-distressed. Since distress risk in traditional accounting models is measured by a dichotomous variable which classifies a company as sound or financially distressed with respect to a specified cutoff, this class of models is also known as binary or dichotomous models. Financial data used in the accounting-based models to predict financial distress, such as profitability, liquidity, and solvency ratios, are measured ex-post. Accounting information is observable, although annual auditor reports produce a delay in the availability of accounting information due to the fact that reports are not released until the following year. The relative simplicity and availability of financial information have made these

[280] Adopted from Altman and Hotchkiss (2005, 234) and supplemented with additional examples.

techniques for decades the most popular analytical tool of financial distress assessment in empirical research.

4.2.1.1 Beaver's Univariate Analysis of Financial Ratios (1966)

Beaver (1966), one of the precursors of modern distress risk assessment, applies a univariate statistical analysis for the prediction of corporate failure. Three criteria are used for the selection of 30 ratios to analyze 79 failed firms within 5 years prior to default:

- Popularity / frequency of the appearance of the ratios in the literature
- Performance of the ratios in previous studies
- Use of ratios within the framework of a "cash-flow" theory.[281]

Within the scope of the cash-flow model the firm is viewed *"as a reservoir of liquid asserts which is supplied by inflows and drained by outflows"*. [282] Beaver does not define distress risk explicitly. As long as the reservoir is full the company remains solvent. The probability that the reservoir will be exhausted increases the risk of default. Four propositions based on logical rather than theoretical knowledge are derived from this cash-flow concept:

(a) The larger the amount of liquid assets and (b) the larger the amount of cash flows from operations, the smaller the risk of default.

c) The larger the amount of total debt held and (d) the larger the cash outflows from operations, the higher the risk of default.

Beaver performs comparison of the means of failed firms with non-distressed companies and shows that failed firms have lower financial ratios. Even five years prior to bankruptcy, the financial ratios of the failed firms are substantially lower than of comparable sound enterprises. The ratios become significantly worse as default approaches. Based on the propositions above, he performs a dichotomous classification test of the predictive ability of the chosen accounting measures and identifies the six most powerful ratios: cash flow to total debt, net income to total assets, total debt to total assets, working capital to total assets, current ratio, and no-credit interval.[283]

There are two types of errors which can occur in classification models. The type I error equals misclassifying a financially distressed firm. The type II error means a misclassifying of a sound company. In the model by Beaver one year prior to default the Type I error is 22% and the Type II error is 5% respectively. While the Type II error remains

[281] Beaver (1966, 78-79).
[282] Beaver (1966, 80).
[283] The ratios are listed in declining order of their predictive ability.

unchanged over time, the Type I error becomes larger with an increasing number of years prior to default.

Despite Beaver's predictors performing well in the short term,[284] the univariate analysis has a number of limitations. First, single ratios calculated by Beaver do not capture time variation of financial ratios. This means that accounting ratios have their predictive ability one at a time, and it is impossible to analyze, for instance, rates of change in ratios over time. Second, single ratios may give inconsistent results if different ratio classifications are applied for the same firm.[285] Third, many accounting variables are highly correlated, so that the interpretation of a single ratio in isolation may be incorrect. The single ratio is not able to capture multidimensional interrelationships within the firm.[286] Finally, since the probability of failure for a sample is not the same as for the population, specific values of the cutoff points obtained for the sample will not be valid for the population.

To summarize, univariate techniques as analytical tools of distress risk assessment are imperfect and need further development. Seeking to eliminate the weaknesses in Beaver's model and develop its successful extension, Altman (2002) formulated the following questions:

- Which ratios are the most important in detecting bankruptcy potential?
- What weights should be attached to those selected ratios?
- How should the weights be objectively established?[287]

A careful consideration of the weaknesses of Beaver's univariate model has led to the development of the Z-Score, which is based on the multiple discriminant analysis and is the subject of the discussion in the next section.

4.2.1.2 Altman's Z-Score (1968)

Altman challenges the quality of the univariate ratio analysis as an analytical technique. He applies multivariate discriminant analysis to derive a linear combination of the ratios which "best" discriminate between financially distressed and non-distressed groups. Altman uses a sample of 33 bankruptcies filed between 1946 and 1965 and matches them with 33 non-distressed firms from the same industry and of similar size. All companies are operating in the manufacturing industry; small firms with assets less than $ 1 million are deleted from the sample. Similarly to Beaver, he selects 22 financial ratios

[284] Cybinski (2003, 12).
[285] Keasey and Watson (1991).
[286] Cybinski (2003, 13).
[287] Altman (2002, 9).

based on their popularity in the literature and potential relevance to the study and groups them into five categories: profitability, liquidity, leverage, solvency, and activity. After numerous statistical tests of the interrelations among variables, tests of statistical significance and predictive accuracy, Altman is able to specify five ratios which are the most significant indicators of distress risk. An overall score, known as Altman's Z-Score, can be computed from the following discriminant function:

$$Z = 0.012X_1 + 0.014X_2 + 0.033X_3 + 0.006X_4 + 0.999X_5 \quad (3)$$

where X_1 = working capital to total assets, X_2 = retained earnings to total assets, X_3 = earnings before interest and taxes to total assets, X_4 = market value of equity to book value of total liabilities, X_5 = sales to total assets, and Z = overall index or score. Companies with a Z-Score lower than the cutoff score are financially distressed; firms having a Z-Score higher than the cutoff score are financially sound. The lower a firm's Z-Score, the higher its probability of default.

Altman's model is more accurate than Beaver's univariate technique. In the original sample the Type I error is only 6% and the Type II error is 3% respectively, with overall accuracy of the score of 95%.[288]

After the technique was established, several researchers directly tested the classification accuracy of Altman's Z-Score. Scott (1981) highlights that Altman's variable selection approach may cause a search bias if a chosen set of predictive variables is applied to firms in time periods different from those used in the initial model. Begley et al. (1996) doubt the performance of the model in periods representing a different economic environment. For instance, changes in bankruptcy laws or buyout activities in the 1980s changed the likelihood of bankruptcy. Therefore, the use of the model developed prior to the changes may increase the number of classification errors. Finally, Grice and Ingram (2001) show that the accuracy of the initial model is significantly lower in recent periods and suggest re-estimating the coefficients of the discriminant function using estimation samples close to the testing periods.

Altman (2002) has documented changes in the accuracy and the relevance of original Z-Score in recent decades. While Type I error accuracy continues to be greater than 80% one year prior to default, Type II error increases substantially. The main reason for changes in accuracy is that the U.S. firms, in general, become more risky. This deteriorates the meaning of a number of original financial distress indicators in the Z-Score model. He reestimates the model for later periods and for different predictive samples.

[288] The test is undertaken for the ratios obtained from financial statements one year prior to default.

Most of the misclassified firms in the updated sample have a Z-Score between 1.81 and 2.675. Altman calls this range the "zone of ignorance" or "gray area". He concludes that the use of a more conservative cutoff of 1.81 has 84% accuracy rate, whereas accuracy of the cutoff equal 2.675 is comparable to the original sample and is 94%.

To summarize, Altman's Z-Score substantially improves accounting-based techniques of the identification of financial distress risk. The Z-Score represents a weighted combination of ratios which best separates the two groups of firms. Many statistical packages incorporate the multivariate discriminant analysis and allow estimation of coefficients of the Z-Score function for different geographical markets. This spares the time and work of calculating traditional ratios for drawing conclusions. The accuracy of Altman's model one year prior to default is substantially higher than that of Beaver's univariate model. However, the multivariate discriminant technique also has limitations. The set of the relevant ratios varies from industry to industry. The technique is sensitive to the sample size and number of explanatory variables. It also depends on a number of restrictive assumptions, such as linearity, normality, independence among predictors, whose violation affects robustness of the estimated results.[289]

4.2.1.3 Ohlson's O-Score (1980)

Ohlson (1980) criticizes the restrictive assumptions of multiple discriminant analysis and the output of this technique – a single dichotomous score which, in fact, says nothing about the probability of default. In order to mitigate these problems, he introduces an alternative econometric technique based on the logistic transformations (Logit model). Similar to the discriminant analysis, this technique weights the independent variables and assigns a score. However, unlike discriminant analysis, this method estimates the probabilities of default for each company in a sample.

The logit approach incorporates non-linear effects and uses the logistic cumulative distribution function to maximize the joint probability of default for the distressed firms and the probability of non-failure for the healthy companies in the sample:

$$F(z) = \frac{1}{1+e^{(-z)}} = \frac{1}{1+e^{-(w_0+w_1x_1+\ldots+w_nx_n)}} \tag{4}$$

where z is a linear combination of the independent variables, w_0 is a constant, w_i represents coefficients, and x_i is independent variables. The method of maximum likelihood is applied to estimate the coefficients.

[289] Keasey and Watson (1991, 90).

In addition, Ohlson uses an improved database obtained from annual financial reports which contains information about the date of release and allows comparison regarding whether the company defaulted prior to or after the date of release. The thin time issue is a very important innovation in Ohlson's analysis. The final sample contains 105 industrial firms which went bankrupt in the period between 1970 and 1976. The sample of 2,058 nonbankrupt industrial firms is selected from COMPUSTAT. Similarly to previous researchers, Ohlson chooses his default predictors based on the frequency of appearance in the literature and identifies four basic factors which are statistically significant in assessing the probability of default within one year:

- The size of the company
- A measure(s) of the financial structure
- A measure(s) of performance
- A measure(s) of current liquidity.[290]

Finally, for the estimation of the coefficients and the calculation of the O-Score predicting default within one year, nine independent variables are employed. Two of them are dummies. The use of qualitative variables is another advantage of the logit model compared to the discriminant analysis. The latter is limited to the interpretation of quantitative ratios. The overall O-Score function is defined as:[291]

$$O\text{-}Score = -1.32 - 0.407\log\left(\frac{total\ assets}{GNP\ price\text{-}level\ index}\right)$$

$$+6.03\left(\frac{total\ liabilities}{total\ assets}\right) - 1.43\left(\frac{working\ capital}{total\ assets}\right) + 0.076\left(\frac{current\ liabilities}{total\ assets}\right)$$

$$-1.72(1\ if\ total\ liabilities > total\ assets, else\ 0) - 2.37\left(\frac{net\ income}{total\ assets}\right)$$

$$-1.83\left(\frac{funds\ from\ operations}{total\ liabilities}\right) + 0.285(1\ if\ a\ net\ loss\ for\ the\ last\ two\ years, 0\ otherwise)$$

$$-0.521\left(\frac{net\ income_t - net\ income_{t-1}}{|net\ income_t + net\ income_{t-1}|}\right) \qquad (5)$$

[290] Ohlson (1980, 110).

[291] This is the so-called Model 1, which has the best accuracy among other models. Ohlson tests the predictive ability of three models: Model 1 predicts default within one year, Model 2 predicts default within two years (under consideration that the firm does not fail within the subsequent year), Model 3 predicts default within one or two years.

The higher the O-Score, the higher the risk of default. Ohlson finds that a cutoff of 0.038 minimizes the sum of Type I and Type II estimation errors in his sample. A type I error occurs if the O-Score is less than the cutoff point but the firm is bankrupt. If the O-Score is greater than the cutoff point but the firm is non-bankrupt, this is a Type II error.

Ohlson reports that size of the company appears to be the most significant predictor of financial distress. However, the comparison of the predictive accuracy of the logit model with multivariate discriminant analysis by means of the same set of variables and the same sample had as a result a very modest improvement by O-Score in comparison to the previous models. Ohlson states that *"a logit analysis is not an econometric method which is designed to find an "optimal" frontier, trading off one type of error against another. This is in contrast to multivariate discriminant models which satisfy optimality conditions under appropriate assumptions."*[292]

To summarize, Ohlson introduced a new econometric technique to forecast the probability of default. However, as noticed by Keasey and Watson (1991), *"logit analysis offers as much as any other technique to the user"*.[293] The accuracy of the predicting functions crucially depends not on the method chosen for the analysis, but on the structure and availability of data and the assumptions made concerning costs of misclassification. In this sense, the logit model has many applications for researchers. However, it does not automatically guarantee a substantial improvement in accuracy in predicting financial distress.

Ohlson (1980) has doubted that the choice of different accounting ratios could improve the likelihood function. However, he suggested that such non-accounting information as equity prices or their volatility might be most useful and should be examined in future research. The use of non-accounting information for predicting financial distress has led to the development of a special class of default-risk models based on the value of a firm set by the market. This class of models, referred to as structural or market-based models, is the subject of discussion in the next section.

4.2.2 Market-Based Models

Although accounting-based models are still widely used in empirical research, they have serious limitations, especially when utilized explicitly for measuring distress risk. These obstacles are overcome in market-based models which attempt to estimate the distress risk by means of a combination of the firm's liability structure with market prices of its assets. The fundamental assumption of market-based models is that market values con-

[292] Ohlson (1980, 126).
[293] Keasey and Watson (1991, 92).

tain all information relevant to the providers of capital for computing the probability of default. The first market-based model was introduced in 1974 by Merton. Since the commercial introduction of structural models by KMV and CreditMetrics in the 1990s and the development of reduced models in the early 2000s, market-based models have become very popular among investors.

Hillegeist et al. (2004) and Gharghori et al. (2006) analyze the main promises and perils of both methods and find that market-based models significantly outperform their accounting-based counterparts. The latter suffer under the utilization of fundamental principles of collecting accounting information:

- Accounting data is backward-looking. It is updated infrequently. Hence, the use of past ratios, which are based on the delayed financial reports, does not allow determining each firm's default risk at each point in time.[294] Default information used in market-based models is extractable from market prices and leads to the updated asset values dependent on the chosen frequency: daily, monthly, quarterly, etc.
- Financial statements are generated in accordance with the conservative accounting principles. As a result, book values of assets are understated relative to their market values (especially in the case of fixed assets and intangibles). The application of overstated leverage measures produces distortions in the overall discriminant score of a firm.
- Financial ratios vary substantially across industries. Thus, accounting-based coefficients are specific to the industry and sample used and cannot be generalized with respect to all firms in the market.
- Accounting-based models utilize an ad hoc methodology which is not grounded in the theory able to link accounting ratios and financial distress. As a consequence, classification of the firms heavily depends on the prior specification of distressed and non-distressed stocks. In contrast, market-based models are derived from theory and are economically justifiable.[295] They provide the theoretical determinants of the distress risk and the structure how to extract the distress-relevant information from market prices.
- Accounting-based models do not include volatility of assets into consideration. However, volatility is crucial for analysis and measurement of the risk of default. It

[294] Delay of publicly available financial information is caused by the time needed for auditors to build an independent opinion about the credibility of the data disclosed in financial statements.
[295] Gharghori (2006, 208).

captures the likelihood of the value deterioration to the extent that the firm will not be able to pay its debt.[296]

The main shortcoming of the market-based models is that in reality the market may not accurately reflect all the information contained in financial statements. The efficient market hypothesis underlying the theory of market-based models is a very strong assumption which can lead to potential biases in estimated probabilities of default. Two of the three main market components relevant for the estimation of distress risk – the future market value of assets and the volatility of asset returns – are not directly observable in the market and should be estimated. Another weakness is that market-based models require stocks to be listed on the stock exchange, which is impossible in the case of private firms.[297] Therefore, market-based models also have their limitations. However, compared to the accounting-based models they are still more flexible and provide superior information to researchers interested in the analysis of distress risk and its importance in the cross-section of stock returns.[298]

Methodologically, most of the market-based models are grounded in option-pricing theory (therefore, these techniques are also called option-based approaches). Below I review the two most popular derivations from option pricing theory and a model which belongs to the class of dynamic reduced-form models of default, and explain why these models are preferable for empirical analysis.

4.2.2.1 Option to Default Methodology (Merton, 1974)

Merton (1974) applies the option pricing methodology developed by Black and Scholes (1973) to the valuation of a leveraged firm and relates the risk of default to the capital structure of the company. According to this model, the firm's equity can be seen as a European call option on the firm's assets with a strike price equal to the book value of the firm's liabilities. The "option-like" property of the firm's equity follows from the absolute priority rule with respect to which the shareholders can be seen as residual claimants with limited liability. This limited liability gives the shareholders the right, but not the obligation, to pay off the debtholders and to take over the remaining assets of the firm.[299] Assuming that all liabilities are due on the same date, namely at the maturity of the option, if the market value of the firm's assets is greater than the book value of liabilities at maturity, the shareholders exercise their option on the assets. In this case, the shareholders pay off the debt-holders and the firm continues to exist. If the market

[296] Hillegeist et. al. (2004, 7).
[297] See, for instance, Berg (2007) for this issue.
[298] Hillegeist et al. (2004) report that probabilities of default obtained by means of the market-based models are up to fourteen times more informative than alternative accounting-based statistics.
[299] Crosbie and Bohn (2003, 11).

value of the firm's assets is lower than the book value of liabilities, the option will expire implying that the equity value is zero and the firm defaults. In this case the value is transferred to the debtholders. Therefore, in the Merton framework, the value to the shareholders at the date of maturity of debt is defined by the following boundary condition:

$$V_E = \max\left[V_A - X,\ 0\right] \tag{6}$$

where V_E is the market value of the firm's equity, V_A is the market value of total assets and X is the book value of liabilities.

Similarly to the put-call parity, the debt of the firm can be seen as a default-risk-free loan less a put option sold to equity holders by debtholders.[300] Then, the value to the debtholders at maturity T may be expressed as:

$$X_T = X - \max\left[X - V_A,\ 0\right] \tag{7}$$

In terms of capital structure this implies that equity holders own assets, borrow the debt, and also hold a put option, which enables them to sell the asset for the borrowed amount. Analogously, the debtholders write a put option to the equity holders in recognition of the possibility of default. Therefore, if default occurs, the equity holder would prefer to exercise the put option or to let the call option expire.[301]

Graphically, the option on the firm's assets can be illustrated as follows:

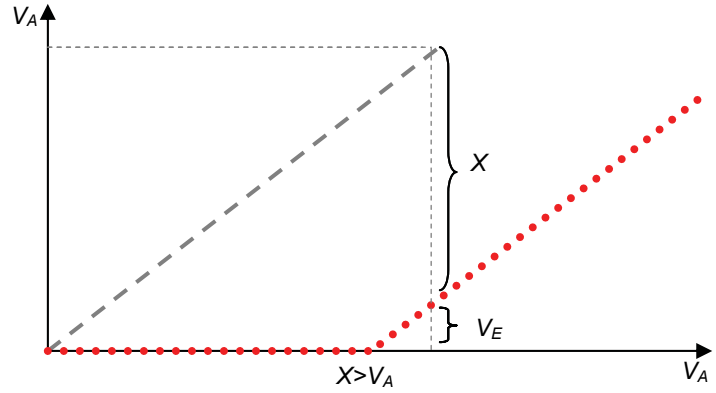

Figure 7: Basic Option Relationships

Given that the behavior of the asset value is described by the same diffusion process as in the model by Black and Scholes (1973), the current stock price is subject to the boundary condition above and can be found analytically by means of the Black-Scholes formula:

[300] The put-call parity states that holding a call option with a specific exercise price is equivalent to buying a share, investing the present value of the exercise price in safe asset, and holding a put option with the same exercise price. (Compare Brealey and Myers, 2000, 591ff.)
[301] I-flex solutions whitepaper (2003, 3).

$$V_E = V_A N(d_1) - Xe^{-rT} N(d_2) \tag{8}$$

where $d_1 = \frac{\ln(V_A / X) + \left(r + \frac{1}{2}\sigma_A^2\right)T}{\sigma_A \sqrt{T}}$, $d_2 = d_1 - \sigma_A \sqrt{T} = \frac{\ln(V_A / X) + \left(r - \frac{1}{2}\sigma_A^2\right)T}{\sigma_A \sqrt{T}}$, V_E is the market value of the firm's equity, V_A is the market value of total assets, X is the book value of liabilities maturing at time T, r is the risk-free rate, σ_A is the volatility of the asset value, $N(.)$ is the cumulative density function of the standard normal distribution, and Xe^{-rT} represents the present value of the promised debt payment.

Merton's model estimates today's risk neutral probability that the value of the firm will be greater than the face value of its debt at time T. Hence, the risk-neutral probability of default is computed as:

$$PD = 1 - N(d_2) \tag{9}$$

It can be seen that the risk-neutral probability of default depends on the five option variables influencing d_2. Particularly, the risk of default will be higher, implying that d_2 is lower when:

- The (natural logarithm of) current value V_A is low
- The (natural logarithm of) face value of debt at maturity X is high or, alternatively, when the firm's leverage X/ V_A is high and, therefore $\ln(V_A / X)$ is low
- The volatility of the firm's returns σ_A is high
- The average maturity of debt is longer
- The risk-free interest rate is low

Merton's model is a relatively simple and robust technique which builds a general theoretical framework for valuing contingent claims. It produces forward-looking probabilities of default conditional on the company's current asset value, leverage, volatility, debt structure, and the market risk-free interest rate. However, various restrictive assumptions made by Merton do not hold in reality. In practice, the capital structure of the firm is more complex. It incorporates many classes of debt with different maturity. In the Merton model the bond is seen as a zero-coupon bond while in reality many of the corporate bonds have a coupon. In the Merton model default can happen only once, at the time T when the debt is mature. In fact, default can happen during the life of the bond and, therefore, it is important to specify a lower and upper default boundary. In addition, asset volatility and the risk-free rate are not constant.

These shortcomings have led to the development of a number of extensions of the Merton approach on the theoretical front in order to bring the model closer to reality. The most important are the models by Black and Cox (1976), Geske (1977), Longstaff and Schwarz (1995), Leland and Toft (1996), Collin-Dufresne and Goldstein (2001).[302] Black and Cox (1976) enhance the model by relaxing assumptions for default before maturity. In their version of the model, default can happen every time the asset value reaches a pre-specified lower boundary. Geske (1977) extends the model by allowing for coupon and more complex debt structures. The firm has multiple options to default on different types of debt. Thus, an option on a stock can be seen as a compound option. Leland and Toft (1996) assume a company which continuously issues bonds with fixed maturity and continuous coupon, and model an endogenous default boundary. The Longstaff and Schwarz (1995) model allows stochastic interest rates. And, finally, Collin-Dufresne and Goldstein (2001) extend the model of Longstaff and Schwarz for changing leverage ratios because in practice the firms usually adjust their outstanding debt levels in response to changes in firm value.

One of the most successful approaches to the implementation of the Merton model was developed by Kealhofer and Vasicek (1995). This is a proprietary model of Moody's-KMV.[303] The commercial version of this model is widely used among practitioners. Since this model is also very often applied to empirical research, I would like to discuss this deviation from the Merton model separately.

4.2.2.2 The KMV Model (1995)

The KMV model is a generalization of the Merton model that allows for different classes and various maturities of liabilities.[304] The consideration of different classes of debt captures nuances of the capital structure. Unlike the Merton model, the firm is treated as a perpetual entity that is continuously borrowing and repaying debt and, thus, the equity is seen as a perpetual down-and-out call option on assets. Moreover, all classes of liabilities, including equity, may make fixed cash payouts like coupon, dividends, etc. Default can occur both at and before the date of maturity (company defaults on its obligations if the market value of equity falls below a certain value called a default point). Kealhofer (2003) emphasizes that while the Merton model is aimed at the estimation of the company's debt value based on its asset value and volatility, the KMV

[302] For a comprehensive reference see, for instance, Eom, Helwege, and Huang (2004) or Uhrig-Homburg (2002).
[303] KMV is a subsidiary of Moody's corporation, the world's leading provider of quantitative credit analysis solutions to lenders, investors, and corporations.
[304] In addition to common equity, the firm may have preferred stock and any type of debt: short-term and long-term debt, warrants, convertible debt, nondebt fixed liabilities.

model focuses on the relationship between the firm's equity and asset characteristics which allow estimating a robust measure of the company's default risk.[305]

Basically, the KMV model uses two Merton equations to translate the value and volatility of the firm's equity into an implied probability of default. Following from the equation (8), the equity value in the Merton model can be represented as a function of the asset value. Therefore, one can apply Ito's lemma to determine an instantaneous standard deviation of equity that can be otherwise estimated from the historical share prices:

$$\sigma_E = \frac{V_A}{V_E} \cdot \frac{\partial V_E}{\partial V_A} \cdot \sigma_A = \frac{V_A}{V_E} \cdot N(d_1) \cdot \sigma_A \tag{10}$$

where $\frac{\partial V_E}{\partial V_A}$ is the partial derivative of the value of equity with respect to the asset value.[306] In the KMV model two relevant variables – the value of the firm and its volatility – should be estimated. This can be done by solving simultaneously nonlinear equations (8) and (10) numerically for V_A and σ_A. However, KMV argues that solving both equations simultaneously provides bad results. Instead, KMV uses a nontrivial iterative solution technique to estimate the market asset value and the market asset volatility. After obtaining the solution, the distance-to-default (DD) can be computed as follows:

$$DD = \frac{\ln(V_A / X) + \left(\mu - \frac{\sigma_A^2}{2}\right)T}{\sigma_A \sqrt{T}} \tag{11}$$

where μ is an estimate of the expected return on the firm's assets. Therefore, the distance-to-default is *"the number of standard deviations that the firm can be expected to be away from default at the time T"*.[307] In other words, the distance-to-default is a normalized distance of a firm's asset value from its default threshold.[308] Crosbie and Bohn (2003) point out that in practice the assumption of the Normal distribution leads to the underestimation of actual default probabilities.[309] To avoid this effect, after calculating the distance-to-default, the KMV departs from the general framework of the Merton model and converts the distance-to-default into expected default frequency (EDF or probability of default) using empirical mapping based on 30 years of default history collected by KMV. As a result, the empirical distribution of EDFs obtained from the KMV's proprietary default database has much wider tails than the Normal distribution.

[305] Kealhofer (2003, 32).
[306] See for details Hull et al. (2004, 6).
[307] Reisz and Perlich (2004, 7).
[308] Sundaram (2006, 5).
[309] Crosbie and Bohn (2003, 18).

Reisz and Perlich (2004) highlight the inconsistence in the use of the contingent claims approach of Merton which assumes normality of returns for the estimation of a firm's value and its standard deviation and the departure from this assumption by determining default frequency from historical data. If the proprietary comprehensive database is not accessible, as is the case for many academic researchers because of the high subscription costs, the KMV methodology is hardly applicable. In addition, KMV uses a sophisticated iterative procedure to determine asset volatility and account for changes in market leverage.

Bharath and Shumway (2004) criticize the KMV model for its complexity and expensiveness and perform tests of accuracy of the model in comparison to its "naive" alternative. The idea of the "naive" approach is to construct a measure of default which is similar to that of KMV without solving equations or iterating.

To estimate the naive probability of default, Bharath and Shumway (2004) make the following approximations:

- Market value of each firm's debt (D) equals its face value: $Naive\ D = X$
- Firms close to default have very risky debt. The risk of this debt is highly correlated with their equity risk: $Naive\ \sigma_D = 0.05 + 0.25 \cdot \sigma_E$, where 0.05 reflects term structure volatility and $0.25 \cdot \sigma_E$ represents volatility associated with default risk.
- Then the approximation of the total volatility can be computed as:

$$Naive\ \sigma_A = \frac{V_E}{V_E + Naive\ D} \cdot \sigma_E + \frac{Naive\ D}{V_E + Naive\ D} \cdot \sigma_D = \\ = \frac{V_E}{V_E + X} \sigma_E + \frac{X}{V_E + X} \cdot \left(0.05 + 0.25 \cdot \sigma_E\right) \tag{12}$$

- To capture the same information as by the KMV iterative process, Bharath and Shumway set the expected return to be equal to the firm's stock return over the previous time period:

$$Naive\ \mu = r_{it\text{-}1} \tag{13}$$

- Obtained with these approximations, the volatility of the total assets and the expected return can be used in the KMV formula to calculate the distance-to-default:

$$Naive\ DD = \frac{\ln\left(V_A / X\right) + \left(r_{it-1} - 0.5 Naive\ \sigma_A^2\right) T}{Naive\ \sigma_A \sqrt{T}} \tag{14}$$

Bharath and Shumway (2004) advocate that *naive DD* is easy to compute. It retains the same structure as KMV distance-to-default and expected default frequency, and it outperforms the KMV model in the out-of-sample tests. However, hazard models can have even better out-of-sample performance. [310]

Keeping in mind that hazard models are currently state of the art for reduced form default models, in the next section I would like to introduce a market-based hazard model by Shumway (2001) which also can be used in empirical research for determining default risk.[311]

4.2.2.3 The Simple Hazard Model by Shumway (2001)

Generally speaking, hazard rate models specify the probability per unit of time (so-called hazard rate) that a firm that has survived to the beginning of the respective period will fail in this time period. If structural models derive the probability of default from the capital structure of the firm, hazard models relate probability of default to the intensity of default, which is a function of the explanatory variables. The explicit accounting for time allows researchers to capture the changes in the default risk through time and to adjust time-varying intensity of default automatically.

Shumway (2001) defines three main advantages of the hazard models in comparison to static classification approaches (e.g. Altman, 1968; Zmijewski, 1984):

- Hazard models control each firm for a number of periods at distress risk. Some of the companies will default after many years being financially distressed while other firms may default in their first distressed year.
- Hazard models incorporate time-varying covariates (explanatory variables that change with time).
- Hazard models can generate more efficient out-of-sample forecasts by processing much more data.[312]

A typical discrete-time hazard at time t can be interpreted as a conditional probability of default at time t, given that the default did not happen prior to time t. Provided that time $t = 1,...,T$, Θ is a vector of parameters of the function *f*, and *x* is a vector of explanatory variables used to predict default, the hazard model relates the following components as:

[310] Bharath and Shumway (2004, 23).
[311] Unlike structural models, which view the debt, equity, and other claims issued by the firm as contingent claims on the firm's asset value, reduced form models are usually based only on the prices of traded liabilities and do not depend on the balance sheet information about capital structure. The hazard model is one of the specifications of reduced form models.
[312] Shumway (2001, 102-103).

$$S(t,x;\Theta) = 1 - \sum_{j<t} f(j,x;\Theta) \tag{15}$$

$$\phi(t,x;\Theta) = \frac{f(t,x;\Theta)}{S(t,x;\Theta)} \tag{16}$$

where the survivor function $S(t,x;\Theta)$ specifies the probability of surviving up to time t, the hazard function $\phi(t,x;\Theta)$ gives the probability of default at *t* conditional on surviving to *t*, and the cumulative density function $F(t,x;\Theta)$ corresponds to the probability mass function of failure $f(t,x;\Theta)$.

In order to estimate the $S(t,x;\Theta)$, researchers need to estimate the hazard function. This can be difficult because hazard models have nonlinear likelihood functions and time-varying covariates. Shumway (2001) shows that discrete-time hazard models have the same likelihood function as logit models. In this case it is possible to apply computational programs estimating logit likelihood functions to the hazard rate. Then, the estimation of the parameters of the hazard model is equivalent to the logit program estimating the parameters of a multi-period logit model with an adjusted standard error structure.

Shumway uses three market-driven variables in his model and compares the accuracy of the market information to the results of a hazard model which utilizes accounting-based information. He concludes that half of the accounting variables used in the classification models are poor predictors of default. In contrast, market-driven variables – past stock returns, market size, and idiosyncratic volatility – are strongly related to the probability of default and allow analyzing the probability of default in its dynamics accounting for periods the company spent in financial distress prior to default.

To summarize, market-based models can be seen as superior to the traditional accounting-based techniques. Market-based information allows for the creation of dynamic models which account for the default intensity prior to the failure and are able to compute the probability of default at each point in time. While advances on the theoretical front have led to the development of different extensions of the classic option-based approach and of the reduced-form hazard models, in practice, many of these extensions are difficult to implement. The most successful implementations of market-based models used in current empirical research are Merton's model, the KMV model, and the simple hazard model by Shumway (2001).

Up to now, I have discussed the capital market perspective on distress risk, its behavior at different stages of the distress process, and analyzed different approaches to distress

risk assessment. The next section completes the chapter about financial distress and risk by investigating the results of empirical research on the "distress risk factor". This section deals with empirical studies on the nature of distress risk and their results, distress risk pricing in equity returns, the relation to the capital structure, and helps to position my empirical study in the body of empirical literature on financial distress risk.

4.3 The "Distress Risk Factor" in Empirical Research

In his article about recent developments in finance, Cochrane (2001) writes:

"We once thought that the capital asset pricing model (CAPM) provided a good description of why average returns on some stocks <...> were higher than others. Now we recognize that the average returns of many investment opportunities cannot be explained by the CAPM <...>. We once thought that long-term interest rates reflected expectations of future short-term rates <...>. Now, we see time-varying risk premiums in bond <...> and in stock markets. ...The strength and usefulness of many <empirical> results are hotly debated, as are the underlying reasons for many of these new facts. But the old world is gone."[313]

During the last two decades empirical research has disproved again and again the fundamental issue of modern asset pricing theory and showed that high average returns by some classes of stocks can be explained by other risk factors than market volatility. Despite remaining theoretical purity in this field, empirical research has been able to specify a number of such variables which are useful in explaining the cross-section of average returns. Two of these effects – the size and the value premium – gave birth to the so-called dominant distress factor hypothesis, which asserts that small stocks and stocks with higher book-to-market ratio (hereafter BM) earn higher returns as a compensation for higher distress risk. The natural explanation of the size premium is that small size stocks have smaller market capitalization. During bad times a risk-averse investor would rather sacrifice a part of his expected return in order to ensure that the stock is countercyclical and does well under weak economic conditions. Since small stocks are more likely to default in recessions than large firms, they should offer a higher equity return as a compensation for higher risk. The high BM firms tend to have persistently lower earnings. This fact implies that a company is financially distressed. Since firms with distressed characteristics perform poorly, especially in recession, a rational investor holding such stocks will demand a higher risk premium.

[313] Cochrane (2001, 36-37).

As noted by Agarwal and Taffler (2002), there is no agreement in the empirical literature about how the term distress factor is defined.[314] In their pioneering work on the risk factors in equity returns Fama and French (1992, 1993, and 1995) focus on the individual firm's financial distress. Cochrane (2001) argues that in accordance with rational asset pricing, the distress risk factor is an aggregate macroeconomic factor because idiosyncratic distress cannot deliver a risk price.[315] Therefore, the distressed risk factor can be seen as an additional systematic risk factor which is not explained by the CAPM.

Fama and French (2007) distinguish three possible explanations for the distress risk premium dependent on the direction of financial thought:

- The rational asset pricing relates the distress risk premium to the degree of "relative" distress in the economy. From this point of view distress risk is systematic and, therefore, is priced in equity returns.[316]
- Irrational asset pricing explains the distress risk premium due to investor overreaction to good or bad news or simply due to investors' risk aversion (they dislike distressed stocks). Overreaction causes prices to adjust more than is justified by fundamentals. This leads to the underpricing of distressed stocks and the overpricing of growth stocks in recession.[317]
- The random explanation for the distress risk premium suggests that the CAPM holds and the distress risk premium may occur randomly because of data snooping, survivor bias, or bad proxy for the market portfolio in the CAPM tests.[318]

The main purpose of this section is to represent and discuss current empirical studies on distress risk in equity returns. Most of them address the same question: Can the distress risk premium be explained by nondiversifiable risk? The answer on this question is not clear, often provides opposite conclusions, and, hence, requires additional investigation.[319]

Chen, Roll, Ross (1986), Lang and Stulz (1992), and Denis and Denis (1995) demonstrate that distress risk is related to aggregate factors and varies with the business cycle, which implies that distress risk is systematic. In contrast, Opler and Titman (1994) and

[314] Agarwal and Taffler (2002, 1). The distress factor can be computed as the difference between returns of highly distressed and sound stocks. Fama and French (1993) show that a similarly defined distress factor (they use the difference in returns between small and big companies (SMB) to capture the size effect and the difference in returns between high and low BM ratio (HML) to capture the value effect) is significant in explaining stock returns.
[315] Cochrane (2001, 56).
[316] See e.g. Chan and Chen (1991), Fama and French (1992, 1996), Black and Fraser (2004).
[317] See e.g. Lakonishok, Shleifer, and Vishny (1994), Haugen (1995), Griffin and Lemmon (2002), Hirshleifer (2001).
[318] See e.g. Lo and MacKinley (1988), Breen and Korajczyk (1995), Kothari, Shanken, and Sloan (1995).
[319] For the purposes of this chapter I use the terms distress risk, default risk, and bankruptcy risk interchangeably.

Asquith, Gertner, and Sharfstein (1994) find that distress risk is of idiosyncratic nature, and, therefore, there might be no significant positive relation between distress risk and expected returns.

Dichev (1998) shows that if the distress risk factor hypothesis is true and distress risk is systematic, then it should account for size and BM effect. He analyzes results of portfolio sorts and coefficients of Fama-MacBeth regressions and concludes that distress risk is not systematic. The main results of his study are:

- Firms with a high probability of default have earned significantly lower than average returns since 1980. On average, highly risky stocks underperformed low distressed firms by 1.2% per month between 1980 and 1995. A possible explanation is that the market does not fully reflect all available distress information in the stock prices. As a result, the most distressed firms earn lower subsequent returns up to four years after default and bankruptcy.
- The size and BM effects are unlikely to be related to distress risk. A return premium related to distress risk cannot fully explain the BM effect even if distress were rewarded by higher returns. Distressed firms generally have higher BM, but the most distressed firms have lower BM. The size effect virtually disappears after 1980.[320]

Therefore, the pattern of returns of distressed companies prior to and after default does not support the distress risk factor hypothesis and contradicts the rational asset pricing explanation. Existence of the negative risk premium is inconsistent with the theory of efficient markets and can be explained only by the mispricing hypothesis.

Similar to Dichev (1998), Griffin and Lemon (2002) indicate some problems with the Fama and French (1992) distress factor. The authors find that the "distress" effect is strongest among growth stocks, although these stocks are negatively related to the probability of default. Investigating average annual buy-and-hold returns for portfolios sorted on BM and the probability of default, they suggest that firms with high distress risk earn low average returns because of the underperformance of low BM stocks. Griffin and Lemmon (2002) confirm the results of Dichev (1998) that high distress risk firms are subject to mispricing. The researchers observe that stocks in the highest distress quintile are mostly small firms with low analyst coverage and weak current earnings. These stocks suffer from large information asymmetries which make the judgment of their solvency position difficult, and, therefore, rational arbitrage is less likely to be

[320] Dichev (1998, 1132).

effective. As a result, investors overprice low BM stocks and underprice high BM stocks and overestimate the payoffs from future growth opportunities.[321]

Vassalou and Xing (2004) use the Merton model to compute the Distance Likelihood Indicator (a measure of probability of default) and perform asset-pricing tests of whether default risk is systematic, and, therefore, whether it is priced in equity returns. Unlike Dichev (1998) or Griffin and Lemmon (2002), who, in fact, test the validity of the Fama-French distress factor, Vassalou and Xing (2004) test not only whether the SMB and HML factors proxy for default risk, but also whether default risk which appears in regression as a factor is priced in stock returns:

$$r_t = \beta_0 + \beta_1 EMKT_t + \beta_2 SMB_t + \beta_3 \Delta(SV)_t + \varepsilon_t \tag{17}$$

where r_t is the excess return over a risk-free rate at time *t*, *EMKT* is the excess return over the market portfolio, and $\Delta(SV)$ is the aggregate survival measure found as a difference between 1 and the probability of default (DLI).

In contrast to previous research, the authors apply a market-driven indicator of financial distress based on the option pricing methodology (Dichev (1998) and Griffin and Lemmon (2002) rely upon the Z-Score and O-Score respectively) and implement a different econometric methodology (the Generalized Methods of Moments) to test the asset pricing model specified above. Analysis of the coefficients provides evidence that the default variable is positively related to the excess returns and causes a statistically significant risk premium. This implies that distress risk is systematic and it is priced in the cross-section of equity returns. Default risk is related to the aggregate factors and varies with the business cycle. The Fama-French factors SMB and HML become significant in the presence of the distress risk variable, however, they are rather unrelated to distress risk.

Agarwal and Taffler (2002) compare the results from Dichev (1998) with the conclusions from Vassalou and Xing (2002)[322] and ask whether the distress risk factor is a market mispricing anomaly or an omitted variable in the context of the Fama-French (1992) three factor model. These authors make a number of innovations which significantly improve the results and validate a rational pricing explanation for the distress risk premium. First, they account for the time-varying behavior of the bankruptcy risk premium. Second, they consider the impact of the stock market movements and the effect of changes in the GDP growth rate to test the accuracy of distress risk pricing by the

[321] Griffin and Lemmon (2002, 2333).
[322] This is an earlier version of Vassalou and Xing (2004).

market. Third, they apply the Fama and French (1992) methodology to the different geographical area covering all non-financial companies listed at the London Stock Exchange (LSE) from 1979 to 2000. Agarwal and Taffler (2002) extend the model of Fama and French (1992) by the Z-Score, which is the binary measure of distress risk and equals zero if $Z-Score>0$ and one if $Z-Score\leq 0$.[323] Results of cross-sectional regressions running conditional on the different states of the stock market and the different states of the economy indicate that the distress risk premium is systematic, it varies with the state of the overall economy and is rationally priced by the market. Distress risk is independent of the size and BM effect. During upturns, distressed stocks participate in the prosperity of the economy and earn higher than average returns. However, during downturns distressed stocks are likely to fail. The proportion of stocks which go bankrupt in recession is sufficient to drive down the returns of distressed stocks, which lead to their underperformance. Agarwal and Taffler (2002) criticize the non-consideration of the time-varying nature of distress risk by Dichev (1998). Running regressions unconditionally provides evidence of significantly low returns and may cause wrong inferences with respect to the nature of distress risk.

Considering a new variable by examination of the distress risk factor, Agarwal and Taffler (2006) investigate whether mispricing of distressed stocks can be explained by momentum.[324] They find that the distress factor measured by the Z-Score subsumes the momentum. Consistent with Griffin and Lemmon (2002), the authors show that distressed stocks are not followed by many analysts, are difficult to value, and therefore exhibit a greater momentum effect. Heterogeneous beliefs with underlying asymmetric information diffuse slowly in the market causing lower momentum returns. Agarwal and Taffler (2006) confirm the results of some researchers that size is unlikely to be related to distress risk and BM is orthogonal to distress factor.

Charitou et al. (2004) investigate the impact of default risk on stock returns by means of option pricing theory. They argue that mispricing effects observed in previous research by Dichev (1998) and Griffin and Lemon (2002) can be explained by the default option discount. In rational asset pricing, default risk is interpreted as a penalty for which shareholders require higher returns. Positive risk premium is related to systematic risk. However, default risk may be systematic in a different sense. If distress risk is defined in terms of option pricing theory as an option to default that shareholders have, the higher uncertainty underlying the default option may be reflected positively ex ante in current prices and may lead to the negative realized returns. The option return discount means

[323] The Z-Score cut-off is updated for the UK companies.
[324] Momentum is defined as the existence of medium-term continuation of stock returns.

that ex post many distressed firms are likely to default, exercising their default option but foregoing their growth options and, consequently lowering their average realized returns.[325] Measuring distress risk with Merton's model and performing a comprehensive analysis only on the distressed stocks, the researchers obtain the following results:

- The option-based measure of the probability of default is statistically significant in explaining stock returns
- As expected, the overall relation between default risk and subsequent stock returns is negative
- The impact of default risk at stock returns decreases with size
- The size effect is stronger among NASDAQ growth stocks than at the main exchanges (NYSE, AMEX), which are represented mostly by value firms
- Small value firms have significantly lower median returns independent of the size or BM
- The higher the default risk, the stronger the impact on subsequent stock returns for large value firms
- Large value firms earn higher returns than large growth firms.[326]

Therefore, the option pricing methodology is not only able to provide a solid theoretical rationale on why distressed stocks, on average, earn lower returns but also explore the asymmetric nature of the default risk premium.

Kalckreuth (2006) and Garlappi et al. (2006) investigate the negative excess returns by distressed firms and question whether the markets are indeed so inefficient and irrational that default risk is permanently mispriced? Both papers develop theoretical models showing that low average returns on distressed stocks may be attributable to some overlooked economic mechanisms.

Assuming that financial markets are efficient, financially distressed firms are overpriced and have low average returns. Kalckreuth (2006) shows that this is an equilibrium phenomenon which is addressed to the control rights and incentives of the owners to withdraw the resources of the firm in the form of non-cash returns or so-called returns "in kind". The closer to bankruptcy, the stronger incentives become to extract the firm's assets in the form of private benefits (this can be, for instance, buying the firm's assets at a bargain price). Very often, when facing financial distress, the regular dispersed

[325] Charitou et al. (2004, 4).
[326] Charitou et al. (2004, 20).

shareholders will try to sell the stocks of distressed companies, which rapidly decline in value. However, there are insiders and specialists with a very specific know-how, such as managers of the firm or private equity firms, who would like to take over the distressed company. The takeover contest between investors for obtaining the control rights results in a large premium for a firm close to default because *"the non-cash components of the return to equity are important and the probability of a contest for control is high"*.[327] The price run-ups reflect the lower stock returns. This behavior is called a wrecking behavior of distressed stocks.[328]

Unlike Kalckreuth (2006), Garlappi et al. (2006) relate the mispricing anomaly to the shareholders' bargaining power in default. This shareholders' advantage is defined as "*ability of shareholders to extract rents in renegotiation with other claim-holders in the event of financial distress"*.[329] The model set-up by Garlappi et al. (2006) is based on the option pricing methodology with equity as a call option on the firm's asset value and non-zero payoffs to the shareholders upon default (absolute priority rule deviations). Default is seen as a trigger of liquidation. Since liquidation is usually only a choice of last resort which leaves the shareholders with nothing, many firms in financial distress will try to renegotiate their debt and take advantage of the bargaining game in private workouts or under Chapter 11. In fact, the shareholder advantage is not a new asset pricing factor: it captures different cash-flow realizations.

Graphically, the equity payoff with shareholder advantage upon default can be illustrated as follows:

[327] Kalckreuth (2006, 8).
[328] Kalckreuth (2006, 1) use the following allegory from the Concise Oxford Dictionary of Current English to explain why this theory is called a "Wreckers Theory" of financial distress: A wrecker is one who tries from shore to bring about a shipwreck with a view to profiting from the wreckage, or one who steals such wreckage; a person employed in demolition or in recovering a wrecked ship or its contents […]
[329] Garlappi et al. (2006, 2). If shareholders are able to take advantage of bargaining with creditors in default, the absolute priority rule is violated.

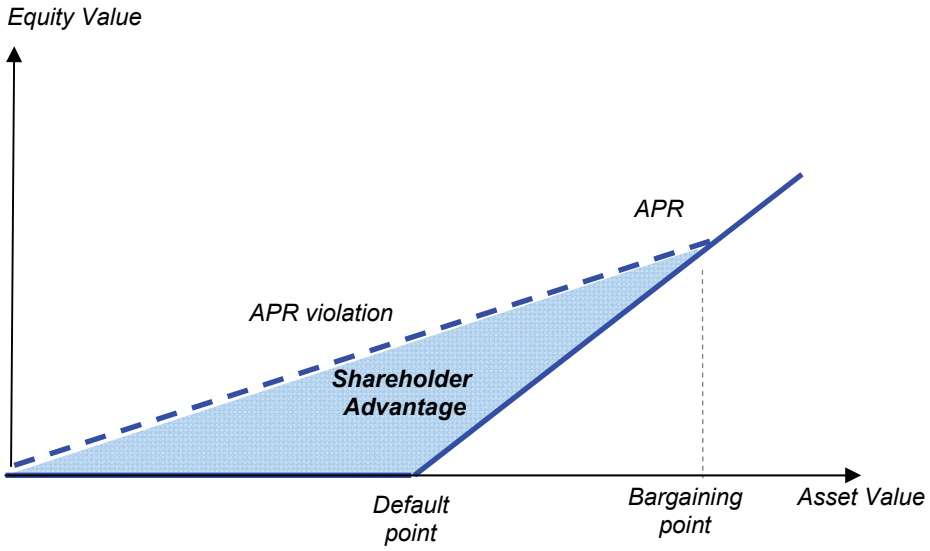

Figure 8: Equity Payoff with Shareholder Advantage[330]

Garpappi et al. (2006) start with an analysis of the shareholder advantage effect on the simulated data and then perform empirical tests on the true data obtained from CRSP, COMPUSTAT, and MKMV databases. The researchers succeed in confirming empirically the theoretical propositions of their model that the markets are rational in pricing default risk. However, the relationship between the default probability and expected returns depends on the strengths of the shareholders' bargaining power. Firms with low shareholder advantage (i.e. little bargaining power) have an upward-sloping relationship between the probability of default and expected returns. This means that the closer to default, the higher the expected returns are. In contrast, firms with substantial shareholder advantage have lower returns, their risk-return relationship is downward sloping and hump-shaped. Therefore, the distress risk premium can be explained rationally by systematic risk. According to Garlappi et al. (2006), the lower returns of distressed stocks observed in many empirical studies results from a strong bargaining power of the shareholders.

Hussain et al. (2002) replicate the Fama-French (1993) three factor model for the UK market. The researchers invalidate the concerns of the proponents of the random theory of distress risk that higher risk premium can be caused by data snooping. They demonstrate that the Fama-French model holds: the size and value effects are real and exist in the British market. However, the mispricing anomalies are also present here. Hussain et al. (2002) involve in their research the severely distressed stocks with negative BM. The authors suggest that the low average distress premium may be related to the group of

[330] Adopted from Garlappi et al. (2006, 9).

companies with negative BM because they are most likely to fail, and therefore they are not rewarded by higher returns.

One of the most comprehensive recent studies analyzing pricing of distressed stocks was undertaken by Campbell et al. (2006). The researchers use a new extended set of predictors which consist both of accounting and equity market-based variables and demonstrate that distressed firms have such risk characteristics which should imply high returns: high leverage, lower profitability, lower past stock returns, more volatile past stock returns, lower cash holding, higher BM ratios, and lower prices per share. However, in contrast, since 1981 financially distressed stocks have had anomalously low returns accompanied by increasing risk measured by higher standard deviations, market betas, and loadings on value and small-cap risk factors. The underperformance of distressed firms is very difficult to explain with rational asset pricing. Campbell et al. (2006) find that neither are negative returns clustered around earnings announcements nor is return differential driven by differences in size and value. Similarly to Griffin and Lemmon (2002), the authors observe that the underperformance of distressed stocks is stronger when arbitrage is expensive. They suggest that low returns on distressed stocks may be related to institutional holdings. If institutional investors prefer to hold safer securities, the transition effect of the shift to institutional investing might have a negative influence on the performance of distressed stocks.[331] They also point out that in the absence of a comprehensive theory also the shareholder advantage of Garlappi et al. (2006) and the "wreckers" theory of financial distress of Kalckreuth (2006) have the potential to explain why some investors hold distressed stocks with anomalously low returns. However, there is no suitable theory which would be able to explain why other rational investors fail to arbitrage the distress anomaly.[332]

To summarize, the empirical work undertaken over the past decade and discussed in the section above is still unable to find a rational explanation for the existence of the distress risk premium. In the last section of this chapter I undertake a critical appraisal of the theoretical and empirical research on the distress risk premium, identify the shortcomings of the current empirical studies, and outline the research gap, which I partly fill with the findings of my personal research, provided in the next chapter of this dissertation.

[331] The fact that the institutional holdings of stocks over the analyzed period almost doubled supports this idea.
[332] Campbell et al. (2006, 25).

4.4 Critical Appraisal and Research Gap

The critical analysis of the existing theory and empirical research on financial distress risk and its pricing in equity returns and the attempt to synthesize the empirical and theoretical works in a holistic concept have as a result the following conclusions:

- Corporate failure is often seen as a local problem of a single firm with origins of the disaster in the insufficient monitoring of the cash flow generating power and in high leverage. Influences of systematic factors on cash generation and the level of leverage are almost untreated.
- The empirical analysis of risk attributes in financial distress is limited to the estimation of the risk at the stage of financial distress close to default. Behavior of risk in the separate phases of the downward spiral and the risk resolution in the restructuring remain unstudied in empirical work.
- The behavior of debt value and the risk of debt as well as its relation to equity value and equity risk in financial distress needs additional examination. This is important for two reasons. First, it could provide useful insights into corporate financial distress. Second, it is helpful in the analysis of the implications on capital structure.
- Available empirical studies on the behavior of systematic risk at the stage of financial distress of firms approaching bankruptcy are inconsistent and suffer from the absence of consistent methodology in the estimation of systematic risk as well as from unstationarity of raw data.
- Maybe the most important shortcoming is the absence of a well-founded theory on financial distress risk and its relation to equity returns. Many regularities in the research emerge from models based on empirical observations lacking a reference to theory. As a consequence, it is very difficult to verify the plausibility of empirical asset pricing specifications with theoretical arguments.
- The literature on the idiosyncratic risk in equity returns shows that it is highly fragmented and incomplete. Assuming that a part of the idiosyncratic risk is not diversifiable, investors permanently overvalue distressed stocks and underestimate the real risk premium.
- The absence of a grounded theory on financial distress and missing unified definitions of risk factors results in empirical evidence which is inconclusive as to whether distress risk is systematic and whether its impact on the returns of distressed stocks is positive or negative. This produces different mispricing hypotheses when researchers are not able to explain observing phenomena with rational asset pricing theory.

Almost all of the available studies on the pricing of distress risk leave more open questions than provide answers. Daniel (2006) has outlined three main questions which, in fact, remain unanswered from study to study:

- Is it possible that there is some other risk measure which might explain the returns of the growth, highly distressed stocks?
- If not risk, what is responsible for these return patterns? Does it mean that the market fails to fully incorporate all available information into a single financial distress measure? Are size and BM potentially proxies for the costs of arbitrage or for information uncertainty?
- Which of the variables that forecast distress forecast equity returns and why?[333]

The need for extended research in the area discussed above as well as the high relevance of this subject for financial stability explain my interest in the topic and consequent desire to contribute with the dissertation at hand to the research on corporate failure. With my empirical study I want to fill only a particular gap in the research on corporate financial distress and distress risk. I examine the behavior of distress risk and its nature in a more detailed manner. Unlike the previous research, I assume that distress risk is systematic in a different sense, not as it is defined in the context of rational asset pricing theory. I assume that systematic risk consists of market risk and of the undiversified part of idiosyncratic volatility. I focus on the question of whether the risk of default is systematic and whether idiosyncratic volatility is priced in equity returns.

[333] Daniel (2006, 25).

5 Empirical Analysis of Risk

5.1 Research Design

The research design at hand is based on the research questions developed in chapter 2. The sample consists of sound and financially distressed companies. I apply the contingent claim methodology developed by Black and Scholes (1973) and extended by Merton (1974) in order to estimate default probabilities of the individual firms. These default probabilities are used as a basic criterion for the distinction between healthy and financially distressed firms. The data employed in this study for regression analysis is calculated in the spirit of the previous work of Barath and Shumway (2004), Daniel and Titman (1997), Hillegeist et al. (2004), and Vassalou and Xing (2004). In order to test the developed hypotheses, I apply the Fama-MacBeth methodology for calculating standard errors from cross-sectional regressions that correct for cross-sectional correlation in a panel.

5.1.1 Derivation of the Hypotheses

Systematic and idiosyncratic components of distress risk have been extensively analyzed in the context of corporate bond pricing in an attempt to define the elements of credit spreads and to explain the yields of defaultable bonds. At the same time, relatively little attention has been paid to the distress risk premium in equity returns. Recent empirical studies have tried to close this gap. However, besides a substantial quantity of statistically significant empirical results, they also submitted a very heterogeneous picture of the nature of distress risk and its pricing in equity returns. The reason why common empirical literature cannot reach a consensus in answering the question about the nature of distress risk is, on the one hand, due to a high sensitivity of the chosen proxies for distress risk to the applied methodology, and, on the other hand, to the time-varying behaviour of the risk of default. Most of the tests are based on the assumption that distress risk is systematic. Therefore, a rejection of the hypothesis leads automatically to the conclusion that distress risk is idiosyncratic. It is especially crucial in the case of financially distressed companies when the risk of financial distress may become so high that the market fails to distinguish between diversifiable and non-diversifiable risk and does not price assets of such companies in a traditional manner.[334]

The main innovation of this empirical study in comparison to previous research is to put together systematic risk variables with idiosyncratic volatility and to test simultaneously

[334] The Sharpe-Lintner-Black (SLB) model proves a positive linear relation between the risk and expected return.

whether, dependent on the underlying market conditions, they will be priced in equity returns.

I start with a selection of a set of factors which can be proxied for systematic and idiosyncratic risk and with a development of the hypotheses. Systematic risk is usually seen as sensitivity of securities or a portfolio of securities to broad movements in the stock market[335] or, more extensively, to economy-wide movements[336]. Since in the context of capital market theory this risk cannot be eliminated, it should be rewarded by the market with a risk premium which implies that systematic risk is priced in equity returns. Idiosyncratic risk is unique with respect to a single company and should disappear in a well-diversified portfolio. I use five variables, four of which are used as proxies for systematic risk (beta, size, book-to-market, default probability) and one of which stands for idiosyncratic volatility. If these factors can capture distress risk, then one would expect that beta, book-to-market, default probability, and idiosyncratic volatility should be positively related to excess returns, whereas the sign of the size coefficient should be negative.

To test formally whether the chosen proxies are significant risk factors I establish the following null hypotheses:

H_0^1: Controlled by default risk, small size stocks (high BM stocks, high idiosyncratic volatility stocks) will outperform large stocks (low BM stocks, low idiosyncratic volatility stocks).

H_0^2: Controlled by size, BM, and idiosyncratic volatility, distressed stocks outperform non-distressed stocks.

I assume that idiosyncratic volatility plays an important role in asset pricing, particularly if we analyze companies severely affected by financial distress. This function of idiosyncratic risk arises from the fact that constraints existing in the real world make it difficult for individual investors to hold a well-diversified market portfolio.[337] If this is true, then bearing an idiosyncratic risk should be also rewarded by the market. Another argument in support of idiosyncratic risk is that if the risks of a company in financial distress become enormously high, the market is not able anymore to differentiate between the systematic and the unsystematic component of total risk, and again, compensates

[335] Lakonishok, Schleifer, Vishny (1994); Agarwal and Taffler (2002).
[336] Roll and Ross (1984), Chan, Ross, Roll (1986).
[337] This idea was recently supported by research by Malkiel and Xu (2006). They point out that liquidity issues, transaction costs, incomplete information as well as institutional restrictions prevent some of the investors from holding the market portfolio. The failure of the one group of investors to hold a market portfolio leads to an inability of the unconstrained investors to hold the market portfolio as well. As a result, investors should take care of the total volatility and not the market risk as is stated in the CAPM model.

rational investors with higher returns. Thus, I expect that the relation of idiosyncratic volatility to excess returns should be positive. To test whether the idiosyncratic effect exists only within the stocks of the firms with high probability of default, I develop the third hypothesis:

H_0^3: The idiosyncratic volatility effect only exists conditional on a very high probability of financial distress.

Since the finding by Fama and French (1992) that size and BM are significant in explaining cross-sectional variation in average returns, and, consequently, are important risk measures, many researchers confirmed these results for different geographical markets.[338] However, an increasing number of researchers disprove these facts providing evidence against an unconditional relationship between beta, size, BM, and returns.[339] I take note of these findings and test the role of each of the five factors in explaining the cross-section of equity returns with respect to the intensity of financial distress in an aggregate unconditional model:

H_0^4: The variables beta, size, book-to-market, probability of default, and idiosyncratic volatility are proxies for distress risk and therefore are priced in equity returns.

Further, if distress risk is systematic, then, per definition, it should vary with the movements of the stock market, i.e. if probability of default, size, and book-to-market represent systematic risk, then their influence on equity prices should be sensitive to up and down fluctuations and their coefficients should vary dependent on the bullish or bearish state of the market. High risk firms should be harder hit if the markets move down and outperform in up markets:

H_0^5: Firms with a high risk of financial distress will do worse in bearish markets and fare better in bullish markets.

The test of this hypothesis in the framework of a multivariate regression model implies that the coefficients of the chosen variables should change their sign, dependent on the underlying stock market conditions. If the proxies are systematic risk factors, then the coefficients for beta, book-to-market, and default probability should be positive in up markets and negative in down markets whereas the constant for size should be positive in down markets and negative in up markets. In the case of idiosyncratic risk, if it is indeed priced in equity returns (the rationale for this will be clarified later), then it should move in the same direction as systematic factors and show a positive relation during the

[338] See e.g. Ho et al. (2000) for the Hong Kong market, Vassalou and Xing for the US market, Chan et al. (1991) for the UK market, Chan and Chui (1996) for the Japanese market.
[339] Fletcher (1997), Lilti and Montagner (1998), Isakov (1999), Agarwal and Taffler (2002).

upward and a negative one during the downward movements of the stock market. The phenomenon that financially distressed firms underperform during economic declines and outperform during upturns is known in the literature as "flight towards quality".[340]

5.1.2 Model Setup

There are two theoretical approaches to the selection of the proper set of the factors affecting the risk premium in equity returns. One possibility is to specify macroeconomic and financial market data which are able to reproduce the systematic risk of the economy.[341] Another way to analyse pricing factors in equity returns is to *"specify characteristics of firms which are likely to explain differential sensitivity to the systematic risk and then form portfolios of stocks based on the characteristics"*[342].

I follow the second methodology, which is currently widely used in empirical research. The formation of portfolios has certain advantages for the analysis of large amounts of data in comparison to the analysis of individual securities. It decreases the sample which contains many more securities than time series observations to a smaller number of analyzed portfolios and thus reduces the cross-sectional dimension of the joint distribution of returns. Moreover, the procedure of combining securities into groups with similar characteristics reduces the effect of measurement error[343]. Another important issue is that econometric techniques applied to the analysis of returns require that returns have approximately the same means and covariance with other returns throughout the sample. At the level of individual securities, this may not always hold if the company moves into another business.[344] Finally, Cochrane (2001) points out that the analysis of pricing factors in returns by constructing portfolios replicates the activity of a real investor and therefore has more economic sense than the simple forming of tests.[345]

The formation of portfolios usually consists of three main steps: first, securities are ranked by some characteristics; then, the sorted securities are formed into portfolios; and finally, statistical tests on the created portfolios are run.

There are different ways of ranking securities into portfolios. The choice of characteristics usually depends on the main objectives of research. Since my research is focused on

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[340] Vayanos (2004, 21). With the term "flight towards quality" researchers usually describe phenomena of a sharp increase in the risk aversion of investors during periods of high economic uncertainty, i.e. if the market falls or economy slumps, investors prefer to increase a quote of safer securities (e.g. treasury bills or governmental bonds) in their portfolios. As a consequence, prices of non-distressed securities go up and prices of distressed stocks decline.

[341] See e.g. Roll and Ross (1980), Brown and Weinstein (1983), Chen, Roll and Ross (1986) on the explanatory power of economy-wide factors in generating process of returns.

[342] Campbell, Lo, MacKinlay (1997), 239.

[343] Lo and MacKinlay (1990), pp. 432.

[344] Soederlind (2005), 54.

[345] Cochrane (2001), 397.

the investigation of properties and origin of distress risk, I use a combination of the market and company-specific information to perform the sorts:

- In June of each year all stocks are sorted into three groups, dependent on their latest available probability of default. Stocks are then independently ranked on their market capitalization into three groups as well.
- Since my study is based on data available for the US-market, I use NYSE size breakpoints in order to divide the whole sample into size groups. The breakdown of size portfolios into groups based on the size of NYSE stocks prevents small market capitalization portfolios from being too small.
- After the securities are sorted based on their probability of default and on size, they are independently ranked on the book-to-market ratio (B/M) calculated at the end of December of each year and sorted into two portfolios. Stocks are also independently ranked on their idiosyncratic volatility, which is estimated as a residual volatility from the market model at the end of June of each year, and sorted into three portfolios. Therefore, I obtain 3x3x2x3=54 portfolios as the intersection of probability of default, size, B/M ratio, and idiosyncratic volatility. Portfolios are rebalanced in June each year.[346]

After the portfolios are formed, I run cross-sectional regression tests such as Fama-MacBeth (1973). These tests are based on a stochastic version of the generalized linear asset pricing model of the form:

$$r_{it} - r_{ft} = \gamma_{0,t} + \gamma_{1,t} BETA_{i,t-1} + \gamma_{2,t} SIGMA_{i,t-1} + \gamma_{3,t} BSM_{i,t-1} + \gamma_{4,t} \ln\left(SIZE_{i,t-1}\right) + \gamma_{5,t} \ln\left(B/M_{i,t-1}\right) + \varepsilon_{it} \qquad (18)$$

where:

r_{it} is the monthly equally-weighted return of portfolio i

r_{ft} is the one-month Treasury bill rate measured at the beginning of month t

$(r_{it} - r_{ft})$ is the equity risk premium on the portfolio i during month t

$BETA_{i,t-1}$ is the beta of portfolio i estimated at the date of portfolio formation

$SIGMA_{i,t-1}$ is the idiosyncratic volatility at the date of portfolio formation

$ln\ (SIZE_{i,t-1})$ is the natural logarithm of the average of market capitalization of stocks (the closing price at the date of portfolio formation multiplied by the number of shares outstanding at the end of the year) in portfolio i at the date of portfolio formation

[346] For more about the possibilities of portfolio formation, resembling process and weighting schemes, see Vaihekoski (2004).

$ln\ (B/M_{it})$ is the natural logarithm of the average of B/M ratios of stocks in portfolio i at the date of portfolio formation

$BSM_{i,t-1}$ is the latest available probability of default

ε_{it} is a random error term with zero mean

$\gamma_{1t}, \gamma_{2t}, \gamma_{3t}, \gamma_{4t}, \gamma_{5t}$ are stochastic regression coefficients (factor sensitivities)

I derive my model from the three factor model of Fama and French (1992). However, unlike previous research, I introduce two additional explanatory variables: the BSM probability of default as a direct measure of default risk and idiosyncratic volatility. The default risk proxy should answer the question of whether default risk is priced in equity returns, whereas idiosyncratic volatility is considered as a measure of firm-specific risk.

There is some rationale why I include idiosyncratic volatility in the cross-sectional multivariate regression model. As noted earlier, in the context of classical portfolio theory, idiosyncratic risk can be diversified. The capital market does not reward investors for holding this type of risk. As a consequence, researchers should be solely interested in the analysis of systematic risk and its influence on equity returns. However, recent empirical studies of changes in the total risk of financially distressed firms show a dramatic increase in the idiosyncratic volatility of delisting candidates.[347] The idea about an unsystematic nature of default risk is also supported by results from Malkiel and Xu (2006) as well as Campbell and Taksler (2002). In the same context, Gatfaoui (2007) reports that in many cases default risk is driven by a combination of systematic and idiosyncratic components of total volatility. I hypothesize that if idiosyncratic risk is too high, it cannot be diversified anymore. As a result, bearing such a high risk should also be compensated by higher expected returns. Therefore, in order to test whether and under which conditions unsystematic risk is priced in equity returns, I introduce this additional variable. I do not rely upon the error term, because it does not only represent an unsystematic component in the pricing equation, but also can stand for any other omitted variables.

Running cross-sectional regressions, I obtain information about the statistical significance of the selected proxies in explaining excess returns. I adopt the tests of Fama-MacBeth (1973) to determine whether the explanatory variables can indeed be used as proxies for systematic and/or idiosyncratic risk. The Fama-MacBeth procedure produces standard errors which are corrected for cross-sectional correlation of the residuals. However, there still might be autocorrelation in the estimates of the coefficients γ_{it}. In the

[347] Fargher et al. (2001), 477.

case of positive autocorrelation in the Fama-MacBeth coefficients, the standard errors will be deflated, leading to high t-statistics, when in reality they are lower. In order to obtain robust Fama-MacBeth estimates, I apply Newey-West correction which takes autocorrelation into account and provides more precise estimates of the standard error for the Fama-MacBeth average coefficients.

5.1.3 The Fama-MacBeth (1973) Procedure in Detail

Fama-MacBeth regression can be seen as an alternative procedure for the analysis of panel data. I apply the Fama-MacBeth cross-sectional tests for the modified multifactor model of Fama and French (1992) and examine the explanatory power of the chosen proxies for equity returns.[348]

The Fama-Macbeth regression is designed as a two-stage procedure consisting of the following steps:

- Specification of the cross-sectional model of the type:

$$\tilde{r}_{i,t} = \gamma_{0,t} + \gamma_{1,t}\beta_{i,M|t} + \sum_{j=2}^{J}\gamma_{j,t}\kappa_{i,j|t} + \tilde{\varepsilon}_{i,t} \qquad (19)$$

  where J-1 explanatory variables $\kappa_{i,j|t}$ are optional additional factors;

- Estimation of the inputs for the explanatory variables $\kappa_{i,j|t}$. The estimates $\hat{\beta}_{i,M|t}$ are obtained from the market model;
- Then, cross-sectional regressions are run for each point in time t = 1, … , T to get time series estimators $\hat{\gamma}_{j,t}$ of regressors with T observations for each coefficient j = 0,1, … , J.
- The cross-sectional estimates $\hat{\gamma}_{j,t}$ are applied in the calculation of time-series averages $\overline{\gamma}_j$:

$$\overline{\gamma}_j = \frac{1}{T}\sum_{t=1}^{T}\hat{\gamma}_{j,t} \qquad (20)$$

- If the CAPM holds, then the relation between risk and return is positive and explained only by one factor (beta), implying that $\overline{\gamma}_0 = 0$, $\overline{\gamma}_1 > 0$ and for all j>1 $\overline{\gamma}_j = 0$. Therefore, standard t-tests are applied to test whether the time series averages as estimates of expected values of coefficients are significantly different from zero:

[348] Details on the Fama-MacBeth (1973) methodology can be found in Campbell et al. (1997, 215-217), Cochrane (2001, 228-234), or Mertens (2002, 18-21).

$$t\left(\overline{\gamma}_j\right) = \frac{\overline{\gamma}_j}{\hat{\sigma}_{\gamma_j}} \tag{21}$$

where $$\hat{\sigma}^2_{\gamma_j} = \frac{1}{T \cdot (T-1)} \cdot \sum_{t=1}^{T} \left(\hat{\gamma}_{jt} - \overline{\gamma}_j\right)^2 \tag{22}$$

are standard errors of the estimates.

5.1.4 Definitions and Description of Variables Used in the Research

In order to test the distress factor hypothesis on the nature of default risk, I provide some definitions and descriptions of the variables used in the empirical study at hand.

Financial distress is defined as a situation in which a company has insufficient cash flows to meet its financial obligations. The measure of the degree of financial distress in my research is the BSM-probability of default. *Default* is determined as an event occurring when (a) there is a missed or delayed payment of interest or principal, or (b) a company files bankruptcy, or (c) there is a distressed exchange.[349] In order to avoid default, or if default has already happened, a company should pursue distressed restructuring to overcome it.

In order to define a good and a bad state of the markets, I adopt the definition first introduced by Lakonishok and Shapiro (1986) and used later by Pettengill et al (1995) for tests of conditional asset pricing models. *A bull-market month* is defined as a period when the return on the market portfolio is greater than the risk free rate. *A bear-market month* is determined as a month when the return on the market portfolio is lower than the risk-free rate.[350]

Since this empirical study deals with the analysis of the high risks a company faces in financial distress, I define the *total risk* as the variance of securities' returns σ_i^2. *Systematic risk* is seen as the square of the beta of individual stocks multiplied by the market variance: $\sigma_M^2 \cdot \beta_{i,M}^2$. Given the variance decomposition, *idiosyncratic variance* is determined as residual variance or the difference between total and systematic risk:

$$\sigma^2_{i,idiosyncr.} = \sigma_i^2 - \sigma_M^2 \cdot \beta_{i,M}^2 \ . \tag{23}$$

5.1.4.1 Black-Scholes-Merton Default Probability

In my empirical study, I measure distress risk by computing the Black-Scholes-Merton probability of default (hereafter BSM) using the methodology of Hillegeist et al. (2004).

[349] The default definition is based on Moody's definition of default for long-term debt. See Moody's (2000, 3).
[350] I adopt the definition of Lakonishok and Shapiro (1986, 123) for up and down markets.

Unlike traditional accounting-based predictors of financial distress, this measure is based on capital market information and provides more accurate predictions of the probability of bankruptcy.[351,352] The methodology of Hillegeist et al. (2004) can be seen as an alternative way to construct the "distance to default", a measure of the difference between the asset value of the company and the face value of its debt, scaled by the standard deviation of the assets' value.

The BSM is calculated using the well-known option pricing formula for the valuation of European call options. In this framework the equity of the company is seen as a call option on the market value of the firm's assets. The face value of debt is considered to be a strike price of the call option. If the value of the firm's assets is greater then the value of its liabilities, the company will exercise its option and repay its creditors. A fall in the value of assets below the amount of debt would represent a default and force equity holders to let the call option expire.[353]

Hillegeist et al. (2004) use five key input variables in order to compute the probability of default (BSM): the market value of equity, the book value of total liabilities, common dividends, preferred dividends, and the annualized standard deviation of daily returns:

$$BSM - prob = N\left(-\frac{\ln\left(V_A / X\right)+\left(\mu-\delta-\left(\sigma_A^2/2\right)\right)\cdot T}{\sigma_A \cdot \sqrt{T}}\right) \tag{24}$$

where N (.) is the cumulative density function of a standard normal distribution. Inside the brackets is the distance between the current value of assets V_A and the face value of total debt X adjusted for the expected growth in asset value $\left(\mu-\delta-\left(\sigma_A^2/2\right)\right)$ relative to asset volatility σ_A, μ is continuously compounded expected return, δ is the dividend rate and T is the time to maturity of debt (I set it to be equal to one year for further analysis).[354]

The market value of equity V_E is calculated based on the closing price at the end of the 1st, 2nd or 3rd month of the fiscal quarter (COMPUSTAT quarterly data#12, #13 and #14 respectively), adjusted for all stock splits and dividends (COMPUSTAT data#17) and multiplied with an adjusted number of outstanding shares (COMPUSTAT data#61). The

[351] Hillegeist et al. (2004) examine the performance of Z-Score, O-Score and BSM-prob. Their analysis shows that BSM-prob contains more information about the probability of default and outperforms other measures.
[352] For the purposes of the empirical study at hand, I use the terms default and bankruptcy interchangeably.
[353] The idea of applying an option pricing model developed by Black and Sholes (1973) to the valuation of firms' equity was first developed by Merton (1974). In his contingent claim framework, equity is seen as a call option on the assets of a company.
[354] For the detailed derivation of BSM-probability of default see Hillegeist et al. (2004), p. 8-10.

book value of total liabilities X corresponds to the COMPUSTAT data#54. Given that the dividend is essentially accruing daily, I derive monthly dividends from an annual estimation of their total sum (COMPUSTAT data#20 and data#24) divided by 12. The annualized standard deviation of daily returns σ_E is estimated from the previous year's stock return data (CRSP daily observations of returns) [355] for each month multiplied by the square root of the number of trading days in a calendar year. I assume that the number of trading days equals 252.

Using the data from COMPUSTAT and CRSP, it must be pointed out that they cannot always be linked directly. While COMPUSTAT contains financial information about the analyzed companies at the end of the fiscal period, CRSP data is collected at the end of the calendar time interval. The research at hand is based on calendar information because it allows the comparison of market data among companies based on a particular point in time. [356] In order to avoid a measurement error by merging the two databases, I make an adjustment for COMPUSTAT companies, for which an accounting year ends at any time between January 1 and May 31.

Given that expected returns, the market value of assets, and asset volatility are not directly observable, I first estimate these three unknown variables in order to estimate BSM probability of default. Hillegeist et al. (2004) found a very elegant and simple solution for obtaining the market value of assets and volatility to estimate expected returns. They use a Newton search algorithm for solving two equations for the market value of assets and asset volatility simultaneously. These are the Black-Scholes-Merton equation for call option V_E and the optimal hedge equation σ_E:

$$\begin{cases} V_E = V_A \cdot e^{-\delta T} \cdot N\left(\dfrac{\ln[V_A / X] + \left(r - \delta + \left(\sigma_A^2 / 2\right)\right) \cdot T}{\sigma_A^2 \cdot \sqrt{T}}\right) - X \cdot e^{-rT} \cdot N\left(\dfrac{\ln[V_A / X] + \left(r - \delta - \left(\sigma_A^2 / 2\right)\right) \cdot T}{\sigma_A^2 \cdot \sqrt{T}}\right) + \left(1 - e^{-\delta T}\right) \cdot V_A \\ \sigma_E = \left(V_A \cdot e^{-\delta T} \cdot N\left(\dfrac{\ln[V_A / X] + \left(r - \delta + \left(\sigma_A^2 / 2\right)\right) \cdot T}{\sigma_A^2 \cdot \sqrt{T}}\right) \cdot \sigma_A\right) / V_E \end{cases} \quad (25)$$

Then the estimated market value of assets V_A is used to estimate an expected return μ:

$$\mu(t) = \max\left[\frac{V_A(t) + Dividends - V_A(t-1)}{V_A(t-1)}, r\right] \quad (26)$$

[355] Center for Research in Security Prices.
[356] Information on the difference in measurement of the data over calendar versus fiscal year can be found in COMPUSTAT User's Guide (2003), pp. 6.

The analysis of the data shows that very often the actual return on assets is negative. Since expected returns cannot be negative, Hillegeist et al. (2004) recommend applying the risk-free rate to such situations as an expected growth rate in returns.

After the unknown parameters are estimated, I calculate the BSM probability of default as in (24) for every company at the end of each calendar month. The resulting probability of default is exponential and shows that most of the firms have BSM close to zero, whereas very few companies have high probabilities of default. BSM is a continuous measure of financial distress and contains, in a statistical sense, more complete information about the severity of financial distress and the risk of default than dichotomous variables. Therefore, BSM captures not only companies which default on their financial obligations and file bankruptcy under Chapter 7 or Chapter 11, but also cases where financially distressed companies avoid bankruptcy by negotiating with creditors out of court and firms which are delisted from the stock exchange because of poor performance as a result of financial distress.

5.1.4.2 Other Variables Used in the Regression Analysis

1. *Market return* is the monthly return on the CRSP equally-weighted portfolio of stocks considered as a proxy for the market portfolio.
2. Risk-free rate is the monthly risk-free interest rate (one month Treasury Bill rate) obtained by Fama-French Data source at Kenneth French's web site at Dartmouth.
3. Stock return is the monthly change in the total value of common equity of a firm adjusted for all stock splits and dividends. Monthly stock returns are realized holding-period returns obtained from CRSP used as proxy for expected returns. Special attention is paid to the returns of companies delisted from the stock exchange for any reason. I calculate the returns of companies delisted from the stock exchange as the sum of regular return and delisting return available at the CRSP data file at the date of delisting. If the delisting return is missing, especially in the case of performance-related delistings, omission of such returns can lead to distortions in the analysis. To avoid a delisting bias, the returns of delisted companies with missing returns at the date of delisting are set to -100%.[357]
4. Size is calculated as the natural logarithm of the product of the closing price at the date of portfolio formation multiplied by the number of outstanding market shares.

[357] Shumway and Wartner (1999) point out that the delisting bias in CRSP's data, and especially for small sized NASDAQ firms delisted for performance reasons, can lead researchers to the wrong conclusion about the existence of the size effect. If the data is corrected for missing delisting returns, the size effect mainly disappears.

5. Book-to-market ratio (BM) is defined as the natural logarithm of the book value of common equity divided by the market capitalization at the end of December of the year t-1. The book value of equity is calculated by means of the methodology of Daniel and Titman (1997) as stockholders' equity (COMPUSTAT data#216) plus deferred taxes (COMPUSTAT data#74) plus investment tax credit (COMPUSTAT data#208) minus preferred stock (COMPUSTAT data#56). Stockholder's equity less or equal to zero is assumed as erroneous and excluded from the sample.

6. Beta is a direct measure of systematic risk. This is the sensitivity of the portfolio return to the market's movements approximated by the CRSP value-weighted market portfolio for NYSE, AMEX, and NASDAQ stocks. I estimate the betas using a rolling regression technique for a window size of 24 months: monthly returns over 24 months ending on December 31 are regressed against market returns. Estimated betas are adjusted for nonsynchronous trading.[358] Computed in this way, the portfolio betas are the sums of the slopes in the regressions of the returns of a portfolio for the current, prior, and next month's market return:

$$\beta_{adj.} = \beta_{-1} + \beta_0 + \beta_{+1} \tag{27}$$

7. Sigma or idiosyncratic volatility is the residual volatility of an equally-weighted portfolio calculated at the portfolio formation date. Assuming that the CAPM with respect to the beta estimation holds, the idiosyncratic volatility can be estimated as the mean square root of the disturbance term in the following regression:

$$r_{it} = \alpha_{it} + \beta_{it} \cdot r_{Mt} + e_{it} \tag{28}$$

   Derived from the equation above, the idiosyncratic volatility is then $\sqrt{\text{var}(e_{it})}$.

5.2 Characteristics of the Sample and Descriptive Statistics

There is a set of databases used for the empirical study at hand. I use the COMPUSTAT Industrial Quarterly file in order to obtain financial and accounting information for individual stocks used for the calculation of the BSM probability. COMPUSTAT annual data files are used to get accounting information for portfolio formation. CRSP monthly and daily data files provide information on stock returns.

This study covers all non-financial companies listed on the NYSE/AMEX/NASDAQ at any time during the period 1980-2004. Financial institutions, including companies operating in finance, real estate and insurance (SIC code 6000 till 6999), are intentionally

[358] Dimson (1979) points out that since many securities are traded on the stock exchange intermittently, the infrequent trading can cause biases in the beta estimators. In order to be sure that the beta estimator is unbiased, it should be adjusted to lagged, matching, and leading market returns.

excluded from the sample because the high financial leverage usual for financial institutions can be crucial for companies in other industries. Unlike financial companies, a high leverage of industry firms is viewed as a signal of the increasing probability of financial distress and therefore of the risk of default.

The raw COMPUSTAT data has a number of extreme values among the variables used in this empirical study. To eliminate the effect of outliers on the generated results I winsorize each variable by the 99th and 1st percentile.

Moreover, to be included in the sample companies should meet additional requirements:

1. They should be listed at the stock exchange for at least 24 months before portfolio formation. This condition ensures a proper beta estimation.
2. Only firms with positive BM ratio are included in the sample. The difficulties in the interpretation of a negative BM ratio by the chosen methodology belong to the principles of the portfolio construction. Negative BM stocks will be automatically sorted into the lowest portfolio decile because of the negative sign instead of going into the highest decile since it should be expected that a negative market value is an attribute of highly financially distressed companies.[359]
3. Only common stock of companies listed at the NYSE, NASDAQ, or AMEX from the CRSP data file is chosen to be merged with the data available at COMPUSTAT. There are two reasons for doing so. First, excluding some series which are typically illiquid and therefore not actively traded at the stock exchange reduces the problem of thin trading. Second, multiple stock series of the same company can cause a multicollinearity problem when econometric procedures are run.

I start building the sample by obtaining financial information from COMPUSTAT and merging it with stock market information available at the CRSP data file. 700 805 firm-quarters are obtained from COMPUSTAT. After merging the data from COMPUSTAT with monthly CRSP data and, in addition, excluding financial companies, the sample has 1 312 768 firm-months. Further, I exclude firms with insufficient lengths of the time series of stock returns to calculate betas of individual securities, companies with missing information about the industry, firms with negative book value of equity, and negative size. The final sample consists of 1 250 433 firm-months representing 14 345 financially

[359] In their research, Fama and French (1995) recommend excluding stocks with negative BM ratios from the sample. Hussain, Toms, and Diacon (2002) also perform empirical tests for negative BM stocks in order to prove whether the BM hypothesis also holds in this case. The results show that distressed stocks with high positive BM indeed incur the positive risk premium, whereas a distressed portfolio with the negative BM does not have any compensation for bearing risk.

distressed and solvent non-financial firms in total. The average number of firms per year in the sample is 4 168, the average number of distressed companies per year is 821.

Table 4: Sample Description

Panel A. Number of financially distressed firms by year (1980-2004)

Year	Average number of firms	Number of distressed firms	% to the total number
1980	1,973	149	7.6
1981	2,160	105	4.9
1982	3,181	224	7.1
1983	3,563	288	8.1
1984	3,952	224	5.7
1985	3,978	350	8.8
1986	4,090	435	10.6
1987	4,279	635	14.8
1988	4,263	1,035	24.3
1989	4,120	647	15.7
1990	4,068	834	20.5
1991	4,029	1,081	26.8
1992	4,154	963	23.2
1993	4,366	1,038	23.8
1994	4,738	963	20.3
1995	5,040	1,016	20.2
1996	5,324	1,039	19.5
1997	5,584	1,041	18.6
1998	5,471	1,113	20.3
1999	5,068	1,547	30.5
2000	4,904	1,663	33.9
2001	4,562	1,744	38.2
2002	4,209	1,246	29.6
2003	3,829	843	22.0
2004	3,299	294	8.9
Average annual number of firms	4,168	821	19.69%
Total firm-years	104,203	20,514	19.69%

Panel B. Number of financially distressed firms by industry – SIC codes[360]

Industry	Firm-Months	Number firms	Average size (MM $)	Number of firms (distressed)	Percent of months (distressed)	Percent of firms (distressed)
Agriculture	5,070	70	203	25	18.3	35.7
Building Materials	25,029	262	1,538	80	16.0	30.5
Chemicals	85,911	874	1,469	233	13.7	26.7
Coal	2,491	28	375	10	21.8	35.7
Computers and Electronics	218,129	2,290	724	832	21.0	36.3
Construction Industries	17,460	204	274	74	22.3	36.3
Food	30,929	305	1,802	71	11.4	23.3
Furniture	15,363	162	467	41	14.8	25.3
Health Services	31,567	459	513	183	26.1	39.9
Leather Products	6,640	56	304	14	12.3	25.0
Manufacturing: Miscellaneous	99,191	1,183	447	351	18.9	29.7
Metal Mining	13,046	158	376	69	21.4	43.7

[360] SIC stands for Standard Industry Classification.

Panel B: Continued

Industry	Firm-Months	Number firms	Average size (MM $)	Number of firms (distressed)	Percent of months (distressed)	Percent of firms (distressed)
Oil and Gas Extraction	58,860	709	502	302	23.5	42.6
Other Mineral Industries	1,840	24	485	10	16.5	41.7
Paper, Printing, Publishing	36,874	319	1,279	75	10.8	23.5
Public Administration	1,344	35	278	5	21.8	14.3
Retail Trade	99,695	1,128	839	421	21.2	37.3
Service Industries	196,614	2,807	616	1,176	25.3	41.9
Social Services	2,470	43	147	16	30.5	37.2
Stone, Steel, Fabricated Products	62,207	622	652	147	13.5	23.6
Textiles	24,605	266	252	96	20.3	36.1
Tobacco	1,916	19	4,777	4	10.0	21.1
Transportation and Communication	149,682	1,496	1,507	513	15.3	34.3
Wholesale Trade	63,500	826	422	333	25.4	40.3
Total	**1,250,433**	**14,345**	**844**	**5,081**	**19.69**	**35.4**

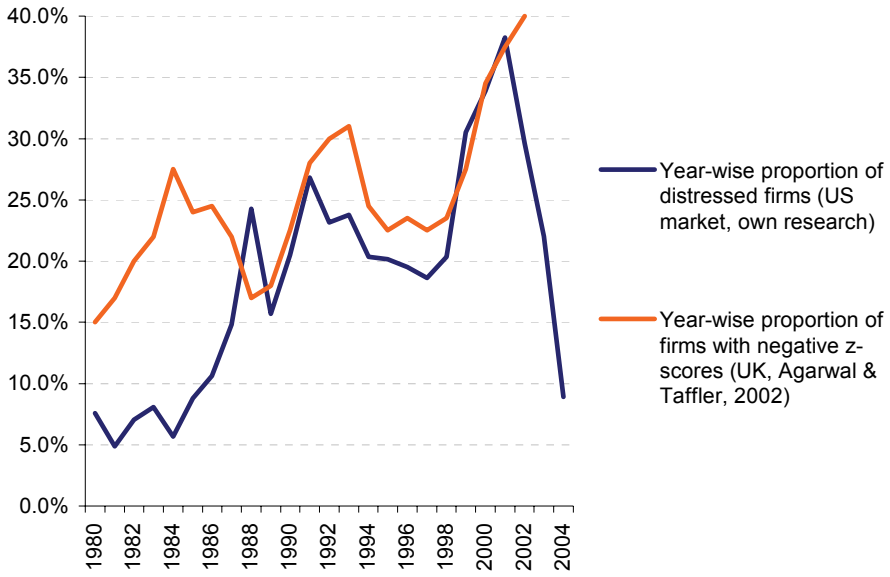
Table 4 provides summary statistics for the sample I used further in empirical analysis. I use the threshold of BSM=0.05 in order to separate sound companies from financially distressed firms. Companies with BSM<0.05 are considered as sound firms, companies with BSM>=0.05 are considered to be financially distressed. The higher the BSM, the higher the probability of default is. Panel A of the Table 4 illustrates that on average about 20% of all companies listed at the NYSE, NASDAQ, and AMEX annually become financially distressed. The proportion of companies at high risk of financial distress changes over time from 7.6% in 1980 to 8.9% in 2004. It has its minimum of 4.9% in 1981 and maximum of 38.2% in 2001. The peak rate in 2001 is almost eight times as large as the lowest rate in 1981. These statistics show that, unlike bankruptcy, financial distress is not as rare an event as one might think.[361] Even in relatively good years (mid-1980s or mid-1990s) a relatively large number of companies might face financial distress. At first glance, statistics show that professionals should pay attention to the financial situation of the company independent of the underlying economic conditions. The relatively high rate of financially distressed companies in healthy economic years might support the idea that it is independent of macroeconomic conditions and is rather of unsystematic nature. However, the data also indicate that annual rates of financial distress substantially increase during recession (e.g. early 1980s, early 1990s, or late 1990s) and decline during an economic upturn.

The results summarized in the Panel A of Table 4 are consistent with empirical studies undertaken for different stock markets by means of alternative measures of financial distress. Figure 9 compares the annual distribution of financially distressed companies

[361] In their research, Hillegeist et al. (2004, 11ff.) show that an average annual rate of bankruptcies (cases of filing for protection under Chapter 11) during 1980-2000 is about 1%, which makes it a relatively rare event even in the case of a recession.

of two geographical markets for almost the same time period: US (the data based on information available for the NYSE, NASDAQ, AMEX) and UK (the data available for the London Stock Exchange, LSE). The data for the UK is taken from an empirical study by Agarwal and Taffler (2006), who analyze the data available for all non-financial companies listed on the LSE from 1979 to 2002. Using the Altman Z-score adopted for the stock market in the UK[362] for the allocation of all firms into groups of financially distressed and healthy companies, they found that the proportion of distressed companies listed on the LSE varies from 14% in 1979 to 40% in 2002. The comparison of two geographical markets, again, supports the hypothesis about the dependence of the rate of financially distressed companies on overall economic health.

Figure 9: Year-Wise Proportion of Financially-Distressed Firms (1980-2004)



The rate of financially distressed firms varies not only from year to year. It also changes substantially across industries. This information is contained in Panel B of Table 4. Based on the number of firms and the number of firm-months, Panel B shows that in the last 25 years especially companies in the mineral industries, such as metal mining (43.7%), oil and gas extraction (42.6%), and other mineral industries (41.7%) as well as firms in the service industries (41.9%) and in wholesale trade (40.3%) have more often become financially distressed than firms in the other sectors. Companies operating in public administration (14.3%) and in tobacco (21.1%) have experienced the lowest rate of financial distress.

Panel B of Table 4 also contains information on the average size of the firms operating in represented branches of the American economy. The highest market capitalization is

[362] See the discriminant model of Taffler (1983, 1984).

observed for tobacco companies ($4,777m). In the cross-section, most sectors with a higher average market capitalization show a relatively low percentage of financially distressed companies (the range for the rate of financial distress varies here between 21% and 27%), whereas low-size industries have a relatively high number of financially-distressed firms (e.g. agriculture (36%), social services (37%), textiles (37%)).

Table 5 reports summary statistics for variables beta, BSM, sigma, size, and BM both for all firms and for three partitions assembled dependent on the probability of financial distress. Except for size, the mean and the median of the variables increase with the probability of financial distress. Companies in the high financial distress risk partition have a substantially higher mean and median size of beta, sigma, and BM than firms with moderate risk of distress or sound companies. The largest number of firm-months (716 406) belongs to healthy companies. There are 139'718 firm-months with moderate risk of financial distress and 221 436 firms-months are at high risk of financial distress.

Table 5 shows that the distribution of BSM is exponential. Sound companies have their probability of default close to zero (with a mean of 0.1% and a median of 0%), whereas the mean and the median in the partition of high risk companies are 24.9% and 17.4% respectively, with few firms having very high risk (86.3% at 99^{th} percentile).

Table 6 presents correlations between firm characteristics. The two key variables of this study, BSM and sigma, have positive Pearson (Spearman) autocorrelation of 0.438 (0.540), providing preliminary support for the hypothesis that idiosyncratic risk is positively associated with probability of default. Beta has also, as expected, positive relation to distress risk. However, the strength of the association is not as high as with idiosyncratic risk (Pearson/Spearman correlation of 0.152 (0.216)). Similar to prior studies (e.g. Vassalou and Xing, 2004) size has a negative correlation with distress risk, whereas BM is positively associated with BSM.

Table 5: Descriptive Statistics

The sample consists of 1 122 580 NYSE/AMEX/NASDAQ non-financial firm-months from 1980 to 2004, with sufficient information available at COMPUSTAT and CRSP for obtaining the values of the variables below. Except for BSM, all variables are winsorized at 1st and 99th percentile in each month to reduce the effect of outliers. Size and BM are in a logarithmic form. Companies are divided into groups according to their BSM-probability of default: sound companies, companies with moderate risk of financial distress, and firms with high risk of financial distress.

	Beta	BSM	Sigma	Size	BM
All Firms					
Mean	0.918	0.053	0.134	4.599	-0.660
Standard Deviation	1.063	0.133	0.088	2.090	1.398
Median	0.874	0.001	0.113	4.443	-0.553
1st Percentile	-1.653	0.000	0.034	0.558	-4.251
99th Percentile	4.150	0.694	0.455	9.624	2.346
Sound companies (BSM<0.01)					
Mean	0.798	0.001	0.107	5.250	-0.947
Standard Deviation	0.911	0.002	0.062	1.980	1.343
Median	0.786	0.000	0.094	5.173	-0.815
1st Percentile	-1.651	0.000	0.034	0.864	-4.364
99th Percentile	3.380	0.009	0.329	9.896	1.703
Moderately distressed companies (0.01<=BSM<0.05)					
Mean	1.071	0.025	0.159	3.822	-0.343
Standard Deviation	1.161	0.011	0.085	1.640	1.249
Median	1.084	0.023	0.147	3.675	-0.260
1st Percentile	-1.669	0.010	0.034	0.438	-3.550
99th Percentile	4.315	0.049	0.450	8.308	2.261
Firms with high risk of financial distress (BSM>=0.05)					
Mean	1.235	0.249	0.209	2.850	0.127
Standard Deviation	1.364	0.203	0.114	1.438	1.324
Median	1.181	0.174	0.191	2.680	0.168
1st Percentile	-1.694	0.051	0.035	0.285	-3.267
99th Percentile	4.940	0.863	0.575	7.190	2.983

Table 6: Correlation Matrix

Spearman (Pearson) correlations are below (above) the main diagonal. All Spearman and Pearson correlations are statistically significant at 5%. Size and BM are in a logarithmic form.

Variable	Beta	BSM	Sigma	Size	BM
Beta		0.152	0.539	-0.058	-0.037
BSM	0.216		0.438	-0.390	0.287
Sigma	0.554	0.540		-0.310	-0.095
Size	-0.059	-0.541	-0.324		-0.119
BM	-0.045	0.344	-0.068	-0.123	

5.3 Time-Series Analysis of Distress Risk Measures

To portray the behavior of the distress risk measures over time, I calculate simple averages of BSM, beta, idiosyncratic volatility, systematic risk, and total variance for all firms for the whole sample period from January 1, 1980 to December 31, 2004. The systematic risk is calculated as beta squared multiplied with market variance: $\beta_{i,M}^2 \cdot \sigma_M^2$. Total risk is the sum of the idiosyncratic variance and of the systematic risk: $\sigma_i^2 = \beta_{i,M}^2 \cdot \sigma_M^2 + \sigma_{i,idiosyncr.}^2$

Figure 10 provides information on the average BSM of all firms over time. The shaded areas are periods of recession as defined by NBER.[363] The graph shows that the probability of default varies noticeably with the business cycle. It declines in boom periods and increases substantially during recessions. Thus, if the behavior of default probabilities is counter-cyclical, then distress risk should contain at least a systematic component.

Figure 10: Aggregate Probability of Default (BSM)

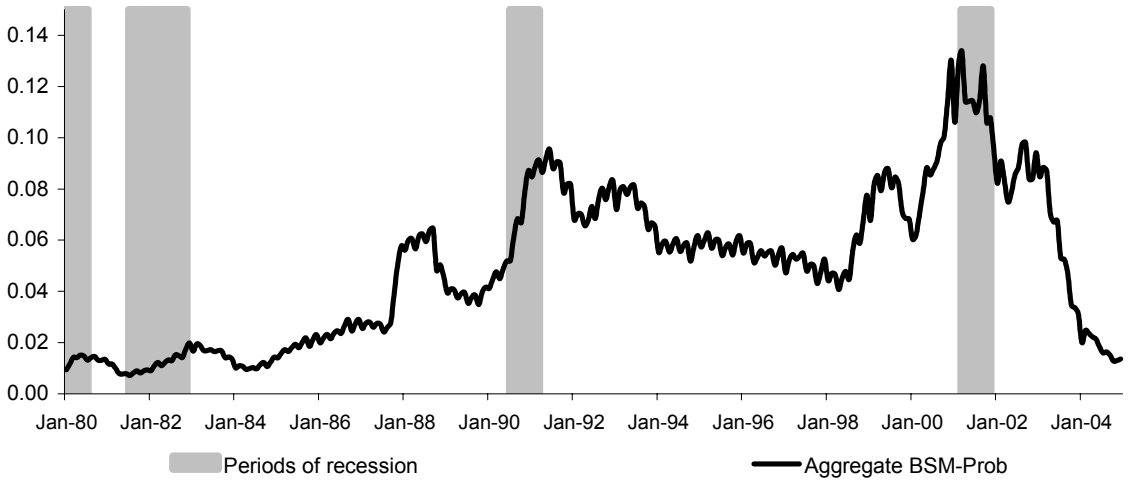
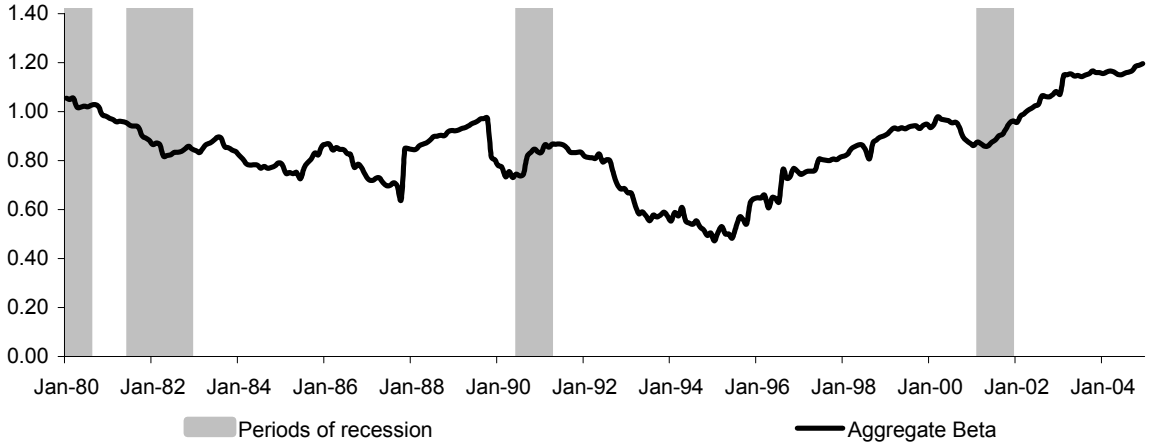


Figure 11 provides information on the behavior of the aggregate beta over time. It is observable that over 15 years, until 1995 the aggregate beta continued to decline showing rather an opposite trend than co-movement with the market. Even in the times of recession in the early 1980s and 1990s, the mean beta was lower than the market beta, which contradicts the fact that beta is the sensitivity of an individual security to market changes. Also in the turbulent years 2000 – 2001 the aggregate beta was less than the market beta. Hence, the main conclusion which can be drawn from this graph is that the systematic risk approximated by beta is not a useful indicator of financial distress over time.

[363] NBER stands for National Bureau of Economic Research.

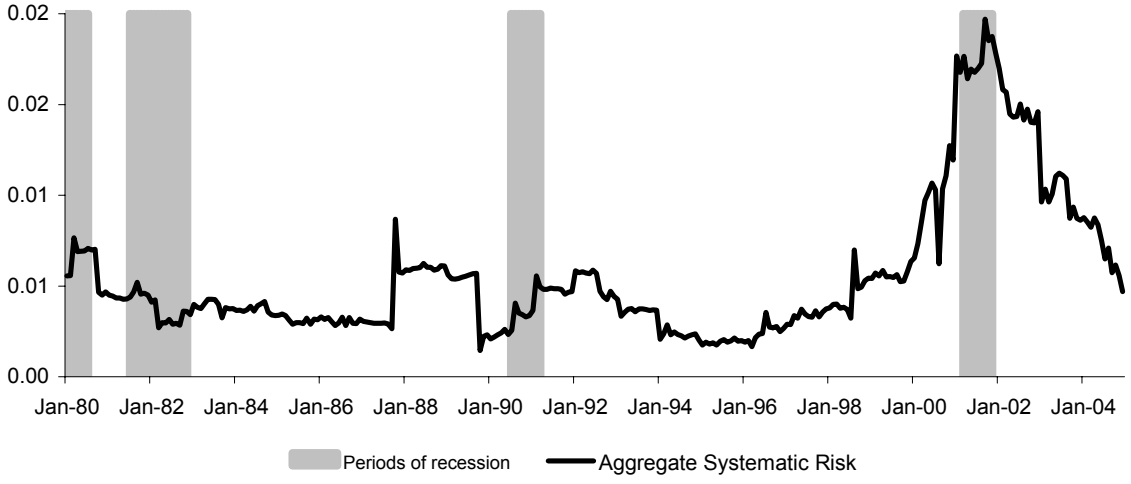
Figure 12 represents the time series mean of the systematic risk calculated by multiplying beta squared with the market variance. Unlike beta, this measure of risk has a clear pattern: it increases in recessions and declines in upturns, reflecting a counter-cyclical character of risk with respect to the overall economy. Consequently, this measure of risk might be more appropriate than beta.

Figure 11: Aggregate Beta of the Sample



Comparing Figure 11 and Figure 12 , one might realize how important it is to make an accurate choice of a proper measure of risk in research. Levy (1978) was one of the first economists to notice the crucial role of the variance as a measure of risk of individual stocks and gave an explanation of why variance is a more precise measure of systematic risk than beta: In imperfect markets investors hold very few stocks in their portfolios, which will result in beta will losing its explanatory power for stock price behavior in comparison to the variance.[364]

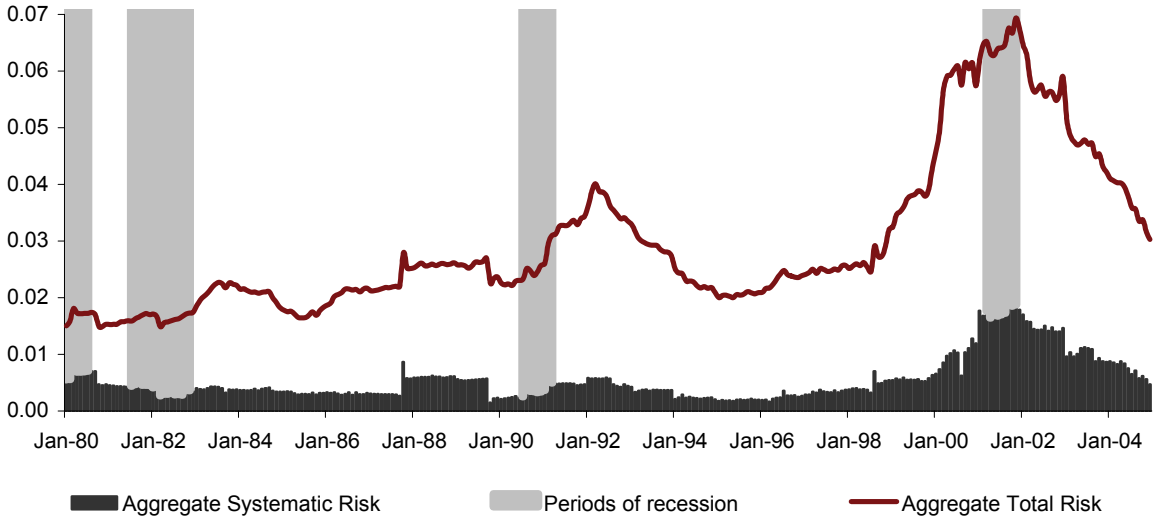
Figure 12: Aggregate Systematic Risk



[364] See Levy (1978).

Figure 13 combines both systematic and idiosyncratic variance in the same chart. If we compare the behavior of the idiosyncratic volatility with the total variance, we recognize that the total variance almost replicates the time path of the idiosyncratic volatility. Unsystematic risk increases substantially in periods of recessions. It is the largest component of the total volatility and might be linked to distress risk. The same behavior pattern, however, is only partly applicable to systematic risk. The graph shows that systematic risk has periods when it remains almost unchanged and even slightly declines. This observation is valid for the first half of the 1980s. From the beginning of the 1990s systematic risk increases, showing a co-movement with the business cycle.

Figure 13: Aggregate Total Risk



Since three measures of risk – systematic risk, idiosyncratic volatility, and total variance – seem to be relevant for the analysis of behavior of risk in financial distress, I divide the sample into two groups to control whether there is a difference in the behavior of the two components of the total variance between distressed and sound companies. The cut-off for sound versus distressed companies is chosen very conservatively by BSM=0.01. I plot the aggregate risk measure for the distressed and for the healthy group into the same graph. The results from the figures below provide important insights for the analysis of the risk characteristics of non-distressed and distressed firms pertaining to underlying economic conditions.

Figure 14 shows that despite the fact that the systematic risk of healthy companies slightly increases during downturns, it does not change substantially over time. In contrast, the risk pattern of distressed companies supports my hypothesis that in periods of economic boom distressed companies better participate in the overall economic expansion (the size of the risk is very close to that of sound companies). However, during recessions distressed companies are more vulnerable and are hit much more from the mar-

ket than sound companies (during downturns the risk increases dramatically in comparison to the control group). Hypothetically, if the assertion above is true, distressed companies should have relatively low returns in recessions and higher premiums in periods in between. In this case distress risk will be dominated by its systematic component.

Figure 14: Sample Mean of Systematic Risk for Sound and Distressed Companies

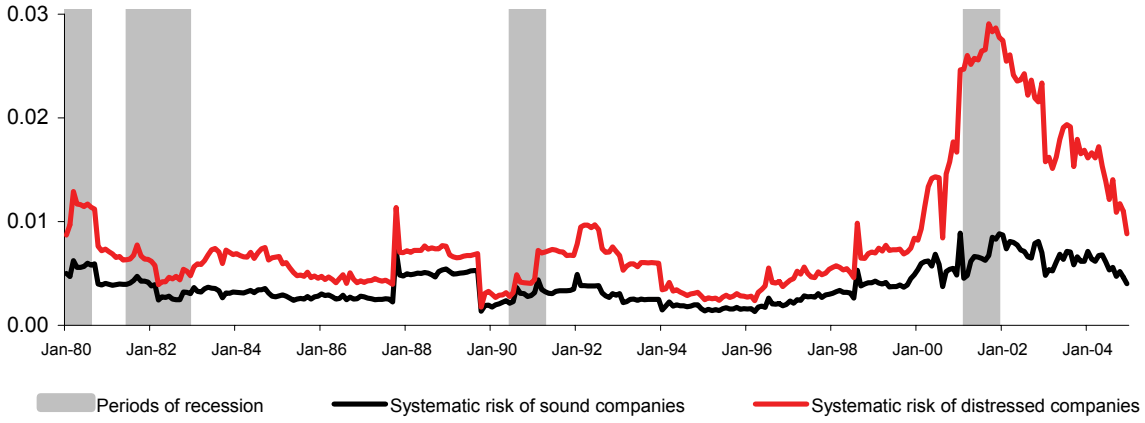
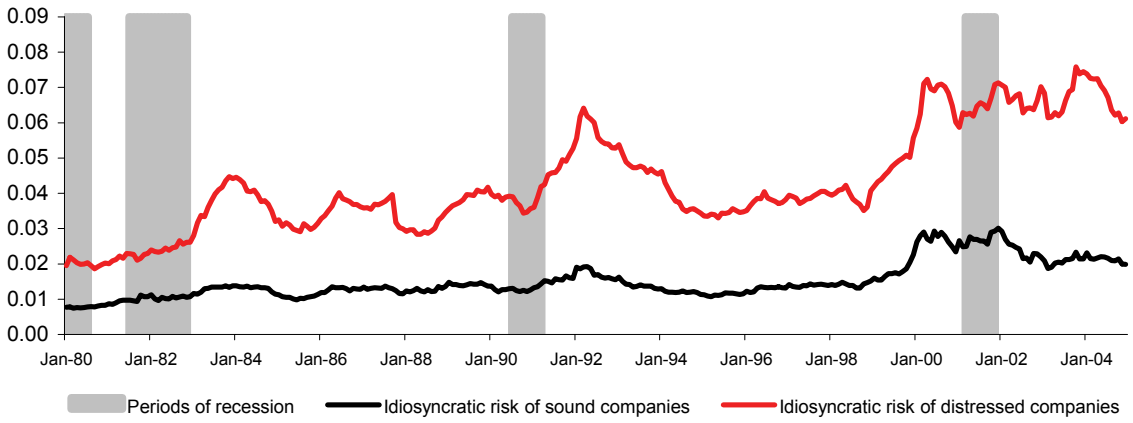


Figure 15 illustrates the time path of the idiosyncratic variance for the two groups. Unlike the systematic risk portrayed in Figure 14, the firm-specific variance of distressed companies is not only much higher, but it also tends to diverge from systematic risk, and this divergence becomes greater when approaching a recession. If distress risk increases in recessions, and this increase results in one-third from an increase in the systemaitc risk and in two-thirds from a rise in idiosyncratic volatility, how does the market reflect those changes and how it does differentiate between priced and not priced components of distress risk? If we assume that external factors during the recession prevent some of the investors from holding the market portfolio, it would mean that a huge proportion of the idiosyncratic risk will not be diversified away. How the market reacts to the remaining portion of the idiosyncratic volatility and whether this contributes to an explanation of the cross-section of distressed returns is the subject of the following empirical analysis.

Figure 16: Aggregate Idiosyncratic Variance of Distressed Firms versus Control Group



A detailed examination of the means of distress risk measures above shows that distress risk is not homogenous in its nature: it consists both of systematic and idiosyncratic components. Therefore, both of them should be considered by explaining the cross-section of expected returns. There is, however, a potential danger in this analysis, resulting in a variety of statistically significant but economically not always correct results: an analysis of financial distress based on capital markets information is extremely sensitive to the choice of the proper risk measure. Since there are no uniform measures of distress risk in equity returns, the choice of different approximations explains the differences of the results produced from one empirical study to another.

5.4 Distress Risk Characteristics and Portfolio Returns

In this section I perform formal tests of the hypotheses H_0^1 - H_0^3 developed in section 5.1.1. To examine the characteristics of distress risk and its relation to equity returns, I sort the securities into portfolios. Every month, from January 1980 to December 2004, I sort the securities into ten portfolios dependent on their latest available probability of default (BSM). Table 7 reports characteristics of the different distress risk portfolios. I also examine whether there is a significant difference between returns of the lowest and highest distress portfolio. Portfolio 1 is the portfolio with the lowest BSM while portfolio 10 is the portfolio with the highest BSM. Obviously, the higher the average BSM, the higher the distress risk is.

The t-values are calculated from Newey-West (1987) standard errors, which are corrected for heteroscedasticity and serial correlation up to four lags and are statistically significant at the five percent level.

Table 7 shows that the return difference between the average equally-weighted return of the high-distress-risk portfolio and the low-distress-risk portfolio is 1.29 percent per

month or 15.48% per year. This difference is statistically significant at the 5% significance level (t-value = 2.39). The pattern of returns provides preliminary support that distress risk is priced in equity returns. The relation between returns and distress risk is convex: The change in expected returns in the lower distress risk portfolios is much smaller than the change in returns at a high level of distress risk.

The average beta and the average idiosyncratic volatility monotonically increase with the probability of default. The relation of the beta to distress risk is linear, which is consistent with CAPM theory. Idiosyncratic volatility increases gradually with the probability of default; however, it makes a jump in the quintile with the highest risk of financial distress. Consistent with previous research, small stocks are likely to fail because they have a higher probability of default. At the same time, small stocks also have higher beta and idiosyncratic volatility. Thus, hypothetically, all variables can be proxies for distress risk. The most difficult issue is to find evidence of whether and when the systematic or the unsystematic component of the distress risk dominates.

Table 7: Characteristics of Portfolios Sorted on the Basis of BSM

BSM-Decile	1	2	3	4	5	6	7	8	9	10	High-Low	t-value
Average BSM	0.000	0.001	0.002	0.003	0.007	0.014	0.028	0.057	0.125	0.317		
Average return (%)	1.20	1.25	1.23	1.30	1.22	1.29	1.34	1.42	1.73	2.48	1.29	2.39
Average Beta	0.57	0.74	0.87	0.97	1.06	1.15	1.23	1.30	1.35	1.49		
Average Idiosyncratic Volatility	0.08	0.09	0.10	0.11	0.12	0.14	0.15	0.17	0.19	0.24		
Average B/M	0.6	0.7	0.7	0.7	0.8	0.8	0.9	1.0	1.1	1.3		
Average size (MM$)	2,556	2,300	1,654	1,082	695	464	275	161	80	40		

To investigate the systematic and unsystematic components of distress risk more closely, I perform sequential sorts on the formed portfolios. The empirical literature on asset pricing has extensively analyzed two effects – the size and the book-to-market effect – questioning whether they are, in fact, different from distress risk. I also analyze these effects in my sample but take a step forward and add a third one – the effect of idiosyncratic volatility. I begin with traditional sorts on size and analyze returns in different BSM portfolios.

5.4.1 Analysis of the Size Effect

Table 8 presents results from portfolio sorts on BSM and size. Small stocks become highly financially distressed more often than companies of bigger size. In my sample, only 2% of the companies with the largest size are in the highest BSM-decile, whereas among the smallest companies about 12% of the firms in the smallest size quintile are allocated in the highest BSM decile.

Panel A of Table 8 shows that size as a distress risk factor exists only in the two quintiles with the highest default risk.[365] The difference in the average return between small and big portfolios varies between 0.66% and 2.05% per month (7.92% and 24.6% per annum respectively) and is statistically significant at the 5% confidence level. It is noticeable that the higher the probability of default, the higher the difference is in the average return between small and big stocks, and the more significant the size effect is. In smaller BSM deciles the difference in returns is close to zero.

Panel B of Table 8 answers the question of how much riskier stocks in the upper BSM deciles are compared to stocks with a lower BSM. Size is inversely related to the probability of default. The variation in the risk of default across size portfolios within the same BSM group is substantially higher in groups with a high probability of default. Up to the 6th BSM decile the average probability of default of the companies varies insignificantly, within the range of the probabilities for sound companies. In the highest BSM deciles small stocks are at least five times riskier than sound companies.

Panel C of Table 8 shows the variation in market capitalization within and across the BSM groups. On average, companies with the lowest probability of default are almost 14 times larger than firms with the highest BSM. Companies in the high BSM deciles tend to be of the smallest size within the size quintiles. Therefore, confirming the results of the previous research, I conclude that the size effect indeed exists only in the smallest firms with a high risk of default.

Panel D reports the distribution of the book-to-market ratios within BSM-size sorted portfolios. The BM is inversely related to the size of the company: it decreases monotonically with size. Companies in financial distress usually experience a dramatic value deterioration. Thus, logically, the highest BM ratios are concentrated in the highest BSM deciles.

Panel E illustrates the average beta across BSM portfolios of different size. Low BSM – low size companies have substantially lower betas than firms in the higher BSM quintile. Low BSM deciles show a clear behavior pattern between beta and size both across BSM deciles and across size quintiles: the sensitivity to market movements decreases with increasing size. The average portfolio betas vary from 0.33 to 1.95 with a mean of 1.14.

[365] This result is consistent with Vassalou and Xing (2004, 848). Vassalou and Xing use Default Likelihood Indicator (DLI) as an alternative measure of probability of default and apply it to the time period from January 1971 to December 1999. Sorting stocks into 25 DLI-Size portfolios, they report that size effect is present only within the highest DLI quintile.

Unlike the average betas, the average idiosyncratic volatility represented in Panel F of Table 8 varies more considerably across BSM deciles, but decreases across size quintiles. The relation between the default risk and the idiosyncratic volatility in lower BSM deciles is almost linear. This holds for all size quintiles. However, the behavior pattern changes in the highest BSM deciles: idiosyncratic risk starts to increase exponentially. Across size quintiles, smaller firms have higher idiosyncratic volatility than larger companies, but this difference almost disappears in the higher BSM deciles. Remembering the correlation matrix presented in the Table 6 , the size and idiosyncratic volatility have the highest negative (positive) correlation with probability of default. At the same time, the idiosyncratic volatility variable has a relatively high negative correlation with size in comparison to beta as a measure of systematic risk. Therefore, hypothetically, the effect of size may be related not to systematic risk but to idiosyncratic volatility. In this case, the high returns of the smallest and severely distressed companies may be rewards for high amounts of non-diversifiable unsystematic risk.

The analysis of the BSM-size sorted portfolios shows that small companies are more likely to default (the BSM of the small firms is constantly higher than by large corporations). One of the reasons why growth stocks default more often is that they accumulate significantly fewer peripheral assets which can be sold in case of financial distress. The size effect indeed is a default risk effect, but it exists only in the highest BSM deciles among the smallest of the small size firms. This result seems to be robust to the choice of alternative measures of the probability of default, to the choice of different time series, to different frequencies of portfolio formation, and to different geographical stock markets.[366] The difference in returns between the smallest and the largest size portfolios in the highest BSM-quintile is statistically significant at the 1% confidence level. Therefore, I cannot reject H_0^1 that controlled by distress risk, the smallest stocks outperform large stocks.

[366] Compare e.g. with empirical results of recent research by Agarwal and Taffler (2006), Vassalou and Xing (2004), Campbell, Hilscher, and Szilagyi (2006).

Table 8: BSM-Size Portfolio Characteristics

The table reports the average equally-weighted return, BSM, size, book-to-market, beta, and idiosyncratic volatility for the 50 BSM-Size sorted portfolios over the sample period from July 1980 to December 2004. Each June the stocks of companies listed at the NYSE/NASDAQ/AMEX are first independently sorted on their latest available BSM probability into 10 portfolios. Then within each BSM-portfolio securities are sorted into five size portfolios based on their market capitalization in June using only NYSE stocks for size breakpoints. Portfolios are rebalanced once a year. Small – Big is the return difference between the smallest and the biggest portfolio within each BSM decile. T-statistics are corrected for heteroscedasticity and autocorrelation up to four lags by means of the Newey-West estimator.

	Low BSM	2	3	4	5	6	7	8	9	High BSM
	Panel A. Average equally-weighted return (in percent)									
Small size	1.23	1.26	1.20	1.44	1.25	1.44	1.59	1.72	2.10	2.93
2	1.27	1.26	1.35	1.27	1.35	1.28	1.22	1.43	1.22	2.06
3	1.27	1.33	1.40	1.37	1.28	0.95	1.33	1.22	0.94	0.96
4	1.19	1.30	1.35	1.37	1.23	1.08	0.98	0.50	0.61	0.80
Large size	1.24	1.32	1.13	1.30	1.09	1.39	0.93	0.79	0.52	0.88
Small-Big	-0.01	-0.06	0.07	0.14	0.16	0.05	0.66	0.93	1.58	2.05
t-value	(-0.06)	(-0.28)	(0.33)	(0.57)	(0.71)	(0.20)	(1.92)***	(1.99)**	(3.06)*	(2.65)*
	Panel B. Average BSM									
Small size	0.0007	0.0014	0.0030	0.0046	0.0100	0.0174	0.0330	0.0627	0.1306	0.3326
2	0.0003	0.0005	0.0011	0.0027	0.0065	0.0118	0.0243	0.0479	0.1127	0.2843
3	0.0002	0.0007	0.0009	0.0027	0.0055	0.0122	0.0236	0.0480	0.1033	0.2673
4	0.0002	0.0007	0.0011	0.0031	0.0050	0.0090	0.0228	0.0471	0.1038	0.2441
Large size	0.0003	0.0004	0.0008	0.0018	0.0049	0.0099	0.0190	0.0496	0.1015	0.2141
	Panel C. Average size (MM $)									
Small size	143	137	108	92	73	60	46	33	22	13
2	594	515	419	321	244	189	139	102	68	50
3	1,294	1,140	876	659	473	359	273	199	141	94
4	3,084	2,643	2,048	1,452	1,081	819	558	448	303	240
Large size	11,331	10,039	7,752	5,885	4,165	2,933	2,019	1,532	855	821
	Panel D. Average BM									
Small size	0.75	0.73	0.78	0.81	0.86	0.94	0.99	1.07	1.22	1.50
2	0.57	0.62	0.64	0.70	0.78	0.84	0.92	0.96	1.14	1.30
3	0.53	0.59	0.65	0.71	0.73	0.83	0.85	1.00	1.15	1.32
4	0.52	0.63	0.66	0.70	0.76	0.80	0.88	0.91	1.11	1.28
Large size	0.54	0.72	0.73	0.73	0.78	0.81	0.83	0.96	1.03	1.36
	Panel E. Average beta									
Small size	0.67	0.86	0.94	1.03	1.08	1.16	1.26	1.28	1.38	1.63
2	0.65	0.75	0.87	0.97	1.02	1.16	1.20	1.32	1.40	1.60
3	0.58	0.68	0.76	0.92	1.03	1.09	1.26	1.47	1.57	1.50
4	0.50	0.60	0.75	0.89	0.97	1.09	1.15	1.41	1.69	1.95
Large size	0.33	0.48	0.71	0.80	0.98	1.02	1.20	1.57	1.47	1.31
	Panel F. Average idiosyncratic volatility of stocks (in percent)									
Small size	8.50	10.3	11.4	12.3	13.1	14.1	15.2	16.8	19.0	24.2
2	7.75	9.07	10.2	11.4	12.4	13.4	14.9	16.5	18.9	23.7
3	7.42	8.61	9.73	10.73	12.3	13.1	14.8	16.7	18.5	24.6
4	6.90	8.15	9.04	10.47	11.7	13.3	15.2	16.9	19.6	24.1
Large size	6.33	7.43	8.44	9.62	10.9	12.8	14.6	16.7	18.8	24.6

* - statistically significant at 1% confidence level
** - statistically significant at 5% confidence level
*** - statistically significant at 10% confidence level

5.4.2 Analysis of the BM Effect

Table 9 contains the characteristics of portfolios sorted on the basis of probability of default and BM. Panel A shows that the BM effect in the whole sample is strongly significant (0.92% per month or 11.04% per year, t=3.57). The BM effect exists in almost every BSM group except the two lowest and the highest BSM deciles. This effect is statistically significant both for non-distressed and distressed stocks. However, the strongest BM effect is present among moderately distressed firms with BSM between 0.05 and 0.1 and in the lower bound within the highest BSM quintile.

Panel B demonstrates that the probability of default increases continuously among BSM deciles. However, the variation in BSM among the BM quintiles is weak. The probability of default varies substantially only within the highest BSM decile, but the return differential among BM quintiles there is low and statistically insignificant. Therefore, I reject the hypothesis (H01) that high BM stocks outperform low BM stocks because of the higher risk of financial distress. The BM effect seems to be independent of my measure of financial distress. Agarwal and Taffler (2006), Agarwal and Poshakwale (2006) obtained the same results conducting research on the UK market measuring financial distress by means of the Z-Score. They conclude that the BM effect is orthogonal to the distress risk.

Panel C reports the average BM ratio across BSM deciles and BM quintiles. Comparing these results with information from Panel A, it can be seen that high BM companies consistently outperform low BM firms. There is a large variation in BM ratios within the BSM deciles. At the same time, the higher distress risk is, the higher the difference in BM within BM quintiles is. The average BM in the low BM quintile of the non-distressed companies is almost seven times lower than in the high BM quintile. Among distressed companies, this difference is more than nine times larger. Hence, even if BM is not a distress risk effect, it still should be related to distress risk.

There is an inverse relation between BM and size (this information is represented in Panel D). Both across BSM portfolios and among BM quintiles smaller stocks have higher BM ratios. The smallest stocks are located in the highest BSM decile, which earns the highest average returns but has no significant return differential across BM quintiles. Thus, the size effect of the smallest stocks within the smallest size quintile can be confirmed also by sorting stocks into portfolios based on different portfolio characteristics.

Table 9: BSM-BM Portfolio Characteristics

The table reports the average equally-weighted return, BSM, size, book-to-market, beta, and idiosyncratic volatility for the 50 BSM-BM sorted portfolios over the sample period from July 1980 to December 2004. Each June the stocks of the companies listed at the NYSE/NASDAQ/AMEX are first independently sorted into ten portfolios based on their latest available BSM probability. Then within each BSM-portfolio securities are sorted into five BM portfolios based on their book value and market capitalization available at the end of December of the previous calendar year. The six-month lag prevents the bias associated with reporting delays. Since most of the NASDAQ stocks are growth stocks with low BM, I use only NYSE stocks for the BM breakpoints. Portfolios are rebalanced once a year. High – Low is the return difference between the highest and the lowest BM portfolio within each BSM decile. T-statistics are corrected for heteroscedasticity and autocorrelation up to four lags by means of the Newey-West estimator.

	Low BSM	2	3	4	5	6	7	8	9	High BSM
	Panel A. Average equally-weighted return (in percent)									
Low BM	0.98	0.94	0.92	0.80	0.76	0.51	0.58	0.83	0.86	2.12
2	1.26	1.35	1.12	1.28	1.10	1.20	1.22	1.22	1.53	2.40
3	1.24	1.30	1.33	1.33	1.33	1.53	1.48	1.71	1.87	2.63
4	1.32	1.39	1.33	1.55	1.55	1.47	1.54	1.58	1.83	2.46
High BM	1.30	1.41	1.58	1.58	1.49	1.63	1.81	1.58	2.12	2.70
High - Low	0.32	0.47	0.66	0.78	0.73	1.12	1.23	0.75	1.26	0.58
t-value	(1.21)	(1.40)	(2.17)**	(2.16)**	(1.94)*	(3.38)***	(2.84)***	(1.82)*	(3.20)***	(1.00)
	Panel B. Average BSM									
Low BM	0.0007	0.0013	0.0026	0.0056	0.0116	0.0176	0.0335	0.0636	0.1317	0.2926
2	0.0002	0.0008	0.0013	0.0033	0.0072	0.0136	0.0294	0.0595	0.1282	0.3077
3	0.0001	0.0004	0.0010	0.0027	0.0061	0.0131	0.0242	0.0581	0.1222	0.3067
4	0.0001	0.0008	0.0010	0.0021	0.0061	0.0123	0.0272	0.0528	0.1233	0.3133
High BM	0.0004	0.0006	0.0034	0.0033	0.0060	0.0129	0.0274	0.0550	0.1227	0.3428
	Panel C. Average BM									
Low BM	0.19	0.22	0.23	0.23	0.24	0.24	0.23	0.24	0.23	0.22
2	0.38	0.43	0.46	0.48	0.50	0.51	0.52	0.53	0.54	0.54
3	0.58	0.63	0.67	0.71	0.74	0.77	0.80	0.82	0.85	0.87
4	0.86	0.89	0.93	0.97	1.03	1.09	1.14	1.19	1.25	1.31
High BM	1.33	1.43	1.49	1.57	1.64	1.76	1.90	2.05	2.32	2.70
	Panel D. Average size (MM$)									
Low BM	3,578	2,244	1,537	1,038	675	490	305	170	109	62
2	2,970	2,564	1,856	1,203	748	503	304	201	76	46
3	1,904	2,011	1,527	1,085	614	486	266	145	65	40
4	1,496	2,060	1,429	940	696	436	233	133	69	29
High BM	1,844	2,394	1,756	1,035	695	386	253	164	85	45
	Panel E. Average beta									
Low BM	0.84	1.09	1.24	1.32	1.42	1.45	1.58	1.62	1.60	1.67
2	0.64	0.83	0.94	1.07	1.18	1.29	1.33	1.42	1.48	1.63
3	0.58	0.69	0.81	0.89	0.99	1.12	1.19	1.30	1.36	1.46
4	0.40	0.55	0.68	0.79	0.89	1.01	1.09	1.19	1.25	1.39
High BM	0.30	0.42	0.57	0.69	0.79	0.88	0.96	1.07	1.16	1.43
	Panel F. Average idiosyncratic volatility of stocks (in percent)									
Low BM	10.01	12.4	13.9	15.4	16.5	17.8	19.5	21.5	23.6	28.1
2	7.90	9.32	10.6	11.8	13.1	14.6	15.7	17.9	20.4	25.2
3	7.17	8.15	9.41	10.41	11.4	12.8	14.2	16.1	18.4	23.6
4	6.35	7.40	8.41	9.53	10.7	11.9	13.5	15.3	17.5	22.9
High BM	5.87	6.93	8.19	9.18	10.4	11.8	12.7	14.7	17.2	23.3

*** - statistically significant at 1% confidence level

** - statistically significant at 5% confidence level

* - statistically significant at 10% confidence level

The beta and the idiosyncratic volatility monotonically decrease with increasing BM and have a linear relation to the distress risk. This is consistent with the correlations in the Table 6. Distress stocks have higher beta and idiosyncratic volatility than sound companies. Distressed firms in the low BM quintile have higher beta and idiosyncratic volatility than distressed stocks with high BM.

Analyzing the BM effect in distressed portfolios, I did not find statistically significant evidence that BM is a distress risk effect. The highest BSM decile experience large variations in default risk among BM quintiles. However, the effect of BM in this decile is weak; the difference in the return between the value and the growth stocks is low and statistically insignificant (0.58% per month, t-value =1.0). A possible explanation for the BM effect is that it is independent of the risk of default.

5.4.3 Analysis of the Idiosyncratic Volatility

Table 10 demonstrates the idiosyncratic volatility effect controlled for the probability of default. Sorted based on idiosyncratic volatility, both sound and moderately distressed stocks with high idiosyncratic risk underperform distressed stocks with high sigma. Consistent with rational asset pricing, idiosyncratic risk is not rewarded by higher returns (the return differential of sound and moderately distressed companies is even negative, but statistically insignificant).

It is noticeable that only in the deciles with severely distressed stocks (BSM deciles 8, 9, and 10) is the risk premium positive. However, the idiosyncratic volatility effect exists only in the highest BSM decile, where the difference in returns is not only positive (0.85% per month or 10.2% per year) but also statistically significant. In previous sorts there was a strong variation in the distress risk among size quintiles suggesting that size is related to the distress risk. The deviation in BSM among sigma quintiles is very low and is almost zero in the highest BSM quintile. At the same time, idiosyncratic volatility monotonically increases with an increasing probability of default. On average, the firm-specific risk in the lowest BSM decile is almost three times lower than in the highest BSM decile. Idiosyncratic volatility also varies across sigma quintiles, showing that highly distressed companies tend to have the highest idiosyncratic volatility.

The close to zero variation in probability of default in the highest BSM quintile accompanied by a high variation in the idiosyncratic volatility and a statistically significant difference in returns in this BSM decile leads to the question of whether idiosyncratic volatility is a distress risk effect. Since idiosyncratic volatility does not cause a meaningful variation in the probability of default, I would suggest that the idiosyncratic risk effect exists only conditional on a very high probability of financial distress.

The idiosyncratic effect is negatively related to the size and positively related to the BM: across sigma quintiles, low sigma portfolios are larger and have a lower BM ratio. Beta increases monotonically both across BSM deciles and among sigma quintiles supporting the observation that stocks approaching default experience a substantial increase in total volatility.

Unlike the presence of the size and the BM effect, I cannot confirm that the idiosyncratic volatility is directly related to distress risk. High sigma firms, on average, underperform low sigma companies, but the difference is not statistically significant. The idiosyncratic volatility is closely related to the distress risk. It also has one of the highest positive correlations with BSM compared to the other variables. However, usually it is not rewarded by the market.

A possible explanation of the idiosyncratic risk puzzle is that it exists conditional on a high probability of default. If a high proportion of firm-specific risk is not diversifiable anymore, the market may grant investors higher returns for bearing this risk. I cannot reject the H_0[1] that stocks with high idiosyncratic volatility will outperform stocks with low idiosyncratic volatility.

Another way to analyze the relation between distress risk and size, BM, and idiosyncratic volatility is to reverse the sorting order and to investigate whether distress risk prevails in the presence of these three effects. The results of this experiment are reported in the next section.

5.4.4 Analysis of the Distress Risk Effect

I repeat the same exercise for portfolios sorted on size, BM, and idiosyncratic volatility in order to answer the question of how high the distress risk premium is dependent on these three characteristics of the portfolios and whether there is a discrepancy in pricing stocks with different intensity of financial distress.

Table 11 contains two-way portfolio sorts on size and probability of default. Similar to the results obtained by ranking portfolios on BSM and then sorting securities into size quintiles, a positive and statistically significant distress risk premium exists only within the smallest size quintile. Severely distressed companies in this size quintile outperform sound firms with low probability of default by 1.46% per month (or 17.52% p.a., t-value = 2.90). In all other quintiles, both of medium and large size, the return differential between high and low distress risk portfolios is negative and statistically insignificant. Therefore, reverse sorting confirms the hypothesis that only severely distressed companies of smaller size are able to earn returns higher than the returns of low risk firms.

Table 10: BSM-Idiosyncratic Volatility Portfolio Characteristics

The table reports the average equally-weighted return, BSM, size, book-to-market, beta, and idiosyncratic volatility for the 50 BSM-Sigma (idiosyncratic volatility) sorted portfolios over the sample period from July 1980 to December 2004. Each June stocks of the companies listed at the NYSE/NASDAQ/AMEX are first independently sorted into ten portfolios based on their latest available BSM probability. Then within each BSM-portfolio securities are sorted into five sigma portfolios based on their idiosyncratic volatility estimated from the market model with an equally-weighted CRSP market index. Portfolios are rebalanced once a year. High – Low is the return difference between the return of the portfolio with the highest idiosyncratic volatility and the return of the portfolio with the lowest idiosyncratic volatility. T-statistics are corrected for heteroscedasticity and autocorrelation up to four lags by means of the Newey-West estimator.

	Low BSM	2	3	4	5	6	7	8	9	High BSM
	Panel A. Average equally-weighted return (in percent)									
Low Sigma	1.24	1.36	1.39	1.44	1.37	1.37	1.24	1.33	1.62	1.86
2	1.31	1.31	1.42	1.30	1.46	1.48	1.58	1.43	1.69	2.60
3	1.29	1.32	1.32	1.32	1.15	1.36	1.39	1.45	1.69	2.41
4	1.16	1.24	1.11	1.18	1.15	1.39	1.28	1.43	1.89	2.63
High Sigma	0.78	1.02	0.69	1.04	1.00	0.81	1.17	1.43	1.65	2.71
High - Low	*-0.45*	*-0.34*	*-0.70*	*-0.40*	*-0.36*	*-0.55*	*-0.07*	*0.10*	*0.03*	*0.85*
t-value	*(-1.18)*	*(-0.84)*	*(-1.72)*	*(-0.92)*	*(-0.90)*	*(-1.48)*	*(-0.16)*	*(0.21)*	*(0.07)*	*(1.66)**
	Panel B. Average BSM									
Low Sigma	0.0002	0.0003	0.0019	0.0019	0.0057	0.0143	0.0267	0.0542	0.1241	0.3133
2	0.0002	0.0006	0.0030	0.0030	0.0057	0.0127	0.0243	0.0538	0.1257	0.3180
3	0.0002	0.0006	0.0028	0.0028	0.0061	0.0116	0.0273	0.0573	0.1273	0.3276
4	0.0003	0.0009	0.0034	0.0034	0.0077	0.0140	0.0279	0.0605	0.1211	0.3162
High Sigma	0.0010	0.0015	0.0060	0.0060	0.0119	0.0171	0.0338	0.0592	0.1287	0.3104
	Panel C. Average idiosyncratic volatility of stocks (in percent)									
Low Sigma	4.94	5.73	6.43	7.06	7.96	8.74	9.52	10.71	12.23	15.12
2	6.03	7.01	7.93	8.85	9.67	10.81	11.96	13.29	15.23	18.57
3	7.41	8.46	9.47	10.50	11.45	12.44	13.78	15.29	17.64	21.36
4	9.14	10.60	11.62	12.64	13.65	14.92	15.90	17.81	20.27	25.13
High Sigma	13.75	15.59	17.12	18.27	19.36	20.55	22.06	23.88	26.78	33.86
	Panel D. Average size (MM$)									
Low Sigma	2,966	3,217	2,070	1,260	781	383	222	126	56	21
2	3,435	3,263	2,222	1,464	915	535	289	210	60	35
3	2,525	2,172	1,752	1,192	716	497	296	168	86	49
4	1,864	1,412	1,284	899	633	494	296	170	100	51
High Sigma	1,061	820	599	452	310	315	234	126	88	40
	Panel E. Average BM									
Low Sigma	0.91	0.93	0.96	0.99	1.07	1.12	1.25	1.29	1.38	1.52
2	0.69	0.76	0.83	0.86	0.91	1.00	1.02	1.16	1.27	1.48
3	0.53	0.61	0.68	0.72	0.80	0.87	0.93	1.02	1.13	1.41
4	0.46	0.53	0.55	0.60	0.66	0.74	0.79	0.88	1.07	1.32
High Sigma	0.32	0.33	0.37	0.43	0.47	0.53	0.56	0.67	0.80	1.12
	Panel F. Average beta									
Low Sigma	0.30	0.45	0.57	0.63	0.70	0.78	0.81	0.87	0.92	1.02
2	0.44	0.57	0.69	0.79	0.87	0.95	1.03	1.13	1.17	1.27
3	0.58	0.70	0.80	0.92	1.00	1.08	1.18	1.27	1.31	1.37
4	0.74	0.90	1.00	1.05	1.18	1.23	1.28	1.37	1.45	1.58
High Sigma	1.05	1.25	1.37	1.44	1.50	1.55	1.63	1.65	1.69	1.89

* - statistically significant at 10% confidence level

Panel B of Table 11 provides additional evidence on the distress risk puzzle and its relation to the size effect. Independent of size sorts, all portfolios in the high BSM decile have a considerably higher probability of default than low BSM portfolios. The size effect is strongly related to distress risk. According to the data in Panel B and Panel C, larger companies in the highest BSM decile are almost five times less distressed than the smaller stocks which have a high risk of default (medium and large firms, on average, have only moderate probability of default within the next 12 months).

Vassalou and Xing (2004) suggest that a positive distress risk premium for smaller size implies that distress risk is non-diversifiable and, as a consequence, systematic. It is empirically proven that smaller companies with higher risk have lower chances to recover from distress than large corporations.[367] Therefore, investors require a higher premium for holding stocks of such firms. However, following from Panel F, small stocks with high probability of default also have high idiosyncratic volatility. Surprisingly, the highest idiosyncratic volatility exists among the smallest firms.

Thus, the reverse sorting confirms not only the relation between distress risk and size, but also the fact that severely distressed companies, which are able to earn higher returns compared to low-risk firms, have a high proportion of non-diversifiable idiosyncratic volatility. My results are consistent with those of Malkiel and Xu (1997) and Dempsey et al. (2001), who have found that small firms with high idiosyncratic volatility are riskier than stocks of large companies with low idiosyncratic volatility. A possible explanation of the distress risk premium of the smallest stocks with high idiosyncratic volatility can be that the non-diversified part of the idiosyncratic volatility will be treated as a systematic effect by the market. Investors holding such stocks will require a higher risk premium compared to other securities, and, thus, this will be reflected in equity returns.

Vassalou and Xing (2004) also report that small stocks as an asset class are not homogenous with respect to their default characteristics and returns. In my research, moderately distressed small stocks have portfolio characteristics similar to sound small companies. The moderately distressed companies earn only slightly higher returns than sound small stocks, have a BM similar to the BM of the sound companies, and a slightly higher beta and idiosyncratic volatility. In the case of highly distressed stocks, already the BSM varies between 0.0637 and 0.3453, which is on average about seven times higher than the average probability of default of moderately distressed stocks.

[367] Moulton and Thomas (1993), Hotchkiss (1995).

Table 11: Distress Effect in Size Portfolios

The table reports the average equally-weighted return, BSM, size, book-to-market, beta, and idiosyncratic volatility for the 50 Size-BSM sorted portfolios over the sample period from July 1980 to December 2004. Each June stocks of the companies listed at the NYSE/NASDAQ/AMEX are first independently sorted on their size into five portfolios. Then within each size-quintile securities are sorted into ten BSM portfolios based on their lates available probability of default. Portfolios are rebalanced once a year. 1st is the lowest BSM decile, 10th is the highest BSM decile. High – Low is the return difference between the return of the portfolio with the highest and with the lowest probability of default within the same size quintile. T-statistics are corrected for heteroscedasticity and autocorrelation up to four lags by means of the Newey-West estimator.

	1	2	3	4	5	6	7	8	9	10	High-Low	t-value
	Panel A. Average equally-weighted return (in percent)											
Small Size	1.200	1.347	1.458	1.384	1.340	1.615	1.740	1.837	1.899	2.667	1.467	(2.90)***
2	1.242	1.348	1.391	1.159	1.210	1.201	1.236	1.128	1.214	0.606	-0.635	(-1.32)
3	1.282	1.317	1.202	1.322	1.343	1.362	1.140	1.148	1.029	0.899	-0.383	(-0.80)
4	1.217	1.392	1.355	1.391	1.400	1.313	1.228	1.076	1.301	1.187	-0.029	(0.09)
Big Size	1.314	1.215	1.402	1.175	1.264	1.194	1.107	0.928	0.915	1.313	-0.001	(0.27)
	Panel B. Average BSM											
Small Size	0.0016	0.0036	0.0077	0.0141	0.0237	0.0402	0.0637	0.1043	0.1804	0.3453		
2	0.0007	0.0012	0.0022	0.0035	0.0057	0.0077	0.0088	0.0139	0.0274	0.0794		
3	0.0002	0.0008	0.0009	0.0014	0.0023	0.0033	0.0050	0.0074	0.0162	0.0536		
4	0.0005	0.0002	0.0007	0.0009	0.0005	0.0015	0.0032	0.0036	0.0101	0.0382		
Big Size	0.0000	0.0002	0.0004	0.0005	0.0004	0.0008	0.0019	0.0025	0.0076	0.0227		
	Panel C. Average size (MM$)											
Small Size	72	72	67	62	56	50	43	41	35	32		
2	282	284	288	286	292	291	285	286	284	287		
3	668	696	680	686	673	685	681	669	681	676		
4	1,608	1,697	1,711	1,688	1,713	1,706	1,706	1,696	1,656	1,752		
Big Size	8,114	8,174	8,355	8,317	8,318	8,516	8,387	7,355	6,763	6,091		
	Panel D. Average BM											
Small Size	0.80	0.82	0.84	0.91	0.97	0.99	1.05	1.08	1.11	1.16		
2	0.55	0.60	0.64	0.69	0.73	0.76	0.78	0.81	0.86	0.98		
3	0.50	0.59	0.62	0.62	0.65	0.68	0.72	0.77	0.81	0.88		
4	0.47	0.57	0.61	0.61	0.63	0.67	0.70	0.77	0.77	0.93		
Big Size	0.48	0.60	0.68	0.74	0.70	0.72	0.74	0.75	0.78	0.76		
	Panel E. Average beta											
Small Size	0.69	0.88	0.98	1.04	1.11	1.18	1.21	1.28	1.35	1.54		
2	0.79	0.92	0.99	1.02	1.05	1.15	1.19	1.21	1.35	1.59		
3	0.71	0.71	0.78	0.87	0.93	0.94	1.04	1.15	1.27	1.55		
4	0.66	0.60	0.63	0.74	0.76	0.82	0.94	1.01	1.20	1.40		
Big Size	0.42	0.47	0.52	0.61	0.67	0.73	0.81	0.92	1.02	1.20		
	Panel F. Average idiosyncratic volatility of stocks (in percent)											
Small Size	9.93	12.0	13.2	13.9	14.8	15.9	17.2	18.6	20.6	24.8		
2	9.29	10.4	10.9	11.3	11.6	12.2	12.4	13.1	14.2	16.8		
3	8.26	8.53	9.04	9.57	9.91	10.2	11.1	11.7	12.9	15.6		
4	7.50	7.60	7.96	8.30	8.60	9.07	9.79	10.2	11.4	13.8		
Big Size	6.50	6.53	7.02	7.24	7.45	7.73	8.32	8.96	9.72	11.4		

*** - statistically significant at 1% confidence level

Three main conclusions can be drawn from Table 11. First, high distress risk is rewarded only for the smallest firms with the highest probability of default, a high BM ratio, high beta, and high idiosyncratic volatility. Second, the negative correlation between size and idiosyncratic volatility as well as its high proportion among the smallest firms support the idea that idiosyncratic volatility can serve as systematic risk and will be rewarded. And third, since size is clearly related to distress risk, it is correct to use it as a proxy for systematic risk.

Table 12 describes the distress risk effect in BM portfolios. The presence of the BM effect is already visible in Panel A. High BM stocks have higher average returns than securities in the lower BM quintiles. In the whole sample, the distress premium is 1.14% per month (13.68% a year, t-value = 2.0). However, within BM groups, the distress risk premium seems to be present only in the upper quintiles, and only in the highest quintile does it seem to be related to the BM. The return differential between small value stocks with the highest probability of default and the highest BM and value stocks with lower distress risk is positive, 1.30% per month (15.60% per annum, t-value = 2.04). This finding supports the conclusions drawn from Table 11 that size, BM, and default risk are related, and that this relation is strong in the highest BSM decile.

Results from the Table 12 help to better understand the BM effect from the Table 9. Despite the fact that small growth stocks in the medium BM quintiles do not experience any substantial variation in the BM among BSM deciles, they still earn higher returns than bigger growth stocks. Their BM ratios are constantly low, independent of the probability of default. There are several reasons why small low BM firms are able to earn higher returns. First, the default risk premium among small growth stocks may be related to high proportions of idiosyncratic volatility (see Panel F of Table 12). Many of these companies are young, small NASDAQ high-tech firms with a relatively small book value, but large amounts of entrepreneurial firm-specific risks. Second, low BM quintiles may experience some interaction between size and BM, which causes variability in stock returns. Third, Akgun and Gibson (2001) suggest that BM and size may be related to two coherent effects: default risk and recovery risk, which can be barely separated from each other. If the default risk increases, the BM ratio increases as well, leading to a premium for holding stocks with high distress risk. Due to the size effect, small growth stocks usually have a higher probability of default than larger stocks, which will increase the risk of recovery in case of default. Small growth stocks operate under rapid technological change and have substantially less fixed assets which they can use for the resolution of financial distress than value companies. Therefore, the higher returns for small low BM firms can be seen as a compensation for higher recovery risk. And fi-

nally, Campbell et al. (2006) explain a wide spread in BM by different factors driving firms into bankruptcy. Some companies go bankrupt after realized losses have driven down their book values relative to market values, whereas others default after bad news about future prospects has driven down market values relative to book values.[368]

Briefly summarized, the reverse sorting brings clarity about the distress risk effect and its relation to the BM. The analysis shows that the BM effect exists only in the highest BM quintile with the highest probability of default and the lowest size. However, unlike the BM hypothesis, low BM portfolios with high probability of default also earn higher returns. A possible explanation is that distress risk is not homogenous (systematic) in nature as it has been hypothesized earlier. Low BM growth stocks may have a higher proportion of residual idiosyncratic volatility which will be rewarded by the market. The assumption that distress risk is heterogeneous and consists both of the systematic and the idiosyncratic component would explain why low BM stocks with higher risk have higher returns. On the other side, low BM growth stocks with high probability of default may be subject to recovery risk, which can hardly be separated from distress risk. For low BM stocks the chances to recover will be much lower, since high BM firms have more assets for the restructuring. Therefore, investors will require a premium for holding distressed low BM growth stocks in their portfolios.

[368] Campbell et al. (2006, 9).

Table 12: Distress Effect in BM Portfolios

The table reports the average equally-weighted return, BSM, size, book-to-market, beta, and idiosyncratic volatility for the 50 BM-BSM sorted portfolios over the sample period from July 1980 to December 2004. Each June the stocks of the companies listed at the NYSE/NASDAQ/AMEX are first independently sorted into 5 BM portfolios based on their book value and market capitalization available at the end of December of the previous calendar year. The six-month lag allows preventing bias associated with reporting delays. Since most of the NASDAQ stocks are growth stocks with low BM, I use only NYSE stocks for the BM breakpoints. Then within each BM quintile portfolios are sorted into deciles based on their latest available BSM probability. 1st is the lowest BSM decile, 10th is the highest BSM decile. Portfolios are rebalanced once a year. High – Low is the return difference between the return on the highest and the lowest BSM portfolio within each BM quintile. T-statistics are corrected for heteroscedasticity and autocorrelation up to four lags by means of the Newey-West estimator.

	1	2	3	4	5	6	7	8	9	10	High-Low	t-value
	Panel A. Average equally-weighted return (in percent)											
Low BM	1.10	1.05	0.91	0.70	0.58	0.68	0.49	0.62	0.94	2.03	0.93	(1.15)
2	1.25	1.15	1.18	1.13	1.07	1.17	1.05	0.74	1.16	1.76	0.52	(0.86)
3	1.22	1.42	1.36	1.21	1.46	1.36	1.30	1.64	1.79	2.57	1.35	(2.21)**
4	1.26	1.37	1.51	1.39	1.49	1.54	1.54	1.60	1.75	2.30	1.04	(1.73)*
High BM	1.35	1.62	1.65	1.69	1.75	1.74	1.99	1.78	2.36	2.65	1.30	(2.04)**
	Panel B. Average BSM											
Low BM	0.001	0.001	0.002	0.003	0.006	0.013	0.024	0.050	0.102	0.252		
2	0.000	0.001	0.001	0.002	0.004	0.009	0.020	0.042	0.100	0.274		
3	0.000	0.001	0.001	0.002	0.005	0.010	0.020	0.039	0.102	0.274		
4	0.000	0.001	0.002	0.004	0.009	0.013	0.023	0.048	0.101	0.277		
High BM	0.002	0.003	0.005	0.010	0.018	0.029	0.047	0.081	0.153	0.350		
	Panel C. Average size (MM$)											
Low BM	3,639	3,034	1,974	1,765	1,181	742	474	246	138	60		
2	2,633	2,696	2,146	1,684	1,240	735	497	271	128	44		
3	1,477	2,044	1,642	1,310	908	603	381	299	142	46		
4	1,685	1,742	1,289	916	688	485	332	210	136	38		
High BM	2,040	1,969	924	590	344	271	134	103	65	44		
	Panel D. Average BM											
Low BM	0.21	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.19	0.18		
2	0.42	0.42	0.42	0.43	0.43	0.42	0.42	0.42	0.43	0.42		
3	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.67	0.67		
4	0.99	0.98	0.98	0.97	0.98	0.98	0.98	0.99	0.98	0.99		
High BM	1.59	1.67	1.66	1.72	1.72	1.79	1.80	1.91	1.99	2.19		
	Panel E. Average beta											
Low BM	0.80	1.00	1.15	1.31	1.32	1.43	1.50	1.58	1.64	1.70		
2	0.63	0.80	0.91	0.99	1.10	1.25	1.33	1.40	1.44	1.60		
3	0.54	0.68	0.78	0.88	0.98	1.09	1.19	1.29	1.37	1.55		
4	0.35	0.54	0.70	0.80	0.88	0.96	1.12	1.19	1.24	1.42		
High BM	0.33	0.49	0.67	0.73	0.82	0.93	1.00	1.10	1.23	1.41		
	Panel F. Average idiosyncratic volatility of stocks (in percent)											
Low BM	9.45	11.4	13.2	14.4	15.8	17.2	18.5	20.8	23.1	27.1		
2	7.58	8.9	10.2	11.1	12.3	13.8	15.2	16.9	19.6	24.5		
3	6.97	8.13	9.09	9.98	11.11	12.5	13.7	15.5	17.8	23.1		
4	6.20	7.54	8.79	9.68	10.70	12.00	13.09	14.9	16.8	22.0		
High BM	6.38	7.85	9.39	10.69	11.43	12.57	13.89	15.56	18.28	23.5		

** - statistically significant at 5% confidence level

* - statistically significant at 10% confidence level

Table 13 shed light on the existence of the distress risk effect in the presence of idiosyncratic volatility. Very few companies with low idiosyncratic volatility are highly financially distressed in the sample. The number of financially distressed companies increases monotonically with rising idiosyncratic volatility.

Panel A of Table 13 shows that only portfolios with the highest idiosyncratic volatility and the highest risk of failure generate superior returns. The distress risk premium is strongly related to idiosyncratic volatility: it is present in the two upper sigma quintiles with the highest probability of default. The portfolio with the highest idiosyncratic volatility (29.3%) and the highest probability of default (0.396) posts significantly higher average returns. The return differential is 2.21% per month or 26.52% per year and statistically highly significant (t-value = 4.38). Similar results are found when the whole sample is used. The mean difference in return between the highest and the lowest distress risk portfolio is positive (1.05% per month or 12.6% per year, t-value = 2.89). Results from Table 10 and Table 13 show that distress risk prevails over idiosyncratic volatility. This is consistent with Chen and Cholette (2006), who suggest that idiosyncratic volatility does not subsume the distress risk effect. The idiosyncratic risk effect exists conditional on the high probability of default.

Panel E of Table 13 provides information on the size of the companies. Size monotonically decreases with increasing idiosyncratic volatility and probability of default. Distress risk is rewarded only in the smallest portfolios with the highest idiosyncratic volatility. This observation is consistent with findings by Dimpsey, Drew, and Veeraraghavan (2002). They challenge the efficient market hypothesis framework and suggest that not only holding assets with systematic risk is rewarded by the market. Investors should be also compensated for the non-market correlated risk contained in portfolios of small stocks with high idiosyncratic volatility.

Looking at Panel F of Table 13 I did not find any support for the hypothesis that small financially distressed firms with low BM earn higher returns because of their exposure to high idiosyncratic risk. Most of the low BM stocks have low or moderate probability of default in the sigma portfolios, whereas highly financially distressed stocks have high BM. Beta is not related to the distress risk in the sigma portfolios. Its variation among the BSM deciles is insignificant.

Table 13: Distress Effect in Sigma Portfolios

The table reports the average equally-weighted return, BSM, size, book-to-market, beta, and idiosyncratic volatility for the 50 Sigma-BSM sorted portfolios over the sample period from July 1980 to December 2004. Each June the stocks of the companies listed at the NYSE/NASDAQ/AMEX are first independently sorted into five Sigma portfolios based on their idiosyncratic volatility estimated from the market model with an equally-weighted CRSP market index. Within each sigma quintile securities are sorted into 10 portfolios based on their latest available BSM probability. Portfolios are rebalanced once a year. 1st is the lowest BSM decile, 10th is the highest BSM decile. High – Low is the return difference between the return of the portfolio with the highest probability of default and the return of the portfolio with the lowest default probability within the same sigma quintile. T-statistics are corrected for heteroscedasticity and autocorrelation up to four lags by means of the Newey-West estimator.

	1	2	3	4	5	6	7	8	9	10	High-Low	t-value
	Panel A. Average equally-weighted return (in percent)											
Low Sigma	1.13	1.21	1.32	1.27	1.57	1.24	1.25	0.60	0.85	1.00	-0.13	(-0.05)
2	1.17	1.21	1.31	1.20	1.30	1.06	1.31	1.32	1.46	1.71	0.54	(1.59)
3	1.15	1.40	1.38	1.27	1.31	1.32	1.40	1.20	1.31	1.55	0.40	(1.20)
4	0.83	1.19	1.07	1.36	1.28	1.50	1.43	1.71	1.36	1.97	1.13	(2.33)**
High Sigma	0.41	0.80	0.87	0.70	1.13	1.38	1.80	1.61	2.10	2.61	2.21	(4.38)***
	Panel B. Average BSM											
Low Sigma	0.000	0.000	0.001	0.001	0.002	0.006	0.012	0.018	0.046	0.149		
2	0.000	0.001	0.001	0.001	0.003	0.006	0.010	0.019	0.037	0.103		
3	0.001	0.002	0.003	0.006	0.010	0.016	0.023	0.043	0.071	0.180		
4	0.002	0.004	0.009	0.015	0.022	0.039	0.056	0.087	0.151	0.270		
High Sigma	0.003	0.009	0.018	0.029	0.045	0.069	0.099	0.148	0.231	0.396		
	Panel C. Average idiosyncratic volatility of stocks (in percent)											
Low Sigma	5.14	5.35	5.49	5.68	5.88	5.99	6.21	6.36	6.91	7.34		
2	7.57	7.73	7.81	7.92	8.08	8.34	8.50	8.94	9.18	9.80		
3	11.0	11.1	11.3	11.4	11.5	11.7	11.8	12.2	12.4	13.4		
4	14.8	15.0	15.3	15.3	15.5	15.7	16.0	16.3	17.0	18.1		
High Sigma	21.2	22.1	22.8	23.1	23.5	24.1	24.8	25.4	27.3	29.3		
	Panel D. Average beta											
Low Sigma	0.31	0.30	0.40	0.42	0.48	0.49	0.36	0.44	0.37	0.37		
2	0.60	0.61	0.65	0.67	0.68	0.74	0.75	0.79	0.77	0.69		
3	0.90	0.99	0.98	0.99	1.01	1.01	1.02	1.01	1.01	0.94		
4	1.27	1.28	1.29	1.25	1.28	1.27	1.32	1.29	1.24	1.19		
High Sigma	1.48	1.60	1.64	1.62	1.71	1.65	1.62	1.62	1.68	1.67		
	Panel E. Average size ($MM)											
Low Sigma	3,163	3,413	3,082	2,854	2,352	1,910	1,000	887	361	34		
2	2,361	2,729	2,582	2,767	2,122	1,916	1,409	1,120	544	165		
3	1,326	1,202	1,026	745	821	690	579	468	299	207		
4	577	633	515	420	413	276	198	155	112	101		
High Sigma	453	275	325	223	167	117	91	73	64	61		
	Panel F. Average BM											
Low Sigma	0.80	0.88	0.87	0.95	1.00	1.02	1.05	1.20	1.27	1.40		
2	0.54	0.62	0.70	0.73	0.80	0.85	0.92	1.02	1.13	1.43		
3	0.43	0.55	0.62	0.69	0.79	0.84	0.91	1.04	1.17	1.40		
4	0.37	0.47	0.59	0.65	0.73	0.81	0.91	1.02	1.17	1.48		
High Sigma	0.29	0.42	0.50	0.52	0.60	0.67	0.86	0.91	1.06	1.47		

*** - statistically significant at 1% confidence level

** - statistically significant at 5% confidence level

To summarize, the analysis of the reversed sorts cannot reject H_0^2 that distress risk prevails over the size, BM, and idiosyncratic volatility. Controlling for size, BM, and idiosyncratic volatility, severely distressed stocks outperform non-distressed stocks. Therefore, all three effects are related to distress risk. Small stocks with a high BM and high idiosyncratic volatility are more likely to default. Preliminary tests show that distress risk is priced, but it is not homogenous in nature as earlier believed. Distress risk consists both of systematic and unsystematic components. The size and the BM ratio can be used as proxies for systematic risk, whereas idiosyncratic volatility serves as proxy for firm-specific risk, which is not correlated with the market. There is also some evidence that the non-diversifiable part of the idiosyncratic volatility in the case of financial distress is treated as systematic risk by the market, which explains why small firms with high idiosyncratic volatility earn a positive risk premium in financial distress.

5.5 Results of Regression Analysis

As already mentioned above, the purpose of this part of the empirical analysis is to test for a systematic relationship between distress risk and equity returns. Tests for a systematic relationship utilize the modified three factor model of Fama and French (1992) augmented by the direct proxy for distress risk (the probability of default BSM), and the idiosyncratic volatility (sigma). For each month from June 1980 to December 2004, I run Fama-MacBeth (1973) cross-sectional regressions of the form described in the equation (18).

Table 14 presents the results of the cross-sectional analysis. The coefficients on beta show that it is statistically significant at the 10% level (t = -1.85) if the BSM variable is present in the equation. However, this result is not robust to add other variables to the regression. The coefficient on beta becomes weaker and statistically insignificant in the five factor model. There is no evidence of any size or sigma effect. The size coefficients are indistinguishable from zero, indicating that this variable cannot explain the cross-sectional variation in stock returns. The BM effect is positively related to the stock returns: high BM stocks outperform low BM stocks by 30 basis points, which is the statistically significant difference at the 10% level (t = 1.88). The coefficients of size, sigma, and BM remain uninfluenced in the presence of the BSM variable, showing that there is no common variation between sigma, size, BM, and BSM, which is linked to stock returns.

Pettengill et al. (1995) point out that tests of the systematic relationship between risk factors and returns based on the CAPM produce biased results due to the aggregation of

positive and negative market excess return periods.[369] The problem arises from the use of realized returns as a proxy for expected returns in the models based on the Sharp-Lintner-Black CAPM proposition regarding the positive tradeoff between risk and expected returns. In the CAPM world, expected market risk premium is always positive, which does not necessarily hold for the realized market risk premium. It implies that the relationship between risk (approximated by beta) and expected returns differs from the relationship between risk and realized returns. The CAPM does not indicate what the relationship should be if the realized market return is negative.[370] According to the CAPM, high beta portfolios have higher expected returns than low beta portfolios due to higher risk. This means that there is a non-zero probability that the realized high beta portfolio returns may be less than the realized returns of the low beta portfolio; otherwise, no investor would hold the low beta portfolio. This will be the case if the realized market return is lower than the risk-free rate. Therefore, it implies a reasonable inference that the realized returns of the high-risk portfolio may be lower than the realized returns of the low risk portfolio when the market return is less than the risk-free rate.[371]

In the context of a multi-factor model, the conclusions of Pettengill et al. (1995) mean that the empirical tests of the influence of risk factors on realized excess return produce biased estimators of the risk premiums. In order to avoid this bias, a researcher should run regressions conditional on the underlying market situation. To test for a systematic, conditional relationship between risk factors and realized returns, I determine the up and down market states following the methodology of Lakonishok and Shapiro (1986). Up markets are defined as the months in which the realized market return is higher than the risk-free rate. Months in which the realized market return is lower than the risk-free rate are defined as down markets.[372] In periods with positive market risk, the premium relationship between return and systematic risk factors should be positive (except the size variable, which is inversely related to returns). In down markets, the predicted portfolio return should have a negative risk premium proportional to the risk factors (again, except the size variable which coefficient should be positive). A conditional systematic relationship is approved if the null hypothesis is rejected in favor of the alternative:

Up markets (*for each* γ_i , $i = 1 \text{ to } 5$):	*Down markets* (*for each* γ_i , $i = 1 \text{ to } 5$):
$H_0 = \overline{\gamma}_i = 0$	$H_0 = \overline{\gamma}_i = 0$
$H_1 = \overline{\gamma}_i > 0$	$H_1 = \overline{\gamma}_i < 0$

[369] Pettengill et al. (1995, 109).
[370] Morelli (2006, 3).
[371] Pettengill et al. (1995, 104).
[372] Lakonishok and Shapiro (1986, 123).

The results of the conditional regression analysis are presented in Table 15. Consistent with the hypothesis that distress risk is systematic, financially distressed stocks underperform in down markets by 9.68% (t –value = -2.51). This result is statistically significant at the 5% level. In up markets, financially distressed stocks are able to outperform healthy stocks by 9.12% (t-value = 3.77), which is statistically significant at the 1% level.

Except for the size variable, all coefficients become higher and strongly statistically significant in down markets, showing that financially distressed companies are more sensitive to bad market conditions and are hit harder in bad states of the world when market sentiment is generally pessimistic.[373] In up markets, investors are less concerned about default. As a result, distressed stocks fare better and prosper from a booming economy. This explains why financially distressed companies outperform healthy stocks in bullish markets and earn lower return in the bad state of the world: in bearish markets, investors experience a sharp increase in their risk aversion and prefer to hold a higher proportion of safer securities (e.g. government bonds) in their portfolios. My results are consistent with observations by Agarwal and Taffler (2002) that the "flight towards quality" effect explains significantly lower returns of the distressed stocks in down markets.[374]

Consistent with the distress factor hypothesis, high beta stocks have a statistically significant positive risk premium in up markets, whereas in down markets a substantial increase in systematic risk leads to a significant underperformance of distressed stocks. I confirm the findings of Pettengill et al. (1995) on the existence of a systematic relationship between beta and the realized returns in the conditional model.

Both in up and down markets, idiosyncratic volatility is statistically significant in the pricing equation. Therefore, I confirm my hypothesis that non-diversifiable risks of financially distressed companies different from market risk are priced in equity returns. In bearish markets, financially distressed firms have a large, highly statistically significant negative risk premium attributed to idiosyncratic volatility (-15.5%, t-value = -2.83, significant at the 1% level). In bullish markets, financially distressed firms have a risk premium of 10.82% attributed to idiosyncratic risk (t-value = 2.10, significant at the 5% level). Hence, non-diversifiable proportions of idiosyncratic risk by financially distressed stocks are treated by the markets as systematic and rewarded by higher returns in up markets. In down markets, idiosyncratic volatility boosts the negative effect of systematic risk on equity returns, increasing the probability of default.

[373] Compare to Pettengill et al. (2002, 133).
[374] Agarwal and Taffler (2002, 17).

Unlike the BM ratio being a systematic risk factor, the results show that a positive BM premium exists in bear markets. The risk compensation attributed to size is indistinguishably different from zero and statistically insignificant. This is inconsistent with the distress risk argument.[375]

[375] Pettengill et al. (2002), Howton and Peterson (1998) report similar results arguing against the possibility that size and BM are distress risk effects.

Table 14: Cross-Sectional Regression Results. Unconditional Model.

In June of each year from 1980 to 2004 all stocks are sorted into three groups based on their latest available probability of default. Stocks are then independently ranked on their market capitalization into three groups as well. NYSE size breakpoints are used in order to divide the whole sample into size groups and to prevent small market capitalization portfolios from being too small. Then securities are sorted into two portfolios based on their book-to-market ratio calculated at the end of December of the previous calendar year. Stocks are also independently ranked on their idiosyncratic volatility, which is estimated as a residual volatility from the market model at the end of June of each year. Finally, there are fifty-four portfolios obtained at the intersection of the probability of default, size, BM, and idiosyncratic volatility. Portfolios are rebalanced at the end of June each year.

BM is calculated as the book value of equity (the sum of the stockholders' equity plus deferred taxes plus investment tax credit excluding preferred stock) divided by the market capitalization at the end of December of the previous calendar year. Portfolio betas are the sum of slopes in the regression of the portfolio return on a previous, current, and following month's market return. Assuming that the CAPM fully describes the relation between systematic risk and return, the idiosyncratic volatility is a square root of the residual variance obtained from the above regression.

In order to avoid the influence of outliers on the results of the regressions, the smallest and the largest 1% of the observations on variables used in the regression analysis are set equal to the 1% and 99% respectively. r_{it} is the equally-weighted return on portfolio i during month t. r_{ft} is the one-month Treasury bill rate at the beginning of the month t. ln (SIZE) and ln (BM) are the natural logarithms of the average market capitalization and the average BM ratio respectively of stocks in portfolio i in June of year t. BSM is the latest available probability of default. Mean is the time-series average of the cross-sectional regression coefficients (risk premiums) estimated for each risk factor by Fama-MacBeth cross-sectional regressions running every month from July 1980 to December 2004. t-statistics are adjusted for autocorrelation by means of the Newey-West correction factor. Negative BM ratios are excluded. The last period return for stocks delisted from the stock exchange because of poor performance is the sum of return and delisting return as it is recorded in CRSP at the date of delisting. If delisting return is missing, it is set equal to -100%.

$$r_{it} - r_{ft} = \gamma_{0,t} + \gamma_{1,t} BETA_{i,t-1} + \gamma_{2,t} SIGMA_{i,t-1} + \gamma_{3,t} BSM_{i,t-1} + \gamma_{4,t} \ln\left(SIZE_{i,t-1}\right) + \gamma_{5,t} \ln\left(B/M_{i,t-1}\right) + \varepsilon_{it}$$

	γ_0	γ_1	γ_2	γ_3	γ_4	γ_5
Mean	1.03	-0.53		1.64		
T-Statistic	(3.21)	(-1.85)		(0.79)		
P-Value	(0.0015)	(0.0660)		(0.4293)		
Mean	1.43	-0.35			-0.04	0.32
T-Statistic	(2.46)	(-1.33)			(-0.63)	(2.31)
P-Value	(0.0145)	(0.1847)			(0.5280)	(0.0219)
Mean	1.05	-0.47	-0.34	1.84		
T-Statistic	(3.33)	(-1.61)	(-0.10)	(0.88)		
P-Value	(0.0010)	(0.1088)	(0.9237)	(0.3771)		
Mean	1.16	-0.43		1.34	-0.002	0.29
T-Statistic	(2.02)	(-1.73)		(0.65)	(-0.03)	(1.90)
P-Value	(0.0441)	(0.0851)		(0.5166)	(0.9771)	(0.0589)
Mean	1.00	-0.36	-0.24	1.21	0.02	0.30
T-Statistic	(1.73)	(-1.41)	(-0.06)	(0.60)	(0.26)	(1.88)
P-Value	(0.0857)	(0.1612)	(0.9499)	(0.5511)	(0.7983)	(0.0608)

Table 15: Conditional Regression Analysis for Up and Down Markets.

In June of each year from 1980 to 2004 all stocks are sorted into three groups based on their latest available probability of default. Stocks are then independently ranked on their market capitalization into three groups as well. NYSE size breakpoints are used in order to divide the whole sample into size groups and to prevent small market capitalization portfolios from being too small. Then securities are sorted into two portfolios based on their book-to-market ratio calculated at the end of December of the previous calendar year. Stocks are also independently ranked on their idiosyncratic volatility, which is estimated as a residual volatility from the market model at the end of June of each year. Finally, there are fifty-four portfolios obtained at the intersection of the probability of default, size, BM, and idiosyncratic volatility. Portfolios are rebalanced at the end of June each year.

BM is calculated as the book value of equity (the sum of the stockholders' equity plus deferred taxes plus investment tax credit excluding preferred stock) divided by the market capitalization at the end of December of the previous calendar year. Portfolio betas are the sum of slopes in the regression of the portfolio return on a previous, current, and following month's market return. Assuming that the CAPM fully describes the relation between systematic risk and return, the idiosyncratic volatility is a square root of the residual variance obtained from the above regression.

In order to avoid the influence of outliers on the results of the regressions, the smallest and the largest 1% of the observations on variables used in the regression analysis are set equal to the 1% and 99% respectively. r_{it} is the equally-weighted return on portfolio i during month t. r_{ft} is the one-month Treasury bill rate at the beginning of the month t. ln (SIZE) and ln (BM) are the natural logarithms of the average market capitalization and the average BM ratio respectively of stocks in portfolio i in June of year t. BSM is the latest available probability of default. Mean is the time-series average of the cross-sectional regression coefficients (risk premiums) estimated for each risk factor by Fama-MacBeth cross-sectional regressions running every month from July 1980 to December 2004. t-statistics are adjusted for autocorrelation by means of the Newey-West correction factor. Negative BM ratios are excluded. The last period return for stocks delisted from the stock exchange because of poor performance is the sum of return and delisting return as it is recorded in CRSP at the date of delisting. If delisting return is missing, it is set equal to -100%.

The months when the return on market index (CRSP equally-weighted index) is lower than the risk-free rate are defined as down markets. The months when the return on market index is higher than the risk-free rate are defined as up markets.

$$r_{it} - r_{ft} = \gamma_{0,t} + \gamma_{1,t} BETA_{i,t-1} + \gamma_{2,t} SIGMA_{i,t-1} + \gamma_{3,t} BSM_{i,t-1} + \gamma_{4,t} \ln\left(SIZE_{i,t-1}\right) + \gamma_{5,t} \ln\left(B/M_{i,t-1}\right) + \varepsilon_{it}$$

	γ_0	γ_1	γ_2	γ_3	γ_4	γ_5
Panel A. Return on market < Risk-free rate						
Mean	-1.45	-1.75	-15.5	-9.68	0.09	1.46
T-Statistic	(-1.95)	(-4.66)	(-2.83)	(-2.51)	(0.74)	(4.61)
P-Value	(0.0536)	(<.0001)	(0.0056)	(0.0135)	(0.4606)	(<.0001)
Panel B. Return on market > Risk-free rate						
Mean	2.77	0.66	10.82	9.12	-0.03	-0.54
T-Statistic	(3.44)	(1.91)	(2.10)	(3.77)	(-0.26)	(-2.37)
P-Value	(0.0007)	(0.0583)	(0.0376)	(0.0002)	(0.7925)	(0.0192)

5.6 Chapter Summary: Main Findings

The empirical analysis undertaken in chapter 5 provides a feasible explanation of the role of idiosyncratic volatility in pricing financially distressed stocks. Unlike previous research, this study has a number of innovations which allow obtaining new findings and extend the theoretical and empirical knowledge about financial distress:

- In my research, I use for the first time a direct measure of financial distress based on capital market information (BSM). This measure allows an assessment of sensitivity of the solvency position of a firm to the changes in the probability of default. Empirical results show that if the variation in BSM is low, which is common for sound and moderately distressed companies, there is also little change in the solvency position of the firm. A large variation in the BSM causes a shift in the solvency position to insolvency.
- For the first time, I simultaneously test the influence of systematic and idiosyncratic risk on equity returns and validate the conditional relationship between realized returns, distress risk, systematic risk, and idiosyncratic volatility.
- The results show that financial distress is not a rare event. On average, about 20% of all non-financial companies listed at the three main stock exchanges in the U.S. (NYSE/NASDAQ/AMEX) become financially distressed every year. However, only a small proportion of the distressed stocks will default. Hillegeist et al. (2004) estimate that, on average, only 1% of non-financial companies in the U.S. file for protection under Chapter 11 every year. The majority of financially distressed firms survive. This illustrates the rationale behind investment strategies in distressed securities.
- Financial distress happens both in boom periods and in recession, but due to the negative correlation of the probability of default with the business cycle, the outcome of financial distress will result in bankruptcy more often in the recession than in an upturn.
- Both time series analysis of distress risk and results from multivariate regressions show that distress risk premium is time-varying dependent on the state of the market. It is higher in up markets and lower in down markets. Thus, conditional models are more suitable for the evaluation of the relationship between distress risk factors and realized excess returns.
- Financial distress risk is asymmetric. Similarly to Agarwal and Taffler (2002), I found that it becomes more important during down markets. Up markets are dominated by a positive investment sentiment. Investors take more risks, which results in

higher returns. Distressed stocks participate in overall economic growth and market upturn and outperform sound stocks. However, during down markets, investors become more risk averse, shifting their portfolios towards safer financial instruments such as government bonds. This phenomenon, known as "flight towards quality", on the one side, and the fact that weaker firms have a higher probability of default during bad states of the market, on the other side, push returns of distressed stocks down, which results in large negative risk premiums and underperformance of distressed stocks in down markets.

- Firms which have a high probability of default tend to be small, with high BM and a high proportion of idiosyncratic volatility. However, while size and BM seem to be related to distress risk, the idiosyncratic volatility effect exists only conditional on high probability of default. Different types of portfolio sorts demonstrate that sound or moderately distressed stocks do not earn superior returns if idiosyncratic volatility is high. In contrast, the market does not reward an investor for holding high proportions of idiosyncratic volatility and even punishes him with negative returns. This does not hold for distressed stocks. Consistent with the hypothesis that distress risk is systematic, the market treats high proportions of the residual, non-diversifiable idiosyncratic volatility of distressed stocks as systematic and compensates it with higher returns. Therefore, distress risk is rationally priced by the market. This finding highlights the difference between three important definitions: market risk, idiosyncratic volatility, and systematic risk. In the context of portfolio theory, risk is systematic if it is not diversifiable. For a long time, researchers used the terms market risk and systematic risk interchangeably. The analysis of distress risk shows that not only market risk is priced in equity returns. Financially distressed stocks have large proportions of idiosyncratic volatility, which I call residual idiosyncratic volatility in terms of its non-diversifiability. This portion of idiosyncratic volatility has a huge influence on excess returns during up and down markets and therefore is seen as systematic by the market as well.

- Unlike previous research by Griffin and Lemon (2002) and Vassalou and Xing (2004), who use the portfolio formation method to analzye the size and BM effect in financially distressed stocks, I find no evidence that size and BM are distress risk effects of systematic or idiosyncratic nature. Sequential sorts show that distress risk, size, and BM are related to each other, whereas the independent sorts used in the regression analysis confirm the hypothesis of Agarwal and Taffler (2002) that size and BM are effects independent of the distress risk.

6 Conclusions and Outlook

The overall objective of this dissertation was twofold. First, the author has attempted to integrate the separate empirical observations on single distress events and the theoretical propositions in a comprehensive conceptual framework that can be used as a theoretical basis for the analysis of corporate financial distress as a dynamic process. I succeeded in identifying single distress events and assigning them to the particular phases of the developed financial distress cycle. I also described the triggers, mechanisms, and catalysts of financial distress in each phase of this process. Secondly, I performed an empirical study with a focus on the examination of the behavior, attributes, and nature of distress risk. For these purposes, I collected 1 250 433 firm-months observations representing 14 345 non-financial solvent and distressed companies listed at the NYSE/NASDAQ/AMEX during the period 1980 - 2004. The data was extracted from three main databases: COMPUSTAT North America, the database of U.S. and Canadian fundamental and market information on active and inactive publicly held companies provided by Standard & Poor's investment services; CRSP, a comprehensive collection of security price, return, and volume data of the Center for Research in Security Prices of the University of Chicago; and the Fama-French data source at Kenneth French's website at Dartmouth. Based on these extensive data, several research questions have been analyzed in the empirical part of the dissertation.

Since the traditional portfolio theory is not able to explain the return paths of financially distressed stocks, the first research question has investigated different approaches for the determination of systematic and financial distress risk in order to be able to choose a proper risk measure which would be able to explain the returns of highly financially distressed stocks. The second research question has examined whether the market is able to incorporate all available information into a single distress measure. In this respect, the distress factor hypothesis has been analyzed. For the first time, the size and the BM factors have been augmented by the idiosyncratic volatility puzzle to test which of these variables predict equity returns of distressed stocks. The third research question has asked whether it is possible to explain the impact of financial distress on the stock returns with rational asset pricing. The results obtained shed a new light on the role of idiosyncratic volatility in explaining the distress risk puzzle. The sections below summarize the overall and most important findings of this dissertation, determine the contribution of this empirical study to the research on corporate financial distress and asset pricing, and analyze the implications of this research project for academicians and practitioners.

6.1 Summary of Findings

Since I was able to contribute both to theoretical and empirical research of corporate financial distress, it is reasonable to distinguish between theoretical and empirical findings. The following advances were made on the theoretical front:

Systemizing the knowledge about financial distress, I transform the standard opinion about single distressed events into a comprehensive market-based framework in which financial distress is determined in terms of a dynamic process as a series of subsequent stages characterized by a special set of adverse financial events. I show that it is important to analyze this versatile and complex economic category broken down into single states because each of the stages has its specific attributes and therefore contributes differently to the overall process of value deterioration. Three important dimensions of the distress dynamics should be explored for understanding the coherence of the change in financial conditions with the changing financial positions of a firm. The distress dynamics should be analyzed over the time window, under consideration of the impact of different financial states (solvent versus insolvent), and taking into account the characteristic signals which appear at different distress stages and cause the transition from one phase of corporate failure to another. According to my framework, the first level of the distress cycle is strategic, when the company loses its competitive positions. As soon as the lost market shares are reflected in the first breaches in profitability, a transition occurs from the strategic level of financial distress to the operational level. Further worsening of performance leads to failure when the revenues become permanently insufficient to cover costs. An unstoppable decline in cash flows leads to cash shortage and signals that the economic failure is deteriorating to insolvency. Since the leverage continues to increase, the fall in value of the firm's assets below some lower threshold causes default and the transformation to bankruptcy. This distress framework is very simple and useful for the analysis of risk behavior and the destruction of value in the downward spiral. It explains the economic signals and their mechanics as an integral part of corporate failure.

On the empirical front, I was able to integrate the theory of financial distress into the modern asset pricing theory and to examine a particular financial distress phenomenon from the theoretical capital market perspective. I show that the recent developments in the stock markets require a revision of the traditional portfolio theory. The growth of the derivatives market segment, the appearance of complex financial instruments, and a continuously increasing risk appetite of institutional investors lead to an increase in idiosyncratic risks in the economy. These risks can be exploited in order to achieve

higher returns. Therefore, the systematic risk defined in classical portfolio theory as market risk should be redefined. My empirical research with respect to distressed stocks demonstrates that systematic risk consists of market risk and a nondiversifiable part of idiosyncratic volatility. Defined in this manner, the pricing of systematic risk can be easily explained with the rational asset pricing theory.

In my empirical study, I argue that many researchers draw wrong inferences between financial distress and risk when they analyze the relationship between realized returns, distress risk, systematic risk, and idiosyncratic volatility unconditionally. In order to avoid this bias, I test for the systematic conditional relationship between distress risk and equity returns. To do so, I extend the three factor model of Fama and French (1992) by a direct measure of financial distress basing my calculations on the modified contingent claim methodology and Merton (1974) and by adding the direct measure of idiosyncratic volatility. Unlike previous empirical studies, I test simultaneously for the relationship between distress risk, idiosyncratic volatility, and excess returns conditional on the underlying bullish or bearish state of the markets.

The results of the regression analysis validate that the markets are able to incorporate all available market information in a single distress measure. And this measure in my model is the probability of default. The markets are rational. They properly price distressed risk, which is time-varying, systematic, and asymmetric. The asymmetry of distress risk means its conditional relationship to excess returns. Distress risk becomes more important in down states of the market. During up markets, financially distressed companies prosper from the booming economy. Bullish markets are dominated by positive investor sentiment and therefore higher risk appetite. Under these favorable conditions, high distress risk leads to higher than average returns. However, in down markets, which are dominated by the increasing risk aversion of investors, the flight towards quality pushes down returns of distressed stocks, leading to large negative risk premiums.

Finally, Table 16 shows how my empirical study is related to the existing literature on financial distress and risk premium. It extends existing research and sheds light on the role of idiosyncratic volatility in pricing stocks of distressed companies.

Table 16: Empirical Studies on Distress Risk and its Pricing in Equity Returns.

Author(s)	Object of Investigation	Sample	Empirical Validation	Significant Results	Related Research
Agarwal and Taffler (2002)	Test of the dominant distress factor hypothesis: whether the financial distress factor is related to the size and B/M and whether the risk of bankruptcy is priced by the market under condition of the changing state of the economy and stock market.	2 356 non-financial UK companies fully listed on the London Stock Exchange (LSE) at any time during the period 1979-2000.	Three factor model of Fama-French (1992) augmented by Z-Score. Fama-MacBeth (1973) cross-sectional tests. Robustness check of the Z-Score effects by portfolio formation method similar to Dichev (1998).	(1) No evidence in support of the distress factor hypothesis for size and value effects in stock returns. (2)Bankruptcy risk is rationally priced by the market. (3) High beta stocks significantly outperform during up markets and economic upturns and significantly underperform in down markets and economic downturns.	Fama & MacBeth (1973), Fama & French (1993, 1995), Dichev (1998), Griffin & Lemmon (2002), Lakonishok, Schleifer & Vishny (1994), Vassalou & Xing (2004), Lang & Stulz (1992), Denis & Denis (1995)
Agarwal and Taffler (2006)	Investigation of whether distress risk is priced by the market and whether size, BM, and/or momentum proxy for distress risk in UK.	2 459 non-financial UK firms listed on LSE from 1979 to 2002.	Fama-French three factor model (1993) to test whether various portfolios earn superior returns on a risk-adjusted basis. To test for momentum the three factor model of Fama & French (1992) augmented by Z-Score and momentum is applied. The tests are based on the Fama-MacBeth (1973) methodology.	(1) Size and value premia are not related to the distress factor. (2)Distress risk is not systematic. Negative Z-Score stocks earn lower returns than sound stocks. (3) Market underreaction leads to an apparent negative risk premium on distressed stocks.	Ferguson & Shockley (2003), Fama & French (1993, 1995), Chan & Chen (1991), Daniel & Titman (1999), Griffin & Lemmon (2002), Lesmond et al. (1999)
Campbell, Hilscher, Szilagyi (2006)	Exploration of the determinants of corporate failure and of the pricing of financially distressed stocks.	The new dataset obtained from Kamakura Risk Information Services (KRIS) and containing about 800 bankruptcies, 1600 failures from 1963 through 2003.	Dynamic logit model with a new set of predictive variables to forecast bankruptcy more accurately. Portfolio formation based on the estimated probabilities of default, and analysis of average returns on distressed portfolios.	(1) Differences in accounting and market-based firm characteristics explain much of variation in failure rate. (2) Distressed stocks have high standard deviation, market beta, and loadings on Fama-French HML and SMB factors. (3) However, they have low average returns. Therefore, distress premium cannot be explained by risk.	Dichev (1998), Griffin & Lemmon (2002), Vassalou & Xing (2004), Garlappi, Shu & Yan (2006).

Dichev (1998)	Representation of the comprehensive evidence of the relation between bankruptcy risk and systematic risk.	All industrial firms available simultaneously on the NYSE/ AMEX/NASDAQ tapes and in the COMPUSTAT annual industrial and research files for the period 1981 to 1995.	The firms are ranked on probability of default using two models: the Alt-man's Z-Score (1968) and the Ohlson's O-Score (1980). Statistical tests of the significance of a distress risk measure, market size, and BM in explaining security returns by means of Fama-MacBeth regressions (1973).	(1) Bankruptcy risk is not rewarded by higher returns. Firms with high bankruptcy risk have earned significantly lower than average returns since 1980. (2) A return premium related to the bankruptcy risk cannot fully explain the B/M effect. (3) The size effect disappears in the 1980s and 1990s.	Asquith, Gertner & Scharfstein (1994), Opler & Titman (1994), Altman (1993), Fama & French (1992), Roll 1995)
Garlappi, Shu & Yan (2006)	Theoretical investigation of how default risk should affect equity returns and examination of empirical evidence on this relationship.	All non-financial firms presented simultaneously in COMPUSTAT, CRSP, and MKMV databases between 1969 and 2003.	Development of the theoretical model based on valuation models of strategic debt service, extension of the model for the shareholder bargaining power and liquidation costs. Empirical validation of equity returns and default probabilities derived within the model on true data by means of portfolio formation method and cross-sectional regression analysis.	(1) The new explanation of the relationship between default risk and equity returns based on shareholder advantage is consistent with the risk-return trade-off. (2) For a given probability of default the expected return is higher for firms whose shareholders have weak bargaining power and/or economic gains from renegotiation are low.	Dichev (1998), Griffin & Lemmon (2002), Vassalou & Xing (2004), Campbell, Hilscher & Szilagyi (2006)
Griffin and Lemmon (2002)	Examination of the relationship between BM, distress risk, and stock returns.	Nonfinancial NYSE/NASDAQ/ AMEX stocks with nonnegative book values from COMPUSTAT and monthly returns from CRSP from July 1965 to June 1996.	Formal tests of statistical significance of the value effect by application of different return sorts and across different portfolio regimes. Distress risk is proxied by Ohlson's O-Score. Time-series regressions in the spirit of Fama and French (1993) of monthly excess returns on the value-weighted market index, size (SMB) and BM (HML) factors. Mispricing hypothesis (systematic expectational errors) is examined	(1) Low average returns of firms with high distress risk and low BM are driven by poor stock performance. Low analyst coverage and information asymmetry lead to the overpricing of the low BM firms and the underpricing of the high BM firms (mispricing hypothesis) by investors who underestimate current weak fundamentals and overestimate the payoffs from future growth opportunities of currently distressed stocks. (2) The value premium is not related to	Fama & French (1993), Dichev (1998), Daniel & Titman (1997), Ferson & Harvey (1999), La Porta (1996), La Porta et al. (1997).

			by means of the analysis of abnormal stock price performance around earnings announcements.	the systematic risk.	
Outecheva (2007)	A simultaneous test of the influence of market risk and of idiosyncratic volatility on equity returns and validation of the conditional relationship between realized returns, distress risk, systematic risk, and idiosyncratic volatility. Investigation of whether distress risk is priced in equity returns and whether beta, size, BM, probability of default, and idiosyncratic volatility proxy for distress risk in the U.S.	All non-financial companies listed on the NYSE/AMEX/ NASDAQ and presented simultaneously in CRSP and COMPUSTAT databases from 1980 to 2004.	Three factor model of Fama-French (1992) extended by the direct measure of distress risk and idiosyncratic volatility. Portfolio formation, analysis of returns of distressed stock portfolios sorted in two ways. Time series analysis of distress risk. Fama-MacBeth (1973) cross-sectional tests conditional on the state of the market.	(1) Distress risk premium is real, time-varying dependent on the state of the market. (2) Distress risk is systematic, consisting of the market risk and of the nondiversifiable part of the idiosyncratic volatility. (3) In up markets stocks with high risk of default outperform sound stocks. In down markets flight towards quality leads to the decreasing interest of investors in distressed stocks and lower returns. (4) Size and BM effects are independent from the distress risk.	Dichev (1998), Griffin & Lemmon (2002), Vassalou & Xing (2004), Campbell, Hilscher & Szilagyi (2006), Agarwal & Taffler (2002), Garlappi, Shu & Yan (2006), Agarwal & Taffler (2006)
Vassalou and Xing (2004)	Computation of Default Likelihood Indicator (DLI) for individual firms in order to assess the effect of default risk on equity returns. Examination of whether default risk is systematic or not.	COMPUSTAT annual files with "Debt in One Year" and "Long-Term Debt" series for all companies from January 1971 to December 1999.	Merton's (1974) option pricing model. Tests of the ability of the DLI measure to capture default risk. Asset pricing tests of whether default risk is priced by means of the Generalized Methods of Moments (GMM) methodology of Hansen (1982).	(1) Size and B/M effects are intimately related to default risk. (2) Default risk is systematic and it is priced in the cross section of equity returns.	Fama & French (1993, 1996), Griffin & Lemmon (2002), Dichev (1998), Shumway (1996)

6.2 Implications for Theory and Practice

This research project was inspired by the empirical phenomenon of financial distress and contributes new insights to this exciting and complex field of financial research. I overcome the limitations of previous studies (estimation of the binary distress risk measure based on pure accounting information, adhering to the traditional definitions of systematic risk, ignoring idiosyncratic volatility, unconditional tests of distress risk factor in equity returns) and deliver a comprehensive theoretical framework of the dynamic corporate failure process which is supported empirically. Therefore, my research contributes to a better understanding of the mechanisms and processes of financial distress in different theoretical and practical domains:

For science

My research brings the scientific community a bit further in the understanding of what happens during the financial process, which sub-processes run at each stage of the adverse distress development, and why financially distressed stocks in certain circumstances can be attractive for investors with sound risk appetite. I contribute to asset pricing theory by identifying the nature of distress risk and answering positively the question of pricing this risk in equity returns. The developed distress risk cycle can be used both for the education purposes for the systematic understanding of the corporate financial distress phenomenon and as a basis for the development of still absent theoretical models of financial distress.

For practitioners

In fact, the whole academic discussion of this dissertation was triggered by practitioners and their observations regarding the discrepancy between the theory postulating that only market risk is priced in equity returns and practice where idiosyncratic risks have been increasing continuously for the last decade. The need for a theoretical explanation of why some types of investors, such as private equity houses, hedge funds, and other institutional investors, can outperform the market by ignoring market risk inspired me to pursue this direction of research. Practitioners can use the results of my empirical study to improve their knowledge about financial distress and distress risk. The financial world can particularly benefit in the following ways:

- Learn what happens with the value of the company in financial distress and how risk affects the deteriorating performance of the bankruptcy candidate.

- Learn which strategic and operational factors signal aggravation of financial situation in order to be able to establish an early-warning system to avoid the deepening of financial distress and bankruptcy.
- Profit from knowledge about the pricing of distressed stocks and be able to improve the strategy of investing in distressed securities.
- Adjust the cost of capital of distressed stocks for nondiversifiable idiosyncratic volatility for more accurate valuation of distressed companies.
- Consider the idiosyncratic volatility effect through the computation of excess returns.

6.3 Research Outlook

As any other empirical study, my research is not free of limitations, which can be regarded as a starting point for future research. The accessibility of data has allowed me to design this research for the U.S. market. Unfortunately, I did not have the chance to obtain the data for Continental Europe in order to test whether inferences drawn from my model also hold for different samples and markets. The model can also be extended to test the relationship between distress risk and returns under good and bad states of the economy. In my model, following Lakonishok et al. (1994), I assume that systematic risk indicates the sensitivity of individual stocks or portfolios of stocks to broad market movements. However, it is possible to define systematic risk in terms of the overall economy and of the sensitivity to macroeconomic shocks and to test whether the model works conditionally on the state of the economy.

As mentioned above, I develop an integral concept of financial distress, which can be used as a theoretical basis for developing more complex and sophisticated theoretical models. In this respect, one of the extensions of my model may be the development of theoretical foundations for an empirical test of the influence of distress risk on the proper form of financing distressed situations. Two issues are important in this context. First, financial distress implies that the value of a firm's equity in such a situation lies below the value of debt (so-called "underfunding"), and the firm does not have enough coverage to borrow additional debt through the bank. Thus, it has to look for alternative ways to obtain outside financing to enforce distressed restructuring. However, such financing can be very costly for some distressed firms, because *"problems of asymmetric information <in capital markets> affect financially unhealthy firms'*

ability to obtain outside finance" (Whited, 1992).[376] Therefore, the domination of the systematic or idiosyncratic element of distress risk may have a different impact on the choice of financing. Second, state of the art research on corporate financial distress and its resolution provides unsatisfying results about the success rate of distressed restructurings: the percentage of firms recovered from financial distress varies from 10% to 34% dependent on the sample selection, length of the time series, and overall economic conditions. Such a low incidence of success points out that the interrelation between financial distress and recovery has not yet been investigated thoroughly enough to provide constant results. I think that the awareness of the dependence of proper financing on the underlying type of risk may have a direct, enhancing effect on the value of a distressed company and reduce the length of time it spends in reorganization.

For corporate valuation, my findings that idiosyncratic volatility is priced in returns of distressed stocks means that the cost of capital usually calculated under the consideration of only systematic risk is permanently undervalued and many distressed stocks with a high proportion of idiosyncratic volatility are rather overvalued. The challenge for researchers in the field of corporate valuation is how to integrate idiosyncratic volatility into the discount rate for the valuation of distressed stocks.

In the area of asset pricing, researchers should be aware that the traditional definition of systematic risk in terms of the CAPM does not reflect current developments in financial markets and requires the redesigning of the traditional model to include the nondiversifiable idiosyncratic volatility. In this context, my model can be refined by new measures of systematic risk and idiosyncratic volatility.

In the field of portfolio management, the results of my empirical study may be used for the development of new strategies of active investing in distressed securities which significantly outperform the market.

I believe that corporate financial distress is still a very young field of theoretical and empirical research and invite theoreticians and practitioners to continue the examination of this challenging and promising area of modern finance.

[376] Whited (1992, 1428).

7 References

Acharya, V., Sundaram, R., John, K. (2004): On the Capital Structure Implications of Bankruptcy Codes. Working Paper, London Business School.

Agarwal, V., Poshakwale, S. (2006): Does Distress Risk Explain Size and Book-to-Market Effects? Working Paper, Cranfield University School of Management.

Agarwal, V., Taffler, R. (2002): The Distress Factor Hypothesis in Equity Returns: Market Mispricing or Omitted Variable? Working Paper, Cranfield School of Management.

Agarwal, V., Taffler, R. (2006): Does Financial Distress Drive the Momentum Anomaly? Working Paper, Cranfield School of Management.

Aharony, J., Jones, C., Swary, I. (1980): An Analysis of Risk and Return Characteristics of Corporate Bankruptcy Using Capital Market Data. In: The Journal of Finance, 35(4), 1001-1016.

Akerlof, G. (1970): "The Market for "Lemons": Quality Uncertainty and the Market Mechanisms. In: Quarterly Journal of Economics, 84(3), 488-500.

Akgun, A., Gibson, R. (2001): Recovery Risk in Stock Returns. In: Journal of Portfolio Management, 27(2), 22-31.

Almeida, H., Philippon, T. (2006): The Risk-Adjusted Cost of Financial Distress. Working Paper, Stern School of Business, New York University.

Altman, E. (1968): Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. In: The Journal of Finance, 22(4), 589-609.

Altman, E. (1983): Corporate Financial Distress and Bankruptcy, 1st Edition, New York: John Wiley & Sons.

Altman, E. (1984): The Success of Business Failure Prediction Models. In: Journal of Banking and Finance, 8, 171-198.

Altman, E. (2002): Bankruptcy, Credit Risk, and High Yield Bonds. Blackwell Publishers, Oxford.

Altman, E., Brenner, M. (1981): Information Effects and Stock Market Response to Signs of Firm Deterioration. In: Journal of Financial and Quantitative Analysis, 16(1), 35-51.

Altman, E., Hotchkiss, E. (2005): Corporate Financial Distress and Bankruptcy: Predict and Avoid Bankruptcy, Analyze and Invest in Distressed Debt. 3rd Edition, New Jersey: John Wiley & Sons.

Andrade, G., Kaplan, S. (1998): How Costly is Financial (Not Economic) Distress? Evidence from Highly Leveraged Transactions that Became Distressed. In: The Journal of Finance, 53(5), 1443-1493.

Ang, A., Hodrick, R., Xing, Y., Zhang, X. (2006): The Cross-Section of Volatility and Expected Returns. In: The Journal of Finance, 61(1), 259-299.

Ang, J., Chua, J. (1981): Corporate Bankruptcy and Job Losses Amnog Top Level Managers. In: Financial Management, 1, 70-74.

Ang, J., Chua, J., McConnell, J. (1984): The Administrative Costs of Corporate Bankruptcy: A Note. In: The Journal of Finance, 37(1), 219-226.

Arogyaswamy, K., Barker III, V., Yasai-Ardekani, M. (1995): Firm Turnaround: An Integrative Two-Stage Model, 32(4), 493-525.

Asquith, p., Gertner, R., Sharfstein, D. (1994): Anatomy of Financial Distress: An Explanation of Junk Bond Issuers. In: The Quarterly Journal of Economics, 109, 625-658.

Bab, A. (1991): Debt Tender Offer Techniques and the Problem of Coercion. In: Columbia Law Review, 91, 846-890.

Babenko, I. (2003): Optimal Capital Structure of the Firm in the Presence of Costs of Financial Distress. Working Paper, Haas School of Business, University of California at Berkeley.

Bagnoli, M., Lipman, B. (1988): Successful Takeovers without Exclusion. In: Review of Financial Studies, 1, 89-110.

Bali, T., Cakici, N. (2006): Idiosyncratic Volatility and the Cross-Section of Expected Returns. Working Paper, City University of New York.

Barberis, N., Huang, M. (2005): Stocks as Lotteries: The Implications of Probability Weighting for Security Prices. Working Paper, Yale International Center for Finance, Yale University.

Barker, V., Moon, M. (1994): Retrenchment: Cause of Turnaround or Consequence of Decline? In: Strategic Management Journal, 15(5), 395-405.

Beaver, W. (1966): Financial Ratios as Predictors of Failure. In: Journal of Accounting Research, 5, 71-111.

Bebchuk, L. (2002): Ex-Ante Costs of Violating Absolute Priority in Bankruptcy. In: The Journal of Finance, 57(1), 445-460.

Begley, J., Ming, J., Watts, S. (1996): Bankruptcy Classification Errors in the 1980s: An Empirical Analyis of Altman's and Ohlson's Models. In: Review of Accounting Studies, 1, 267-284.

Beneish, M., Press. E. (1993): Cost of Technical Violation of Accounting-Based Debt Covenants. In: The Accouting Review, 68, 233-257.

Berg, D. (2007): Bankruptcy Prediction by Generalized Additive Models. In: Applied Stochastic Models in Business and Industry, 23, 129-143.

Bernstein, P. (1985): Diversification: Old, New, and Not-So-New. In: Financial Analysts Journal, 3/4, 22-24.

Betker, B. (1995a): Management's Incentives, Equity's Bargaining Power and Deviations from Absolute Priority in Chapter 11 Bankruptcies. In: Journal of Business, 4, 161-183.

Betker, B. (1995b): Am Empirical Examination of Prepackaged Bankruptcy. In: Financial Management, 2, 3-18.

Betker, B. (1997): The Administrative Costs of Debt Restructurings: Some Recent Evidence. In: Financial Management, 26(4), 56-68.

Bharath, S., Shumway, T. (2004): Forecasting Default with KMV-Merton Model. Working Paper, University of Michigan.

Bibeault, D. (1982): Corporate Turnaround: How Managers Turn Losers into Winners. New York: McGraw-Hill Book Company.

Black, A., Fraser, P. (2004): The Value Premium: Rational, Irrational or Random. In: Managerial Finance, 30, 57-75.

Black, F., Cox, J. (1976): Valuing Corporate Securities: Some Effects of Bond Indenture Provisions. In: Journal of Finance, 31, 351-367.

Black, F., Sholes, M. (1973): The Pricing of Options and Corporate Liabilities. In: The Journal of Political Economy, 7, 637-654.

Blinder, A., Maccini, L. (1991): Taking Stock: A Critical Assessment of recent research on Inventories. In: Journal of Economic Perspectives, 5(1), 73-96.

Boissay, F. (2006): Credit Chains and Propagation of Financial Distress. Working Paper Series, No. 573, European Central Bank.

Bolton, P., Scharfstein, D. (1996): Optimal Debt Structure and the Number of Creditors. In: The Journal of Political Economy, 104(1), 1-25.

Boyer, B., Mitton, T., Vorkink, K. (2007): Idiosyncratic Volatility and Scewness: Time Series Relations and the Cross-Section of Expected Returns. Working Paper, Brigham Young University.

Branch, B. (2002): The Costs of Bankruptcy. In: International Review of Financial Analysis, 11, 39-57.

Brealey, R., Meyers, S. (2000): Principles of Corporate Finance. 6th Edition, McGraw-Hill, New York.

Breen, W., Korajczyk, R. (1995): On Selection Biases in Book-to-Market Tests of Asset Pricing Models. Working Paper, Kellogg Graduate School of Management, Northwestern University.

Brennan, M. (1975): The Optimal Number of Securities in a Risky Asset Portfolio When There Are Fixed Costs of Transacting: Theory and Some Empirical Results. In: Journal of Financial and Quantitative Analysis, 10, 483–496.

Bris, A., Welch, I., Zhu, N. (2006): The Costs of Bankruptcy: Chapter 7 Liquidation versus Chapter 11 Reorganization. In: The Journal of Finance, 61(3), 1253-1315.

Broadie, M., Chernov, M., Sundaresan, S. (2004): Oprimal Debt and Equity Values in the Presence of Chapter 7 and Chapter 11. Working Paper, Columbia Business School.

Brown, D. (1989): Claimholder Incentive Conflicts in Reorganization: The Role of Bankruptcy Law. In: The Review of Financial Studies 2(1), 109-123.

Brown, D., James, C., Mooradian, R. (1993): The Information Content of Distressed Restructurings Involving Public and Private Debt Claims. In: Journal of Financial Economics, 33, 93-118.

Brown, G., Kapadia, N. (2007): Firm-Specific Risk and Equity Market Development. In: Journal of Financial Economics, 84, 358-388.

Broxtermann, J. (2003): Vulture Investing. Master Thesis, University of St. Gallen.

Campbell, J. (2000): Asset Pricing at the Millennium. In: The Journal of Finance, 55(4), 1515-1568.

Campbell, J., Hilscher, J., Szilagyi, J. (2006): In Search of Distress Risk. Working Paper 12362, NBER Series.

Campbell, J., Lettau, M., Malkiel, B., Xu, Y. (2001): Have Individual Stocks Become More Volatile? An Empirical Exploration of Idiosyncratic Risk. In: The Journal of Finance, 56(1), 1-43.

Campbell, J., Lo, A., MacKinley, A. C. (1997): The Econometrics of Financial Markets. Princeton University Press, New Jersey.

Campbell, J., Taksler, G. (2002): Equity Volatility and Corporate Bond Yields. Discussion Paper Number 1945, Harvard Institute of Economic Research.

Carapeto, M. (2003): Is Bargaining in Chapter 11 Costly? Working Paper, Caas Business School.

Chan, A., Chui, A. (1996): An Empirical Re-Examination of the Cross-Section of Expected Returns: UK Evidence. In: Journal of Business Finance and Accounting, 23, 1435-1452.

Chan, K., Chen, N.-F. (1991): Structural and Returns Characteristics of Small and Large Firms. In: The Journal of Finance, 46, 1467-1484.

Chan, L., Hamao, Y., Lakonishok, J. (1991): Fundamental and Stock Returns in Japan. In: the Journal of Finance, 46, 1467-1484.

Charitou, A., Lambertides, N., Trigeorgis, L. (2004): Is the Impact of Default Risk on Stock Returns Systematic? An Option Pricing Explanation. Working Paper, University of Cyprus.

Chatterjee, S., Dhillon, U., Ramirez, G. (1995): Coercive Tender and Exchange Offers in Distressed High-Yield Debt Restructurings: An Empirical Analysis. In:Journal of Financial Economics, 38, 333-360.

Chatterjee, S., Dhillon, U., Ramirez, G. (1996): Resolution of Financial Distress: Debt Restructuring via Chapter 11, Prepackaged Bankruptcies, and Workouts. In: Financial Management, 25(1), 5-18.

Chen, G., Merville, L. (1999): An Analysis of the Underreported Magnitude of the Total Indirect Costs of Financial Distress. In: Review of the Quantitative Finance and Accounting, 13, 277-293.

Chen, J., Chollete, L. (2006): Financial distress and Idiosyncratic Volatility: An Empirical Investigation. Working Paper, Columbia Business School, Columbia University.

Chen, N., Roll, R., Ross, S. (1986): Economic Forces and the Stock Market. In: The Journal of Business, 59(3), 383-403.

Chua, C., Goh, J., Zhang, Z. (2006): Idiosyncratic Volatility Matters for the Cross-Section of Returns – in More Ways than One! Working Paper, Singapore Management University.

Cochrane, J. (1999): New Facts in Finance. In: Economic Perspectives, 23(3), 36-58.

Cochrane, J. (2001): Asset Pricing. Princeton University Press, New Jersey.

Coffee, J., Klein, W. (1991): Bondholder Coercion: The Problem of Constrained Choice in Debt Tender Offers and Recapitalization. Working Paper, Law School, Columbia University.

Collin-Dufresne, P., Goldstein, R. (2001): Do Credit Spreads Reflect Stationary Leverage Ratios? In: The Journal of Finance, 56, 1929-1957.

Crosbie, P., Bohn, J. (2003): Modeling Default Risk. White Paper, Moody's-KMV.

Cybinski, P. (2003): Doomed Firms: An Econometric Analysis of the Path to Failure. Ashgate Publishing Ltd., Aldershot.

D'Aveni, R. (1989): The Aftermath of Organizational Decline: A Longitudinal Study of the Strategic and Managerial Characteristics of Declining Firms. In: Academy of Management Journal, 32(3), 577-605.

Damodaran, A. (2002): Investment Valuation. 2nd Edition, New York: Wiley Finance.

Daniel, K. (2006): Discussion: In Search of Distress Risk and Default Risk, Shareholder Advantage, and Stock Returns. Presentation at the 3rd Credit Risk Conference, Moody's-NYU, NY.

Daniel, K., Titman, S. (1997): Evidence on the Characteristics of Cross-Sectional Variation in Stock Returns. In: The Journal of Finance, 52(1), 1-33.

Datta, S., Iskandar-Datta, M. (1995): Reorganization and Financial Distress: An Empirical Investigation. In: The Journal of Financial Research, 18(1), 15-32.

Davydenko, S. (2005): When Do Firms Default? A Study of the Default Boundary. Working Paper, London Business School.

Davydenko, S., Franks, J. (2004): Do Bankruptcy Codes Matter? A Study of Defaults in France, Germany, and the UK. Working Paper, London Business School.

Delianedis, G., Geske, R. (2005): Credit Risk and Risk Neutral Default Probabilities: Information About Rating Migrations and Defaults. Working Paper, Anderson School of Management at UCLA.

Dempsey, M., Drew M., and Veeraraghavan M. (2002): Idiosyncratic Risk and Australian Equity Returns. Working Paper, Griffith University.

Denis, D., Denis, D. (1995): Causes of Financial Distress Following Leveraged Recapitalizations. In: Journal of Financial Economics, 37, 129-157.

Diamond, D. (1984): Financial Intermediation and Delegated Monitoring. In: The Review of Economic Studies, 51(3), 393-414.

Diamond, D. (1993): Seniority and Maturity of Debt Contracts. In: Journal of Financial Economics, 33, 341-368.

Dichev, I. (1998): Is the Risk of Bankruptcy a Systematic Risk? In: the Journal of Finance, 53(3), 1131-1147.

Dimson, E. (1979): Risk Measurement When Shares Are Subject to Infrequent Trading. In: Journal of Financial Economics, 7, 197-226.

Dothan, M. (2006): Costs of Financial Distress and Interest Coverage Ratios. In: The Journal of Financial Research, 29(2), 147-162.

Duffie, G., Wang, K. (2004): Multi-Period Corporate Failure Prediction with Stochastic Covariates. NBER Working Paper.

Easterbrook, F., Fischel, D. (1983): Voting in Corporate Law. In: Journal od Law and Economics, 26(2), 395-427.

Eom, Y., Helwege, J., Huang, J.-Z. (2004): Structural Models of Corporate Bond Pricing: An Empirical Analysis. In: The Review of Financial Studies, 17(2), 499-544.

Eraslan, H. (2003): Corporate Bankruptcy Reorganizations: Estimates from a Bargaining Model. Working Paper, Wharton School, University of Pennsylvania.

European Distressed Debt: Market Outlook 2007. Survey, Cadwalader, Wickersham & Taft LLP and Rotschild.

Fama, E., French, K. (1992): The Cross-Section of Expected Stock Returns. In: The Journal of Finance, 47(2), 427-465.

Fama, E., French, K. (1993): Common Risk Factors in the Returns on Stocks and Bonds. In: Journal of Financial Economics, 33, 3-56.

Fama, E., French, K. (1995): Size and Book-to-Market Factors in Earnings and Returns. In: The Journal of Finance, 50(1), 131-155.

Fama, E., French, K. (1996): Multifactor Explanations of Asset Pricing Anomalies. In: The Journal of Finance, 51(1), 55-84.

Fama, E., French, K. (2004): New Lists: Fundamentals and Survival Rates. In: Journal of Financial Economics, 73(2), 229-269.

Fama, E., French, K. (2007): The Anatomy of Value and Growth Stock Returns. Working Paper, Chicago University.

Fama, E., MacBeth, J. (1973): Risk, Return, and Equilibrium: Empirical Tests. In: The Journal of Political Economy, 81, 607-636.

Fargher, N., Wilkins, M., Holder-Webb, L. (2001): Initial Technical Violations of Debt Covenants and Changes in Firm Risk. In: Journal of Business Finance and Accounting, 28(3) & (4), 465-480.

Ferguson, J. (2004): Distressed Debt Europe: The Next Frontier for US Distressed? In: High Yield Report, July 5, 8-9.

Fisher, T., Martel, J. (2005): The Irrelevance of Direct Bankruptcy Costs to the Firm's Financial Reorganization Decision. In: Journal of Empirical Legal Studies, 2(1), 151-169.

Fitzpatrick, J. (2004): An Empirical Investigation of the Dynamics of Financial Distress. Dissertation, The State University of New York at Buffalo.

Fletcher, J. (1997): An Examination of the Cross-Sectional Relationship of Beta and Return: UK Evidence. In: Journal of Economics and Business, 49, 211-221.

Foster, G. (1986): Financial Statement Analysis. Prentice-Hall, Engelwood Cliffs, N.J.

Franks, J., Sanzhar, S. (2003): Evidence on Debt Overhang from Distressed Equity Issues. Working Paper, London Business School.

Franks, J., Sussman, O. (2000): Resolving Financial Distress by Way of a Contract: Study of Small UK Companies. Working Paper, London Business School.

Franks, J., Torous, W. (1989): Am Empirical Investigation of U.S. Firms in Reorganization. In: The Journal of Finance, 44(3), 747-769.

Franks, J., Torous, W. (1994): A Comparison of Financial Recontracting in Distressed Exchanges and Chapter 11 Reorganizations. In: Journal of Financial Economics, 35, 349-370.

Fu, F. (2007): Idiosyncratic Risk and the Cross-Section of Expected Stock Returns. Working Paper, Singapore Management University.

Gardner, J. (1965): How to Prevent Organizational Dry Rot. In: Harper's Magazine, 10, 20-24.

Garlappi, L., Shu, T., Yan, H. (2006): Default Risk, Shareholder Advantage, and Stock Returns. Working Paper, University of Texas at Austin.

Gatfaoui, H. (2007): Idiosyncratic Risk, Systematic Risk and Stochastic Volatility: An Implementation of Merton's Credit Risk Valuation. Working Paper, Rouen School of Management.

Gertner, R., Scharfstein, D. (1990): A Theory of Workouts and the Effects of Reorganization Law. In: The Journal of Finance, 46(4), 1189-1222.

Geske, R. (1977): The Valuation of Corporate Liabilities as Compound Options. In: Journal of Financial and Quantitative Analysis, 12, 541-552.

Gestel, T., Baesens, B., Suykens, J., Van den Poel, D., Baestaens, D., Willekens, M. (2006): Bayesian Kernel Based Classification for Financial Distress Detection. In: European Journal of Operational Research, 172(3), 979-1003.

Gharghori, P., Chan, H., Faff, R. (2006): Investigating the Performance of Alternative Default-Risk Models: Option-Based Versus Accounting-Based Approaches. In: Australian Journal of Management, 31(2), 207-234.

Giesecke, K. (2005): Default and Information. In: Journal of Economic Dynamics and Control, Available Online 6 October, 1-23.

Gilbert, L., Menon, K., Schwartz, K. (1990): Predicting Bankruptcy for Firms in Financial Distress. In: Journal of Business Finance & Accounting, 17, 161-171.

Gilson, S. (1989): Management Turnover and Financial Distress. In: Journal of Financial Economics, 25, 241-262.

Gilson, S. (1990): Bankruptcy, Boards, and Blockholders. In: Journal of Financial Economics, 27, 315-355.

Gilson, S. (1995): Investing in Distressed Situations: A Market Survey. In: Financial Analysts Journal, 8-27.

Gilson, S. (1997): Transaction Costs and Capital Structure Choice. In: The Journal of Finance, 52(1), 161-196.

Gilson, S., John, K., Lang, L. (1990): Troubled Debt Restructurings: An Empirical Analysis. In: The Journal of Finance, 48(2), 425-458.

Gless, S. (1996): Unternehmensbewertung: Grundlagen – Strategien – Massnahmen. Wiesbaden Deutscher Universitäts-Verlag.

Goetzmann, W., Kumar, A. (2007): Why Do Individual Investors Hold Under-Diversified Portfolios? Working Paper, Yale University.

Golec, J., Tamarkin, M. (1998): Bettors Love Skewness, Not Risk, at the Horse Track. In: Journal of Political Economy, 106, 205–225.

Gordon, M. J. (1971): Towards a Theory of Financial Distress. In: The Journal of Finance, 26(2), 347-356.

Goyal, A., Santa-Clara, P. (2003): Idiosyncratic Risk Matters! In: The Journal of Finance, 58(3), 975-1007.

Graham, C., Litan, R., Sukhtankar, S. (2002): The Bigger They Are, The Harder They Fall: An Estimate of the Costs of the Crisis in Corporate Governance. Working Papers, The Brookings Institution.

Grice, J., Ingram, R. (2001): Tests of the Generalizability of Altman's Bankruptcy Prediction Model. In: Journal of Business Research, 54(1), 53-61.

Griffin, J., Lemmon, M. (2002): Book-to-Market Equity, Distress Risk, and Stock Returns. In: The Journal of Finance, 57, 2317-2336.

Grossman, S., Hart, O. (1980): Disclosure Laws and Takeover Bids. In: The Journal of Finance, 35(2), 323-334.

Hamada, R. (1972): The Effect of the Firm's Capital Structure on the Systematic Risk of Common Stocks. In: The Journal of Finance, 27, 435-452.

Hambrick, D., D'Aveni, R. (1988): Large Corporate Failure as Downward Spiral. In: Administrative Science Quarterly, 33, 1-23.

Hannan, M., Freeman, J. (1984): Structural Inertia and Organizational Change. In: American Sociological Review, 49(2), 149-164.

Hart, O. (2001): Financial Contracting. In: Journal of Economic Literature, 39, 1079-1100.

Hart, O., Moore, J. (1995): Debt and Seniority: An Analysis of the Role of Hard Claims in Constraining Management. In: The American Economic Review, 85(3), 567-585.

Haugen, R. (1995): The New Finance: The Case Against Efficient Markets. Prentice Hall, Engelwood Cliffs, N.J.

Haugen, R., Senbet, L. (1980): Bankruptcy and Agency Costs: Their Significance to the Theory of Optimal Capital Structure. In: Journal of Financial and Quantitative Analysis, 23(1), 27-38.

Hayes, R., Hillegeist, S. (2006): Financial Distress Risk and CEO Compensation Contracts. Working Paper, Davit Eccles School of Business, University of Utah.

Hege, U. (2003): Workouts, Court-Supervised Reorganization and the Choice between Piblic and Private Debt. In: Journal of Corporate Finance, 9, 233-269.

Hendel, I. (1996): Competition under Financial Distress. In: The Journal of Industrial Economics, 54(3), 309-324.

Hill, N., Perry, S. (1996): Evaluating Firms in Financial Distress: An Event History Analysis. In: Journal of Applied Business Research, 12(3), 60-71.

Hillegeist, S., Keating, E., Lundstedt, K. (2004): Assessing the Probability of Bankruptcy. In: Review of Accounting Studies, 9, 5-34.

Hirshleifer, D. (2001): Investor Psychology and Asset Pricing. In: The Journal of Finance, 56(4), 1533-1597.

Hirt, G., Pandher, G.S. (2005): Idiosyncratic Risk & Return Across S&P500 Stocks. Working Paper Kellstadt Graduate School of Business, DePaul University.

Ho, R., Strange, R., Piesse, J. (2000): CAPM Anomalies in the Pricing of Equity: Evidence from the Hong Kong market. In: Applied Economics, 32, 1629-1636.

Hofer, C. (1980): Turnaround Strategies. In: Journal of Business Strategy, 1, 19-31.

Hopwood, W., McKeown, J., Mutchler, J. (1994): A reexamination of Auditor versus Model Accuracy Within the Context of the Going-Concern Opinion Decision. In: Contemporary Accounting Research, 10, 409-431.

Hull, J., Nelken, I., White, A. (2004): Merton's Model, Credit Risk, and Volatility Skews. Working Paper, University of Toronto.

Hussain, I., Toms, S., Diacon, S. (2002): Financial Distress, Market Anomalies and Single and Multi-Factor Asset Pricing Models: New Evidence. Working Paper, University of Nottingham.

Igbal, Z., Shetty, S. (1995): Layoffs, Stock Price, and Financial Condition of the Firm. In: Journal of Applied Business Research, 11(2), 67-72.

Ingersoll, J. (1987): Theory of Financial Decision Making. Rottman & Littlefield Publishers, Inc.

Interview with Hugh McDonald, a Partner of Allen&Avery (2006). In: Bank Loan Report, 2, 1.

Isakov, D. (1999): Is Beta Still Alive? Conclusive Evidence from the Swiss Stock Market. In: The European Journal of Finance, 5, 202-212.

James, C. (1996): Bank Debt Restructurings and the Composition of Exchange Offers in Financial Distress. In: The Journal of Finance, 41(2), 711-727.

Jay, S. (1993): A Systematic Approach to Risk. In: Accountancy, 111(1195), 72-73.

Jensen, M. (1989): Eclipse of the Public Corporation. In: Harvard Business Review, 5, 61-74.

Jensen, M., Meckling, W. (1976): Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. In: The Journal of Financial Economics, 305-360.

Jiang, X., Lee, B.-S. (2006): The Dynamic Relation Between Returns and Idiosyncratic Volatility. In: Financial Management, 35(2), 43-65.

John, K. Lang, L., Netter, J. (1992): The Voluntary Restructuring of Large Firms in Response to Performance Decline. In: The Journal of Finance, 47(3), 891-917.

Johnson, D. (1989): The Risk Behavior of Equity of Firms Approaching Bankruptcy. In: The Journal of Financial Research, 12(1), 33-50.

Johnson, T. (2004): Forecast Dispersion and the Cross Section of Expected Returns. In: The Journal of Finance, 59, 1957-1978.

Jones, F. (1987): Current Techniques in Bankruptcy Prediction. In: Journal of Accounting Literature, 6, 131-164.

Kahan, M., Tuckman, B. (1993): Do Bondholders Lose From Junk Bond Covenant Changes? In: Journal of Business, 66, 499-516.

Kahl, M. (2001) Financial Distress as a Selection Mechanism: Evidence from the United States. Working Paper, Anderson School, University of California, Los Angeles.

Kahl, M. (2002): Economic Distress, Financial Distress, and Dynamic Liquidation. In: he Journal of Finance, 57(1), 135-168.

Kalckreuth, U. (2006): Wrecking Behavior and the Overpricing of Distressed Companies. Working Paper, Economic Research Center, Deutsche Bank.

Kaplan, S., Stein, J. (1993): The Evolution of Buyout Pricing and Financial Structure in the 1980s. In: The Quarterly Journal of Economics, May, 313-357.

Karels, G., Prakash, A. (1987): Multivariate Normality and Forecasting Business Bankruptcy. In: Journal of Business Finance and Accounting, 14(4), 573-593.

Kealhofer, S. (2003): Quantifying Credit Risk I: Default Prediction. In: Financial Analyst Journal, 1, 30-44.

Kealhofer, S., Bohn, J. (2001): Portfolio Management of Default Risk. White Paper, KMV.

Keasey, K., Watson, R. (1991): Financial Distress Prediction Models: A Review of Their Usefulness. In: British Journal of Management, 2, 89-102.

Kennedy, R. (2000): The Effect of Bankruptcy Filings on Rivals' Operating Performance: Evidence from 51 Large Bankruptcies. In: International Journal of Economics and Business, 7(1), 5-25.

Kothari, S., Shanken, J., Sloan R. (1995): Another Look at the Cross-Section of Expected Stock Returns. In: The Journal of Finance, 50(1), 185-224.

KPMG Distressed Debt Investment and Exit Strategies Survey. KPMG Germany, 2007.

Kraus, K., Haghani, S. (2004): Krisenverlauf und Krisenbewältigung – der Aktuelle Stand. In: Die Unternehmenskrise als Chance, Berlin: Springer Verlag, 13-37.

Kudla, R. (2004): Finanzierung in der Sanierung: Situative Strukturierung der Finanzierung von Krisenunternehmen. Dissertation der Universität Rostock.

Laitinen, E., Laitinen, T. (1998): Cash Management Behavior and Failure prediction. In: Journal of Business Finance and accounting, 25(7&8), 893-919.

Lakonishok, J., Shleifer, A, Vishny, R. (1986): Systematic Risk, Total Risk, and Size as Determinants of Stock Market Returns. In: The Journal of Banking and Finance, 10, 115-132.

Lang, L., Stulz R. (1992): Contagion and Competitive Intra-Industry Effects of Bankruptcy Announcements. In: Journal of Financial Economics, 8, 45-60.

Leland, H., Toft, K. (1996): Optimal Capital Structure, Endogenous Bankruptcy, and the term Structure of Credit Spreads. In: The Journal of Finance, 51, 987-1019.

Levy, H. (1978): Equilibrium in an Imperfect Market: A Constraint on the Number of Securities in the Portfolio. In: The American Economic Review, 68(4), 643-658.

Lie, E., Lie, H., McConnell, J. (2001): Debt-Reducing Exchange Offers. In: Journal of Corporate Finance, 7, 179-207.

Lilti, J., Montagner, R. (1998): Beta, Size, and Return: A Study on the French Stock Exchange. In: Applied Financial Economics, 8, 13-20.

Lintner, J. (1965): The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets. In: Ther Review of Economics and Statistics, 2, 13-37.

Lo, A., MacKinley A.C. (1990): Data-Snooping Biases in Tests of Financial Asset Pricing Models. In: The Review of Financial Studies, 3(3), 431-467.

Lo, A., MacKinley, C. (1988): Stock Market Prices Do Not Follow Random Walks: Evidence from a Simple Specification Test. In: Review of Financial Studies, 1, 41-66.

Longhofer, S., Carlstrom, C. (1995): Absolute Priority Rule Violations in Bankruptcy. In: Economic Review, 4, 21-30.

Longstaff, F., Schwarz, E. (1995): A Simple Approach to Valuing Risky Fix and Floating Rate Debt. In: The Journal of Finance, 50, 789-819.

LoPucki, L., Doherty, J. (2004): The Determinants of Professional Fees in Large Bankruptcy Reorganization Cases. In: Journal of Empirical Legal Studies, 1(1), 111-141.

Lubben, S. (2000): The Direct Costs of Corporate Reorganization: An Empirical Examination of Professional Fees in Large Chapter 11 Cases. In: American Bankruptcy Law Journal, 74, 509-522.

Ma, C., Kao, G., Pace, D. (1997): Understanding Distressed Exchange Offers. In: Journal of Investing, 6(3), 61-69.

Makridakis, S. (1991): What Can We Learn from Corporate Failure? In: Long Range Planning, 24(4), 115-126.

Maksimovic, V., Phillips, G. (1998): Asset Efficiency and Reallocation Decisions of Bankrupt Firms. In: The Journal of Finance, 53(5), 1495-1532.

Malkiel, B., Xu, Y. (1997): Risk and Return Revisited. In: Journal of Portfolio Management, 23(3), 9-14.

Malkiel, B., Xu, Y. (2003): Investigating the Behavior of Idiosyncratic Volatility. In: Journal of Business, 76(4), 613-644.

Malkiel, B., Xu, Y. (2006): Idiosyncratic Risk and Security Returns. Working Paper, the University of Texas at Dallas.

Markowitz, H. (1959): Portfolio Selection: Efficient Diversification of Investments. John Wiley & Sons, NY.

McConnel, J., Servaes, H. (1991): The Economics of Prepackaged Bankruptcy. In: The Journal of Applied Corporate Finance, 4(2), 93-97.

McEnally, R., Todd, R. (1993): Systematic Risk Behavior of Financially Distressed Firms. In: Quarterly Journal of Business and Economics, 32(3), 3-19.

Mertens, E. (2002): The CAPM and Regression Tests. Lecture Notes for Portfolio Theory and Capital Markets, University of Basel.

Merton, R. (1974): On the Pricing of Corporate Debt: The Risk Structure of Interest Rates. In: The Journal of Finance, 29, 449-470.

Merton, R. (1987): A Simple Model of Capital Market Equilibrium with Incomplete Information. In: The Journal of Finance, 42(3), 483-510.

Miller, D. (1977): Common Syndromes of Business Failure. In: Business Horizons, 11, 43-53.

Mitchell, L. (1990): The Fairness Rights of Corporate Bondholders. In: New York University Law Review, 65, 1165-1229.

Mitton, T., Vorkink, K. (2007): Equilibrium Under-Diversification and the Preference for Skewness. In: Review of Financial Studies, 20, 1255–1288.

Moody's Investor Service (2000): Moody's Approach to Evaluating Distressed Exchanges. White Paper, July 2000.

Moody's Investor Service (2007): Corporate Default and Recovery Rates, 1920-2006. Special Comment.

Moody's Investor Service (2007): European Corporate Default and Recovery Rates, 1985-2006. Special Comment.

Mooradian, R. (1994): The Effect of Bankruptcy Protection on Investment: Chapter 11 as a Screening Device. In: The journal of Finance, 49(4), 1403-1430.

Mooradian, R., Ryan, H. (2005): Out-of-Court Restructurings and the Resolution of Financial Distress; Section 3(a)(9) Compared to Investment-Bank-Managed Exchange Offers. In: Journal of Business, 78(4), 1593-1624.

Morelli, D. (2006): Beta, Size, Book-to-Market Equity and Returns: A Study Based on UK Data. In: Journal of Multinational Financial Management, available online 15 December 2006.

Moskowitz, T., Vissing -Jorgensen, A. (2002): The Returns to Entrepreneurial Investment: A Private Equity premium Puzzle? In: The American Economic Review, 92, 745-778.

Mossin, J. (1966): Equilibrium in a Capital Asset Market. In: Econometrica, 34, 261-276.

Mossmann, C., Bell, L., Schwarz, M., Turtle, H. (1998): An Empirical comparison of Bankruptcy Models. In: Financial Review, 33(2), 35-54.

Mueller, R. (1986): Krisenmanagement in der Unternehmung: Vorgehen, Massnahmen und Organisation, 2. Auflage, Frankfurt am Main.

Myers, S., Majluf, N. (1984): Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have. In: Journal of Financial Economics, 13(2), 187-221.

Newey, W., West, K. (1987): A Simple, Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix. In: Econometrica, 55(3), 703-708.

Nosal, E. (1998): Financial Distress and Underemployment. In: The Review of Economic Studies, 65(4), 817-845.

Nothardt, F. (2001): Corporate Turnaround and Corporate Stakeholders: An Empirical Examination of the Determinants of Corporate Turnaround in Germany with a Focus on Financial Stakeholder Theory. Dissertation of the University of St. Gallen, zugel. Dissertation Nr. 2465, St. Gallen.

Nwogugu, M. (2004): Corporate Governance and Risk: The Externalities/Governmental Influence Theories of the Corporate Entity and Financial Distress. Working Paper.

Ofek, E. (1993): Capital Structure and Firm response to Poor Performance: An Empirical Analysis. In: Journal of Financial Economics, 34, 3-30.

Ohlson, J. (1980): Financial Ratios and Probabilistic Prediction of Bankruptcy. In: Journal of Accounting Research, 18(1), 109-131.

Opler, T., Titman, S. (1994): Financial Distress and Corporate Performance. In: The Journal of Finance, 49(3), 1015-1040.

Pettengill, G., Sundaram, S., Mathur, I. (1995): The Conditional Relation between Beta and Returns. In: Journal of Financial and Quantitative Analysis, 30(1), 101-116.

Pettengill, G., Sundaram, S., Mathur, I. (2002): Payment for Risk: Constant Beta Vs. Dual-Beta Models. In: The Financial Review, 37, 123-136.

Pindado, J., Rodrigues, L. (2004): Parsimonious Models of Financial Insolvency in Small Companies. In: Small Business Economics, 22, 51-66.

Pindado, J., Rodrigues, L. (2005): Determinants of Financial Distress Costs. In: Financial Markets and Portfolio Management, 19(4), 343-359.

Platt, H., Platt, M. (2002): Predicting Corporate Financial Distress: Reflections on Choice-Based Sample Bias. In: Journal of Economics and Finance, 26(2), 184-199.

Polkovnichenko, V. (2005): Household Portfolio Diversification: A Case for Rank-Dependent Preferences. In: Review of Financial Studies, 18, 1467–1502.

Purnanandam, A. (2005): Financial Distress and Corporate Risk Management: Theory & Evidence. Working Paper, Ross School of Business, University of Michigan.

Quantitative Methods for Default Probability Estimation – A First Step Towards Basel II (2003). White Paper, I-flex Solutions Limited.

Reilly, F., Brown, K. (2003): Investment Analysis and Portfolio Management. 7th Edition. Thomson South-Western.

Reilly, F., Wright, D., Altman, E. (1998): Including Defaulted Bonds in the Capital Market Asset Spectrum. In: The Journal of Fixed Income, 8(3), 33-48.

Reisz, A., Perlich, C. (2004): A Market-Based Framework for Bankruptcy Prediction. Working Paper, City University of New York.

Roe, M. (1987): Voting Prohibition in Bond Workouts. In: The Yale Law Journal, 97(2), 232-279.

Roll, R., Ross, S. (1984): The Arbitrage Pricing Theory Approach to Strategic Portfolio Planning. In: Financial Analysts Journal, 3, 14-26.

Ross, S., Westerfield, R., Jaffe, J. (2002): Corporate Finance, 6. Auflage, McGraw-Hill, Boston et al.

Roundtable on Preserving Value in Chapter 11 of the University of Rochester (2004). In: Journal of Applied Corporate Finance, 16(2-3), 8-28.

Rubinstein, M. (1973): Corporate Financial Policy in Segmented Securities Markets. In: Journal of Financial and Quantitative Analysis, 12, 749-761.

Russel, P., Branch, B., Torbey, V. (1999): Market Valuation of Bankrupt Firms: Is There an Anomaly? In: The Quarterly Journal of Business and Economics, 38(2), 55-74.

Salerno, T., Hansen, C. (1991): A Prepackaged Bankruptcy Strategy. In: The Journal of Business Strategy, 1-2, 36-41.

Scherrer, S. (1988): From Warning to Crisis: A Turnaround Primer. In: Management Review, 77(9), 30-36.

Schwartz, A. (1993): Bankruptcy Workouts and Debt Contracts. In: Journal of Law and Economics, 36(1.2), 595-632.

Scott, J. (1981): The Probability of Bankruptcy: A Comparison of Empirical Predictions and Theoretical Models. In: Journal of Banking & Finance, 9, 317-344.

Sharpe, W. (1964): Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk. In: The Journal of Finance, 19(3), 425-442.

Shleifer, A., Vishny, R. (1992): Liquidation Values and Debt Capacity: A Market Equilibrium Approach. In: The Journal of Finance, 47(4), 1343-1366.

Shumway, T. (2001): Forecasting Bankruptcy More Accurately: A Simple Hazard Model. In: The Journal of Business, 74(1), 101-124.

Shumway, T., Wartner, V. (1999): The delisting Bias in CRSP's NASDAQ Data and its implications for the Size Effect. In: The Journal of Finance, 44(6), 2361-2379.

Singer, I., Burke, J. (2004): The European Distressed and Defaulted Debt Market: Te Market and Opportunities. Working Paper, NYU Stern School of Business.

Smith, D., Strömberg, P. (2005): Maximizing the Value of Distressed Assets: Bankruptcy Law and the Efficient Reorganization of Firms. In: Systemic Financial Distress: Containment and Resolution, Luc Laeven (ed.), Cambridge University Press, 232-275.

Soederlind, P. (2005): PhD Lecture Notes in Empirical Finance. University of St. Gallen.

Spremann, K. (2005): Rendite und Wirtschaftsentwicklung. In: Versicherungen im Umbruch, Springer Verlag Berlin Heidelberg, 2005, 225-250.

Standard & Poor's COMPUSTAT User's Guide (2003). McGraw-Hill Companies, Inc.

Sundaram, R. (2006): Structural Models: An Overview. Presentation at the 3rd Credit Risk Conference, Moody's-NYU, NY.

Taffler, R. (1983): The Assessment of Company Solvency and Performance Using a Statistical Model. In: Accounting and Business Research, 15, 295-307.

Taffler, R. (1984): Empirical Models for the Monitoring of UK Corporations. In: journal of Banking and Finance, 8, 199-227.

Tashjian, E., Lease, R., McConnell, J. (1996). In: Journal of Financial Economics, 40, 135-162.

Turetsky, H. (2003): When a Troubled Firm is Worth Buying. In: Mergers & Acquisitions: The Dealmaker's Journal, 38(7), 23-30.

Turetsky, H., McEven, R. (2001): An Empirical investigation of Firm Longevity: A Molde of the Ex Ante Predictors of Financial Distress. In: Review of Quantitative Finance and Accounting, 16, 323-343.

Uhrig-Homburg, M. (2002): Valuation of Defaultable Claims –A Survey. In: Schmalenbach Business Review, 54, 24-57.

Uhrig-Homburg, M. (2005): Cash-Flow Shortage as an Endogenous Bankruptcy Reason. In: Journal of Banking and Finance, 29, 1509-1534.

Vaihekoski, M. (2004): Portfolio Construction for Tests of Asset Pricing Models. In: Financial Markets, Institutions and Instruments, 13(1), 1-39.

Vassalou, M., Xing, Y. (2004): Default Risk in Equity Returns. In: The Journal of Finance, 59(2), 831-868.

Vayanos, D. (2004): Flight to Quality, Flight to Liquidity, and the Pricing of Risk. Working Paper 10327, NBER Working Paper Series.

Ward, T., Foster, B. (1997): A Note on Selecting a Response Measure for Financial Distress. In: Journal of Business Finance and Accounting, 24(6), 869-879.

Warner, J. (1977): Bankruptcy Costs: Some Evidence. In: The Journal of Finance, 32(2), 337-347.

Weckbach, S. (2004): Corporate Financial Distress: Unternehmensbewertung bei Finanzieller Enge. Dissertation, University of St. Gallen.

Weiss, L. (1990): Bankruptcy Resolution: Direct Costs and Violation of Priority of Claims. In: Journal of Financial Economics, 27, 285-314.

Weitzel, W., Jonsson, E. (1989): Decline in Organizations: A Literature Integration and Extention. In: Administrative Science Quarterly, 34, 91-109.

Werner, J. (1997): Diversification and Equilibrium in Securities Markets. In: Journal of Economic Theory, 75, 89-103.

Wertheim, P., Robinson, M. (2004): Markets Reactions to Company Layoffs: Evidence on the Financial Distress Versus Potential Benefit Hypothesis and the Effect of Predisclosure Information. In: Journal of Applied Business Research, 20(1), 51-62.

Whitaker, R. (1999): The Early Stages of Financial Distress. In: Journal of Economics and Finance. 23(2), 123-133.

White, M. (1983): The Behavior of Firms in Financial Distress: Bankruptcy Costs and the New Bankruptcy Code. In: The Journal of Finance, 38(2), 477-488.

White, M. (1994): Corporate Bankruptcy as a Filtering Devise: Chapter 11 Reorganizations and Out-of-Court Restructurings. In: Journal of Law, Economics and Organization, 10(2), 268-295.

Whited, T. (1992): Debt, Liquidity Constraints, and Corporate Investment: Evidence from Panel Data. In: The Journal of Finance, 47(4), 1425-1460.

Wruck, K. (1990): Financial Distress, Reorganization, and Organizational Efficiency. In: Journal of Financial Economics, 27, 419-444.

Yang, H. (2003): A Firm's Choice of Methods for Reducing Financial Distress. Working Paper, Kansas State University.

Yost, K. (2002): The Choice Among Traditional Chapter 11, Prepackaged bankruptcy, and Out-of-Court Restructuring. Working Paper, School of Business, University of Wisconsin-Madison.

Zavgren, C. (1983): The Prediction of Corporate Failure: The State of the Art. In: Journal of Accounting Literature, 2, 1-38.

Zavgren, C. (1985): Assessing the Vulnerability to Failure of American Industrial Firms: A Logistic Analysis. In: Journal of Business, Finance and Accounting, 12(1), 19-45.

Zmijewski, M. (1984): Methodological Issues Related to the Estimation of Financial Distress Prediction Models. In: Journal of Accounting Research, 22, 59-82.

Zurada, J. (1998): Neural Networks Versus Logit Regression Models for Predicting Financial Distress Response Variables. In: The Journal of Applied business Research, 15(1), 21-28.

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